JOURNAL OF THE NACAA

ISSN 2158-9459

VOLUME 19, ISSUE 1 – JUNE, 2026

Editor: Bindu Poudel-Ward

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A Survey of Hawai'i Small Ruminant Producers: Respondent Demographics, Management Practices, and Marketing Strategies

Abstract

The small ruminant industry in Hawai'i has grown. A survey was conducted to gather information about this growing industry in Hawai'i. Feeding and grazing practices were diverse among respondents. All goat-owning respondents reported providing grain and mineral supplements, however only 67% of sheep-owning respondents reported providing both grain and mineral supplements. Most respondents sold their products directly to consumers through on-farm sales, local restaurants, or via family and friends. More than half of respondents (54%) reported not implementing any reproductive practices on their operation. These findings show the varied practices between sheep and goat producers, emphasizing the need for additional research and extension activities to provide greater resources.

Keywords: sheep, goats, strategies, protocols, tropical

Introduction

The production of sheep and goats plays an important part of Hawai‘i’s agriculture with there being a 36.1% increase in small ruminant animal units from 2012 to 2022 (Decision Innovations Solutions, 2023). This may be attributed to the rising demand for locally sourced meat in the islands. Martinez et al. (2010) found that consumer demand for locally sourced food has increased, with a high percentage of consumers willing to pay more for locally sourced products (Le, 2023). Sheep, goats, and their products are part of this demand. Despite the growing small ruminant industry in Hawai‘i, there is very limited amount of local, research-based information on the management practices of small ruminant producers. As Hawai‘i’s agricultural landscape continues to evolve, addressing this research gap becomes increasingly crucial to ensure that local producers can effectively navigate the challenges they face and continue to meet the growing demand for small ruminant products. To fill this gap, this study surveyed local small ruminant producers to gather insights into their current management practices.

Methods

The survey was reviewed and approved by the University of Hawai‘i at Mānoa Institutional Review Board (IRB #2023-00283).

Survey Design and Methodology

The survey consisted of 43 questions, incorporating both multiple-choice and open-ended items. Some questions had additional follow-up questions, dependent on a producer’s responses, allowing producers to elaborate on their initial response. Participants were allowed to skip any questions they did not wish to answer, ensuring that the survey process was non-invasive and allowed for more accurate responses.

Survey Distribution

Before full distribution, there was a “soft-launch” one month before the official launch date. A select group of producers participated in this pre-launch phase to evaluate the clarity and relevance of the survey questions. Feedback from these participants was used to refine the questions and ensure their appropriateness for the target audience.

Once the survey questions were validated, the survey was officially made available only to Hawai‘i sheep and goat producers. The survey was distributed through multiple channels to ensure broad participation. These included word-of-mouth among producers, emails, social media platforms (Facebook and Instagram), and through the University of Hawai‘i Extension Livestock Programs, such as the Livestock Wala‘au podcast. Additionally, the survey was shared at various Hawai‘i small ruminant workshops and online webinars, which further enhanced outreach.

Data Collection

The survey data for this study was generated using Qualtrics software (Version April 2023-2025, Qualtrics Copyright © 2025, Qualtrics). To ensure the privacy and confidentiality of participants, all survey responses were kept anonymous, and no identifying information was linked to any responses. Data were downloaded monthly for 11 months and stored in a Microsoft Excel spreadsheet for analysis.

The survey was intended to run from February 1, 2024, to December 31, 2024, lasting 11 months in total. However, due to software issues between April 2024 and May 2024, producers could not access the survey online. Therefore, producers were only able to access the survey for a total of nine months. Out of the 54 responses collected, only 33 were considered “usable.” A response was considered usable if the participant answered at least one question. The total number of sheep and goats in Hawai‘i from this survey represented 9% of the most current data of sheep and goat inventory from USDA-NASS (2022).

Statistical Analysis

The survey was separated into seven categories: producer profile, farm profile, herd profile, feeding practices, meat marketing practices, reproductive practices, and health practices. The data was analyzed in two different ways: 1) by species and 2) by island. Species were categorized into sheep-only (SO) producers, goat-only (GO) producers, and both-sheep-and-goat (BOSG) producers, which consisted of producers who owned both sheep and goats on their operation.

The data were input into a Microsoft Excel spreadsheet. In the spreadsheet, answers to questions were marked with numbers, where “100” signified a “Yes” response, and “0” indicated a “No” response or an unanswered question. The PROC MIXED procedure of SAS version 9.4 (SAS Institute, Inc., Cary, NC) was used to estimate the main effects of species and island on breeds, purpose, identification methods, feed type, marketing practices, reproduction practices, health practices, and other animals that interacted with the sheep or goats. When treatment differences were found to be significant ($p < 0.05$) LS Means were separated using Tukey-Kramer adjustments. Statistical significance was declared at $p < 0.05$, and tendencies are discussed at $0.05 < p \leq 0.10$.

Results

Producer and Farm Profile

The majority of respondents were female (79%) (Figure 1A), with 79% of respondents having completed a college degree (Figure 1B), with 52% holding a Bachelor’s degree (Figure 1C). Respondents’ years of experience in raising sheep and goats varied widely with 39% having five years or less of experience (Figure 1D, Table 1). The majority of respondents’ operations were located on Hawai‘i Island (40%) (Figure 2A). Seventeen respondents (55%) reported having less than ten acres of land (Figure 2B). The total acreage of the respondents’ operations was 19,137 acres, with the smallest operation

covering just 0.2 acres and the largest spanning 18,000 acres (Table 1). Almost half (45%) of respondents had active operations for less than five years (Figure 2C).

In regards to land ownership, 70% of respondents owned the land on which they operated, 20% leased their land, and 10% both owned and leased land (Figure 3A). Of SO respondents who answered the question (n = 19), 58% owned their land, 24% leased, and 14% both leased and owned their land (Figure 3B). Of GO respondents who answered the question (n = 4), all four respondents owned their land. Of BOSG respondents who answered the question (n = 7), 86% owned their land. In regards to species raised, 64% of respondents (n = 21), raised only sheep, 15% (n = 5) raised only goats, and 21% (n = 7) raised both sheep and goats (Figure 4).

Table 1. Producer, farm, and herd profile characteristics of Hawai‘i sheep and goat respondents.

Factor	Unit	*n*	Min	Max	Mean	Median
Years Raising	Years	31	1	35	11.887	10
Acreage of Operation	Acres	31	0.2	18,000	617.3	7
Years of Operation	Years	31	1	40	11	8
Number of Head (Total)	Head	31	2	1,315	106.5	25
Number of Head (SO)	Head	21	2	1,315	157.1	37
Number of Head (GO)	Head	5	6	55	18.6	12
Number of Head (BOSG)	Head	7	12	67	32	25

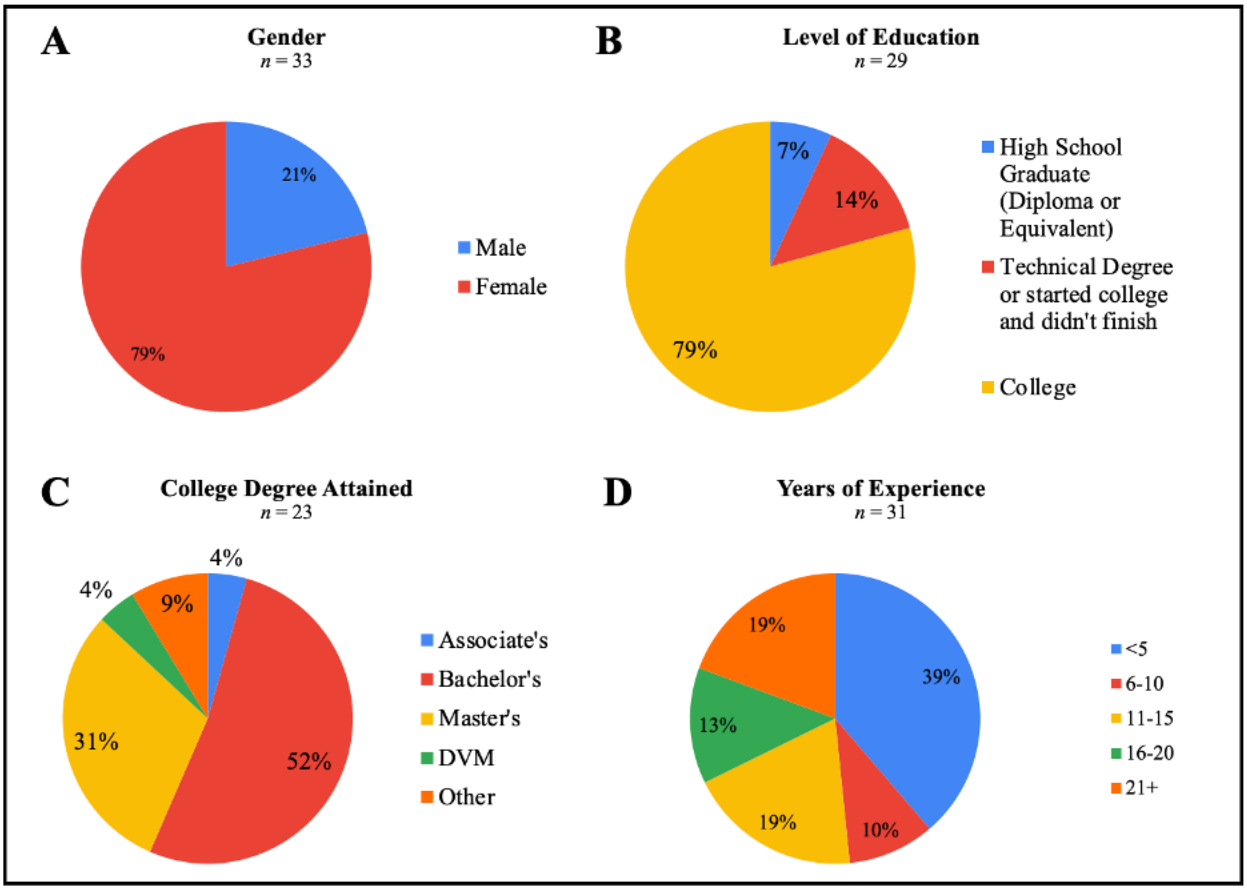

Figure 1: Response rates for an online survey of Hawai‘i small ruminant producers indicating (A) Gender (n = 33); (B) Level of Education (n = 29); (C) College Degree Attained (n = 23); and (D) Years of Experience (n = 31)..

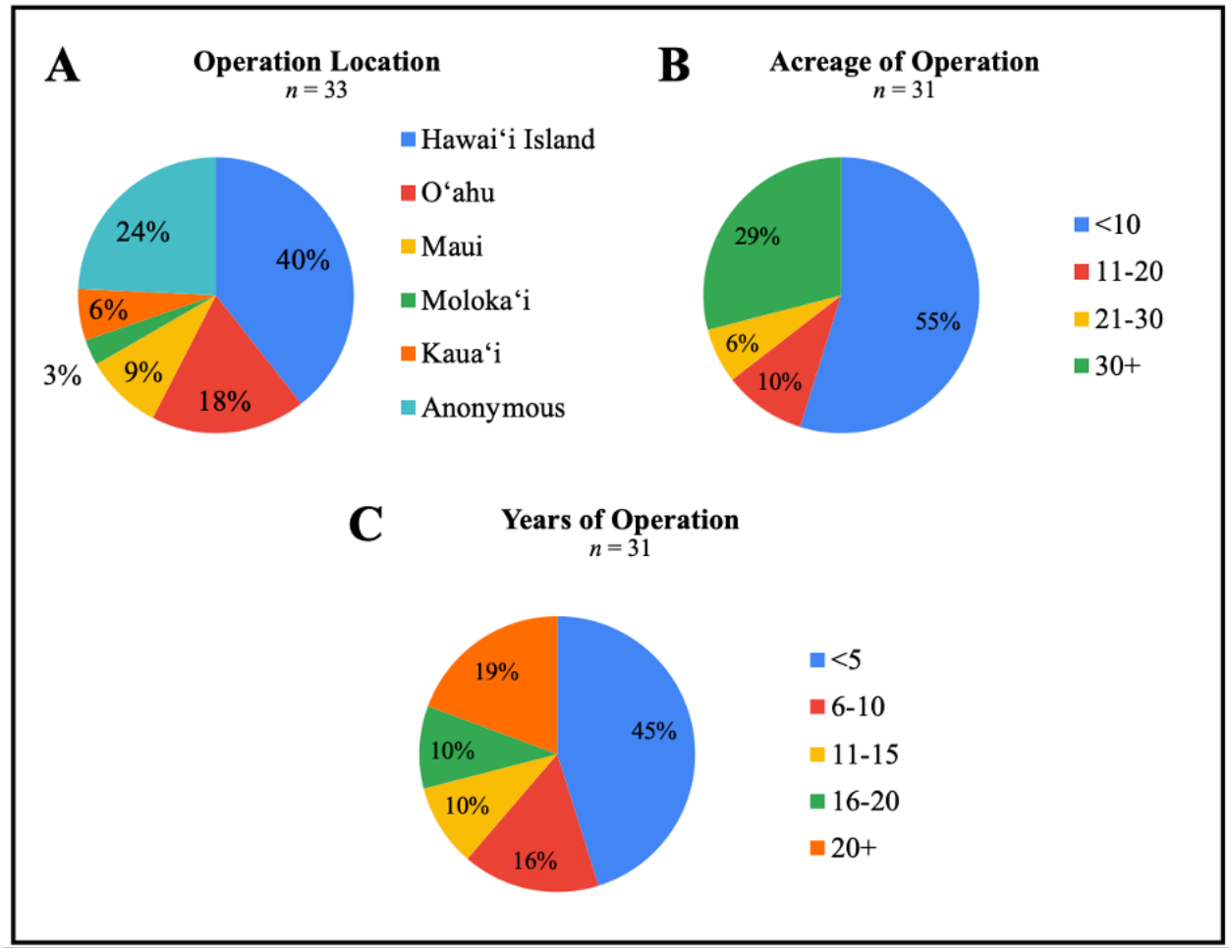

Figure 2: Response rates for an online survey of Hawai'i small ruminant producers indicating (A) Operation Location (n = 33); (B) Acreage of Operation (n = 31); and (C) Years of Operations (n = 31).

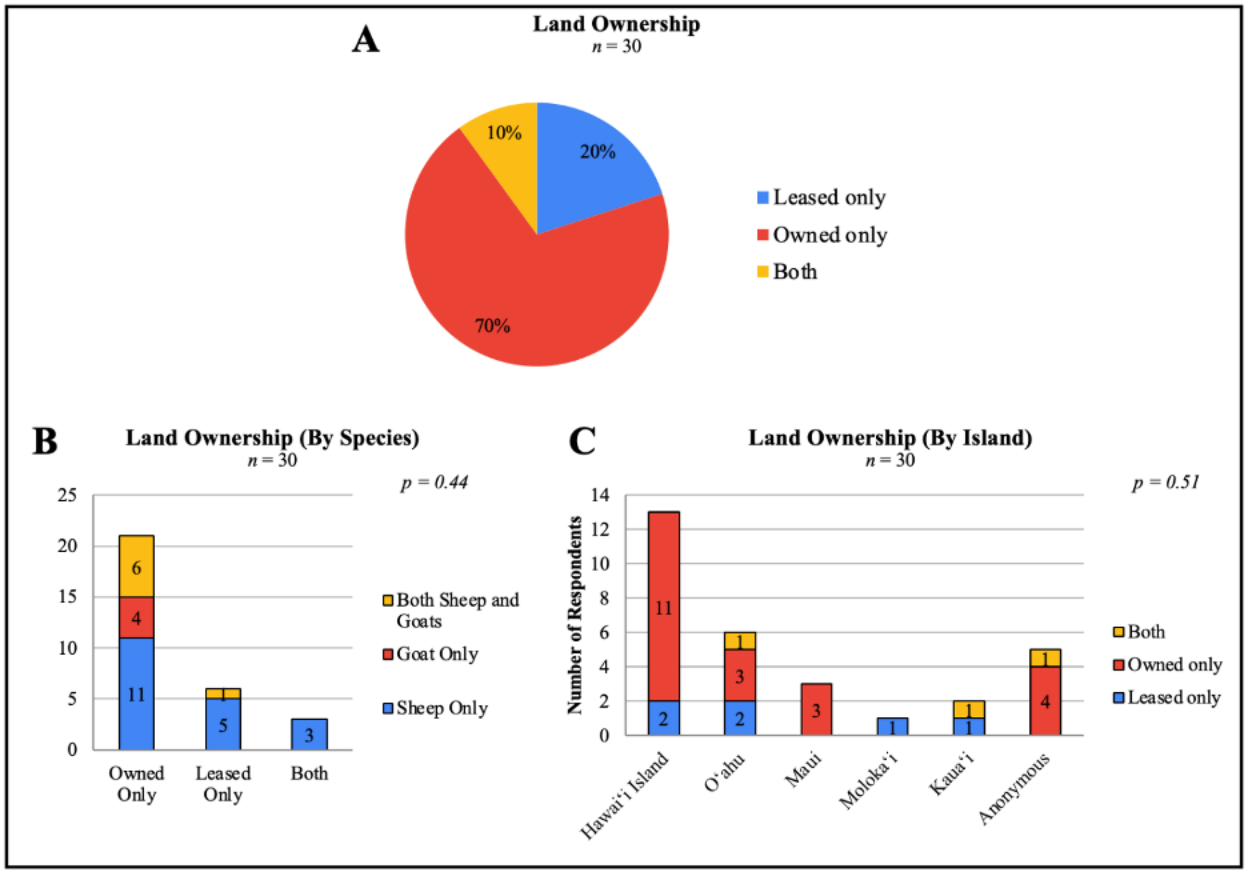

Figure 3: Response rates for an online survey of Hawaiʻi small ruminant producers that showing (A) Land Ownership (n = 30); (B) Land Ownership (by species) (n = 30); and (C) Land Ownership (by island) (n = 30).

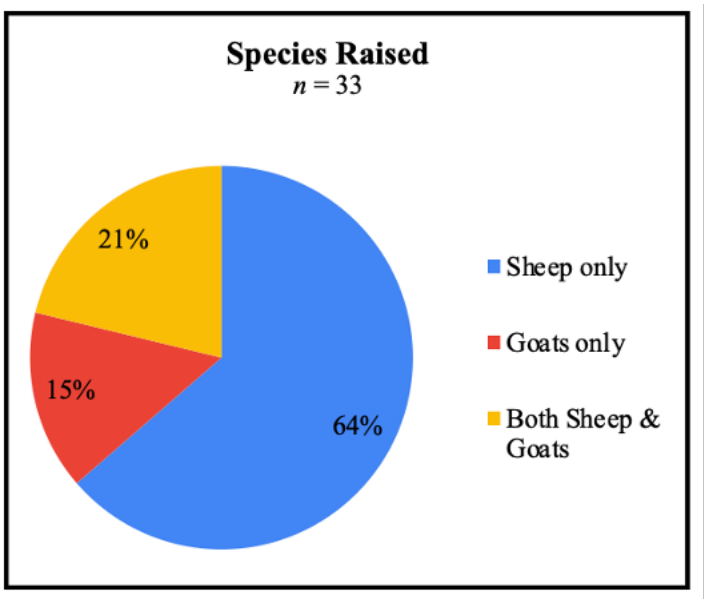

Figure 4: Response rates for species raised by Hawai‘i small ruminant producers (n = 33).

Herd Profile

When asked about breeds, SO and BOSG respondents were combined, with sixteen being SO and five being BOSG. Respondents were allowed to select more than one breed. The most reported sheep breed among respondents who answered the question was Dorper (76%), followed by Katahdin (52%), Barbados (33%), and St. Croix (29%) (Figure 5A). Hawai‘i Island (n = 11) had the most varied breeds, followed by anonymous location (n = 7) ($p = 0.01$) compared to other islands (Figure 5B). Among the 20 respondents who answered the question, 55% reported owning both pure and mixed breed on their operation, 40% owning mixed breed only, and 5% owning purebreds only (Figure 5C).

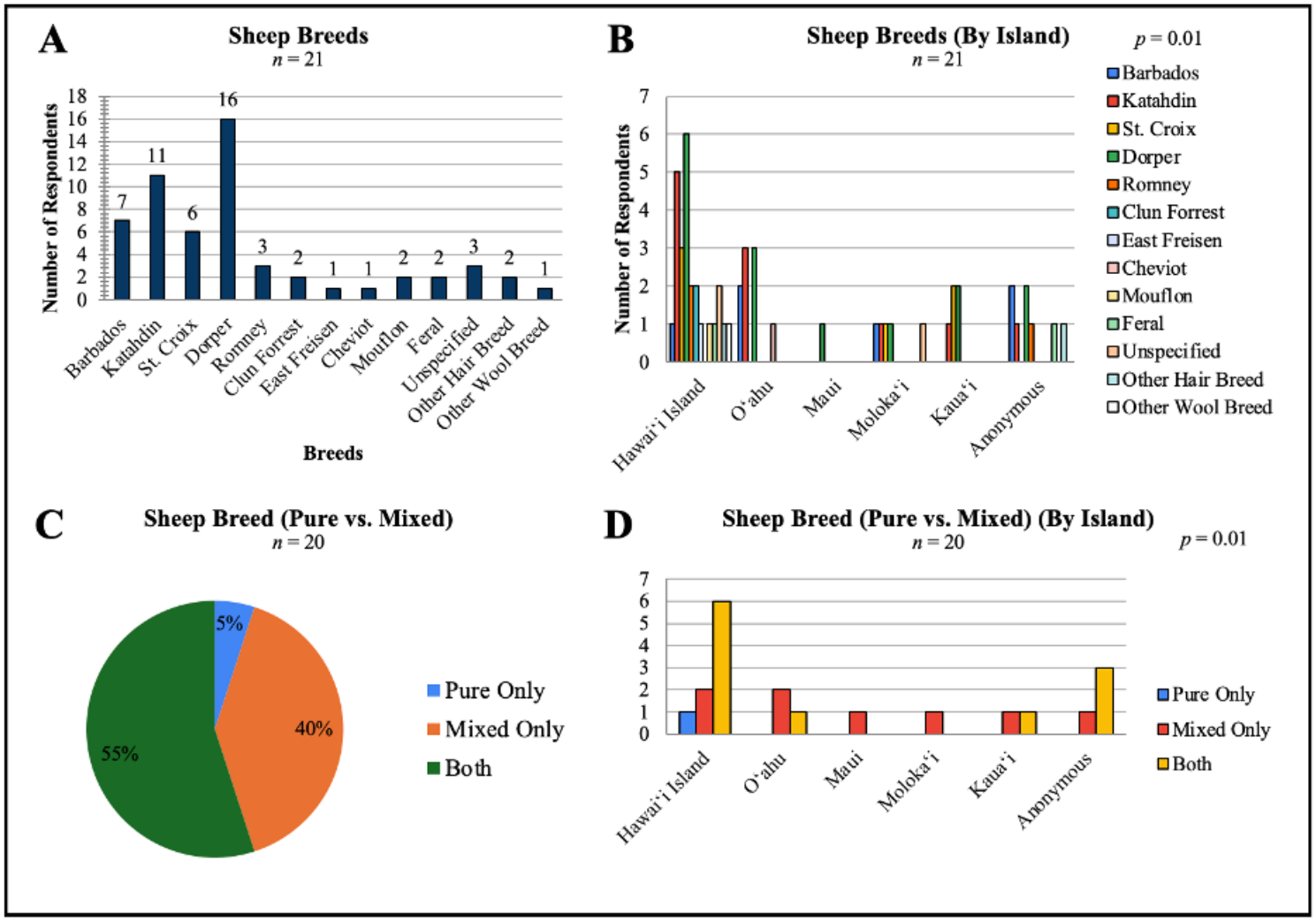

Figure 5: Response rates for an online survey of Hawai‘i small ruminant producers that rasised (A) Sheep Breeds (n = 21); (B) Sheep Breeds (by island) (n = 21); (C) Sheep Breeds (pure vs. mixed) (n = 20); and (D) Sheep Breeds (pure vs mixed) (by island) (n = 20). Respondents were able to select more than one option when applicable.

When asked about goat breeds, GO and BOSG responses were combined, with five being GO and seven being BOSG. Among goat breeds, the most common was Nigerian Dwarf (75%), followed by Nubian (50%), and Boer (42%) (Figure 6A). Hawai‘i Island (n = 11) and Maui (n = 3) respondents had more than three goats breeds and O‘ahu (n = 6) had only one breed recorded ($p = 0.0001$) compared to all other islands (Figure 6B). Among the ten recorded responses, 70% owned both mixed and pure goat breeds, followed by 20% owning pure breeds, and 10% owning only mixed breeds (Figure 6C). Anonymous location had the most respondents who owned both mixed and pure breeds ($p < 0.0001$), followed by Hawai‘i Island and Maui (Figure 6D).

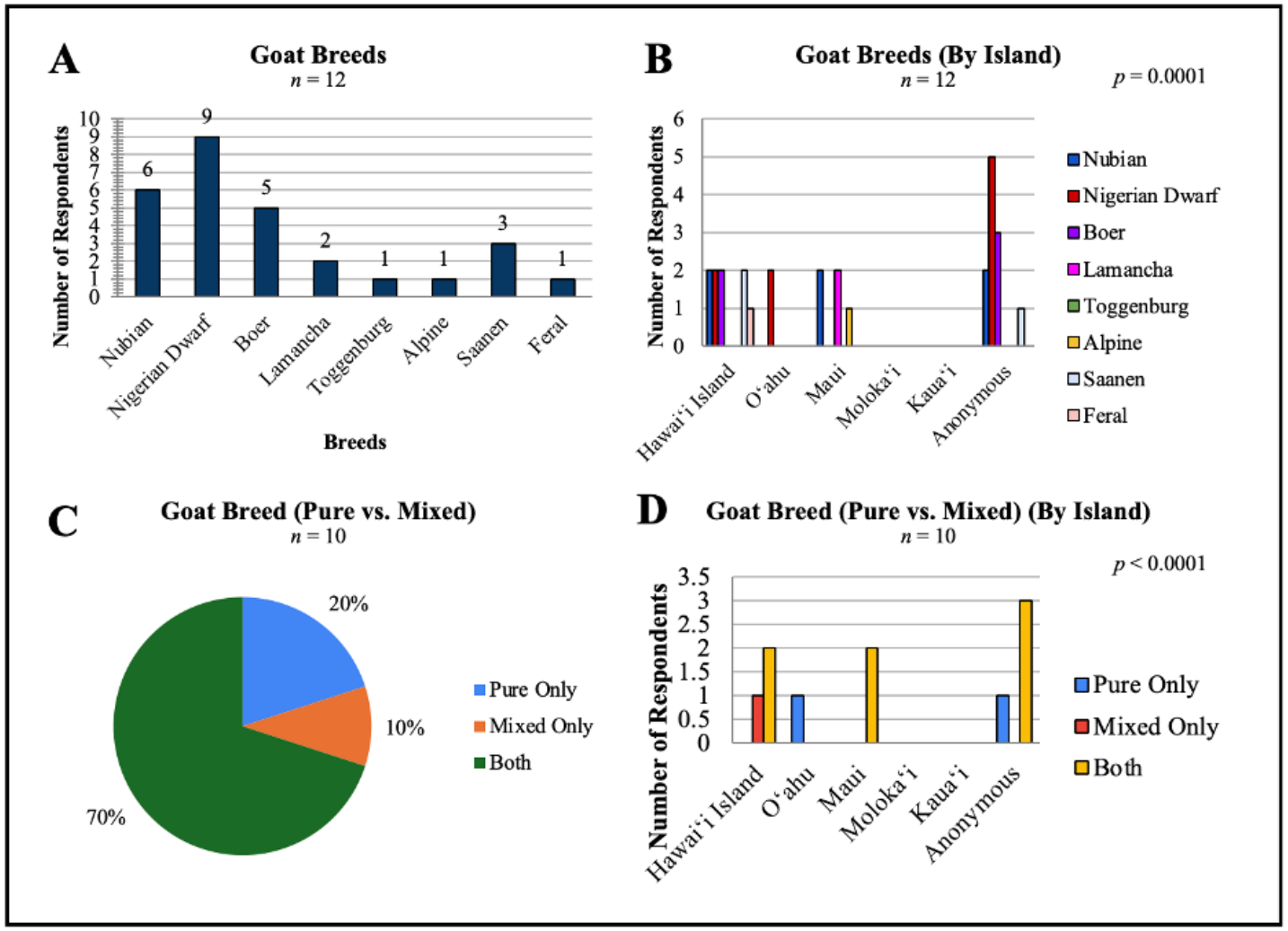

Figure 6: Response rates for an online survey of Hawai'i small ruminant producers that raised (A) Goat Breeds (n = 12); (B) Goat Breeds (by island) (n = 12); (C) Goat Breeds (pure vs mixed) (n = 10); and (D) Goat Breeds (pure vs mixed) (by island) (n = 10). Respondents were able to select more than one option when applicable.

When participants were asked about the primary purposes of raising small ruminants, multiple purposes could be selected or input from the respondents' end. Of the responses, 81% of respondents raised their animals for more than one purpose (Figure 7A). The most common purpose among respondents was seedstock/breedingstock (77%), followed by 69% raising for meat consumption (Figure 7B). Among SO respondents who answered the question (n = 16), 81% reported raising their sheep for meat consumption, 69% raising for seedstock/breedingstock, 25% raising for lawn mower/weed control, and a combined percentage of 18% of raising sheep for wool, 4H/competition/show, and for fun (Figure 7C). There were no recorded responses of raising sheep for milk. Among GO respondents who answered the question (n = 5), 100% raise for milk consumption, 30% raise for seedstock/breedingstock, 20% raise for meat consumption, and a combined percentage of 20% raising for 4H/competition/show and lawn mower/weed control (Figure 7C). Of BOSG respondents who answered the question (n = 5), 100% raise for meat consumption ($p < 0.0001$) compared to 80% raise for seedstock/breedingstock, 80% raise for milk consumption, 60% raise for wool, and a combined percentage of 40% raising for 4H/competition/show, lawn mower/weed control, for fun, and therapy (Figure 7C). O'ahu (n = 6) had the highest number of respondents who raise their animals for lawn maintenance/weed control compared to all other islands (Figure 7D).

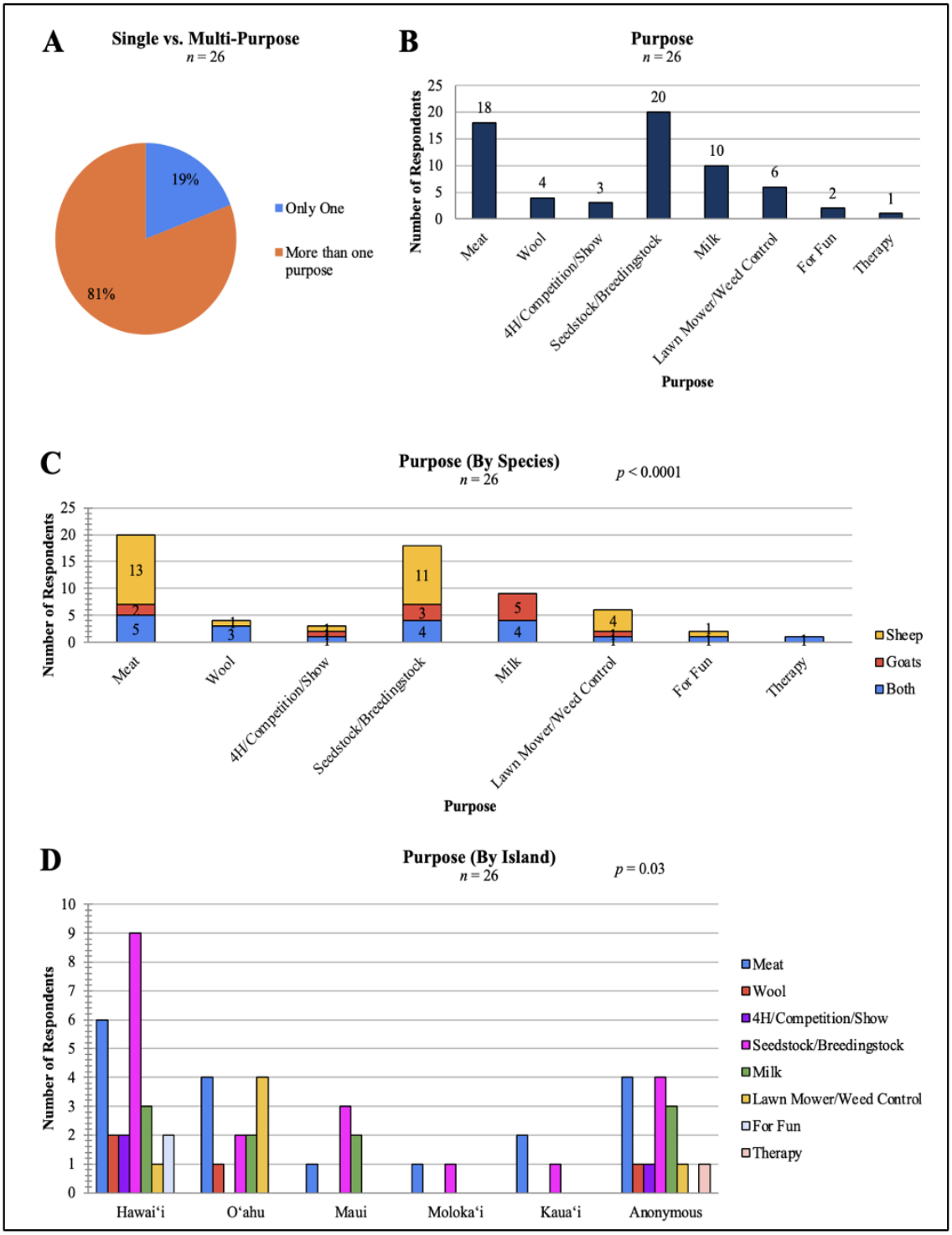

Figure 7: Response rates for an online survey of Hawai‘i small ruminant producers that raise for (A) Single vs Multi-Purpose (n = 26); (B) Purpose (n = 26); (C) Purpose (by species) (n = 26); and (D) Purpose (by island) (n = 26). Respondents were able to select more than one option when applicable.

When asked about identification methods, respondents were allowed to select multiple methods if they used more than one form of animal identification. The most common identification method used among all respondents who answered the question was physical traits (46%), followed by other ear tags (36%), and scrapie ear tag (25%) (Figure 8A). Of the SO respondents, 50% uses other ear tags as a method of identification ($p = 0.01$) (Figure 8B). Of the GO respondents 80% use physical traits, 60% use tattoos, 40% use collars, and 20% uses earmarks (Figure 8B). Of the BOSG respondents who answered the question, 57% used physical traits (Figure 8B). There was no effect of island on identification used ($p = 0.26$) (Figure 8C).

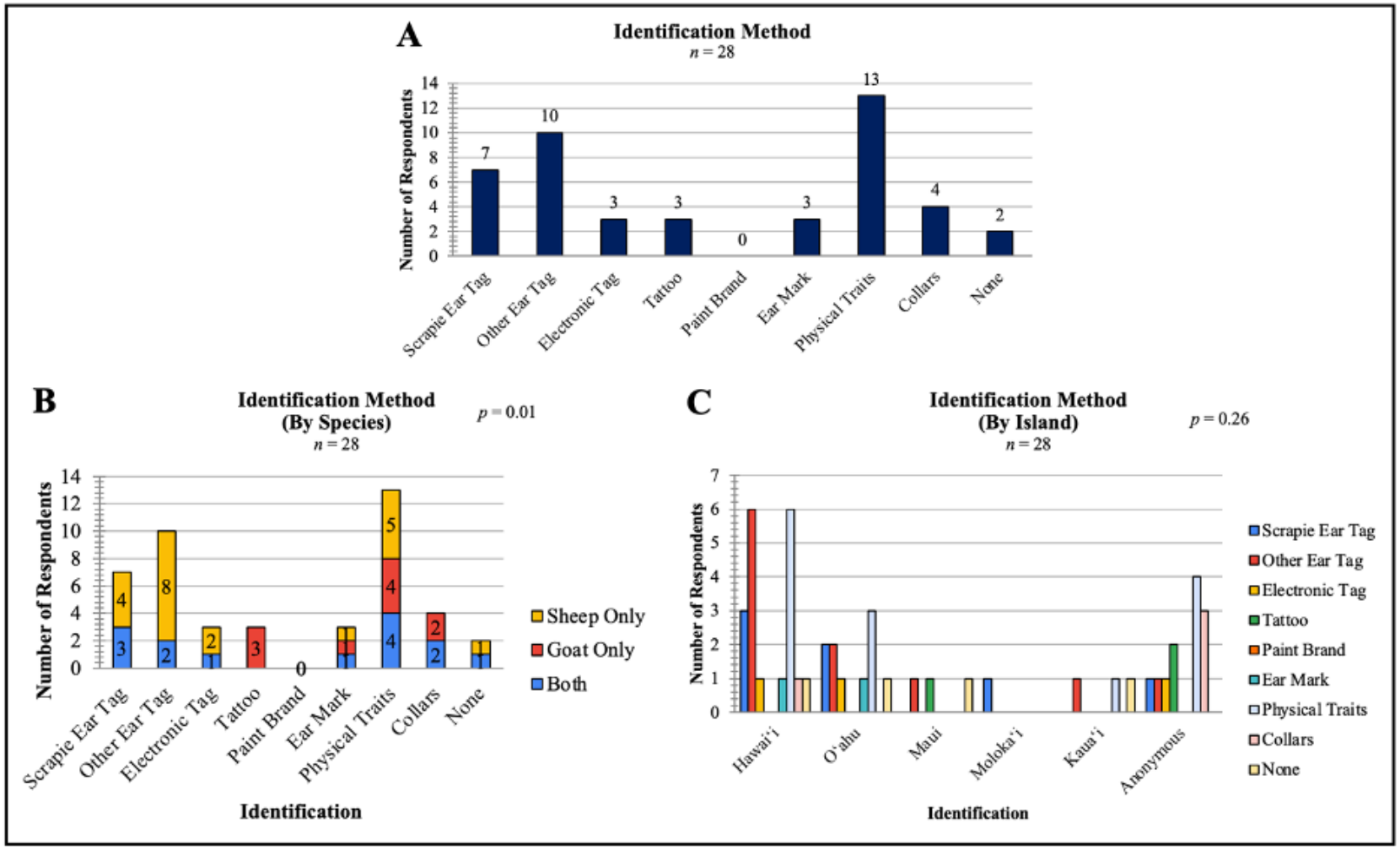

Figure 8: Response rates for an online survey of Hawai'i small ruminant producers indicating (A) Identification Method (n = 28); (B) Identification Method (by species) (n = 28); (C) Identification Method (by island) (n = 28). Respondents were able to select more than one option when applicable.

Feeding Practices

The survey participants were asked about the type of feed supplements provided to their sheep and goats. Participants were able to select more than one choice. Of the 27 respondents who answered the question, 59% give more than one feed supplement, whereas 37% give only one type, and 4% give no feed supplement (Figure 9A). Mineral supplements were the most common given among sheep and goat respondents (Figure 9B), with 93% of SO respondents reporting giving mineral supplements to their sheep (Figure 9c). Of the GO respondents (n = 5) who answered the question, 100% give both mineral supplements and grain to their goats (Figure 9C). Of the six BOSG respondents who answered the question, 100% gave mineral supplements to their animals (Figure 9C). Mineral supplements were a common feed supplement given across all islands with 100% of respondents from O‘ahu (n = 6) ($p = 0.002$) compared to 85% of Hawai‘i Island respondents (n = 11) (Figure 9D).

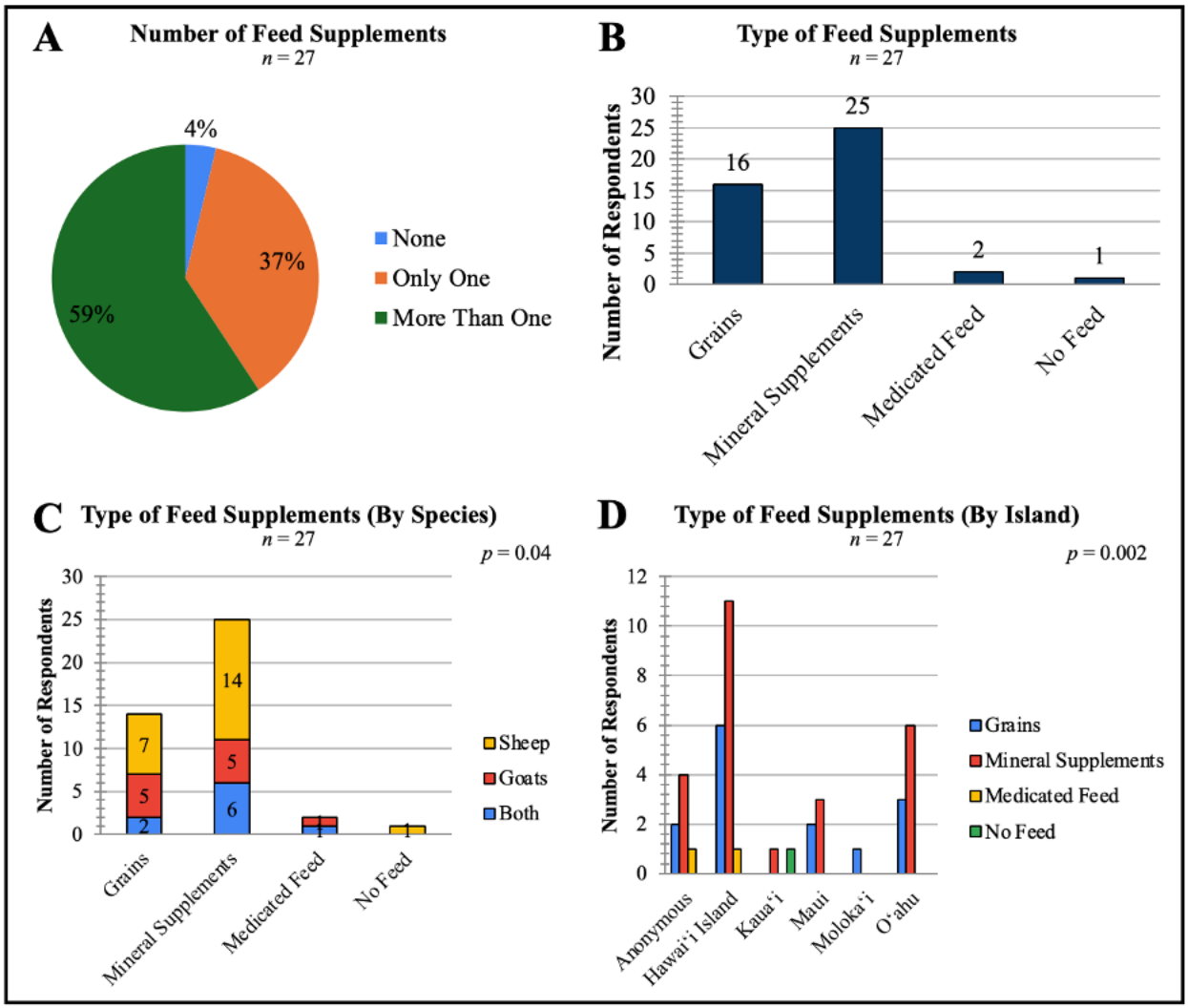

Figure 9: Response rates for an online survey of Hawai‘i small ruminant producers showing (A) Number of Feed Supplements (n = 27); (B) Type of Feed Supplements (n = 27); (C) Type of Feed Supplements (by species) (n = 27); and (D) Type of Feed Supplements (by island) (n = 27). Respondents were able to select more than one option when applicable.

When asked about the type of grazing system implemented on their operation, a total of 28 responses were reported. Over half (53%) of respondents who answered the question indicated they practice rotational grazing only (Figure 10A). Of the SO respondents who answered the question, 69% practice rotational grazing only (Figure 10B). Of the five GO respondents who answered the question, 40% practice rotational

grazing only, 40% practice continuous grazing only, and 10% practiced both (Figure 10B). Of the seven BOSG respondents who answered the question, 29% practice rotational grazing only, 14% practice continuous grazing only, and 57% practice both (Figure 10B). Of O‘ahu respondents (n = 6), 83% practice rotational grazing only (Figure 10C).

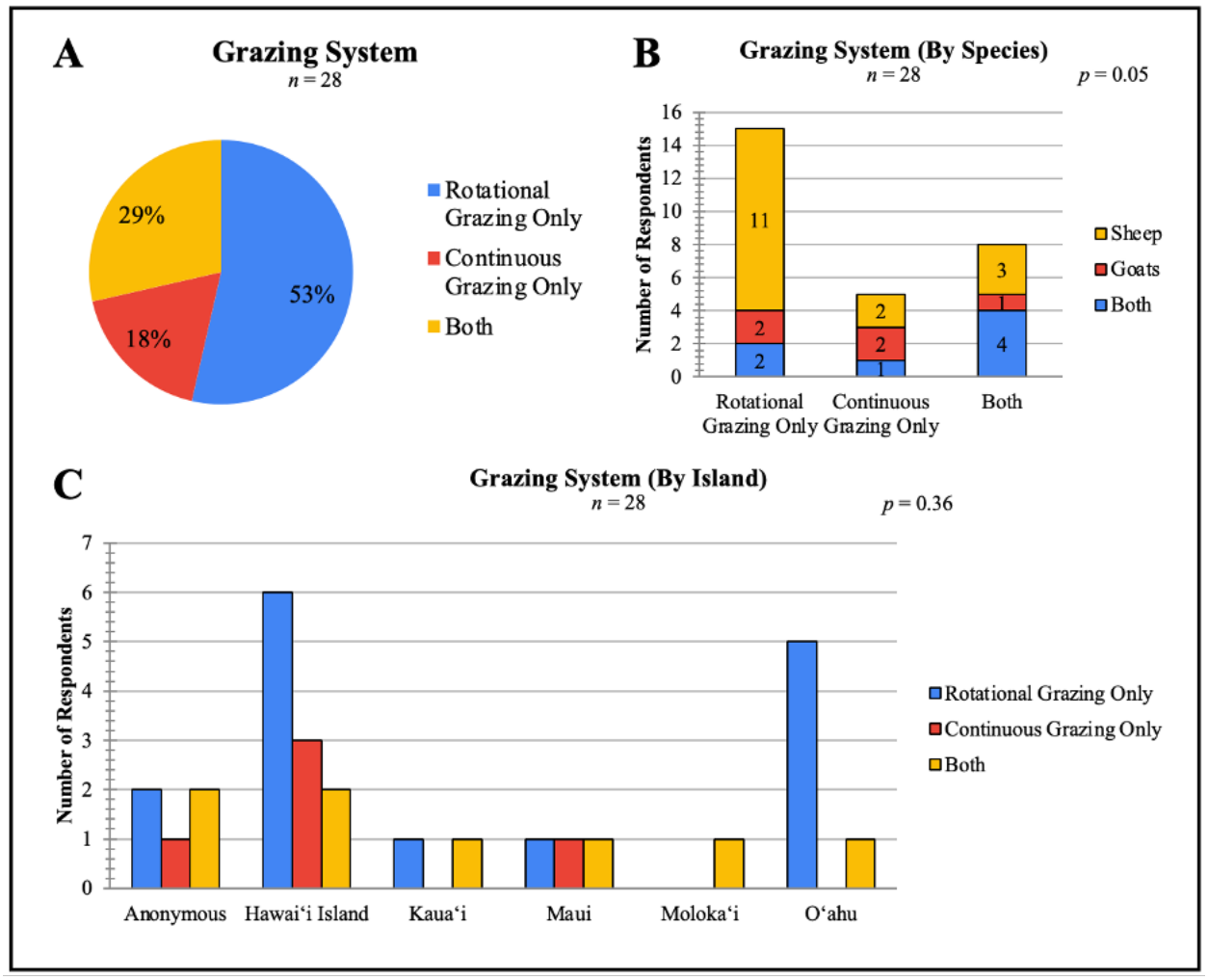

Figure 10: Response rates for (A) Grazing System (n = 28); (B) Grazing System (by species) (n = 28); and (C) Grazing System (by island) (n = 28). Respondents were able to select more than one option when applicable. An online survey was administered to local small ruminant producers in Hawai‘i, asking questions about the management practices they had implemented on their operations as described in the Materials and Methods.

Meat Marketing Practices

Participants were asked to specify where they sell their meat, with the option to select multiple choices. Among the responses to the question, 89% of respondents use more than one marketing outlet to sell their animals (Figure 11A). The most common reported marketing outlets were self-consumption (Figure 11B). Of the three SO respondents who answered the question, all three reported selling to family/friends compared to two raised for self-consumption (Figure 11C). Of the two GO respondents who answered the question, both raised goats for self-consumption (Figure 11C). Only two BOSG respondents answered the question and indicated they both raise for self-consumption and sell to family/friends. One BOSG respondent practiced on farm sales (Figure 11C). Hawai‘i Island (n = 3) had the most varied meat marketing outlets ($p = 0.06$) compared to all other islands (Figure 11D).

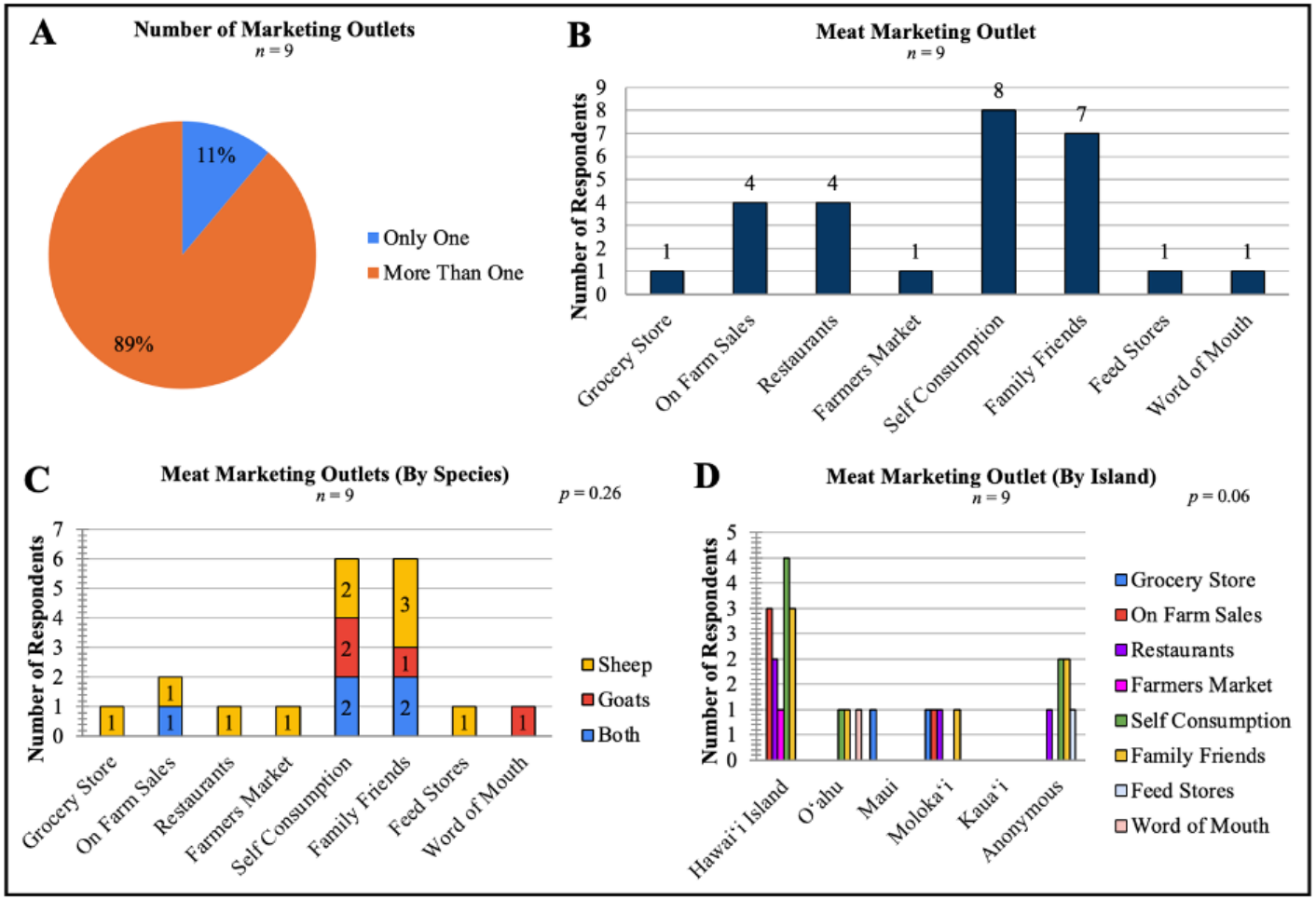

Figure 11: Response rates for an online survey of Hawai'i small ruminant producers showing (A) Number of Marketing Outlets (n = 9); (B)Meat Marketing Outlet (B, n = 9); (C) Meat Marketing Outlets (by species) (n = 9); and (D) Meat Marketing Outlet (by island) (n = 9). Respondents were able to select more than one option when applicable.

Reproduction Practices

Participants were asked if they implemented any reproduction practices on their operation, and were able to select more than one choice. More than half (57%) of all respondents reported not practicing any type of reproductive practice (Figure 12A). Flushing was the most common practice among 22% of the respondents (Figure 12B). Of the SO respondents who answered the question, 57% indicated that they do not implement any reproduction practices (Figure 12C). Of the three GO respondents who answered the question, two did not implement any reproduction practices. Hawai‘i Island (n = 10) had the highest number of respondents who did not implement any reproductive practices (Figure 12D).

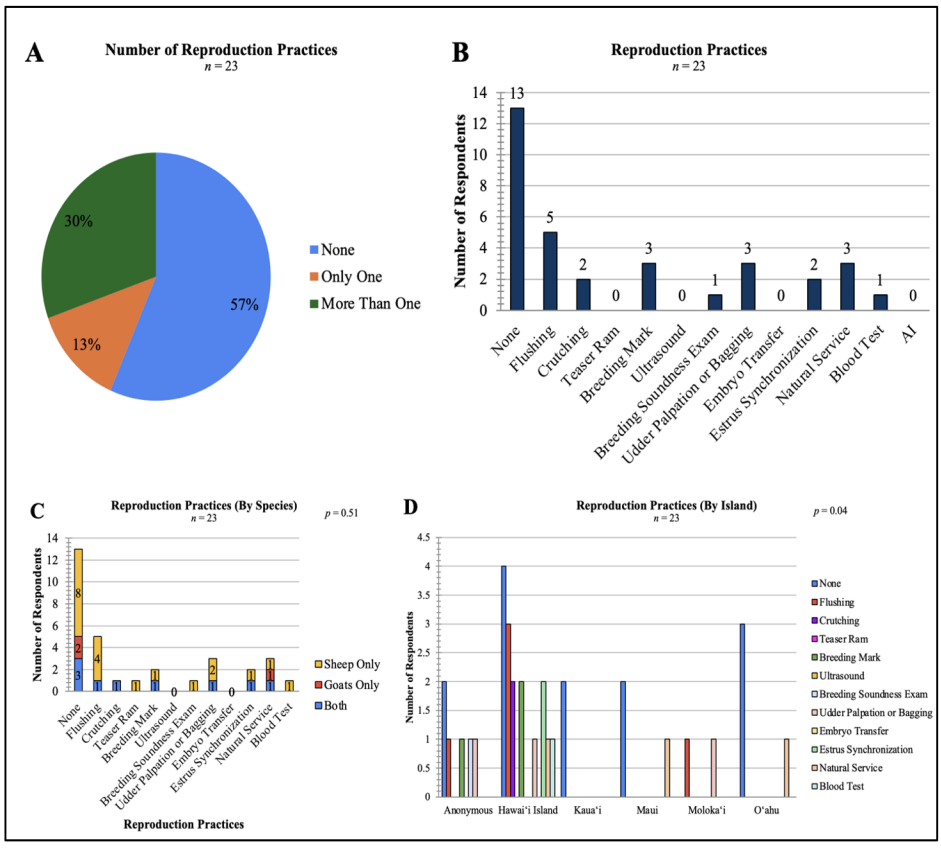

Figure 12: Response rates for an online survey of Hawai‘i small ruminant producers that indicate (A) Number of Reproduction Practices (n = 23); (B) Reproduction Practices

(n = 23); (C) Reproduction Practices (by species) (n = 23); and (D) Reproduction Practices (by island) (n = 23). Respondents were able to select more than one option when applicable.

Health Practices

When asked about implementing health practices in their operation, respondents were able to select more than one option. Ninety-two percent of the respondents implement more than one health practice on their sheep and goats (Figure 13A). The most common health practice among all respondents who answered the question was deworm/coccidia treatment (96%) (Figure 13B). Twenty-nine percent of the respondents who answered the question treated for external parasites. A combined 33% of respondents performed disease testing and training. Of the SO respondents who answered the question, 93% perform deworm/coccidia treatment, compared to 73% practicing hoof trimming, 57% vaccinating, and 40% practicing shearing (Figure 13C). Among GO-respondents (n = 3), the most common practices were deworm/coccidia treatment, hoof trimming, and vaccinations. Of the six BOSG respondents, the most common treatments were deworming/coccidia treatment, followed by shearing and hoof trimming. Each island had at least one respondent who practiced at least one health practice (Figure 13D). Hawai‘i Island (n = 11) had the most varied health practices, including the most respondents who practice deworm/coccidia treatment ($p = 0.05$) compared to all other islands.

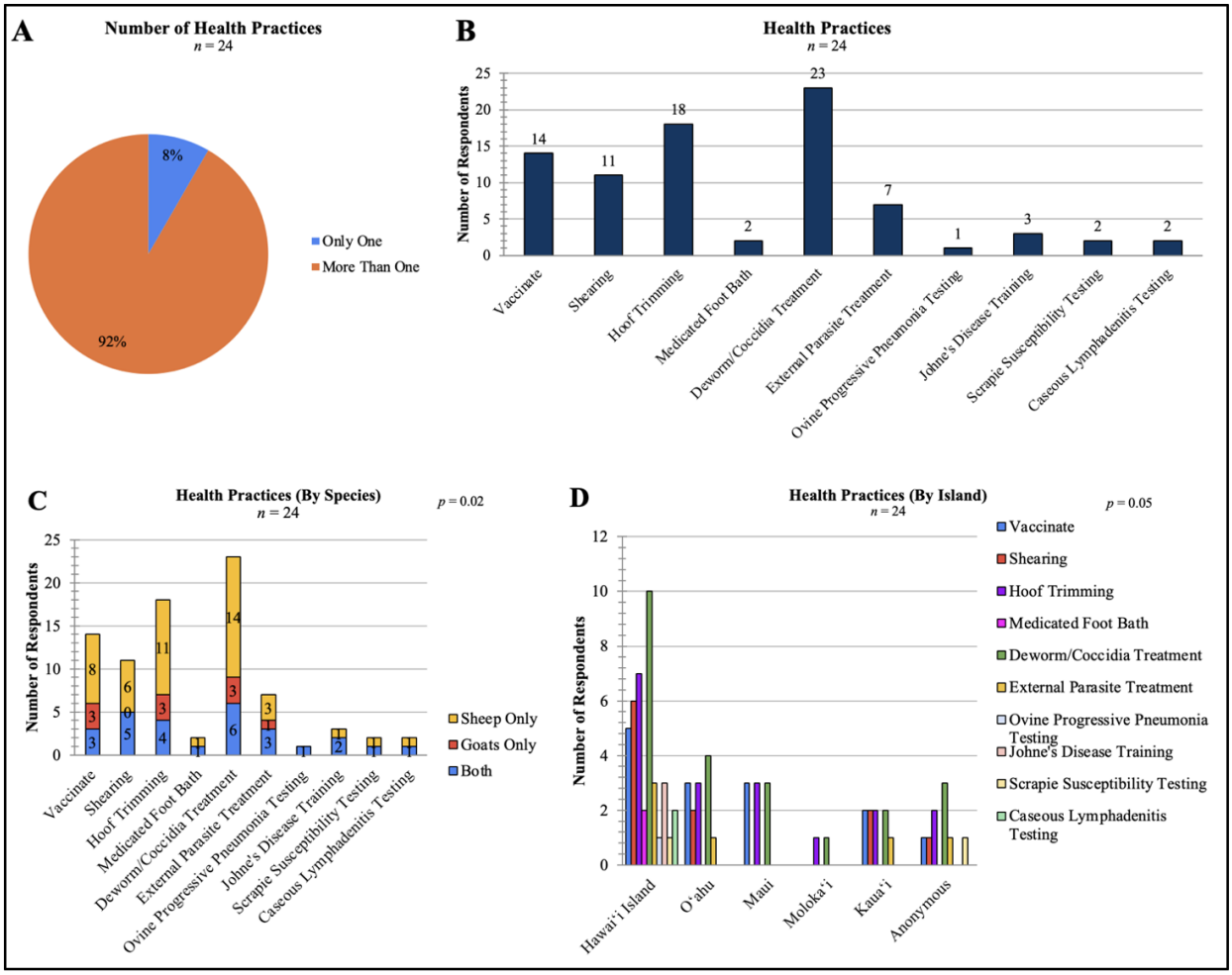

Figure 13: Response rates for an online survey of Hawai‘i small ruminant producers that indicating (A) Number of Health Practices (n = 24); (B) Health Practices (n = 24); (C) Health Practices (by species) (n = 24); and (D) Health Practices (by island) (n = 24). Respondents were able to select more than one option when applicable.

Respondents were asked about other types of animals that come into contact with their small ruminants. Respondents were able to select more than one animal. Dogs were the most common animal among respondents who answered the question (75%) (Figure 14A). Of the SO respondents who answered the question (n = 15), 73% reported having dogs come into contact with their sheep, compared to 40% of respondents reported cattle (Figure 14B). Of the GO respondents who answered the question (n = 3), 100% reported that their dogs, poultry, and cats had come into contact

with their goats. Of the BOSG respondents who answered the question (n = 6), 83% reported having poultry come into contact with their sheep and goats. A combined percentage of 33% reported having horses and donkeys. Hawai‘i Island (n = 6) had the most varied animals, consisting of each listed animal (Figure 14C).

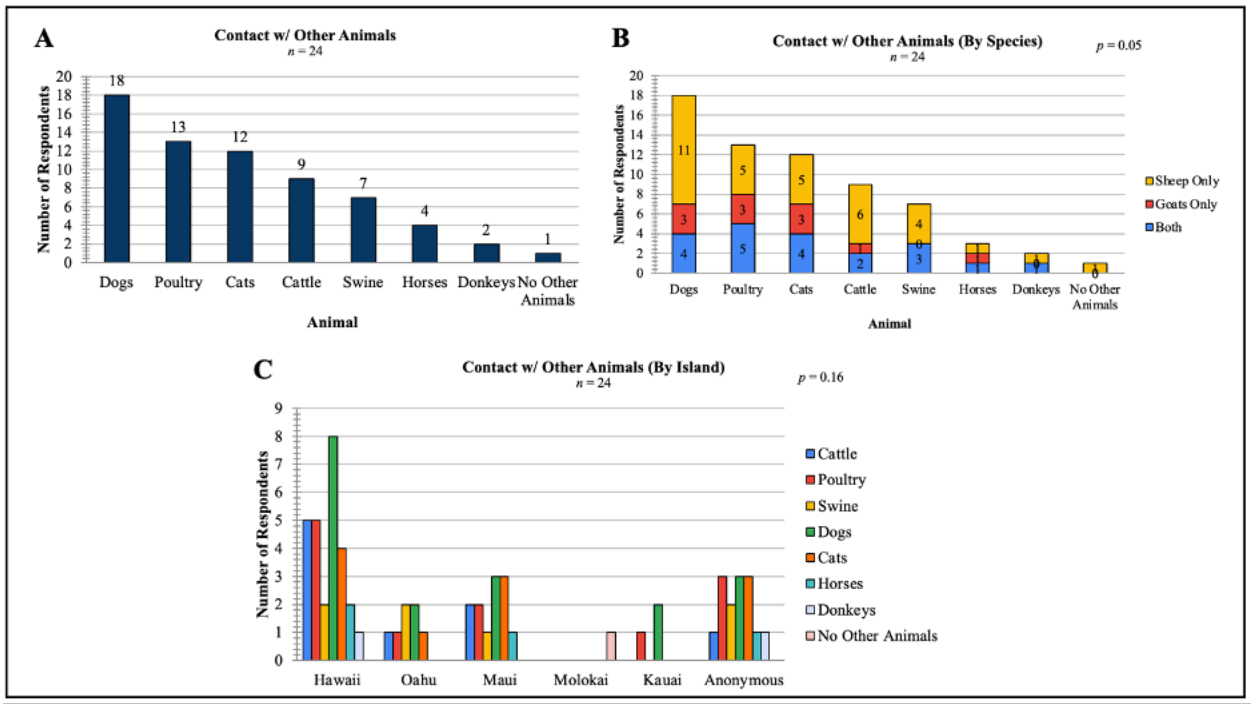

Figure 14: Response rates for an online survey of Hawai‘i small ruminant producers that have (A) Contact w/ Other Animals (n = 24); (B) Contact w/ Other Animals (by species) (n = 24); and (C) Contact w/ Other Animals (by island) (n = 24).

One survey question asked participants if they suspected any diseases in their operation within the past 12 months. Half of the respondents reported suspecting diseases (Figure 15A). Of the respondents who suspected diseases (n = 10), six were SO respondents ($p = 0.78$), compared to two GO respondents, and two BOSG respondents (Figure 15B). Most respondents who answered the question (60%) were from Hawai‘i Island (n = 6) ($p = 0.83$) (Figure 15C).

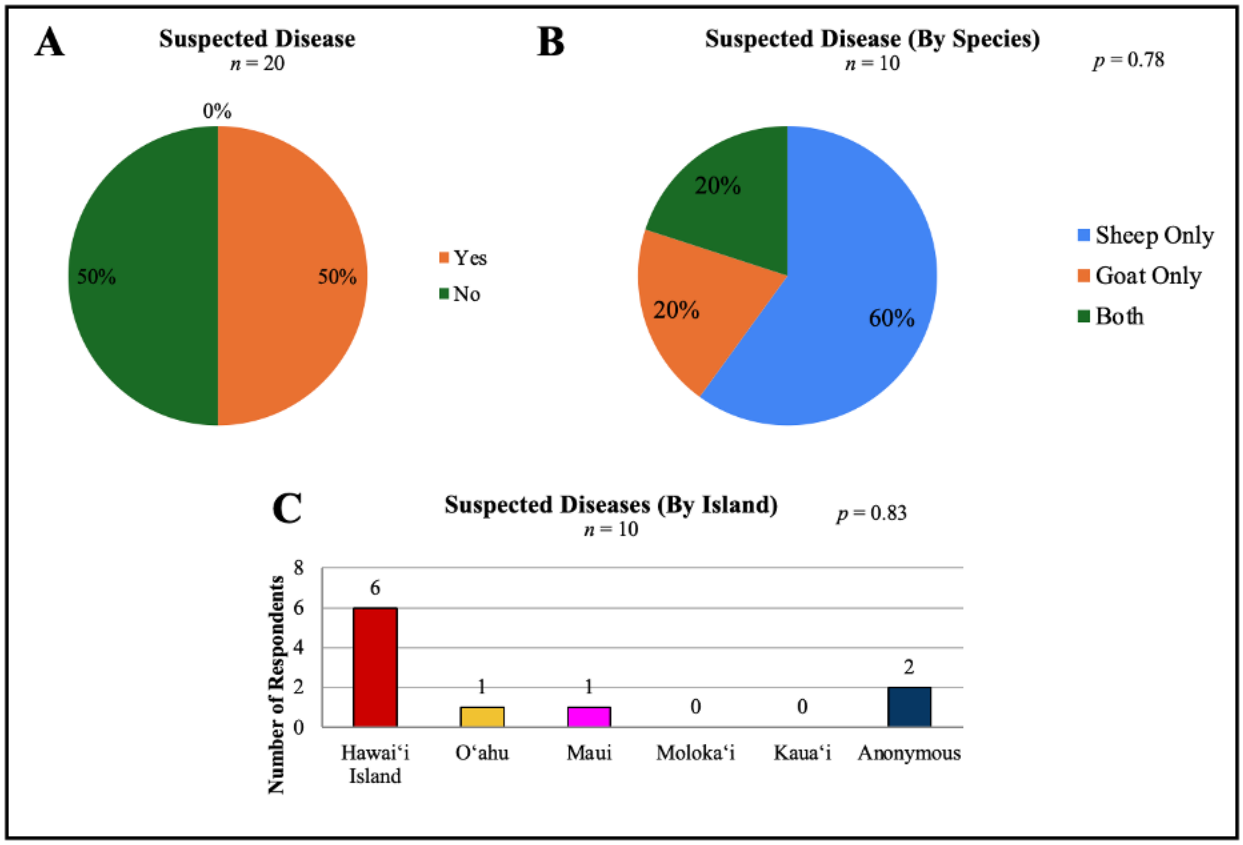

Figure 15: Response rates for an online survey of Hawai'i small ruminant producers that (A) Suspected Disease (n = 20); (B) Suspected Disease (by species) (n = 10); and (C) Suspected Disease (by island) (n = 10). Respondents were able to select more than one option when applicable.

Participants were asked if their operation had been visited by a professional/expert. Respondents were able to select more than one choice. Of the 15 respondents who answered the question, 73% reported being visited by a professional/expert (Figure 16A). Of the 11 respondents who indicated they were visited, five of the respondents were SO respondents ($p = 0.27$) compared to three GO respondents, and three BOSG respondents (Figure 16B). Of the 11 responses, five were from Hawai'i Island ($p = 0.12$), the remaining six respondents came from Maui (3), anonymous location (2), and O'ahu (1) (Figure 16C).

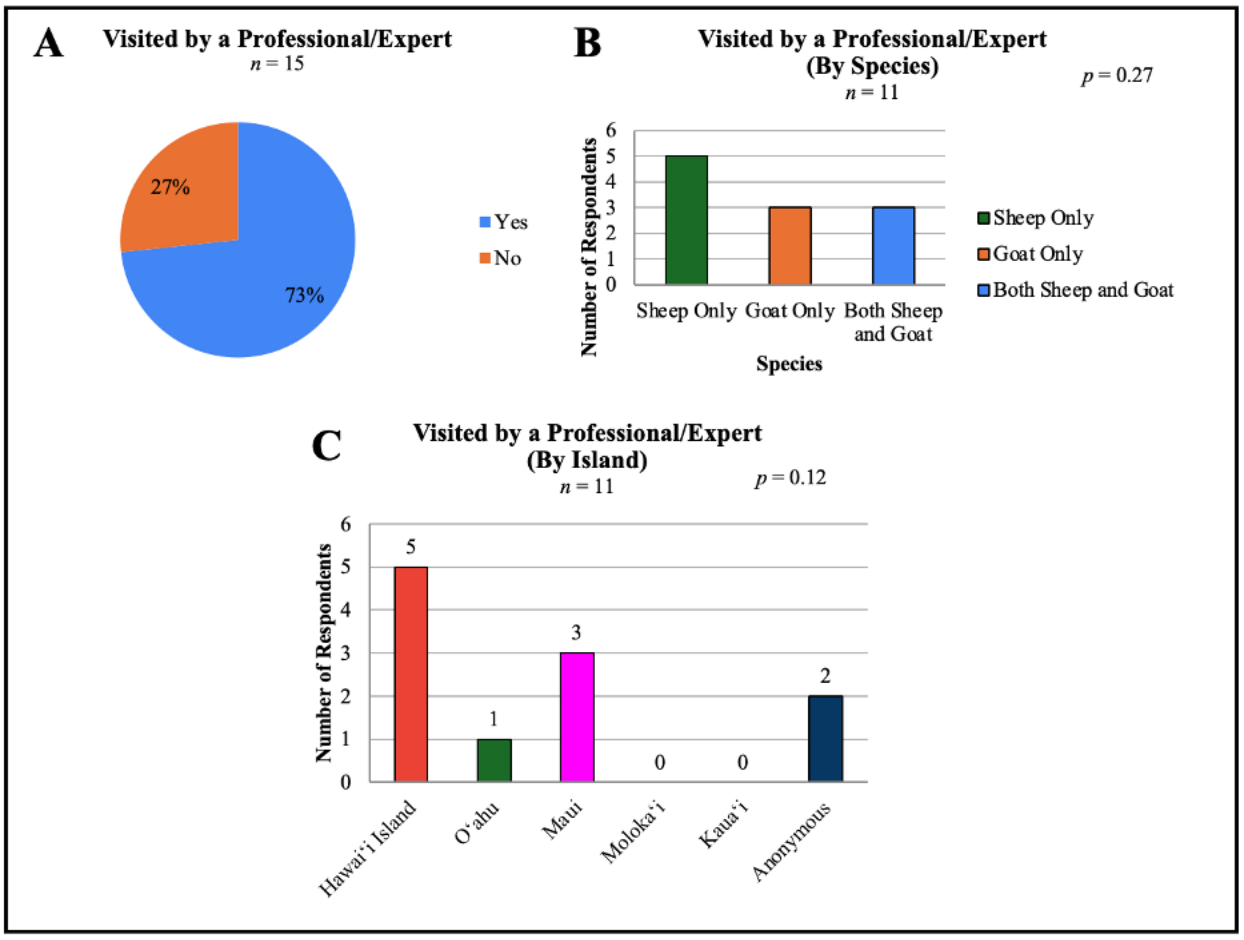

Figure 16: Response rates for an online survey of Hawai'i small ruminant producers that were (A) Visited by a Professional/Expert (n = 15); (B) Visited by a Professional/Expert (by species) (n = 11); and (C) Visited by a Professional/Expert (by island) (n = 11). Respondents were able to select more than one option when applicable.

Discussion

This survey represented 9% of the total number of sheep and goats in Hawai'i (USDA-NASS, 2022). Therefore, it may not fully reflect the entire population of local small ruminant producers. It provides a baseline for producer demographics, management practices, production goals, and the unique challenges these producers face. Based on the smaller response, future small ruminant extension programming in Hawai'i may

benefit from non-email announcements and surveys. However, nationally, producers indicate that they prefer electronic communication (Troxel, 2010). Therefore, it may be beneficial to provide producers with both electronic and non-electronic ways to complete surveys moving forward.

The survey further revealed substantial variation in herd sizes, pointing to a diversity of management styles, operational scales, and environmental conditions among small ruminant producers. In line with global trends, smaller-scale ruminant operations are particularly significant in terms of contributing to ecosystem services such as biodiversity conservation, landscape variety, and cultural value (Karlsson et al., 2022). This finding reflects the broader trend in the U.S., where small-scale farming dominates the sheep and goat industries (Whaley and Hroehlich, 2022).

Breed selection among respondents revealed some notable patterns. Among SO respondents, the Dorper breed was the most common, aligning with global trends where the Dorper breed is favored for its high-quality meat production and adaptability to a variety of environmental conditions (Schoeman, 2000). The survey also highlighted the popularity of Katahdin and St. Croix breeds, which are known for their strong resistance to gastrointestinal nematodes (Burke and Miller, 2004). Only 5% of respondents raised sheep for wool production. Comparing this to the recent data by the USDA-NASS in 2022, less than 7% of sheep farms in Hawai‘i are dedicated to wool production (USDA-NASS, 2022).

Given Hawai‘i’s climate, which is highly conducive to parasite survivability, managing parasites through deworming and coccidia treatments is a critical aspect of herd health (Stevenson et al., 2012). This is reflected in the survey results, where a majority of respondents reported regularly implementing such treatments. The high prevalence of gastrointestinal nematodes in tropical climates further emphasizes the importance of selecting resistant breeds and incorporating effective parasite control measures into herd management strategies.

In regards to goat production, the survey found that the total number of goats represented 0.8% of Hawai‘i’s total goat inventory in 2022, with respondents representing 2.4% of all goat farms in the state (USDA-NASS, 2022). Among GO respondents, the most common breeds were Nigerian Dwarf and Nubian, reflecting a strong focus on companionship and milk production. In fact, 15% of all goats in Hawai‘i were milk goats in 2022 (USDA-NASS, 2022). The presence of Boer goats, although less common in this survey, suggests that there is interest in meat goat production, which aligns with Hawai‘i’s demand for chevon (USDA-NASS, 2022). All GO respondents raised their goats partially for milk consumption, with a notable percentage selling directly to consumers. This direct-to-consumer model is particularly prevalent in Hawai‘i, where consumers demonstrate a clear preference for locally-sourced food (Le, 2023). The trend of direct sales channels, including on-farm sales, restaurants, and family and friends, shows the importance of community-based food systems and local food economies in Hawai‘i. Sheep, goats, mohair, wool, and milk, occupy a significant place in the state’s food systems, ranked as the ninth in market value (USDA-NASS, 2022).

Feeding practices were another key area where differences were noted between sheep and goat respondents. While all GO and BOSG respondents provided grain and mineral supplements, 93% of sheep-owning respondents followed similar practices. Hawai‘i’s high feed costs, due to its reliance on imported feed caused by a lack of local feed mills, are a substantial challenge for producers. Feed-related costs were among the largest expenses in the U.S. agriculture in 2023 (USDA-NASS, 2024). Mineral supplements, a critical component of livestock feed, are also heavily imported (Asem-Hiablie et al., 2018). Interestingly, respondents on Hawai‘i Island were more likely to provide mineral supplementation than those on Kaua‘i, likely due to better access to resources and infrastructure on Hawai‘i Island. This highlights the importance of localized feed solutions and resource accessibility in shaping feeding practices among small ruminant producers in Hawai‘i.

In terms of reproductive practices, the survey revealed a significant underutilization of advanced reproductive management strategies. More than half of the respondents who answered the question indicated that they did not implement any specific reproductive management practices. This could be attributed to several factors such as economic limitation, a lack of interest in the techniques, the high costs often associated with these practices, or limited experience.

Conclusion

The findings of this study provide useful information about the current sheep and goat management practices being implemented on local operations. The variation in these practices reflects individual preferences and the environmental factors that influence the specific needs of each operation. Access to this localized, research-based data can help producers change or improve their practices and make informed decisions to enhance the sustainability and success of their operation.

Conflicts of Interest

The authors declare no conflicts of interest.

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