agriculture

MDPI

Article

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

Maria Bampasidou [1,*], Michael D. Kaller [2] and Shaun M. Tanger [3]

[1] Agricultural Economics and Agribusiness Department, Louisiana State University Agricultural Center, Baton Rouge, LA 70803, USA
[2] School of Renewable Natural Resources, Louisiana State University Agricultural Center, Baton Rouge, LA 70808, USA; mkalle1@lsu.edu
[3] Coastal Research and Extension Center, Mississippi State University, Biloxi, MS 39532, USA; smt489@msstate.edu
* Correspondence: mbampasidou@agcenter.lsu.edu; Tel.: +1-225-578-2367

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

Citation: Bampasidou, M.; Kaller, M.D.; Tanger, S.M. Stakeholder's Risk Perceptions of Wild Pigs: Is There a Gender Difference? *Agriculture* **2021**, *11*, 329. https://doi.org/10.3390/agriculture11040329

Received: 8 March 2021
Accepted: 1 April 2021
Published: 8 April 2021

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	$n = 817$	$n = 224$	$\chi^2(5) = 62.2112$
25–34	1.35	0.00	$p = 0.000$
35–44	4.77	2.23	
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	$n = 812$	$n = 220$	$\chi^2(5) = 2.0341$
White	94.70	95.91	$p = 0.844$
Hispanic	0.25	0.45	
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	n = 647	n = 172	$\chi^2(7) = 79.7726$
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	n = 820	n = 220	$\chi^2(4) = 12.6971$
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	n = 823	n = 223	$\chi^2(8) = 62.6700$
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	n = 816	n = 220	$\chi^2(5) = 18.3457$
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	5.09×10^{-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.

	A					
	1	**2**	**3**	**4**	**5**	
	Strongly Disagree	**Somewhat Disagree**	**Neither Disagree nor Agree**	**Somewhat Agree**	**Strongly Agree**	**Mean**
Production Activities						
Interfere with my farming operations. n = 517	13.35%	4.84%	23.60%	22.24%	35.98%	3.63
Take time away from activities that would be spent in managing farm operations. n = 522	14.94%	4.21%	27.20%	25.10%	28.54%	3.48
Have caused damage to my crops in the past year. n = 526	20.34%	3.61%	20.72%	17.68%	37.64%	3.48

Table 5. *Cont.*

	A					
	1	**2**	**3**	**4**	**5**	
	Strongly Disagree	**Somewhat Disagree**	**Neither Disagree nor Agree**	**Somewhat Agree**	**Strongly Agree**	**Mean**
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**	
	Strongly Disagree	**Somewhat Disagree**	**Neither Disagree nor Agree**	**Somewhat Agree**	**Strongly Agree**	**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.

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

Table 6. *Cont.*

	Chi-Square *p*-Value	T-Test *p*-Value
Health and Safety		
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.	1.164×10^{-2} ***	0.035 **
Transmit diseases harmful to wildlife.	5.063×10^{-3} ***	0.022 **
Transmit disease harmful to farm animals.	6.040×10^{-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.	1.105×10^{-3} ***	0.209
Are being properly managed by FEDERAL wildlife officials.	4.503×10^{-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	5.17×10^{-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 attune 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.

Author Contributions: Conceptualization, M.B. and S.M.T.; methodology, M.B.; software, M.B.; validation, M.B. and S.M.T.; formal analysis, M.B.; investigation, M.B., M.D.K. and S.M.T.; resources, M.B., M.D.K. and S.M.T.; data curation, M.D.K. and S.M.T.; writing—original draft preparation, M.B.; writing—review and editing, M.D.K. and S.M.T.; visualization, M.B.; supervision, S.M.T.; project administration, M.D.K. and S.M.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: This study has received approval from the Louisiana State University Institutional Review Board and received approval number E8897. For more information please contact Dr. Keenan (mkeenan@agctr.lsu.edu).

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.

Acknowledgments: The authors wish to thank. Philip H. Elzer for valuable direction on the project and manuscript. We would also like to thank the several Anonymous reviewers and editor(s) for their contributions during the review process, they are greatly appreciated. Authors would like to thank Xian Guan and Thanos Gentimis with the Department of Experimental Statistics for providing research assistance with analyzing categorical data. Authors appreciate the input and constructive comments provided by Kurt Guidry at Louisiana State University. We are also thankful to the number of researchers who we drew upon while developing our survey instrument; Nan Huff, Mike Mengak, Don Reed.

Conflicts of Interest: The authors declare no conflict of interest.

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	Women	Test for Gender Differences
Hogs currently present	n = 822	n = 226	
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	n = 787	n = 222	
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	n = 820	n = 223	
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	n = 631	n = 135	
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%	

References

1. Konig, H.J.; Kiffner, C.; Kramer-Schadt, S.; Furst, C.; Keulig, O.; Ford, A.T. Human-wildlife coexistence in a changing wordl. *Conserv. Biol.* **2020**, *34*, 786–794. [CrossRef] [PubMed]
2. Trevers, A.; Wallace, R.B.; Naughton-Trevers, L.; Morales, A. Co-managing human-wildlife conflicts: A Review. *Hum. Dimens. Wildl.* **2006**, *11*, 383–396. [CrossRef]
3. Gore, M.L.; Knuth, B.A.; Scherer, C.W.; Curtis, P.D. Evaluating a conservation investment designed to reduce human-wildlife conflict. *Conserv. Lett.* **2008**, *1*, 136–145. [CrossRef]
4. Rutten, A.; Casaer, J.; Strubbe, D.; Leirs, H. Agricultural and landscape factors related to increasing wild boar agricultural damage in a highly anthropogenic landscape. *Wildl. Biol.* **2020**, *1*. [CrossRef]
5. Gore, M.L.; Knuth, B.A.; Curtis, P.D.; Shanahan, J.E. Education programs for reducing American black bear-human conflict: Indicators of success? *Ursus* **2006**, *17*, 75–80. [CrossRef]
6. Bienen, L.; Tabor, G. Applying an ecosystem approach to brucellosis control: Can an old conflict between wildlife and agriculture be successfully managed? *Front. Ecol. Environ.* **2006**, *4*, 319–327. [CrossRef]
7. Zinn, H.C.; Pierce, C.I. Values, gender, and concern about potentially dangerous wildlife. *Environ. Behav.* **2002**, *34*, 239–256. [CrossRef]
8. Butler, S.M.; Huff, E.S.; Snyder, S.A.; Butler, B.J.; Tyrell, M. The role of gender in management behaviors on family forest lands in the United States. *J. For.* **2018**, *116*, 32–40. [CrossRef]
9. Gustafson, P.E. Gender differences in risk perceptions: Theoretical and methodological perspectives. *Risk Anal.* **1998**, *18*, 805–811. [CrossRef]
10. Anthony, M. Gender Differences and Citizen Participation in Wildlife Related Decision-Making Processes. HDRU Series No. 02-5. Ph.D. Thesis, Cornell University, Ithaca, NY, USA, 2002.
11. Gore, M.L.; Kahler, J.S. Gendered risk perceptions associated with human-wildlife conflict: Implications for participatory conservation. *PLoS ONE* **2012**, *7*, e32901. [CrossRef]
12. U.S. Census of Agriculture. *2017 Census of Agriculture Highlights, Female Producers*; US Department of Agriculture, National Agricultural Statistics Service: Washington, DC, USA, 2017.
13. Kellert, S.R.; Berry, J.K. Attitudes, knowledge, and behaviors toward wildlife as affected by gender. *Wildl. Soc. Bull.* **1987**, *15*, 363–371.
14. Lauber, T.B.; Anthony, M.L.; Knuth, B.A. Gender and ethical judgments about suburban deer management. *Soc. Nat. Resour.* **2001**, *14*, 571–583. [CrossRef]
15. Stout, R.J.; Knuth, B.A. Using a communication strategy to enhance community support for management. In *Urban Deer: A Manageable Resource? Proceedings of the 1993 Symposium of the North Central Section, St. Louis, MI, USA, 12–14 December 1993*; McAninch, J.B., Ed.; The Wildlife Society: Bethesda, MD, USA; pp. 123–131.
16. Connelly, N.A.; Decker, D.; Stout, R.J. Overcoming constraints to women's participation in consumptive uses of fish and wildlife. *Trans. N. Am. Wildl. Nat. Resour. Conf.* **1996**, *61*, 379–387.
17. Verchick, R.R.M. Feminist theory and environmental justice. In *New Perspectives on Environmental Justice: Gender, Sexuality and Activism*; New Brunswick Rutgers University Press: New Brunswick, NJ, USA, 2004; 63p.
18. Fulton, D.C.; Manfredo, M.J.; Lipscomb, J. Wildlife value orientations: A conceptual and measurement approach. *Hum. Dimens. Wildl.* **1996**, *1*, 24–47. [CrossRef]
19. Manfredo, M.; Teel, T.; Bright, A. Why are public values toward wildlife changing? *Hum. Dimens. Wildl.* **2011**, *8*, 287–306. [CrossRef]

20. Mohai, P. Men, women, and the environment: An examination of the gender gap in environmental concern and activism. *Soc. Nat. Resour.* **1992**, *5*, 1–19. [CrossRef]
21. Mayer, J.; Brisbin, I.L. *Wild Pigs: Biology, Damage, Control Techniques, and Management*; SNRL-RP-2009-00869; Savannah River National Laboratory: Aiken, SC, USA, 2009. [CrossRef]
22. Tanger, S.M.; Guidry, K.D.; Niu, H. Monetary estimates of feral hog damage to agricultural producers in Louisiana. *J. Natl. Assoc. Cty. Agric. Agents* **2015**, *8*.
23. Dillman, D.A.; Phelps, G.; Tortora, R.; Swift, K.; Kohrell, J.; Berck, J.; Messer, B.L. Response rate and measurement differences in mixed-mode surveys using mail, telephone, interactive voice response (IVR) and the Internet. *Soc. Sci. Res.* **2009**, *38*, 1–18. [CrossRef]
24. Armstrong, J.S.; Overton, T.S. Estimating nonresponse bias in mail surveys. *J. Mark. Res.* **1997**, *14*, 396–402. [CrossRef]
25. Clark, K.E.; Cupp, K.; Phelps, C.L.; Peterson, M.N.; Stevenson, K.T.; Serenari, C. Household dynamics of wildlife value orientations. *Hum. Dimens. Wildl.* **2017**, *22*, 483–491. [CrossRef]
26. Conejero, C.; Castillo-Contreras, R.; González-Crespo, C.; Serrano, E.; Mentaberre, G.; Lavín, S.; López-Olvera, J. Past experiences drive citizen perception of wild board in urban areas. *Mamm. Biol.* **2019**, *96*, 68–72. [CrossRef]
27. Manfredo, M.J.; Bright, A.D. Attitudes and the study of human dimensions of wildlife. In *Who Cares about Wildlife?* Springer: Berlin/Heidelberg, Germany, 2008; pp. 75–109.
28. Evans, M.D.R. Chosen dangers: Consensus and social norms about potentially lethal wildlife according to context and species. *Environ. Econ.* **2014**, *5*, 18–31.
29. Sponarksi, C.C.; Vaske, J.J.; Bath, A.J.; Musiani, M.M. Salient values, social trust, and attitudes toward wolf management in south-western Alberta, Canada. *Environ. Conserv.* **2014**, *41*, 303–310.
30. U.S. Department of the Interior; U.S. Fish and Wildlife Service; U.S. Department of Commerce; U.S. Census Bureau. *2018 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*; U.S. Department of the Interior; U.S. Fish and Wildlife Service; U.S. Department of Commerce; U.S. Census Bureau: Washington, DC, USA, 2018.
31. Laborde, L.P., Jr.; Rohwer, F.C.; Kaller, M.D. Surveying Louisiana waterfowl hunters: Open web and random email surveys produce similar responses to attitudinal questions. *Wildl. Soc. Bull.* **2014**, *38*, 821–826. [CrossRef]
32. Needham, M.D.; Vaske, J.J. Hunter perceptions of similarity and trust in wildlife agencies and personal risk associated with chronic wasting disease. *Soc. Nat. Resour.* **2008**, *21*, 197–214. [CrossRef]
33. Harper, E.E.; Miller, C.A.; Vaske, J.J.; Mengak, M.T.; Bruno, S. Stakeholder attitudes and beliefs toward wild pigs in Georgia and Illinois. *Wildife Soc. Bull.* **2016**, *40*, 269–273. [CrossRef]
34. Caplenor, C.A.; Poudyal, N.C.; Muller, L.I.; Yoest, C. Assessing landowners' attitudes toward hogs and support for control options. *J. Environ. Manag.* **2017**, *201*, 45–51. [CrossRef] [PubMed]
35. Liepins, R.; Schick, R. Gender and education: Towards a framework for a critical analysis of agricultural training. *Sociol. Rural.* **1998**, *38*, 286–302. [CrossRef]
36. Trauger, A.; Sachs, C.; Barbercheck, M.; Kiernan, N.E.; Brasier, K.; Findeis, J. Agricultural education: Gender identity and knowledge exchange. *J. Rural Stud.* **2008**, *24*, 432–439. [CrossRef]
37. Mendoza, C.C. Factors Influencing Participation in Environmental Stewardship Programs: A Case Study of the Agricultural and Forestry Sectors in Louisiana. Ph.D. Thesis, Louisiana State University, Baton Rouge, LA, USA, 2006.
38. Henderson, J.E. Liability, Institutions, and Determinants of Landowner Access Policies for Fee-Based Recreation on Private Lands. Ph.D. Thesis, Louisiana State University, Baton Rouge, LA, USA, 2007.
39. Rogers, D.M.; Vanderman, A.M. Women as farm landlords: Does gender affect environmental decision making on leased land? *Rural Sociol.* **1993**, *58*, 560–568. [CrossRef]
40. Eells, J.C. The land, it's Everything: Women Farmland Owners and the Institution of Agricultural Conservation in the US. Midwest. Ph.D. Thesis, Department of Agricultural Education, Iowa State University, Ames, IA, USA, 2008.
41. Petrzelka, P.; Marquart-Pyatt, S. Land tenure in the US: Power, gender, and consequences for conservation decision making. *Agric. Hum. Values* **2011**, *28*, 549–560. [CrossRef]