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SAN LUIS OBISPO
Natural Resources Management & Environmental Sciences Department
College of Agriculture, Food & Environmental Sciences

Evaluation of the California Department of Food and Agriculture's Climate-Smart Incentive Programs: Final Report

Prepared for the California Department of Food and Agriculture by:
Nick Babin[1], Jet Tan[1], Sarah P. Church[2], Brennan Radulski[2]

[1]Natural Resources Management and Environmental Sciences Department
Cal Poly State University, San Luis Obispo

[2]Department of Earth Sciences
Montana State University

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Acronyms

CDFA	California Department of Food and Agriculture
OEFI	Office of Environmental Farming and Innovation
CSA	climate-smart agriculture
HSP	Healthy Soils Program
SWEEP	State Water Efficiency and Enhancement Program
AMMP	Alternative Manure Management Program
DDRDP	Dairy Digester Research and Development Program
RGA	Request for Grant Applications
SDFR	Socially Disadvantaged Farmers and Ranchers
TA	Technical Assistance
SGMA	Sustainable Groundwater Management Act
USDA	United States Department of Agriculture
VFD	variable frequency drive

1. Executive Summary

This report provides an evaluation of the California Department of Food and Agriculture (CDFA) Office of Environmental Farming and Innovation (OEFI) climate-smart agriculture (CSA) incentive programs. It employed interviews with key stakeholders (n=53) and online surveys (n=403) conducted in early 2023 of 2014-2020 grantees from the Healthy Soils Program (HSP), State Water Efficiency and Enhancement Program (SWEEP), Alternative Manure Management Program (AMMP), and Dairy Digester Research and Development Program (DDRDP). Survey sample sizes and response rates varied by program; 22% for SWEEP (n=141), 27% for DDRDP (n=30), 37% for AMMP (n=38), and 40% for HSP (n=194) (Table 2). This section of the report summarizes the findings from this evaluation and provides programmatic recommendations.

1.1 Limitations of the current study

The present study has some important limitations. First, the surveys were primarily available in online format. This undoubtedly limited accessibility for some respondents. The overall response rate was 30% with no evidence detected of non-response bias (see methods). Finally, the survey is a snapshot of grantees from 2014-2020, and as such does not consider changes in the OEFI programs that occurred subsequently.

1.2 Recommendations

These recommendations are broken into two categories: items that CDFA can address independently, and items that require policy changes and developments at the state level, beyond the control of the Department. This breakdown is intended to help readers understand pathways for change.

Throughout this report, the terms maintenance and persistence are used interchangeably. Practice maintenance was defined by an affirmative response to the survey question "Do you intend to use this practice in the next 12 months?" Intended practice maintenance averaged 75% for all 967 funded practices evaluated across the four programs (Table 4), with Socially Disadvantaged Farmers and Ranchers (SDFRs) maintaining at a higher rate (82%) than non-SDFRs (72%). As a result of their CDFA projects, 70% of respondents implemented additional conservation practices not funded through their original contract and 86% said they gained new knowledge and experience managing climate-smart agricultural (CSA) practices (Figure 3). More than three-quarters of respondents from each program would recommend their funded practices to a friend, and most believe that their farms are more resilient because of these practices (Figure 4). An impressive 85% of respondents from each program said they would apply for the program again (Figure 9). Overall, respondents across all four programs were satisfied with timely invoice payments, with the knowledge and professionalism of CDFA program staff, and had improved perceptions of CDFA following their project (Figures 9-12).

> **State Recommendation 1:** ***Increase and stabilize funding allocations for CDFA climate-smart incentive programs.*** Funded practices are being maintained at a high rate and have scaffolded the implementation of additional practices. OEFI is effectively managing and consistently improving these perennially over-subscribed programs, which is especially impressive given the drastic year-to-year changes in program budget allocations. Increasing and then stabilizing annual funding would be a wise investment in the future of climate-smart and sustainable agriculture in California.

Achieving the ambitious goals of mitigating climate change and transitioning to a more sustainable agriculture will require adoption of CSA practices on a substantial proportion of the 20 million agricultural acres in the state. However, to date the CDFA programs have funded practices on about 300 thousand acres. While this is an impressive achievement, it is not feasible for the state to pay enough farmers to adopt these practices so that the state's goals can be met. Encouragingly, farmers are sharing information (77% of respondents spoke with other growers about their program experiences) and this is leading to the increase of practices outside the project area (57% believed this led to additional adoption of practices on an average of five other farms) (Table 5). In order to deepen and widen the impact of these incentive programs, CDFA has a significant opportunity to further support processes which are known to promote practice adoption. As farmer-to-farmer social networks and trusted technical support are the two most consistent predictors of practice adoption in the United States (Prokopy et al. 2019), they deserve funding consideration.

> **CDFA Recommendation 1:** ***Support strategic approaches to collaboration involving outreach, education, and capacity building of Technical Assistance (TA) providers***[1] ***and farmer-to-farmer networks.*** The recent OEFI block grant pilot programs are an important first step in accelerating the pace and scale of CSA practice adoption through their emphasis on supporting local hubs of CSA adoption. It will be important for future block grant programs to include substantive farmer-to-farmer networking and demonstration components. A program for increasing opportunities for farmer-to-farmer interaction and mutual learning could be modeled after the proposed Farmer-to-Farmer Education Act, which would allow USDA's Natural Resources Conservation Service to enter cooperative agreements that support farmer-to-farmer education.

Almost half of SWEEP and HSP respondents worked with a TA provider at some point during their project, compared to only 20% of AMMP respondents[2] (Figure 17). Most grantees who utilized TA providers found them very or extremely important to the success of their project (Figure 19). HSP SDFR growers (58%) were more likely than SWEEP SDFR growers (39%) to utilize TA (Figure 17). A much higher proportion of SDFRS found TA support extremely important (HSP 46%, SWEEP 70%), compared to non-SDFR growers (HSP 28%, SWEEP 22%) (Figure 20). Some counties have a high perceived need for additional TA (Figure 21-Figure 24).

> **State Recommendation 2:** ***Increase the flexibility of the technical assistance program.*** The technical assistance program is a success and TA providers are especially important for SDFRs and for the strategic approaches to collaboration outlined in the previous recommendation. However, TA dollars are routinely underspent due to the restrictive nature of the funding as outlined in legislation. Under the current law, at least 5% of each program's funding allocation is accorded to TA and this must all be spent to support program applicants in that year's funding cycle. TA providers should have maximal flexibility in the timeline and specific dedication of these resources, as long as funded activities contribute to the overall goal of increasing the pace and scale of CSA practice adoption and maintenance. In addition, the 5% standard set by CDFA should be adjusted upward as demand for TA increases with this increased flexibility.

Across the four programs, the most utilized sources of information related to CSA practices are other farmers and private consultants, while governmental and non-governmental organizations (NGOs) were

[1] The OEFI Technical Assistance Program contracts technical assistance providers to provide free support to HSP, SWEEP and AMMP grant applicants and recipients. These TA providers are housed in Resource Conservation Districts, University of California Cooperative Extension offices and nonprofit organizations.

[2] DDRDP grantees to date have worked exclusively with vendors and are not eligible for the Technical Assistance Program.

the least utilized sources (Figure 25-Figure 28). Statute currently restricts TA funding to these governmental and NGO entities.

> **State Recommendation 3:** ***Redefine the definition of TA providers in statute to encompass private consultants*****.** By law, CDFA-OEFI cannot spend TA program dollars on private consultants. Improve the reach of TA by integrating private consultants into education and outreach roles.

1.2.1 Farm Characteristics

Farm characteristics for survey respondents differed substantially from the statewide farming sector. Mean farm sizes were over four times larger, with ten times more employees, and with half the proportion of leased to owned acreage. This aligns with a concern voiced by interviewees that larger-scale, relatively well-off farms had dominated the receipt of program grants (Table 3). It is likely that larger farms have staff which dedicate some of their time to focus on grant applications, and this advantage was amplified by the first-come first-served nature of these programs. However, the proportion of SDFRs among respondents (18%) was about equal to the statewide share of SDFRs among farmers (19%) (CDFA 2020a).

> **CDFA Recommendation 2:** ***Make the application process more friendly to small and medium farms.*** Equitability would be strengthened by ensuring the allocation of program funds more closely resembles the state's average farm sizes, farm employees per operation and proportion of leased to owned acreage. OEFI could accomplish this by lengthening the application window and eliminating the first-come first-served format. If this fails to realize the desired effect, efforts could be made to redefine equity so that it incorporates farm size. CDFA's 2023 California Underserved and Small Producer Grant Program provides a useful framework that could be applied to the OEFI programs.

Comparing mean farm characteristics data from surveys with data collected by CDFA during the application process would have provided the opportunity to test the representativeness of the survey sample. Unfortunately, the only farm characteristic collected consistently across all funding years was HSP farm size. The average farm size for HSP survey respondents was 995 acres, while the average for the corresponding approved HSP grant applications was 793 acres. This indicates that the HSP responses reported here may be slightly biased towards larger farms, potentially because they had more staff to complete the survey.

> **CDFA Recommendation 3:** ***Standardize OEFI's Request for Grant Applications (RGA)*****.** Future RGAs should collect a standardized array of farm characteristics, including farm size, proportion of leased to total acres, and primary household language.

1.2.2 Practice Maintenance

HSP growers plan to maintain 71% of funded practices after the incentive period with the highest maintenance in no-till (86%) and the lowest in edge-of-field practices[3] (63%) (Figure 31). Cover crop maintenance of 71% was significantly lower than that reported in a recent national survey, where 90% of respondents reported that they were likely to maintain cover crops without incentives (SARE 2023). Potential explanations include the unique climatological (frequent water scarcity and fluctuating timing of

[3] "Edge of Field" practices are defined as: conservation cover, riparian forest buffer, range planting, silvopasture, windbreak/shelterbreak establishment, riparian herbaceous cover, tree/shrub establishment, multi-story cropping, herbaceous wind barrier, grassed waterway, field border, filter strip, and contour buffer strip. Hedgerows were analyzed separately, although they are also edge of field practices.

precipitation) and economic conditions in California, compared to the US Midwest, where most national survey respondents were from.

Cover croppers were also more uncertain about future maintenance, and less likely to expand their practice compared to composters and edge-of-field practitioners (Figure 30). Respondents with previous practice experience have much higher maintenance rates. This was notable with cover cropping (77% with previous experience vs. 67% first-time), composting (82% with previous experience vs. 51% first-time), and edge-of-field practices (73% with previous experience vs. 58% first-time) (Figure 31). Of those growers who were unsure about the value of cover cropping and composting on their farm prior to their project, 50% and 36% respectively were convinced by their project experiences to maintain the practice after the incentive period ended (Figure 39). Nearly three-quarters of cover crop and compost grantees who abandoned the practice would have been more likely to maintain the practice for two more years if HSP financial incentives had continued for those years (Figure 40). About half of all cover croppers and composters reported significant beneficial impacts from their respective practices on soil structure, water infiltration, and water holding capacity (Figure 45). Practice persisters were much more likely to have perceived significant benefits than abandoners (Figure 46).

> **State Recommendation 4:** ***Enable longer grant terms for cover crops and compost.*** First-time practitioners are the desired target for these programs, and the survey results indicate that they are struggling, with substantially lower persistence rates than respondents with previous practice experience. However, the results highlight the importance for maintenance of experiencing significant benefits of the practice and suggest that extending the grant term from three to five years would lead to higher persistence. Therefore, we recommend extending the incentive period to five years. Achieving this would require the state to lengthen liquidation deadlines for program funds to 6-7 years and invest in the staff resources necessary to support longer grant terms. It would also potentially reduce the overall number of funded projects.

Less than half of respondents believe cover crops are financially sustainable without incentives (Figure 52). When asked to estimate a fair payment rate for cover cropping, the average preferred rate was $238 per acre. This is significantly higher than the 2018 HSP rates for single-species ($126 per acre) and multiple-species ($147 per acre) cover crops. The preferred per-ton payment rate for composting was not substantially different from current HSP rates. Composting was twice as likely as cover cropping to increase net profits, with 32% of composters experiencing more than a 2% increase in profits and only 16% of cover croppers reporting the same benefit (Figure 42). However, 22% of respondents agreed that they viewed compost as a temporary substitute for the chemical fertilizers that they have since completely reverted to following the completion of the three-year trial. Indeed only 51% of first-time composters intend to persist with the practice (see above), corroborating interviewees who expressed concern that compost was being treated (erroneously) as a short-term input substitution for chemical fertilizers.

> **CDFA Recommendation 4:** ***Increase the payment rate for cover crops.*** Labor, water, and input prices are higher than in other regions of the country. These input prices have also increased at a higher rate than other states over the last ten years. This magnifies the economic impact of any yield losses, whether real or imagined, as a result of cover cropping. Cover crop incentive rates should increase to reduce the perceived opportunity cost of cover crops.

Cover crop and compost abandoners had significantly smaller farms and fewer employees (Table 6). SDFR growers were much less likely to strongly agree that they possessed the knowledge and skills to successfully manage cover crops and composting (Figure 55-Figure 57). Almost three-quarters of respondents found germination and establishment of the cover crop to be a challenge (Figure 58), with SDFR growers about twice as likely to have found germination and establishment to be extremely challenging (Figure 59). Transporting and spreading compost was the most cited challenge reported by

respondents, with 69% finding it at least slightly challenging, although finding certified (62%) and quality compost (58%) was also at least slightly challenging for the majority of respondents (Figure 60). Finding certified compost was an extreme challenge for a significantly larger proportion of SDFRs (Figure 61).

> **CDFA Recommendation 5:** ***Target additional technical assistance to SDFR growers and smaller farms.*** Technical assistance providers and block grant recipient organizations could address the challenges facing this subset of grantees through targeted educational materials, training, and other implementation assistance.
>
> **State Recommendation 5:** ***Develop pathways for grantees to access equipment and compost supplies.*** State-mandated waste diversion programs play an important role in making certified compost more readily available. Continued support for their development is crucial, as well as guidance for compost grantees to navigate databases of certified compost suppliers. Additional state support for regional equipment-share programs would make needed compost production and spreading equipment more accessible.

Edge-of-field plantings and hedgerows have persistence rates of 64% and 74% respectively (Figure 31). Cost of maintenance and issues with plant survival were the most important challenges for the management of edge-of-field practices, while food safety risks resulting from greater wildlife habitat were not cited as an important challenge (Figure 62). Interviewees commented that the native shrubs utilized in hedgerows and other edge-of-field practices are unfamiliar to many farm workers, and this has impacted plant survival.

> **CDFA Recommendation 6:** ***Target additional technical assistance to hedgerow grantees.*** Technical challenges seem to play a role in the relatively low persistence rate for edge-of-field plantings, especially in the management of native plants. This could be addressed by the development of bilingual educational materials and trainings on hedgerow maintenance. In addition, given the historical misinformation and controversy surrounding hedgerows and food safety, it may be beneficial to document the positive views and experiences of HSP grantees to share with others who may be considering edge-of-field practices.

Micro-irrigation had the highest persistence (84%) and expansion (35%) rates among SWEEP practices, while web-based subscriptions for irrigation management platforms had the lowest persistence (67%) and expansion rates (22%) (Figure 66 and Figure 70). Variable frequency drive (VFD) pumps (79%) and solar (81%) had relatively low persistence rates, given they are fixed infrastructure projects. Only 50% of respondents had tested the distribution uniformity of their irrigation system in the previous two years.

Soil moisture sensor abandoners had considerably larger farms than persisters (6606 acres abandon vs. 1159 acres persist), with on average fewer employees (36 abandon vs. 43 persist) and much larger SWEEP projects (268 abandon vs. 144 persist project acres) (Table 7). Water usage and irrigation efficiency were by far the most significant beneficial impacts reported by soil moisture monitoring grants, followed by crop yields and quality (Figure 71). Persisters were much more likely than abandoners to perceive water usage and crop yields as significant beneficial impacts (Figure 72). Fewer than two-thirds (64%) of respondents agree that they have enough understanding of the data produced by soil moisture sensors to effectively plan irrigation events. SDFRs were almost twice as likely as non-SDFRs to agree that they would have benefited from additional technical assistance in managing soil moisture sensors (Figure 76).

> **CDFA Recommendation 7:** ***Consider project size caps for soil moisture sensors.*** Soil moisture sensors are a labor and knowledge-intensive practice. Abandoners had a combination of bigger farms with less labor and larger SWEEP projects than persisters, and this may have limited the

ability of abandoners to manage this practice effectively. If larger project sizes are allowed, the sensors being incentivized should include automation features like WIFI capabilities and smartphone applications that track moisture at the field level, as well as training on how to use these applications.

CDFA Recommendation 8: ***Incentivize more technical support for DU testing and operation of soil moisture sensors.*** Many interviewees commented that growers received little to no support from product vendors on optimal practice management and data interpretation. Additional training and technical support are warranted, especially for SDFRs. Established TA programs and the newer Water Efficiency Technical Assistance (WETA) grant program can offer this training and support.

AMMP and DDRDP practice persistence rates were high, with 100% persistence of dairy digesters and flush-to-scrape systems, 96% persistence of solid separation systems, and 86% persistence for compost bedded pack barns (Table 8). However, only 43% of compost-bedded pack barn grantees were unlikely to eventually add stalls to their project. (Figure 81).

CDFA Recommendation 9: ***Extend the compliance period from 5 to 10 years for compost bedded pack barns*****.** Survey results were corroborated by interviewees who observed some growers exploiting this practice as a subsidy to build a new barn, which after the grant period ended would be converted to stalls.

AMMP grantees experienced major benefits related to reducing solids in manure ponds, reduced lagoon cleaning costs, and improved cow health (Figure 82). DDRDP participants reported fewer benefits than AMMP participant in odor reduction, lagoon cleaning costs, reduced solids in manure ponds, and water efficiency (Figure 83). AMMP practices led to a 2% or more increase in farm profitability for 35% of grantees, compared to only 10% for DRDDP (Figure 84). A full quarter of DDRDP grantees experienced a 5% or more decrease in profitability as a result of their digester installation, with 23% observing that the benefits of their digester don't outweigh the costs.

1.2.3 CDFA-OEFI Program Administration

A significant proportion of HSP grantees (36%) reduced the complexity of their proposed projects due to time constraints imposed by the first-come, first-served application process (Figure 10). These issues were compounded for HSP SDFR growers, with HSP project complexity reduced by 47% of SDFR growers, compared with 33% of non-SDFR growers (Figure 13). In addition, HSP SDFR growers were also much more likely to have difficulty acquiring supporting application information than non-SDFR growers (48% versus 28%) and to agree that the application window was too short (50% versus 28%).

CDFA Recommendation 10: ***Update the first-come, first-served application process.*** The survey and interview data suggest that a first-come, first-served process leads to rushed or incomplete applications that hinder the participation of SDFRs and results in simplified projects with fewer positive impacts on climate adaptation and mitigation. CDFA has recently established priority ranking criteria that have the potential, along with an early release of the grant details, to address this issue. Future program evaluation should focus on assessing the impacts of these measures on SDFR participation and the number of multi-practice projects.

Both HSP and SWEEP SDFR growers (27% and 56%) were more likely than their non-SDFR counterparts (17% and 20%) to experience budget changes during their project. 47% of HSP SDFR growers found budget changes overly complicated, hindering timely project completion, compared to 25% of non-SDFR growers (Figure 15 and Figure 16). Over half of HSP respondents (54%) experienced

a change in CDFA contact person. SDFR growers (42%) were more likely than non-SDFR growers (31%) to have a negative program experience due to this change (Figure 15).

> **CDFA Recommendation 11:** ***Allow more flexibility in budget change processes.*** Recent modifications by CDFA only require paperwork on changes beyond a certain dollar threshold. The impact of these changes should be assessed, especially on the experience of SDFRs, and further changes initiated as warranted.

Most HSP and SWEEP respondents desired a greater proportion of project funding from advanced payments, with the preferred level of upfront funding averaging 50% of the total project cost. HSP SDFRs were more reliant on advanced payment (27%) than their non-SDFR counterparts (17%). SWEEP SDFRs were much more reliant (38%) on this funding than non-SDFR growers (13%).

> **State Recommendation 6:** ***Increase the amount of advanced funding available to grantees.*** Current regulations limit the total proportion of project funds that may be disbursed in advance to HSP and SWEEP grantees. These limits should be increased to 50% of the total project cost.

> **CDFA Recommendation 12:** ***Make advanced project funding more readily available, especially for SDFRs***. Outreach to SDFRs and small farms should advertise the availability of advanced payments, and CDFA should prioritize their requests.

> **CDFA Recommendation 13:** ***Conduct regular program evaluation.*** This report provides the first comprehensive program evaluation of these OEFI programs. CDFA should commit to regular evaluation, no less than every 4 years, especially in light of new developments that the study could not address such as the block grant program.

2. Introduction

The CDFA-OEFI climate-smart incentive programs are designed to mitigate GHGs and help farmers and ranchers adapt to climate change while incentivizing adoption of sustainable agricultural practices. This suite of programs emerged in the 2010s in response to severe drought conditions and GHG reduction goals dictated by state legislation (AB 32, The Global Warming Solutions Act of 2006).

HSP, SWEEP, AMMP and DDRDP have received more than $800 million in funding since 2014. Resources have been dedicated to incentivizing grower adoption of agricultural practices directed at GHG mitigation, soil health, manure management, renewable energy, and water and energy use efficiency across California (Table 1). To date there has been no comprehensive evaluation of the effectiveness and broader impacts of these programs. This evaluation focused on grantees from the years 2014-2020 and was framed around the following questions:

1. How can CDFA improve the application process and grant awardee experience?
2. What is the prevalence of practice persistence beyond the grant term?
3. What are the co-benefits and costs of specific climate-smart practices?
4. What are the conditions or demographic factors that are associated with practice persistence, abandonment and expansion?
5. Does the allocation of program dollars reflect the demographics of the state agricultural system?
6. How do underrepresented growers experience adoption (maintenance, expansion, barriers, opportunities, etc.) differently?
7. What interventions (program policies and incentives) are needed to support long-term maintenance and expansion of practices? How should these programs change moving forward?
8. What information is most relevant to understanding each program's effectiveness?

Table 1. CDFA-OEFI program characteristics and practices evaluated.

Program	Goals	Practices Evaluated[4]	Eligibility
AMMP	Mitigate GHGs Reduce manure run-off	Solid separation system Flush to scrape system Compost bedded pack barn	Dairy and/or livestock operations
DDRDP	Mitigate GHGs Reduce air pollution Reduce manure run-off Produce renewable energy	Digester	Dairy operations
HSP	Mitigate GHGs Enhance carbon sequestration Enhance soil health	Cover crops Compost Hedgerows Edge-of-field practices	Agricultural operations
SWEEP	Mitigate GHGs Reduce water use Reduce energy use	Micro irrigation Soil moisture sensor Solar Irrigation management subscriptions Pump VFD pump Weather Station	Agricultural operations

3. Methodology

We used a mixed-methods research design to perform this evaluation. Interviews were conducted first, which informed the design of an online survey. All research was conducted under California Polytechnic State University San Luis Obispo IRB #s 2022-099-CP and 2023-023-OL. Fifty-three semi-structured interviews with grower grant recipients (n=14), CDFA staff (n=16), technical assistance providers (n=11), and civil society advocates and critics (n=12) were conducted in the Summer and Fall of 2022 using Zoom. Civil society interviewees represented state and national-level NGOs focused on agroecology, social justice and climate adaptation and mitigation in agriculture. These hour-long interviews were intended to identify program goals and achievements, program practice co-benefits, challenges with participating in programs, recommendations for program changes, program accessibility, and post-program maintenance of climate-smart practices. See Appendix A for the interview guide. An initial interviewee list of ten subjects was compiled in consultation with CDFA staff and a snowball sampling method was utilized whereby each interviewee was asked to identify additional relevant subjects (Schutt 2014). We conducted interviews until saturation was achieved, meaning that data obtained from new interviews was redundant of data already collected. The interviews were recorded (with interviewee permission) using Zoom and professionally transcribed.

Once the interviews were transcribed, NVIVO 13 Pro was used to analyze the interview data (Lumivero 2023). One researcher developed a preliminary thematic analysis codebook for the data. Next, we selected four interview transcripts for two researchers to code within NVIVO, and based on this the codebook was refined and recoded three times until Cohen's Kappa surpassed the minimum threshold of 0.75 (Cohen 1960). A finalized version of the codebook was then used by the same two researchers to code all the interviews. See Appendix B for interview codebook.

[4] Due to survey space constraints the present study limited itself to evaluating these practices, which were selected for their popularity and overall representativeness of each program's goals.

Online surveys were developed, guided by findings from interviews described above. The surveys censused all funded grant recipients (n=1652) from four CDFA-OEFI climate smart incentive programs; HSP 2018-2020 (n=591), SWEEP 2014-2019 (n=829), AMMP 2017-2020 (n=115), and DDRDP 2015-2020 (n=117). Contact information (emails, physical addresses, phone numbers) of grant recipients were obtained from CDFA. If a farming entity or individual received more than one grant from each program, then the study surveyed them once and elicited information on all grants received. After eliminating these duplicates, a total of 1349 unique grant recipients were included in this research.

Content differed somewhat across program surveys due to the idiosyncratic nature of each program, with surveys ranging between 72 to 119 questions and requiring 20-35 minutes to complete. Questions focused on grant specifics (what practices were funded, years, did technical assistance providers aid in the grant, etc.), practice-specific questions (experiences with the practice, persistence and expansion of the practice, benefits realized, etc.), perceptions of CDFA application and administrative processes, and demographic questions. Question types on the survey included Likert scales, multiple choice, and free response. See Appendix C for all four survey instruments.

The survey used multiple contact modes (mail, email, text message) for promotion. All communications included instructions for accessing the web-based Qualtrics surveys (Qualtrics, Provo, UT). The first stage of distribution was a mailed letter containing a link to the online survey. Incentives included $2 placed in the initial letter and a $20 Visa gift card upon completion of the survey. The letter was followed by a combination of three personalized emails and one text message. Further promotion was provided by email listservs and newsletters managed by the California Climate and Agriculture Network, University of California Climate Smart Extension Program, American Farmland Trust, and the California Farm Bureau. All recruits from these venues were verified as grantees before completing the survey. Additionally, translation services were provided to three TA providers with extensive experience working with SDFR grantees. The surveys were conducted anonymously on Qualtrics between February 8, 2023, and March 28, 2023. Non-response bias was tested by comparing data from those who responded to the first mail and email promotion of the survey with those who responded after the third email follow-up. There were no statistically significant differences between respondent groups. All descriptive statistics and statistical tests were conducted utilizing JMP (ver. 15.1) and Julia version 1.8.5 (Bezanson et al., 2017). All tables and figures were developed using MS Excel and Julia version 1.8.5 (Bezanson et al., 2017). The number of respondents differs across survey questions presented in this report as respondents were not required to answer every question and some skip-logic questions were not asked of every respondent.

4. General Survey Response

Section 4 Key Findings

- Survey administered in February-March of 2023.
- 403 completed surveys; **30% overall response rate** (Table 2).
- Response rates varied by program: 22% for SWEEP, 27% for DDRDP, 37% for AMMP and 40% for HSP (Table 2).
- Most respondents' projects were:
  - Completed prior to 2023 (Figure 1).
  - Funded between 2018-2020 (Figure 2).

Table 2. Survey response rates.

Program	N	Responses	Response Rate
HSP	484	194	40%
SWEEP	650	141	22%
AMMP	104	38	37%
DDRDP	111	30	27%
Total	1349	403	30%

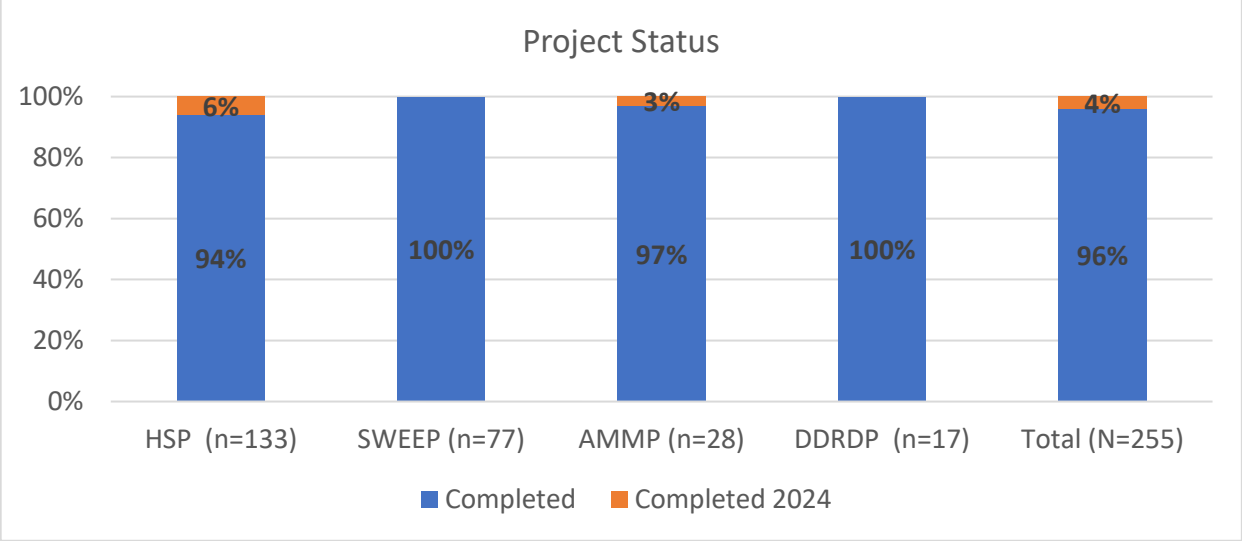

Figure 1. Responses to "What is the status of your project?" (n = 255)

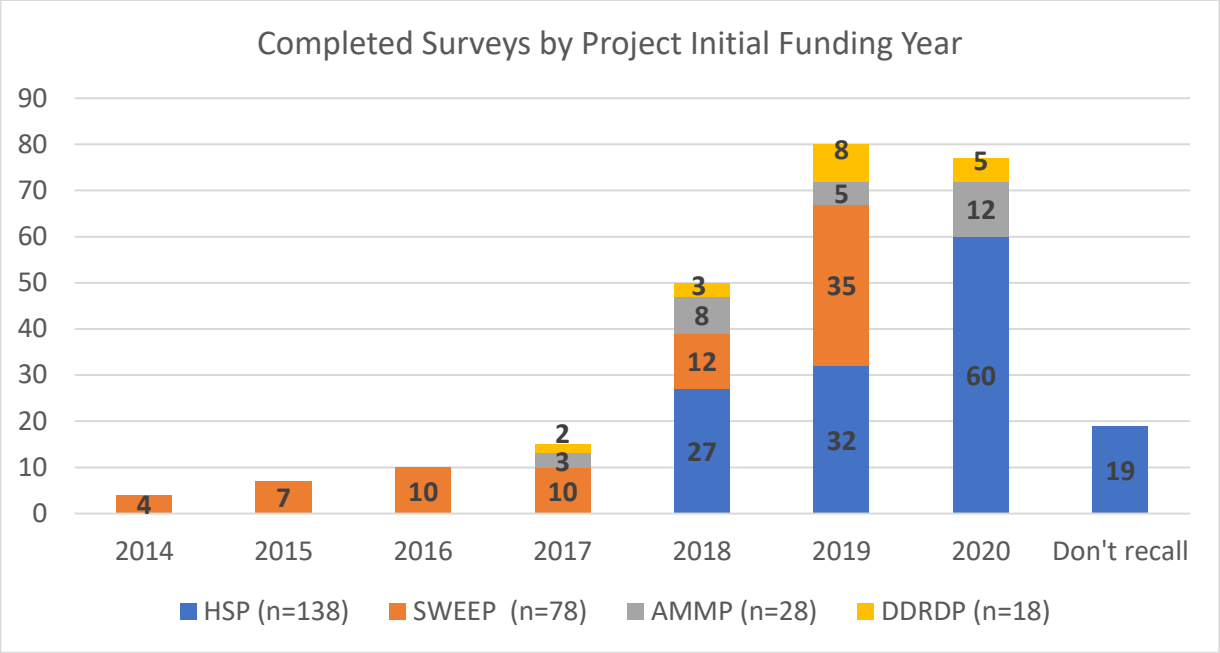

Figure 2. Number of responses to "What year was your project funded?" (n=262)

4.1 Demographics

Section 4.1 Key Findings (across all programs)

- Respondent mean farm and farm manager characteristics **differed substantially** from the demographics of the state agricultural system (Table 1).
- Average respondent farm size was **much higher** (1595 acres) than the California average of 351 acres (USDA 2022).
- Averaged leased acres (23%) was **about half** the California average of 45% (USDA 2015).
- The average number of employees (20) was **ten times higher** than the California average (CDFA 2020a).
- Respondents were 21% female, **lower** than the 37% of all California farmers who are female (USDA 2017).
- Farms located in basins regulated by the Sustainable Groundwater Management Act (SGMA) **were underrepresented**. SGMA regulated basins comprise 88 percent of all irrigated acres (6.7 million acres) statewide (CDWR 2020). The proportion of survey respondent lands under irrigation was high (91%), however **less than a third** (31%) of all respondents were located in a SGMA regulated sub-basin.
- SDFRs made up 18% of all respondents, which is **similar** to the 19% of California farmers who are SDFRs (CDFA 2020b).
- The proportion of surveyed farms with organic certification was **much higher** (22%) than the California average (4%) (USDA 2019).
- About 12% of California farms primarily utilize non-traditional markets[5], which is **much lower** than the almost 40% of our survey respondents who primarily used them (USDA 2020).
- **More than half** of respondents (53%) had an insecure contract, meaning that they did not have a contract for the 2023 harvest.

[5] Non-traditional market farms are those for whom the traditional wholesale market is less important than other direct markets like online, farm stands, community supported agriculture, direct sales to institutions (restaurants, schools, hospitals, etc.), and farmers markets.

- The average farm size for the HSP survey respondents was **higher** (995 acres) than the average for all HSP approved grant applications (793 acres).

Table 3. Mean values of farm and farm manager respondent characteristics for total sample and by program.
± Responses to "What percentage of the croplands you manage are irrigated?"

Variable	HSP (n)	SWEEP (n)	AMMP (n)	DDRDP (n)	Total (N)	California
Average Operation Acres	995 (133)	2428 (100)	1367 (26)	1724 (19)	1595 (278)	351
Leased Acres/ Operation Acres (%)	25% (133)	13% (96)	NA (0)	NA (0)	23% (229)	45%
Employees	5 (136)	36 (100)	21 (3)	35 (19)	20 (285)	2
Male (%)	70% (133)	82% (100)	93% (29)	100% (19)	79% (281)	64%
Age	56 (136)	53 (96)	50 (28)	54 (18)	54 (278)	58
Years in Agriculture	27 (141)	29 (105)	34 (29)	36 (19)	29 (294)	NA
Irrigation (%) ±	86% (128)	96% (106)	92% (27)	96% (18)	91% (279)	98%
SGMA (%)	14% (140)	51% (106)	7% (30)	83% (18)	31% (294)	88%
Socially Disadvantaged (%)	13% (193)	20% (140)	0% (38)	6% (28)	18% (399)	19%
Four Year Degree (%)	88% (193)	90% (144)	58% (38)	57% (28)	84% (403)	NA
Organic (%)	28% (144)	11% (104)	40% (30)	0% (18)	22% (296)	4%
Non-traditional Market (%)	40% (143)	22% (103)	58% (38)	68% (28)	39% (312)	12%
Insecure Contract (%)	66% (123)	45% (93)	40% (30)	37% (24)	53% (270)	NA

4.2 Overall Practice Persistence and Co-benefits

Section 4.2 Key Findings (across all programs)

- **Respondents plan to keep using practices:** Intended practice persistence averaged 75% for all 967 funded practices evaluated across the four programs (Table 4).
  - Persistence was highest in the DDRDP program (100%) and lowest within HSP (71%)
  - SDFR growers had a higher persistence rate (82%) than non-SDFR growers (72%).
- **Networks expanded, unfunded practices implemented, knowledge gained** (Table 5):
  - As a result of participating in a CDFA project:
    - Almost 50% of respondents' farming network expanded.
    - 70% of respondents implemented conservation practices not funded through their original contract.
    - 86% of respondents said they gained new knowledge and experience managing for multiple benefits.

Table 4. Persistence and abandonment rates (%) of OEFI funded practices. Practice persistence is defined by an affirmative response to the survey question "Do you intend to use this practice in the next 12 months?"

Practice	Persistence	Abandonment
HSP Practices (n=437)	71%	29%
SWEEP Practices (n=463)	75%	25%
AMMP Practices (n=45)	93%	7%
DDRDP Practice (n=22)	100%	0%
All OEFI Practices (n=967)	75%	25%
SDFR Respondents (n=51)	82%	18%
Non-SDFR (n=283)	72%	28%

Table 5. Impact of funded projects on grower communication and expanded adoption.

Survey Question	HSP	SWEEP	AMMP	DDRDP	Total
"Have you talked with other growers about your experiences with this program?" - % indicating yes (n/N)	70% (136/194)	85% (99/117)	81% (29/36)	85% (17/20)	77% (281/367)
"About how many people have you spoken with about your experience?" - Average number of growers spoken with (SD,n)	13.4 (23, 136)	11.7 (17, 99)	18.7 (29.4, 29)	11.4 (8, 17)	NA
"Do you think that your project has had a significant impact on the adoption of (healthy soils, water and energy efficient, alternative manure management) practices by other growers?" - % agreeing (n/N)	52% (71/136)	62% (61/99)	55% (16/29)	71% (12/17)	57% (160/281)
"About how many growers do you estimate have adopted (healthy soils, water and energy efficient, alternative manure management) practices, at least partially because of your project?" - Average number of growers adopted (SD,n)	4.6 (7.1, 71)	3.9 (8, 61)	4.5 (5.4, 16)	5.9 (5.4, 12)	NA

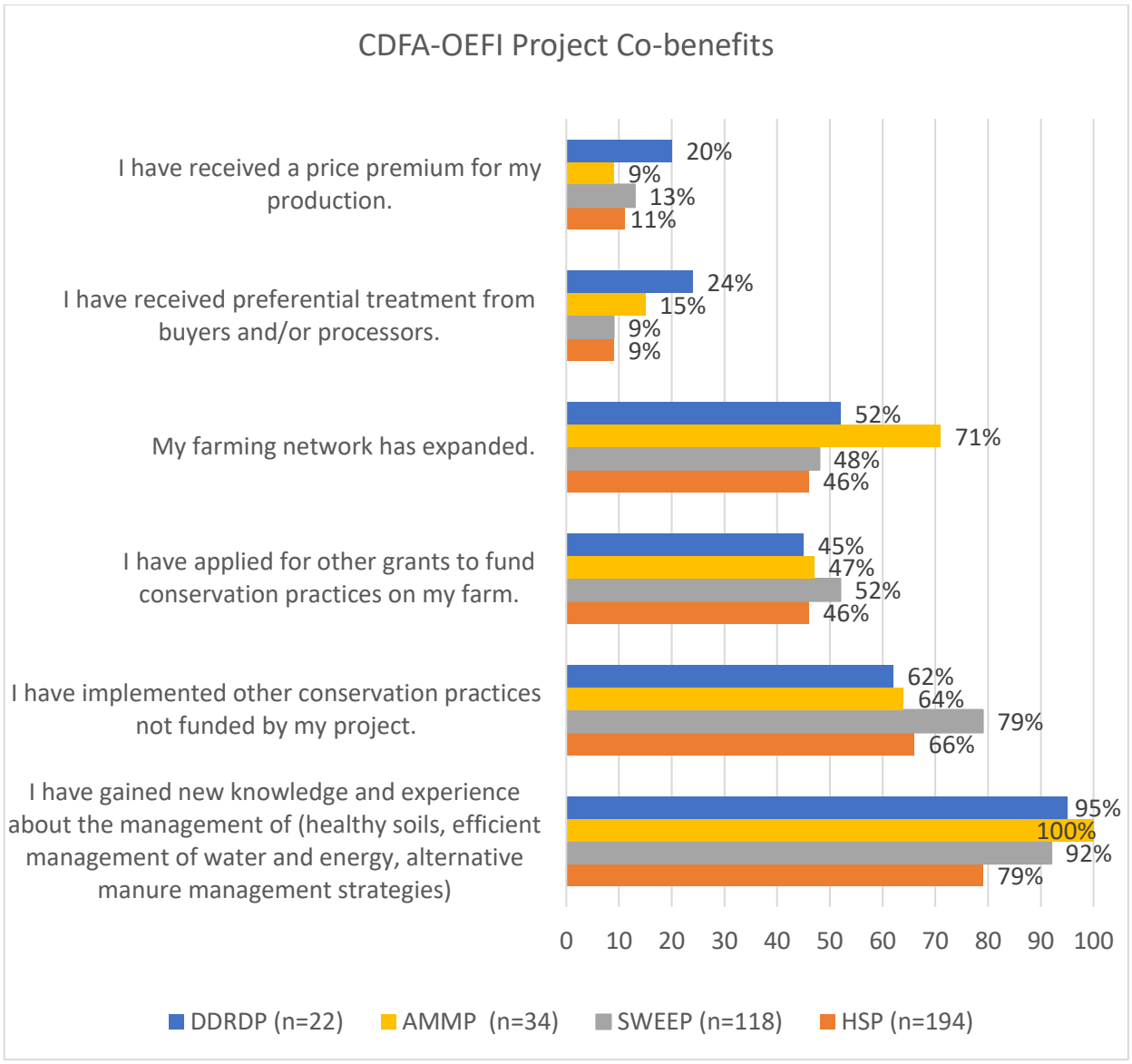

Figure 3. Percentage of responses per program indicating true to the question "As a result of my (HSP, SWEEP, AMMP, DDRDP) project…"

4.3 Project Outcomes

Section 4.3 Key Findings

- **Respondents willing to recommend practices:** More than 75% of respondents across all programs are willing to recommend their funded practices to others (Figure 4).
- **Farms more resilient:** Most respondents believe their farms are more resilient post-project, ranging from 62% for HSP to 86% for AMMP (Figure 4).
- **Programs important for public perception:** Most respondents agree that the CDFA climate-smart incentive programs are important for improving the public perception of agriculture (Figure 4).
- **Positive public perceptions:** AMMP and DDRDP respondents were much more likely than HSP or SWEEP respondents to agree that their project improved the public's perception of their farm (Figure 4).

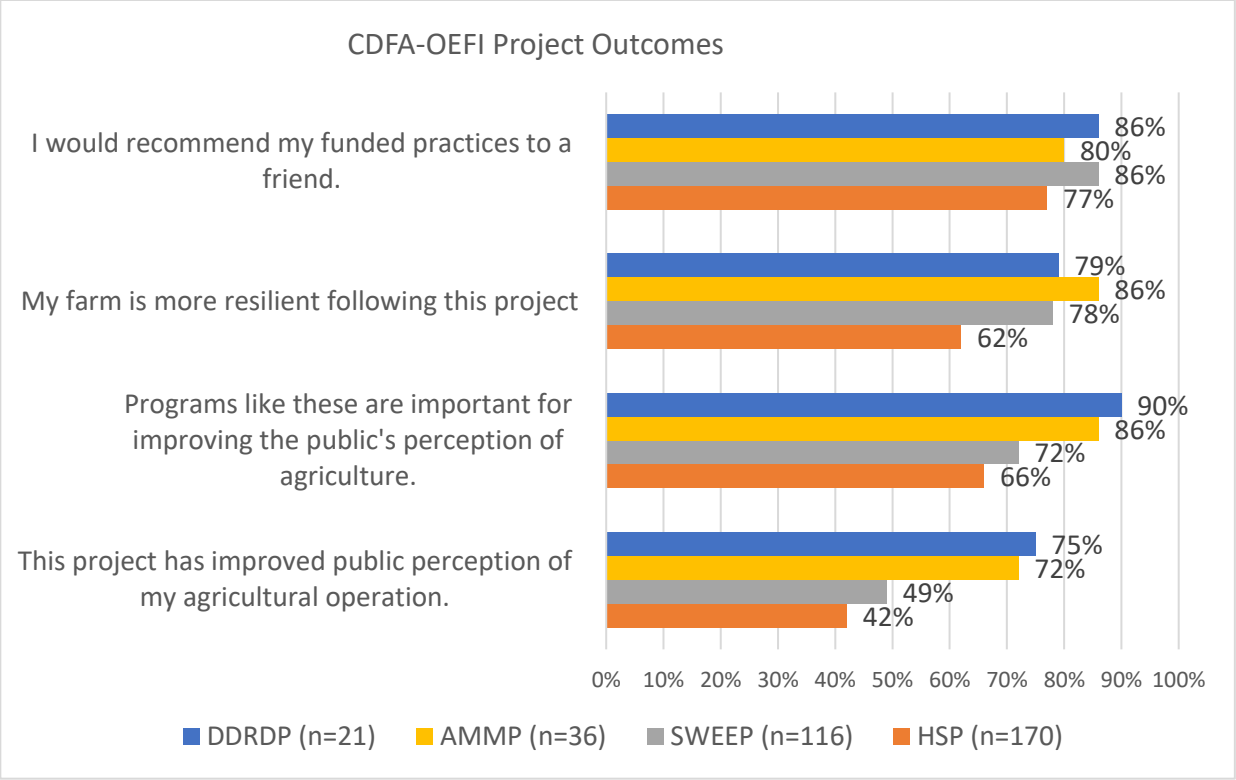

Figure 4. Percentage of respondents "Somewhat agreeing" and "Strongly agreeing" with the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree.

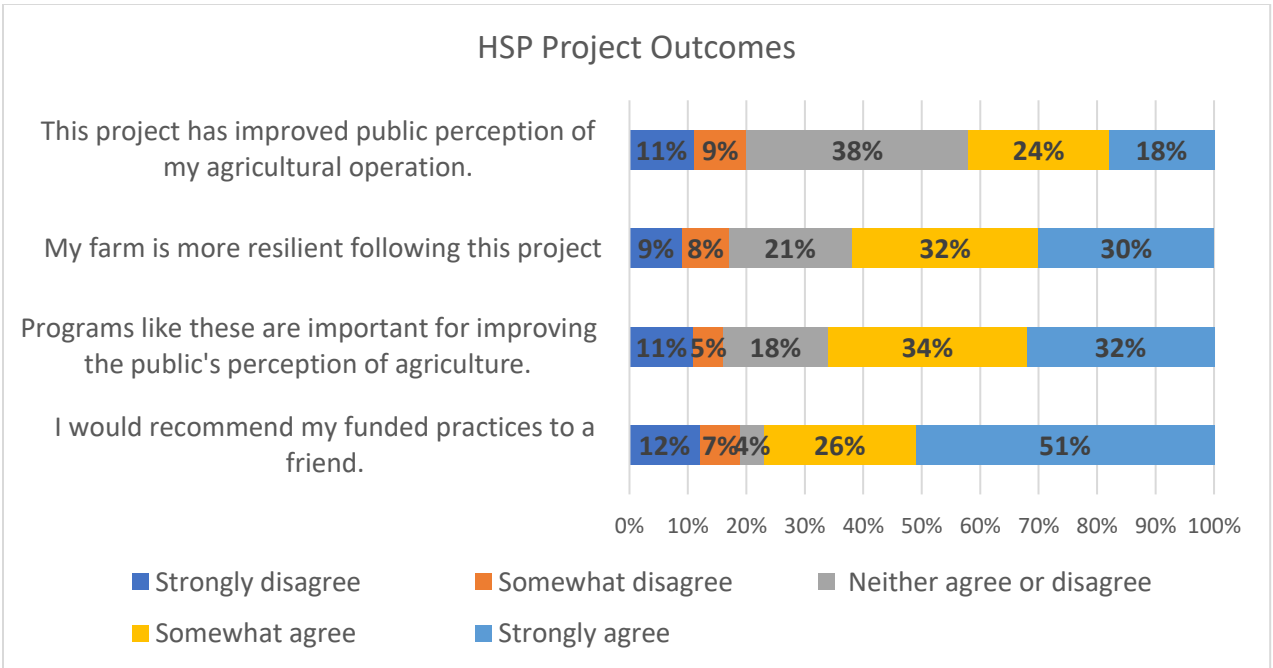

Figure 5. Percentage of HSP respondents to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=170).

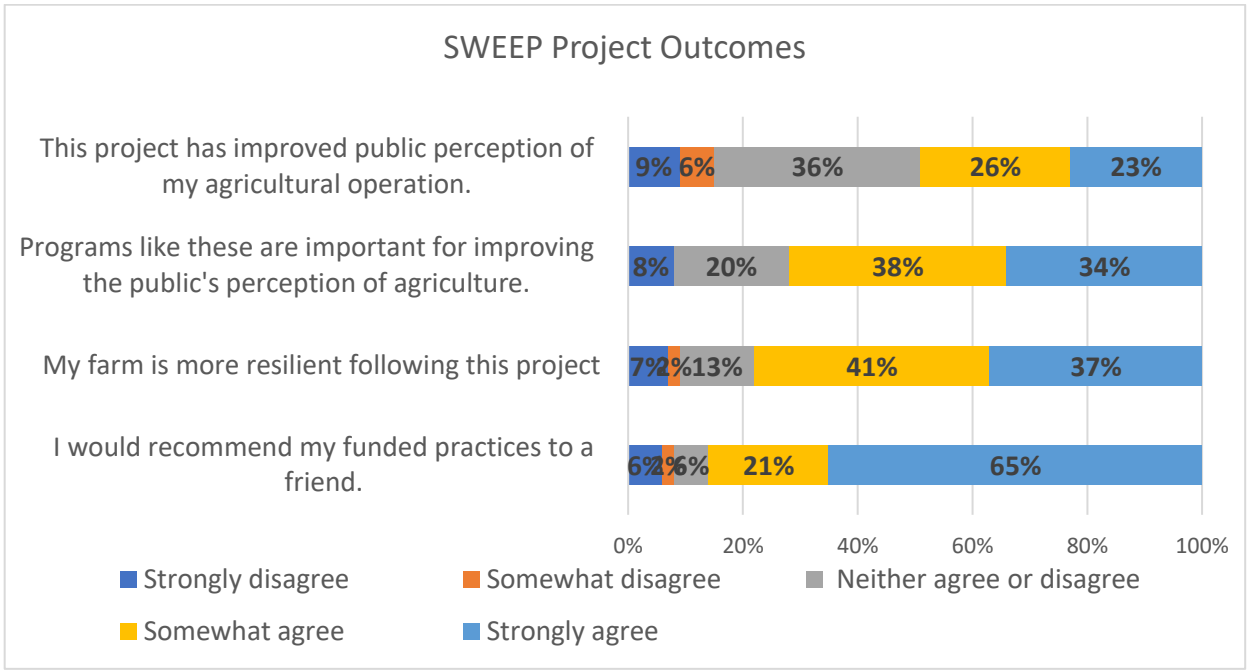

Figure 6. Percentage of SWEEP respondents to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=116).

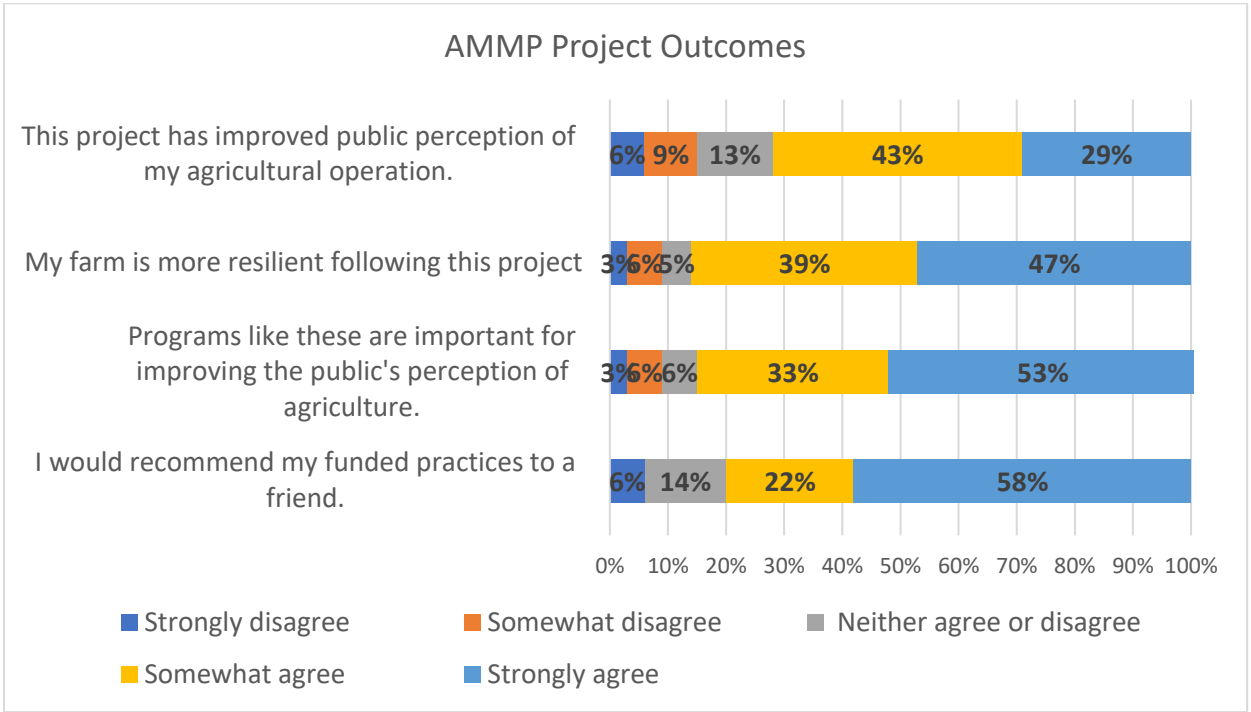

Figure 7. Percentage of AMMP respondents to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=36).

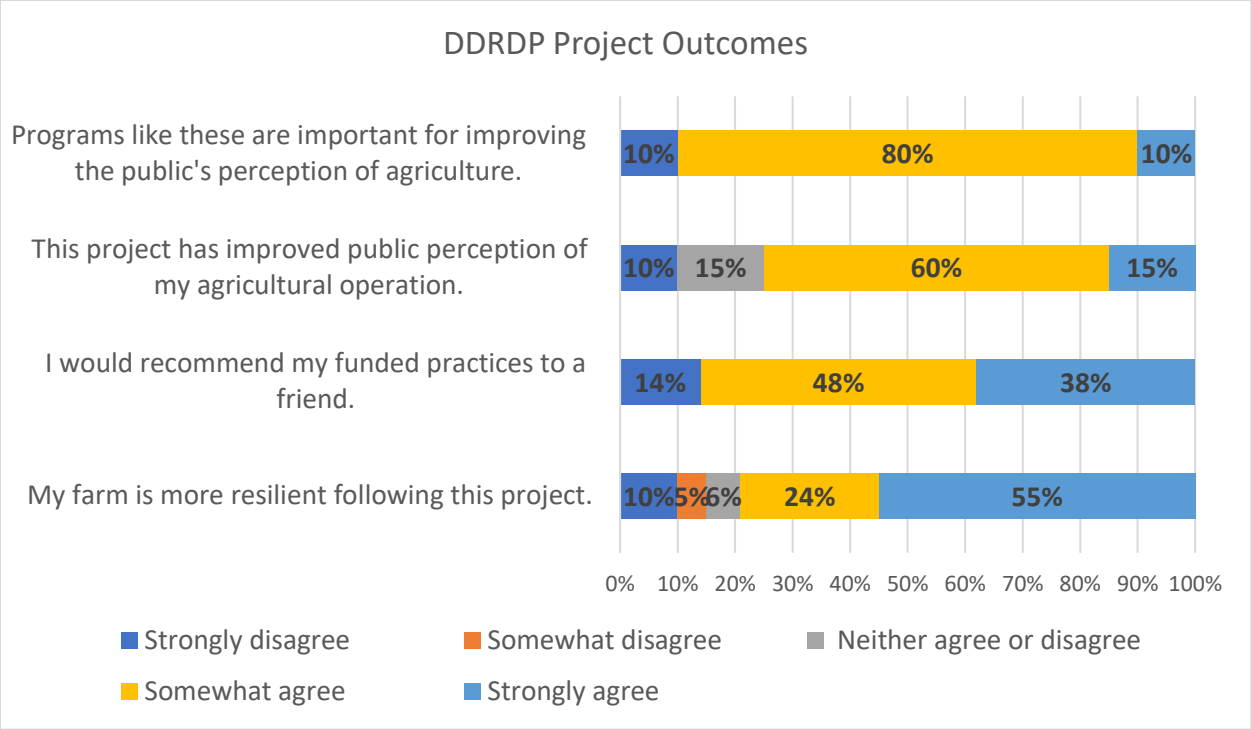

Figure 8. Percentage of DDRDP respondents to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=21).

4.4 Program Evaluation

Section 4.4 Key Findings

- **Positive program experience and improved perceptions of CDFA:** Most respondents, across programs, were satisfied with timely invoice payments and with the knowledge and professionalism of CDFA program staff. They had improved perceptions of CDFA and said they would apply for the program again (Figure 9).
- **Applications are not clear:** Less than 50% of respondents found the application easy to understand (Figure 9).
- **Application window works for most:** Across all programs, about 30% of respondents believed the application window was too short (Figure 9).
- **Some applicants reduced proposed project complexity due to time constraints:** Thirty-six percent of HSP respondents reduced the complexity of their proposed projects due to time constraints, compared to only 12% for SWEEP and 9% for AMMP.
- **Challenges for SDFR Growers:** HSP proposed project complexity was reduced by 47% of SDFR growers, compared with 33% of non-SDFR growers (Figure 13). In addition, HSP SDFR growers were much more likely to have difficulty acquiring supporting application information than non-SDFR growers (48% versus 28%) and to agree that the application window was too short (50% versus 28%).

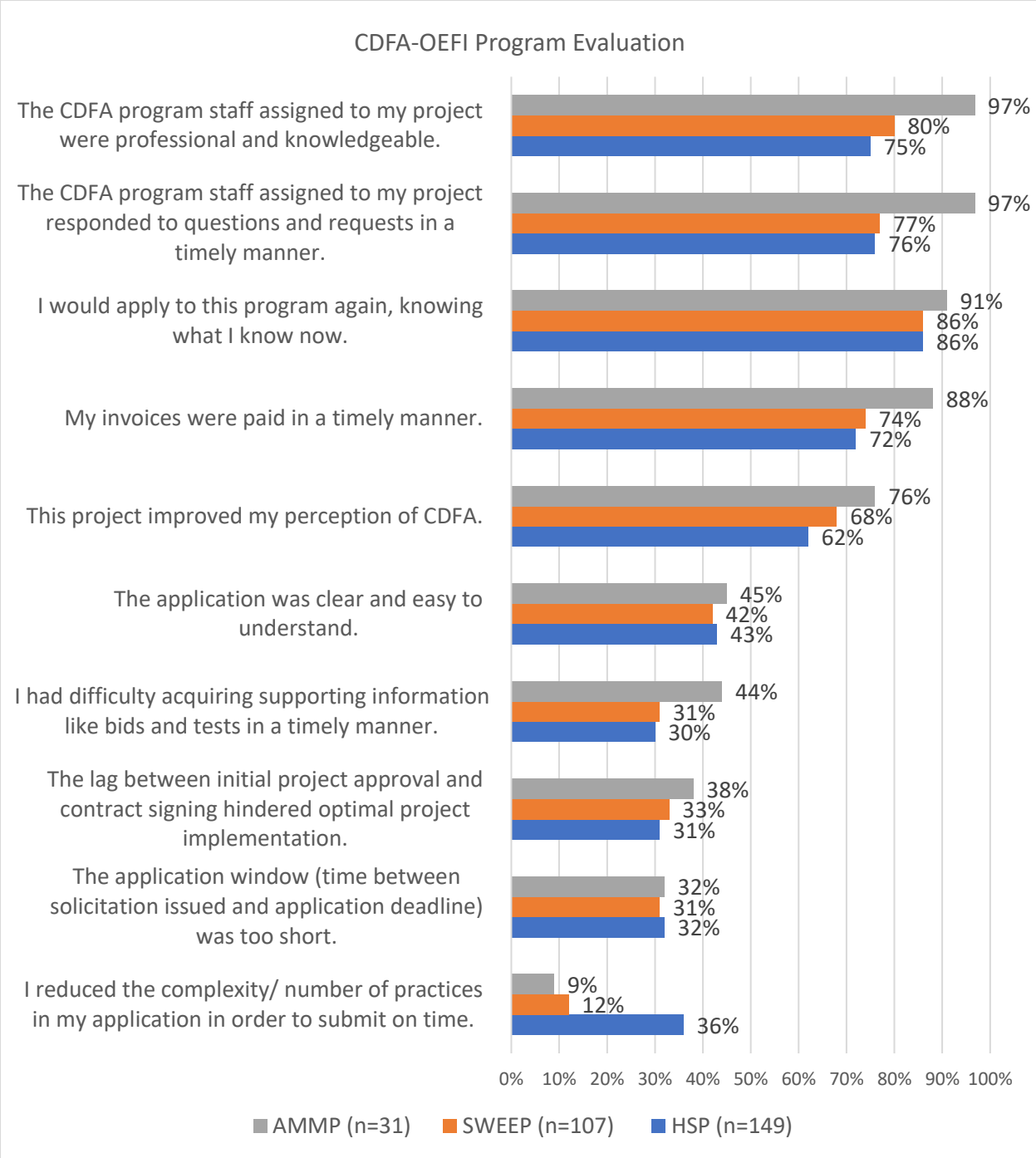

Figure 9. Percentage of respondents "Somewhat agreeing" and "Strongly agreeing" with the question "Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree.

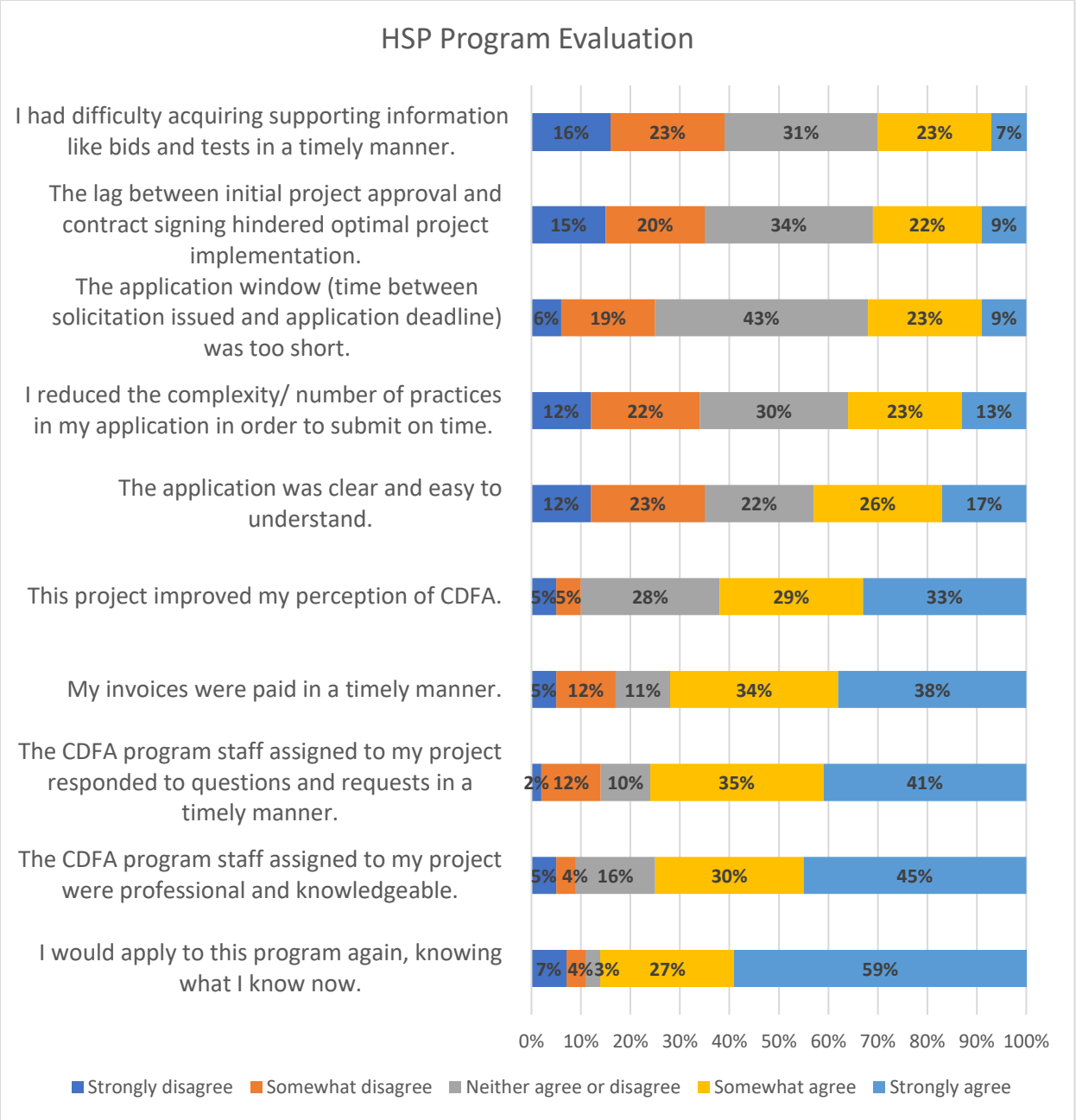

Figure 10. Percentage of HSP respondents to the question "Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=149).

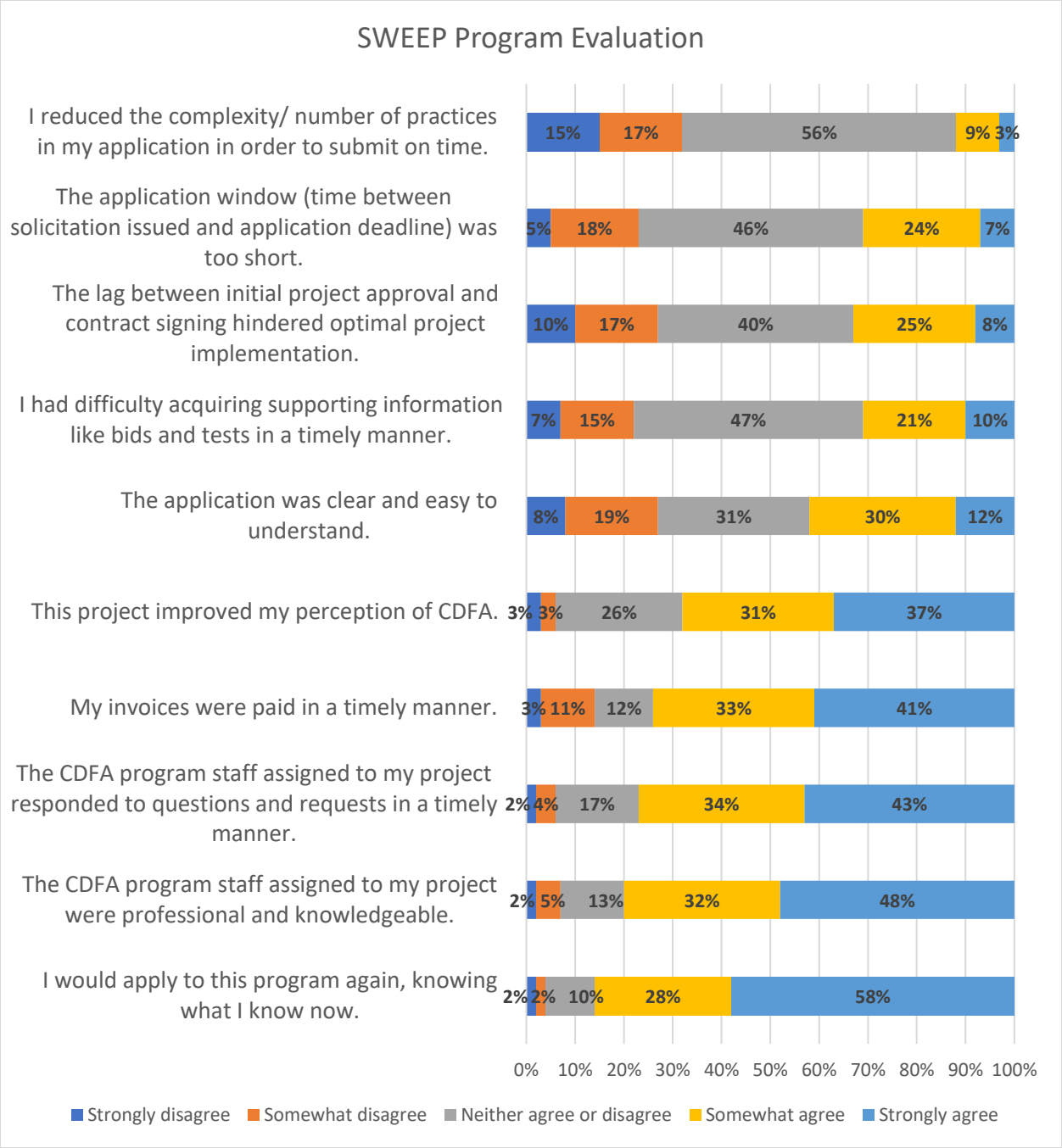

Figure 11. Percentage of SWEEP respondents to the question "Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=107).

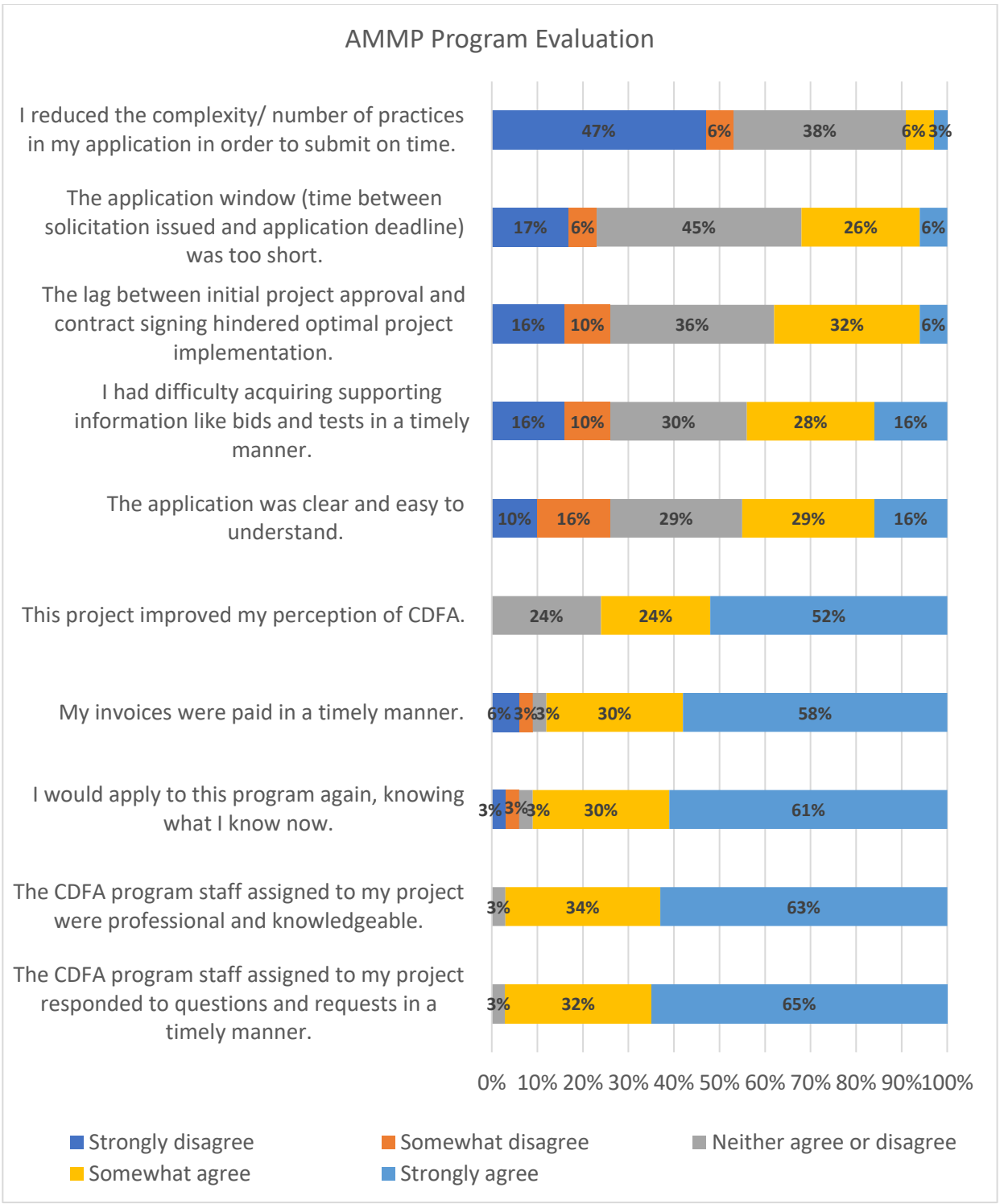

Figure 12. Percentage of AMMP respondents to the question "Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=31).

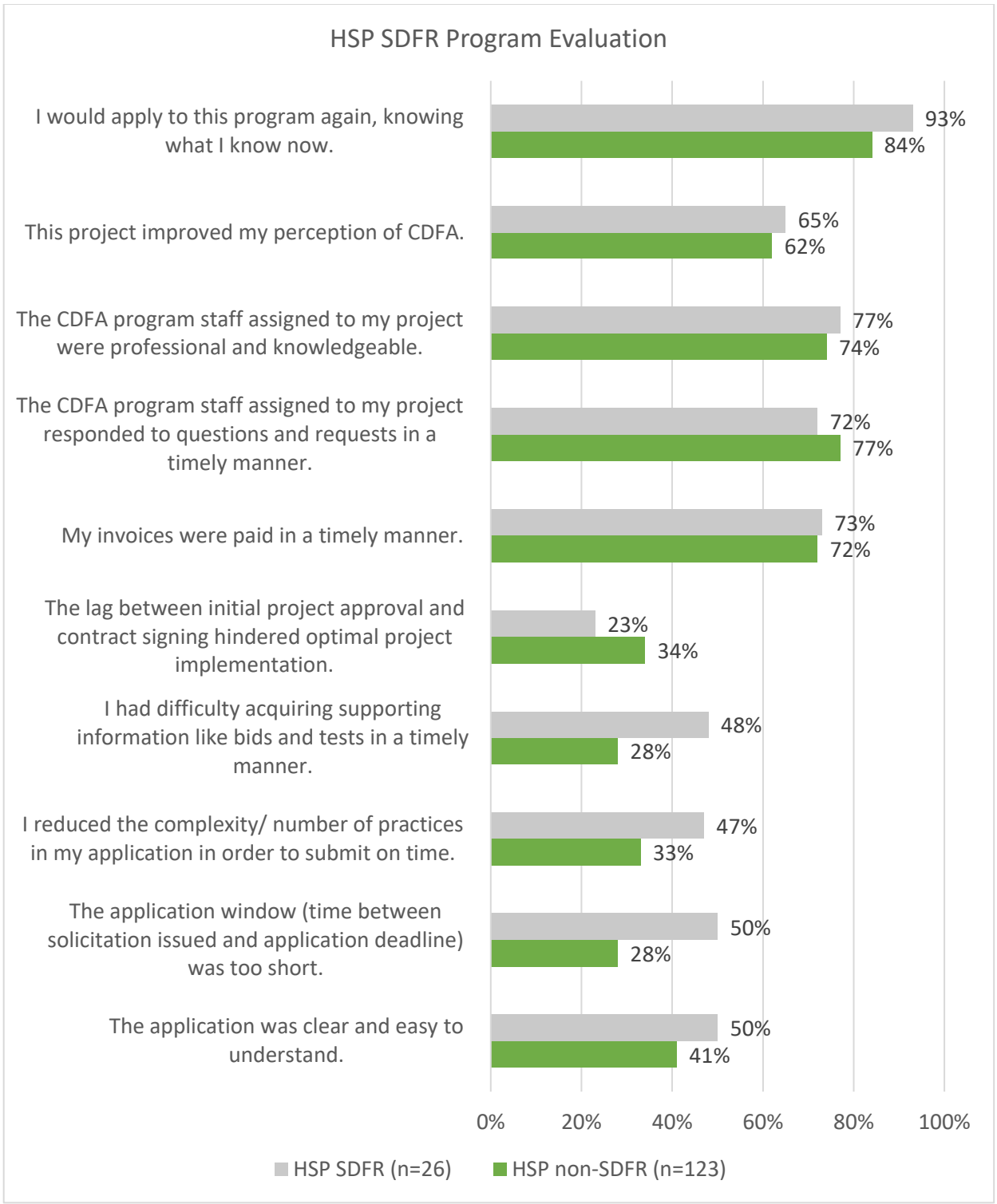

Figure 13. Percentage of SDFR and non-SDFR respondents "Somewhat agreeing" and "Strongly agreeing" with the question "Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree.

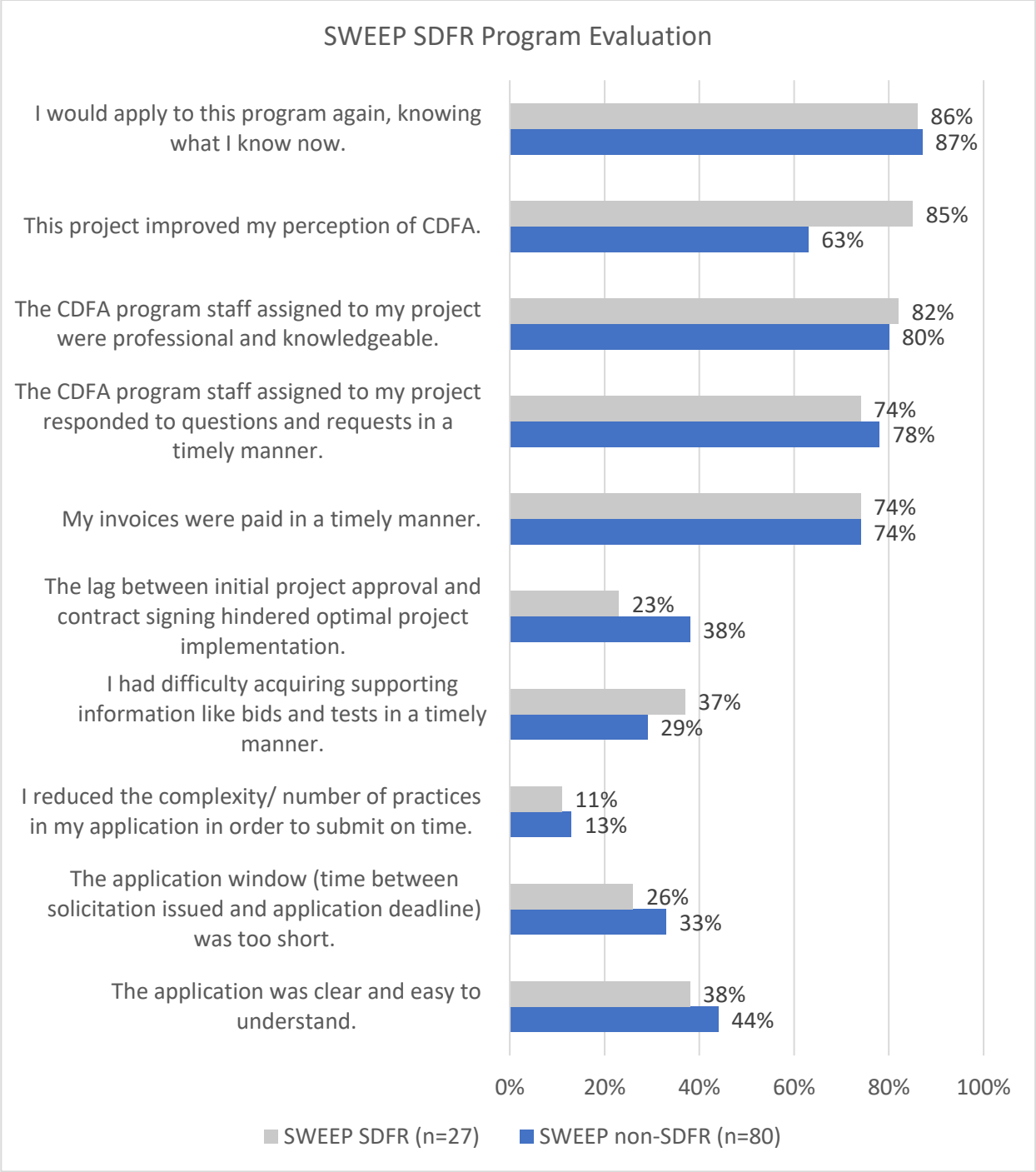

Figure 14. Percentage of SDFR and non-SDFR respondents "Somewhat agreeing" and "Strongly agreeing" with the question "Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree.

4.5 SWEEP and HSP Program Administration: SDFR Experiences

Section 4.5 Key Findings

- **Budget changes and complexity were more challenging for SDFR growers:** Both HSP and SWEEP SDFR growers (27% and 56%) were more likely than non-SDFR growers (17% and 20%) to experience budget changes during their project. 47% of HSP SDFR growers found budget changes overly complicated, hindering timely project completion, compared to 25% of non-SDFR growers (Figure 15 and Figure 16).
- **Change of CDFA contact person was common and challenging to SDFR growers**: Over half of HSP respondents (54%) experienced a change in CDFA contact person. SDFR growers (42%) were more likely than non-SDFR growers (31%) to have a negative program experience due to this change (Figure 15).
- **Most preferred more pre-project advanced payments:** Most HSP and SWEEP respondents desired more availability of advanced payments, with the preferred level of upfront funding averaging 50% of total project cost.
- **SDFRs were reliant on pre-project funding:** HSP SDFRs were more reliant on pre-project funding (27%) than their non-SDFR counterparts. SWEEP SDFRs were much more reliant (38%) on this funding than non-SDFR growers (13%).

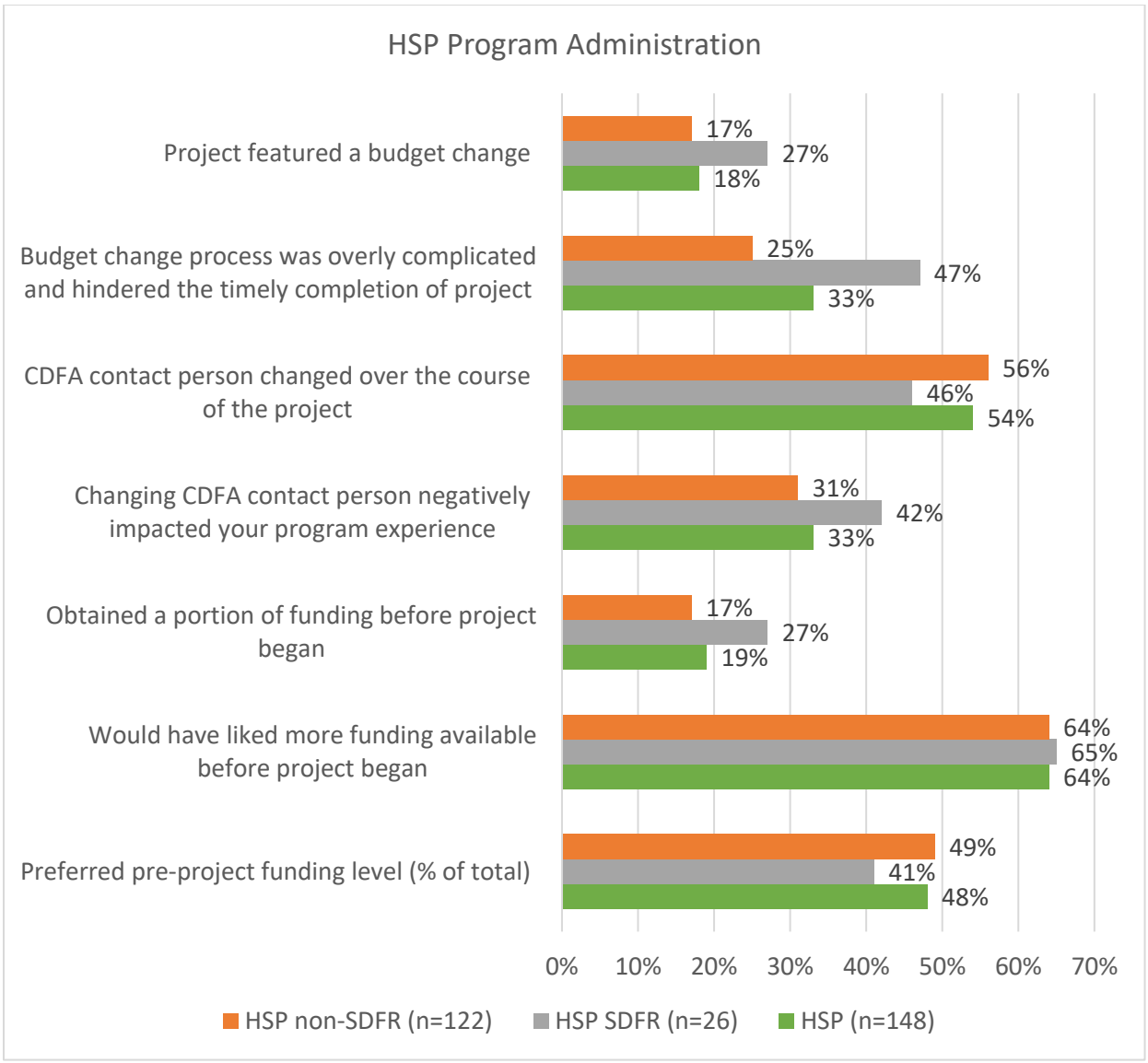

Figure 15. Percentage of "yes" responses to questions evaluating program administration. Only "yes" respondents to the question "CDFA contact person changed over the course of the project" were prompted to reply to the question "Changing CDFA contact person negatively…".

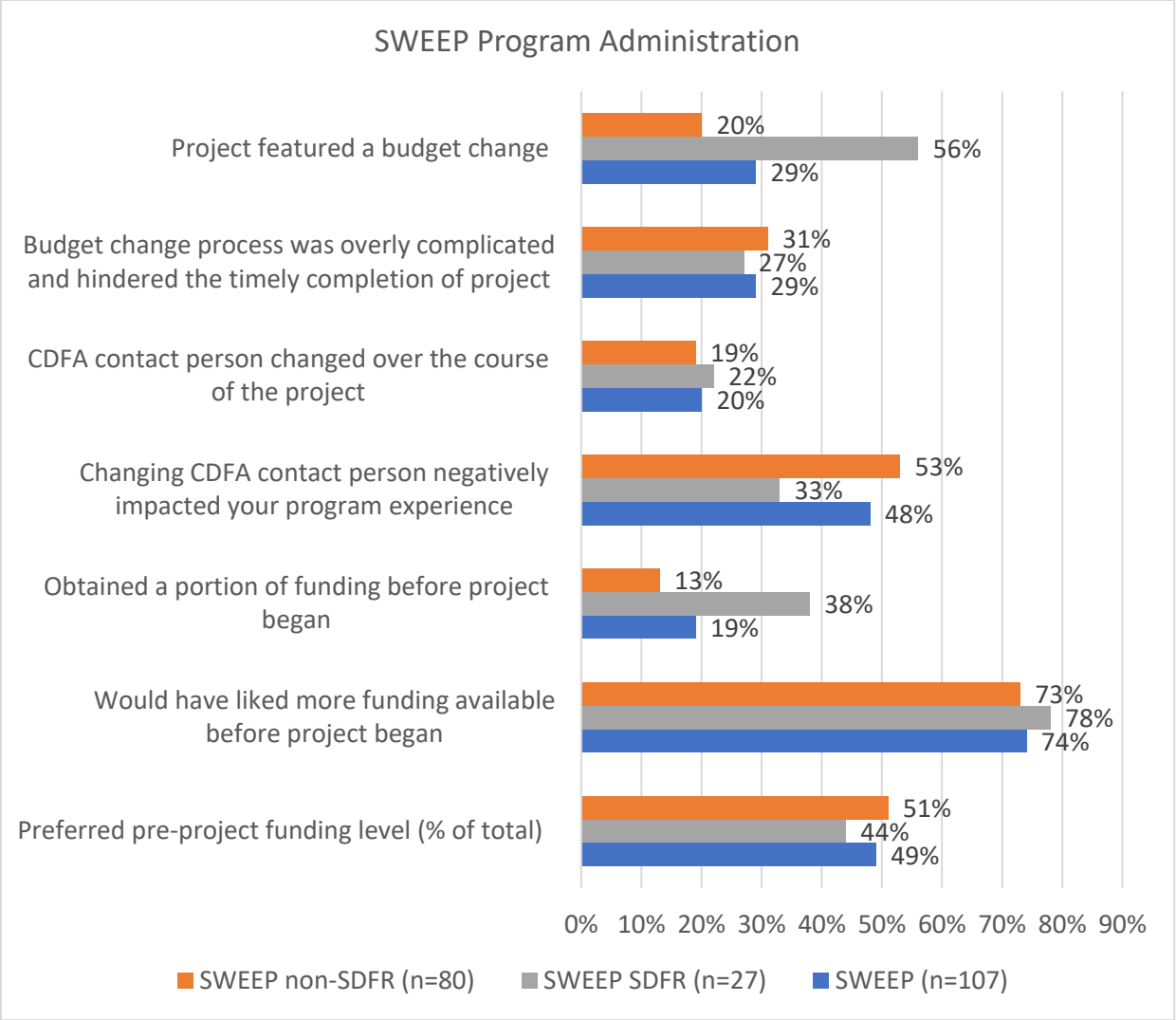

Figure 16. Percentage of "yes" responses to questions evaluating program administration. Only "yes" respondents to the question "CDFA contact person changed over the course of the project" were prompted to reply to the question "Changing CDFA contact person negatively…".

4.6 Technical Assistance Program

Section 4.6 Key Findings

- **TA was used most by SWEEP, HSP, and SDFR growers:** Almost 50% of SWEEP and HSP respondents worked with a TA provider at some point during their project. In contrast, only 20% of AMMP respondents worked with TA provider. More HSP SDFR growers (58%) than SWEEP SDFR (39%) growers utilized TA services (Figure 17).
- TA was utilized across project stages, with variations between SDFR and non-SDFR growers: Across programs and respondents, TA was used most frequently during the exploration and proposal stages of projects. HSP and SWEEP SDFR growers utilized TA more frequently at all project stages compared to their non-SDFR counterparts (Figure 18).
- **TA support was important:** Most grantees who used TA providers found them very or extremely important for their project's success (Figure 19).
- **TA was extremely important to SDFRs:** A much higher proportion of SDFRS found TA

extremely important (HSP 46%, SWEEP 70%), compared to non-SDFR growers (HSP 28%, SWEEP 22%) (Figure 20).

- **Geographic hotspots and gaps in TA utilization were seen:** Figures 21-24 identify areas to target for expanded TA programming.
    - HSP additional support: Siskiyou and Kings counties both had 0% TA utilization and 100% desire more TA support. Both Alameda and San Benito County respondents had 100% TA utilization and 100% desiring more TA support. Other counties with high levels of additional desired support include San Diego (67%), Riverside (60%) and El Dorado (60%)
    - SWEEP additional support: Sonoma, Napa and Yolo counties all had 100% TA utilization and 100% desiring more TA support. Other counties with high levels of desired additional support include Santa Barbara (100%), Colusa (100%), Butte (70%) and Monterey (67%).

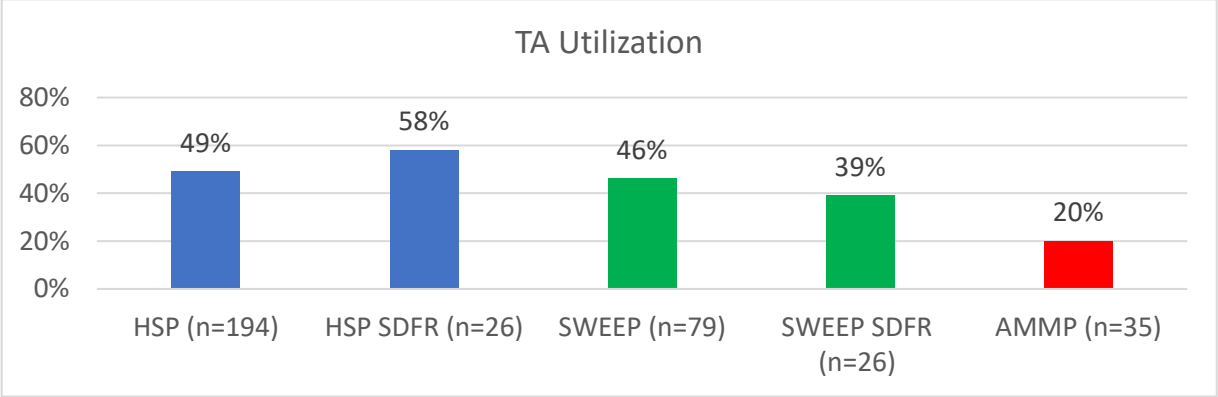

Figure 17. Percentage of yes responses to question "Did you work with a TA provider at any time during your project?" Only reporting SWEEP responses from 2018 and after.

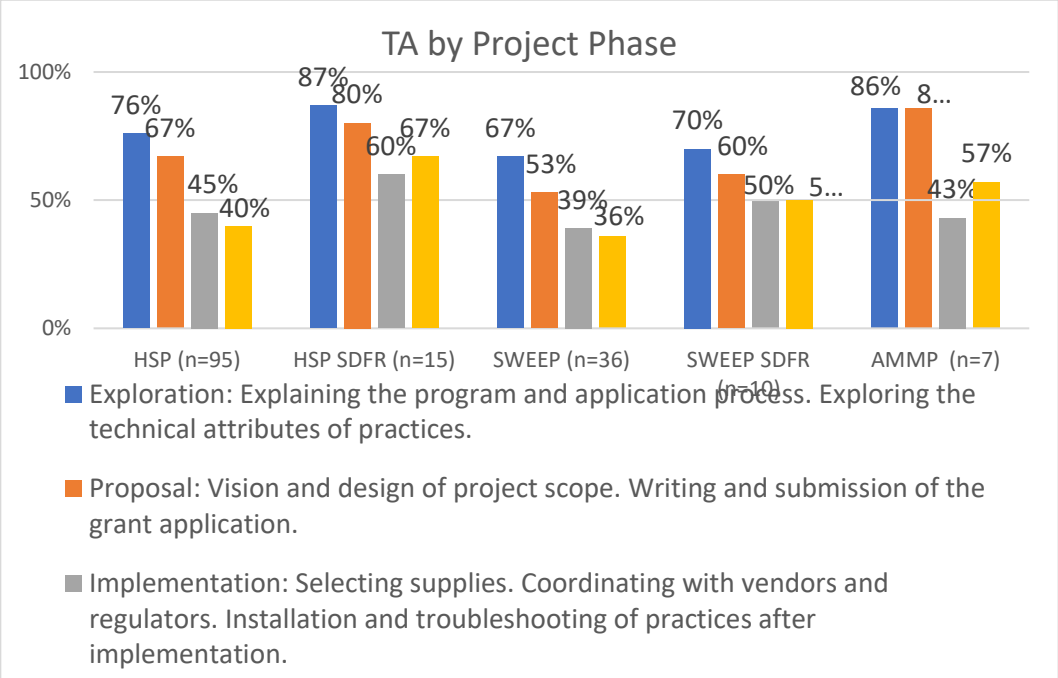

Figure 18. Percentage of responses to question "Check all phases in which TA providers offered support to your project."

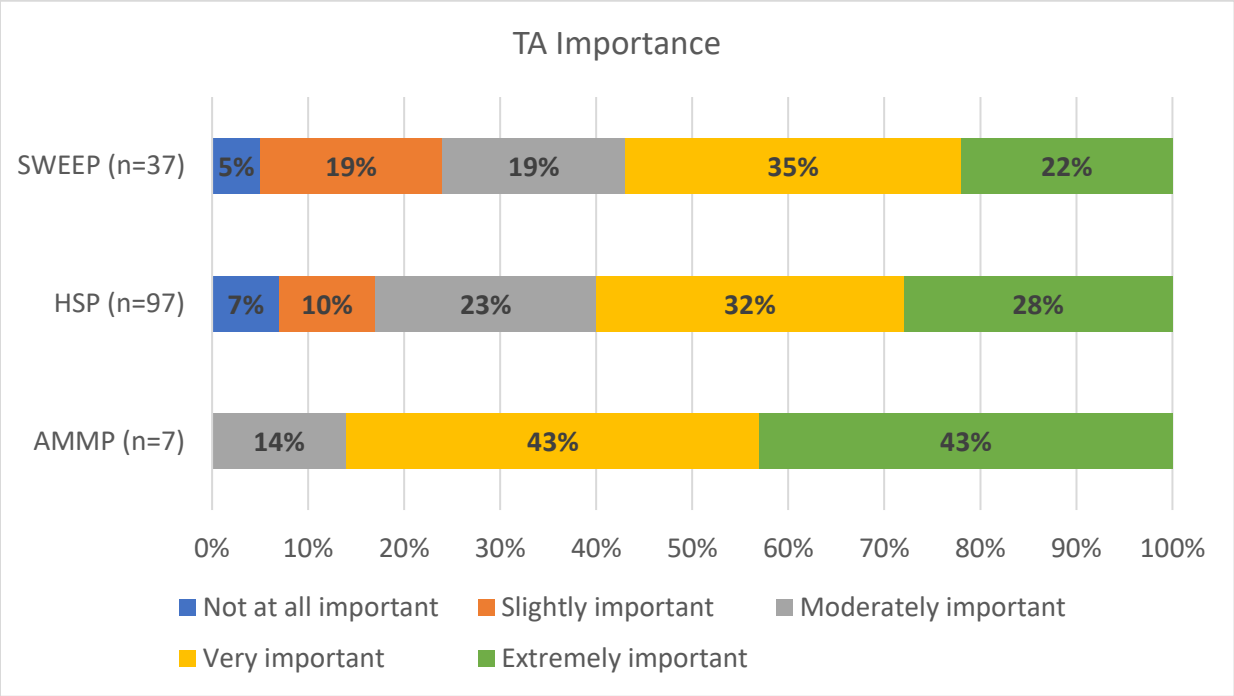

Figure 19. Percentage responding to the question "How important was TA support in carrying out your project?" Five-point scale with options of: Not at all important, Slightly important, Moderately important, Very important, Extremely important.

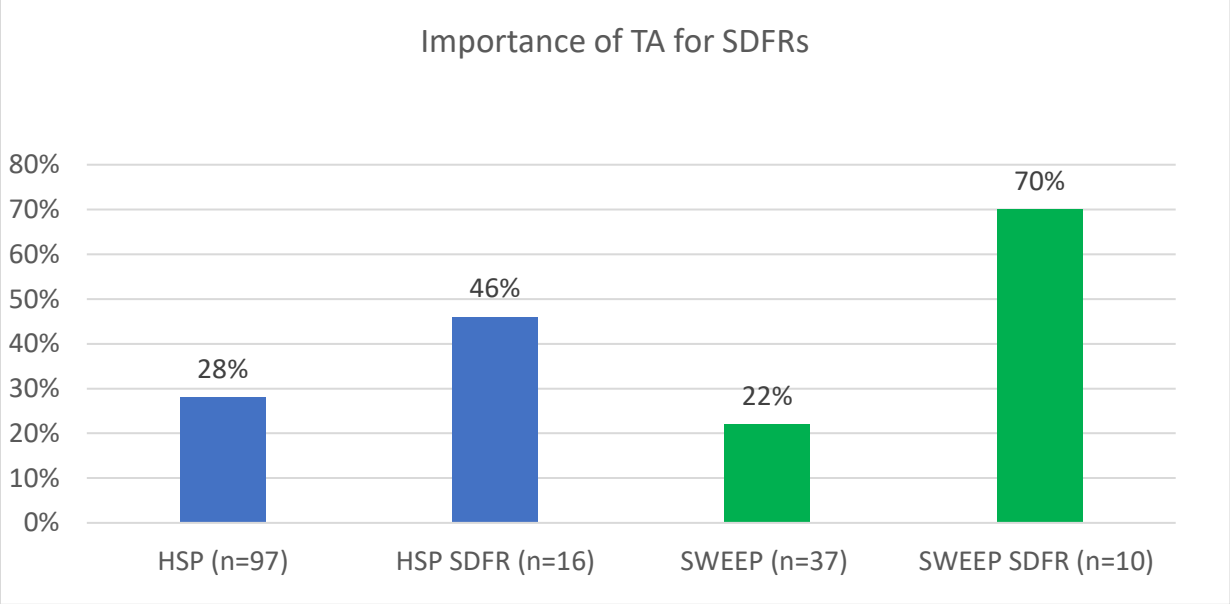

Figure 20. Percentage responding "Extremely important" to the question "How important was TA support in carrying out your project?" Five-point scale with options of: Not at all important, Slightly important, Moderately important, Very important, Extremely Important

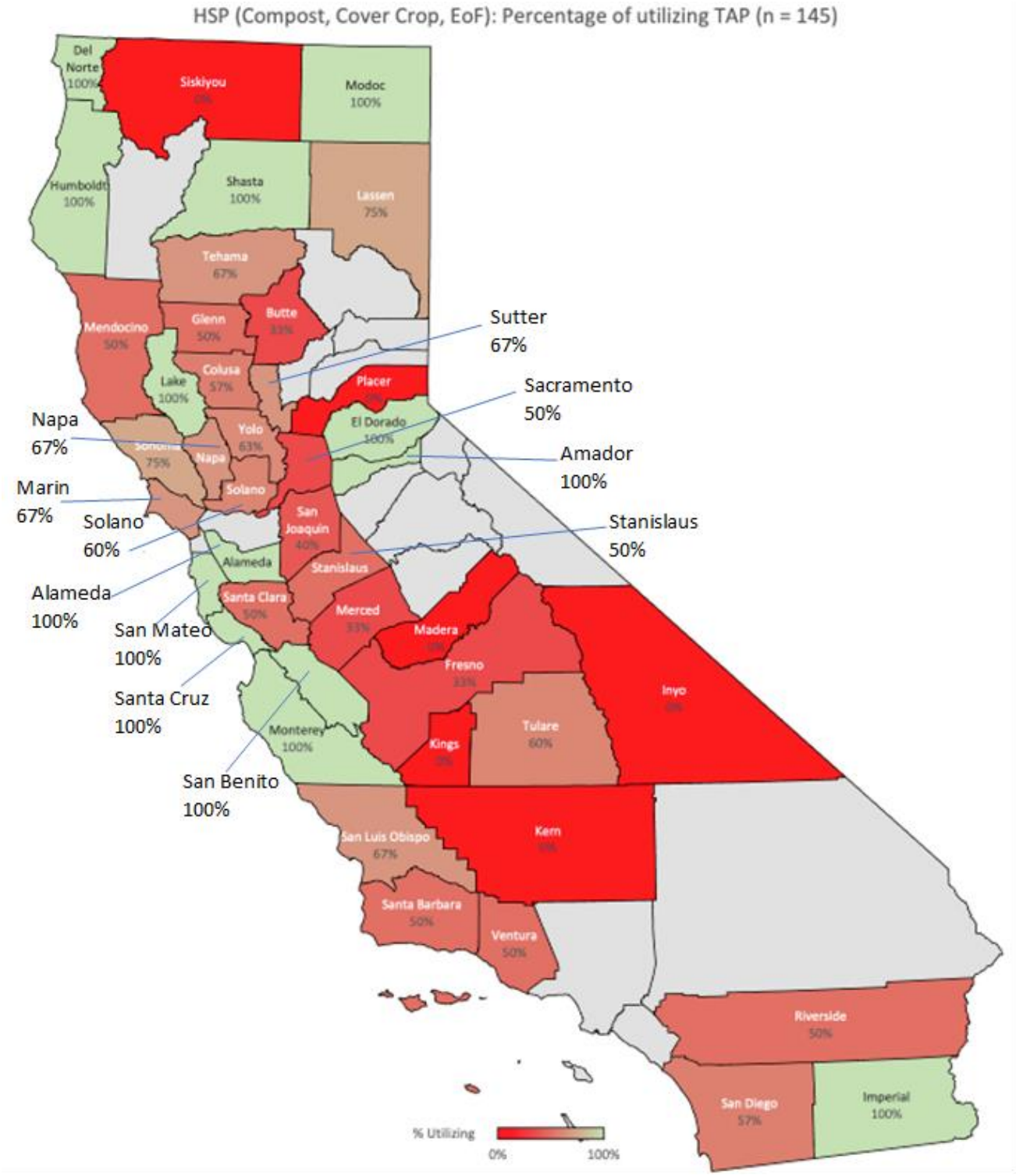

Figure 21. Percentage of respondents by county reporting HSP TA usage.

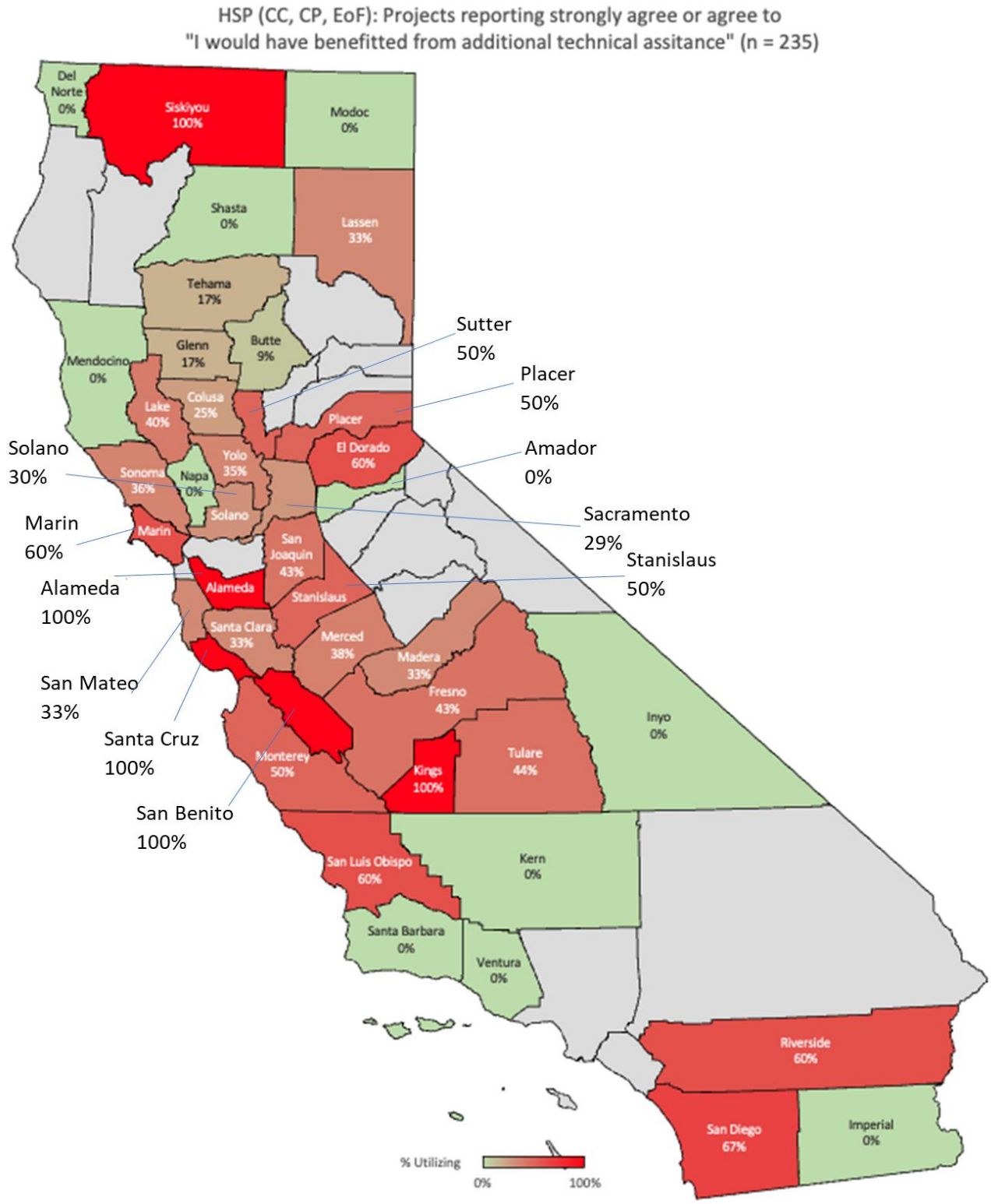

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Figure 22. Projects reporting agree or strongly agree to "I would have benefitted from additional technical assistance".

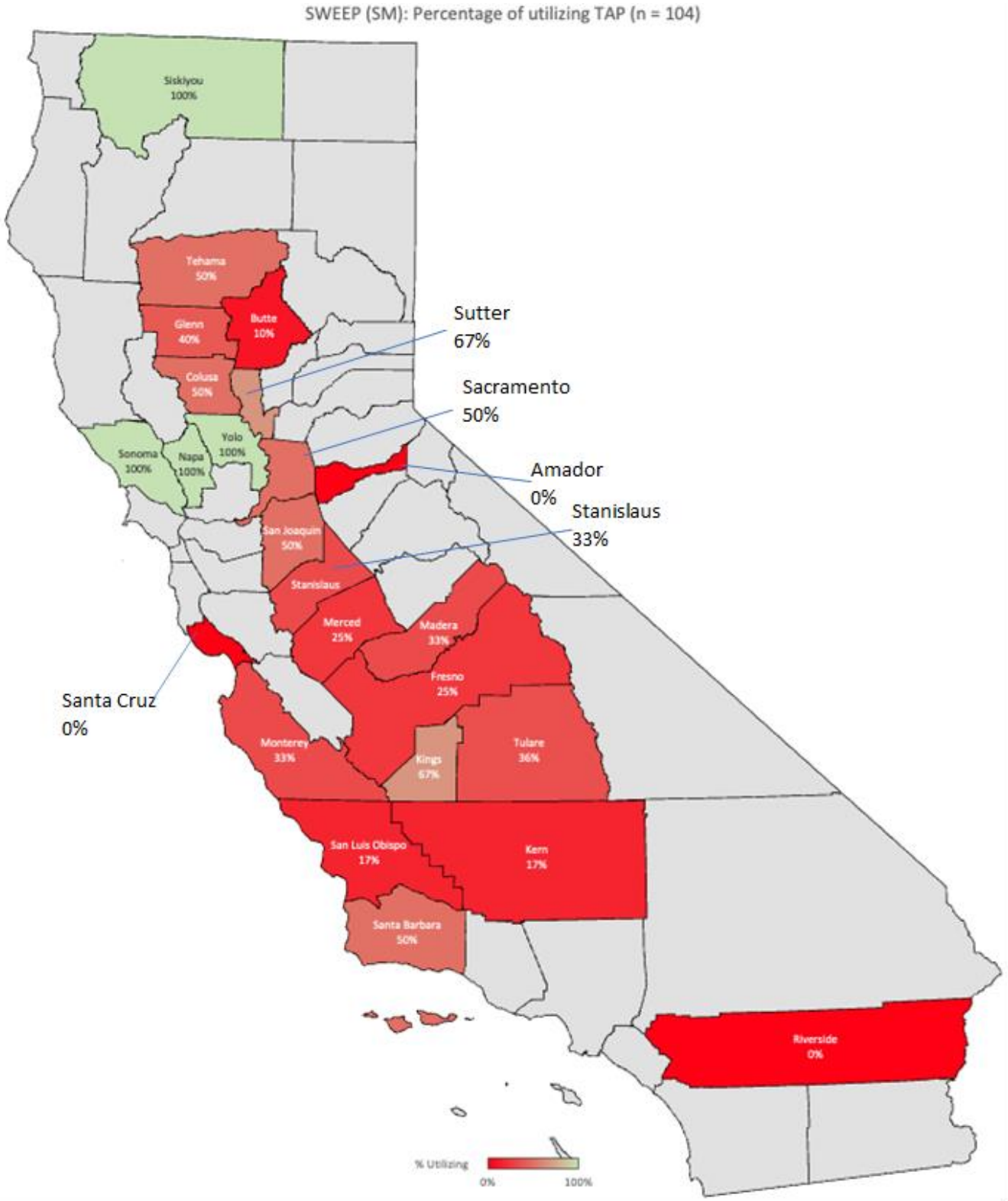

Figure 23. Percentage of respondents by county reporting SWEEP TA usage.

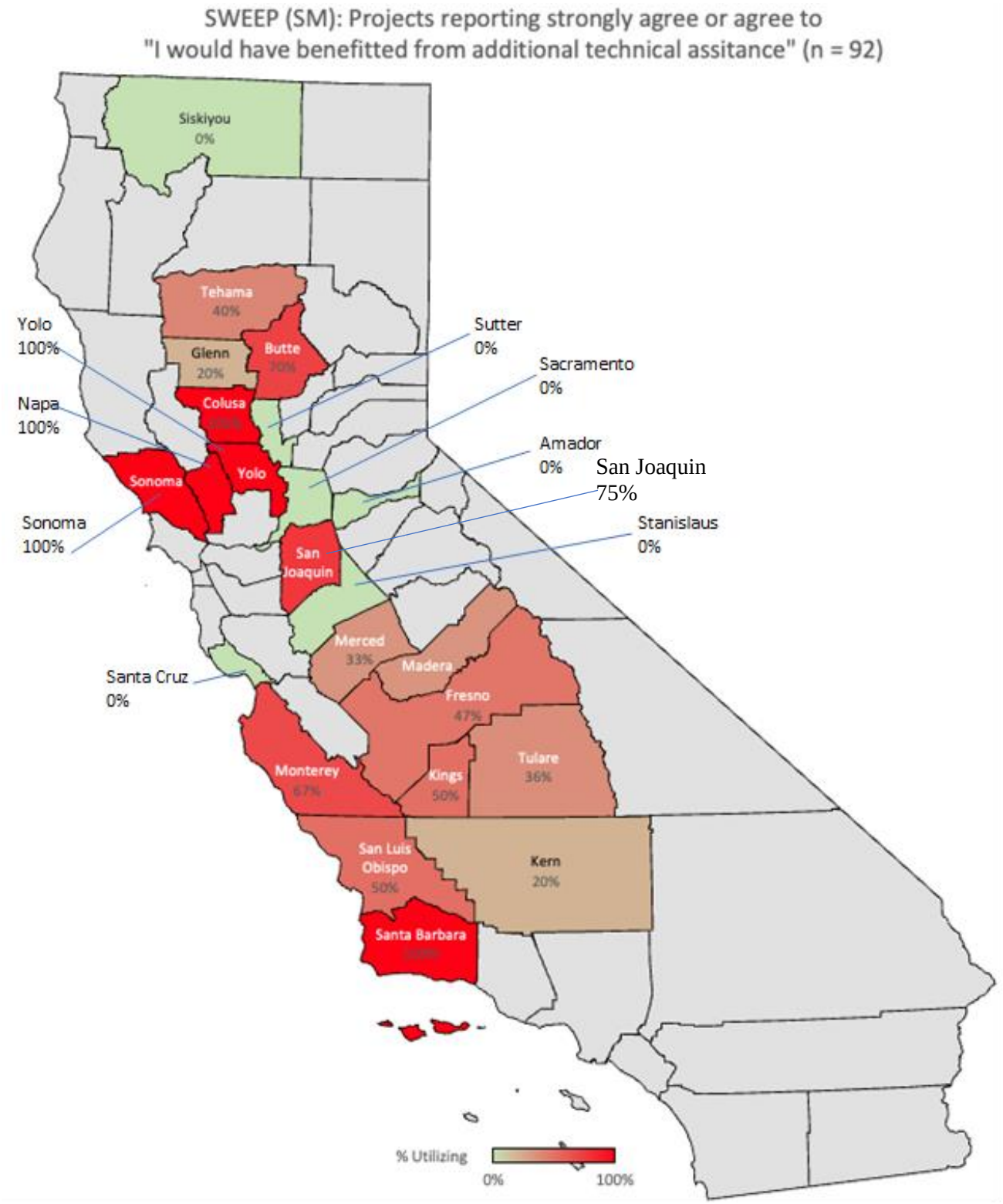

Figure 24. The percentage of SWEEP grantees responding strongly agree or agree to "I would have benefitted from additional technical assistance" by county.

4.7 Information Sources

Section 4.7 Key Findings

- **Farmers and private consultants were the most-used information sources:** Across all programs, the most utilized sources of information related to climate-smart agricultural practices are other farmers and private consultants, while governmental and non-governmental sources were the least utilized (Figure 25-Figure 28).

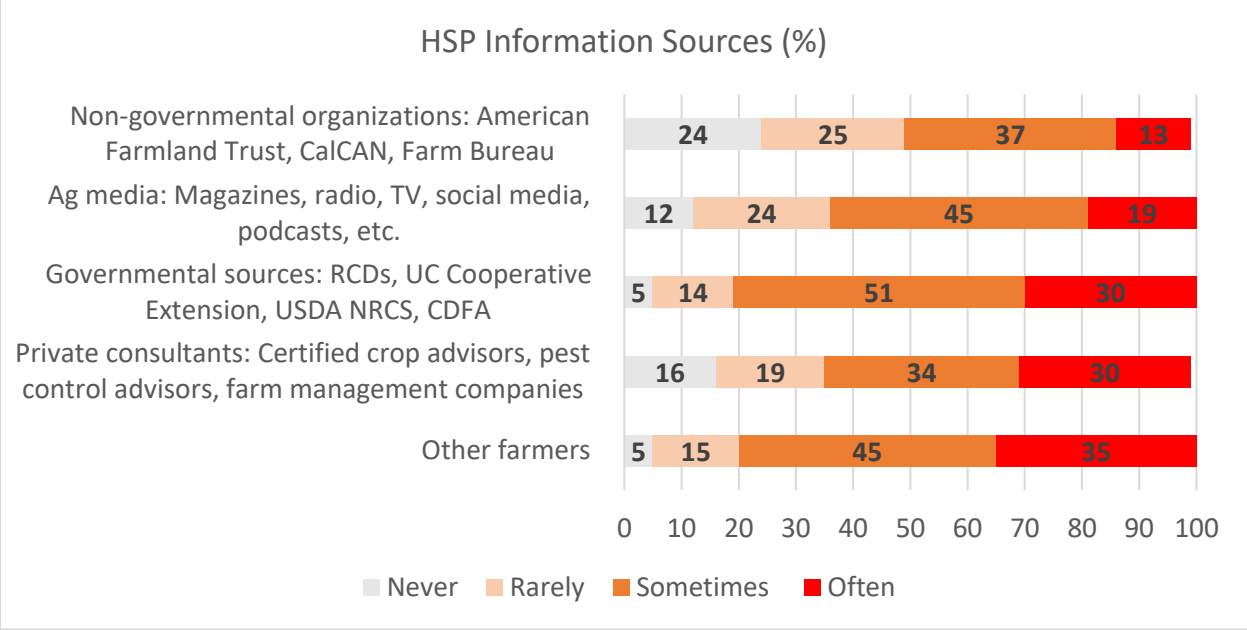

Figure 25. Percentage responses to question "People get information about soil health from a number of different sources. How often do you use the following sources of information?" (N=148)

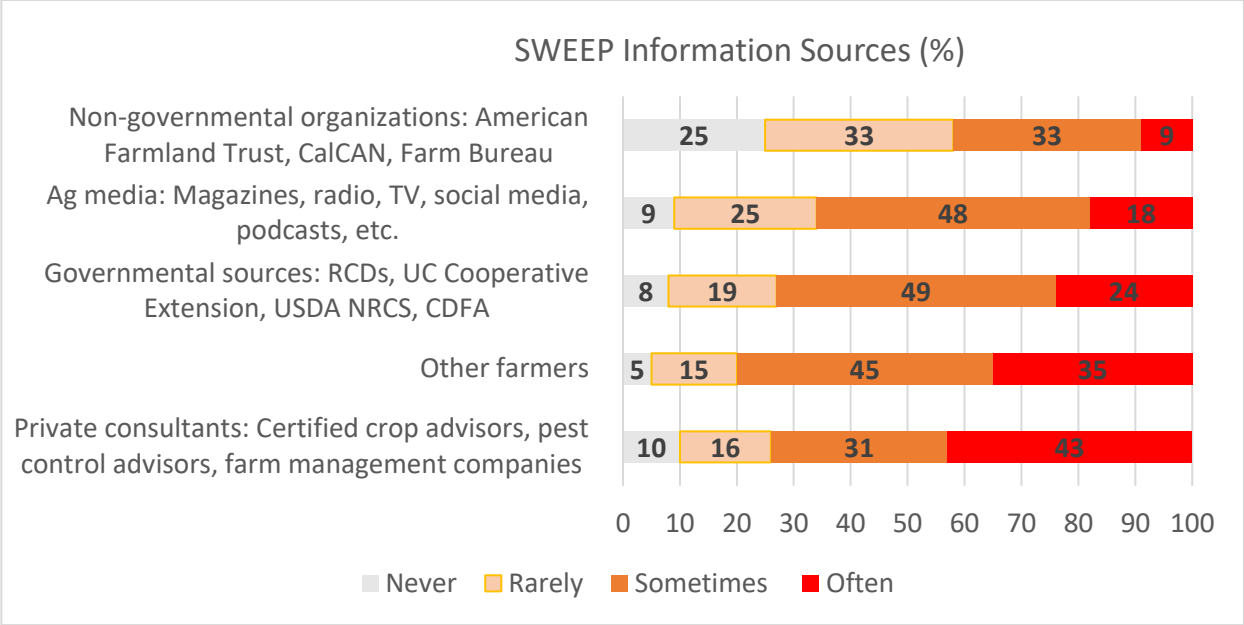

Figure 26. Percentage responses to question "People get information about irrigation water management from a number of different sources. How often do you use the following sources of information?" (N=109)

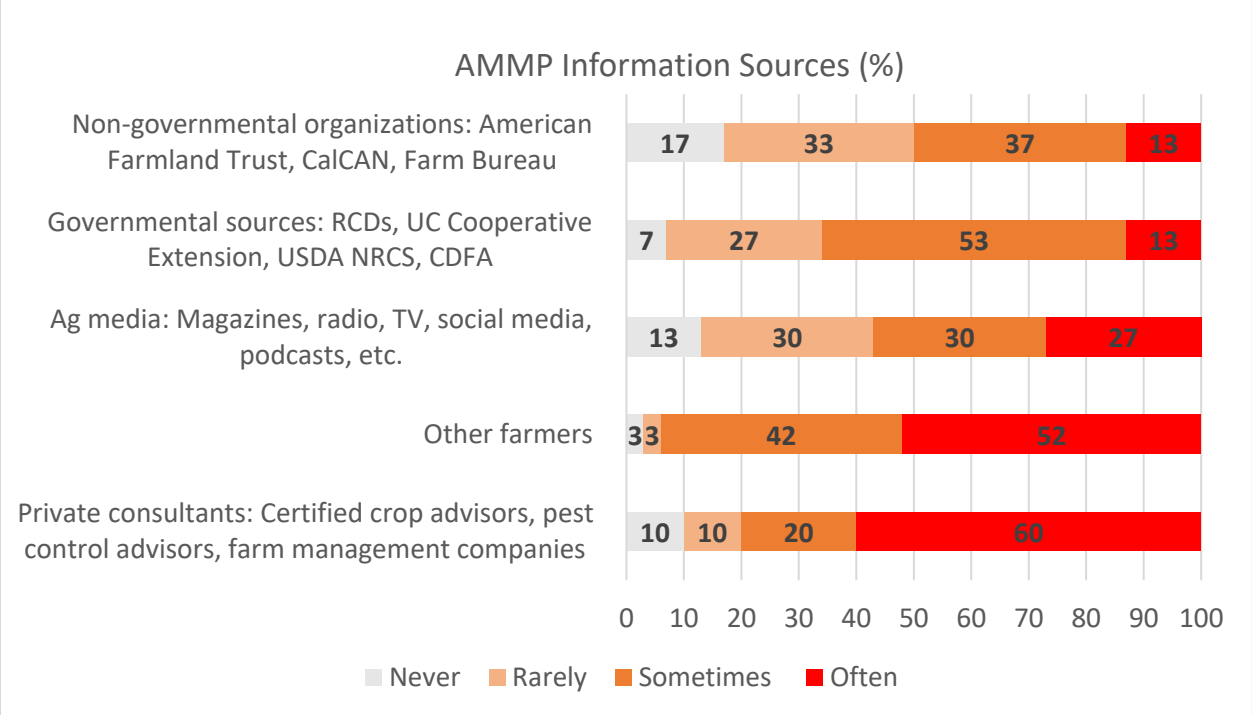

Figure 27. Percentage responses to question "People get information about farm management from a number of different sources. How often do you use the following sources of information?" (N=30)

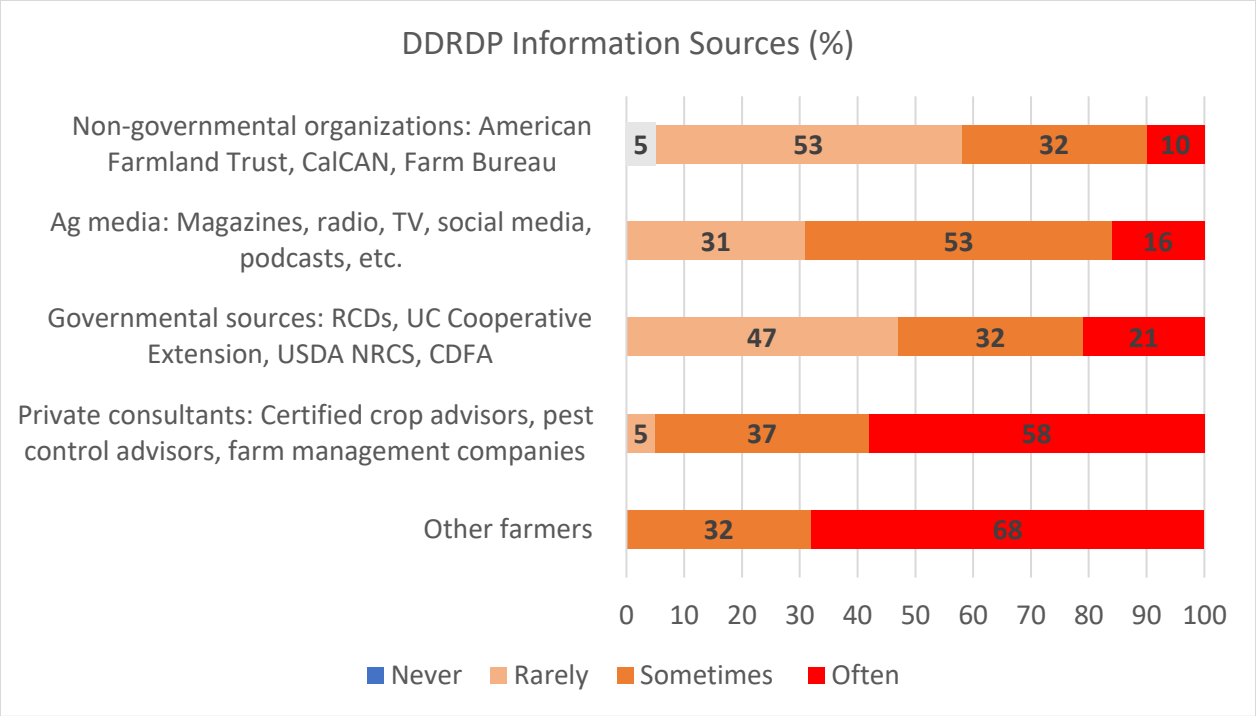

Figure 28. Percentage responses to the question "People get information about farm management from a number of different sources. How often do you use the following sources of information?" (N=19)

5. HSP

Section 5 Key Findings

- **Risk perceptions and motivations:** More than half of all HSP respondents were extremely concerned about water supply, inflation, and regulations as risks to the viability of their farming operation (Figure 30). Improving soil health was by far the single most important motivation for HSP participation (Figure 30).
- **Practice persistence:** HSP growers planned to maintain 71% of funded practices, with the highest persistence in no-till (86%) and the lowest in edge-of-field practices (63%) (Figure 31).
- **Cover crop persistence was relatively low:** Cover crop persistence of 71% was significantly lower than that reported in a recent national survey, where 90% of respondents reported that they were likely to maintain cover crops without incentives (SARE 2023). Potential explanations include the unique climatological (frequent water scarcity and fluctuating timing of precipitation) and economic conditions in California, compared to the US Midwest, where most national survey respondents were from.
- **Prior experience was not prevalent:** Eighty-two percent of cover-croppers had no prior experience, while the remaining 18% averaged 13 years of experience in cover cropping. Seventy-one percent of composters had no prior experience, while the remaining 29% averaged 11 years of experience. Eighty-four percent of edge-of-field grantees had no prior experience and the remaining 16% averaged 9 years of experience.
- **Respondents with practice experience had high persistence rates:** This was notable with cover cropping (77% experienced vs. 67% first-time), composting (82% experienced vs. 51% first-time), and edge-of-field practices (73% experiences vs. 58% first-time) (Figure 31). This suggests that extending the incentive timeframe may help persistence.

- **Hedgerows have lower than expected persistence rates for a "permanent" practice:** Hedgerow practices had a 74% maintenance rate.
- **Age, experience, and labor is associated with persistence:** Persisters of cover crops, compost and hedgerows were younger, had less experience in agriculture, and had significantly more employees than abandoners (Table 6).
- **Cover crop and compost persisters had significantly[6] larger farms:** This is consistent with the literature on BMP adoption that finds in-field practice adoption more likely on larger farms (Prokopy et al. 2019). However, hedgerow abandoners had significantly larger farms than persisters (Table 6).
- **Cover crop and hedgerow persisters had significantly smaller HSP projects:** The ecologically intensive management requirements of these practices were less successful on bigger projects (Table 6).
- **Compost persisters had significantly larger HSP projects:** Composting was much more scale-neutral than cover cropping (Table 6).
- **Farm type and persistence:** Funded practices on grazing operations had the highest abandonment rates (27%), while vineyard respondents did not abandon any practices (Figure 33 and Figure 34).
- **Demographics and persistence:** Persistence rates were similar for male and female respondents, however organic, socially disadvantaged, non-college educated growers and those located in a SGMA basin had higher persistence rates (Figure 34 and Figure 35).
- **Expansion plans low for cover crops:** Respondents intended to expand about a third of funded practices (36%), ranging from a low of 27% for cover crops to a high of 51% for edge-of-field practices (Figure 36). Cover croppers were much more uncertain (70% uncertain), and less likely to expand their practice (only 13% likely to expand) compared to composters and edge-of-field practitioners (Figure 37).
- **Cover crop and compost project experience impacts:** Of those growers who were unsure about the value of these practices on their farm, 50% of cover croppers and 36% of composters were convinced by positive project experiences to maintain the practice after the incentive period ended (Figure 40).
- **Longer incentives could lead to more persistence:** Nearly three-quarters of both cover crop and compost abandoners would have been more likely to maintain the practice for at least two more years if HSP financial incentives had continued for two additional years (Figure 41).
- **Challenges in soil organic matter enhancement:** Only half of respondents recalled experiencing an increase in soil organic matter (SOM) over the length of the project (Figure 42). While funding for HSP practices like cover crops and compost lasts three years, it often takes more time to realize SOM improvements from these practices.
- **Composting outperformed cover cropping in profitability:** Composting was twice as likely as cover cropping to increase net profits, with 32% of composters experiencing more than 2% increase in profits, and only 16% of cover croppers realizing the same benefit (Figure 43).
- **Fertility inputs reduced:** Over half of composters (52%) and under a third of cover croppers (31%) were able to reduce fertility inputs as a result of the respective practice (Figure 44).
- **Compost grants as a short-term subsidy for some:** Twenty-two percent of respondents viewed compost as a temporary substitute for the chemical fertilizers that they have since completely reverted to following the completion of the three-year trial. There was no difference in agreement between the first time and experienced composters (Figure 44).
- **Cover crop adoption led to less tillage and herbicide use:** Thirty-eight percent reduced their herbicide use (with only 5% increasing their use), and 46% percent reduced their tillage (with 15% increasing) as a result of HSP-funded cover crops (Figure 45).

[6] Use of "significant" in this report indicates a statistically significant result of a two-sample T-test ($p < 0.05$).

- **Respondents estimated higher cover crop payment rates than provided by HSP:** When asked to estimate a fair payment rate for cover cropping, the average preferred rate was $238 per acre (SD 86, n=60). This was significantly larger than the 2018 HSP rates for single species ($126 per acre) and multiple-species ($147 per acre) cover crops. The preferred rate for compost application was $68 per ton (SD 20, n=20), compared to the HSP rate of $50 per ton.
- **Perceived beneficial practice impacts:** Cover cropping and composting bring soil structure, water infiltration, and water holding capacity improvements (Figure 46 and Figure 47). Edge-of-field practices excel in pollination benefits, but weeds are a common concern for all three practices (Figure 48).
- **Perception of benefits drove practice persistence:** Persisters perceived more significant benefits than abandoners; especially in soil, water and pollination impacts, highlighting the importance of experiencing these benefits for practice persistence (Figure 47-Figure 49).
- **Adoption would not have occurred without incentives:** Less than half of practitioners would adopt these practices without incentives, showcasing program success in achieving additionality. However, 35% of cover croppers and 29% of composters were uncertain whether these practices pay for themselves and are worth doing in the absence of incentives, suggesting potential long-term challenges (Figure 52- Figure 54).
- **Barriers to success:** The vast majority have the knowledge and technical skills (89% of cover croppers, 88% of composters, 90% of edge-of-fielders) to successfully manage these practices (Figure 52- Figure 54). However, a significant minority do not possess the necessary labor and equipment (18% of cover croppers 20% of composters, 26% of edge-of-field) and felt they would have benefited from more technical assistance with these practices (37% of cover croppers and composters, 34% of edge-of-field).
- **SDFR growers need more support:** SDFR growers were much less likely to strongly agree that they possessed the knowledge and skills to successfully manage these practices (Figure 55-Figure 57). Technical assistance providers could potentially address this outcome through the development of educational materials and trainings targeting SDFRs.
- **Cover crop challenges:** Almost three-quarters of respondents found germination and establishment of the cover crop to be a challenge (Figure 58), with SDFR growers about twice as likely to have found germination and establishment to be extremely challenging (Figure 59). This could have been aggravated by the fact that most respondents were running projects between 2018 and 2022, when California experienced particularly dry winters.
- **Compost challenges:** Transporting and spreading compost was the most cited challenge reported by respondents, with 69% finding it at least slightly challenging, although finding certified (62%) and quality compost (58%) was also at least slightly challenging for most respondents (Figure 60). Finding certified compost was an extreme challenge for a significantly larger proportion of SDFRs (Figure 61).
- **Hedgerow challenges:** Cost of maintenance and issues with plant survival were the mostimportant challenges for the management of edge-of-field practices (Figure 62).

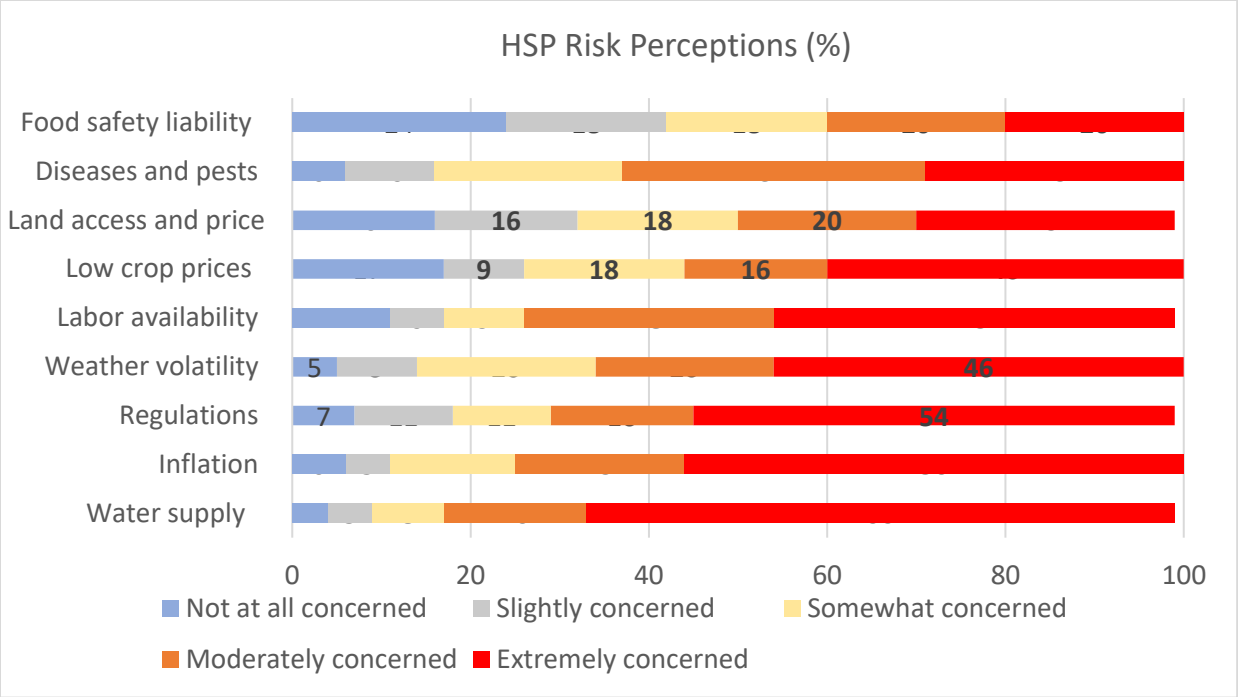

Figure 29. Percentage responses to question "Adoption of conservation practices is often motivated by a desire to manage risk. How concerned are you about the impact of the following risks on the viability of your farming operation" (n=148)

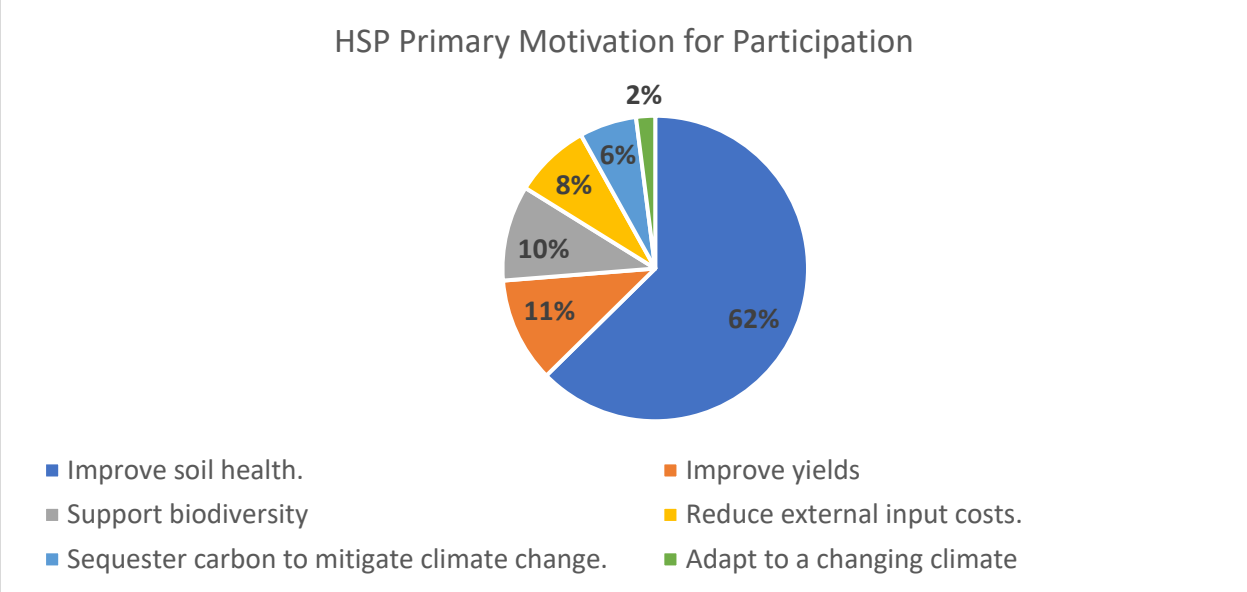

Figure 30. Percentage responses to question "Please select your single most important motivation for participating in the HSP." (n=146)

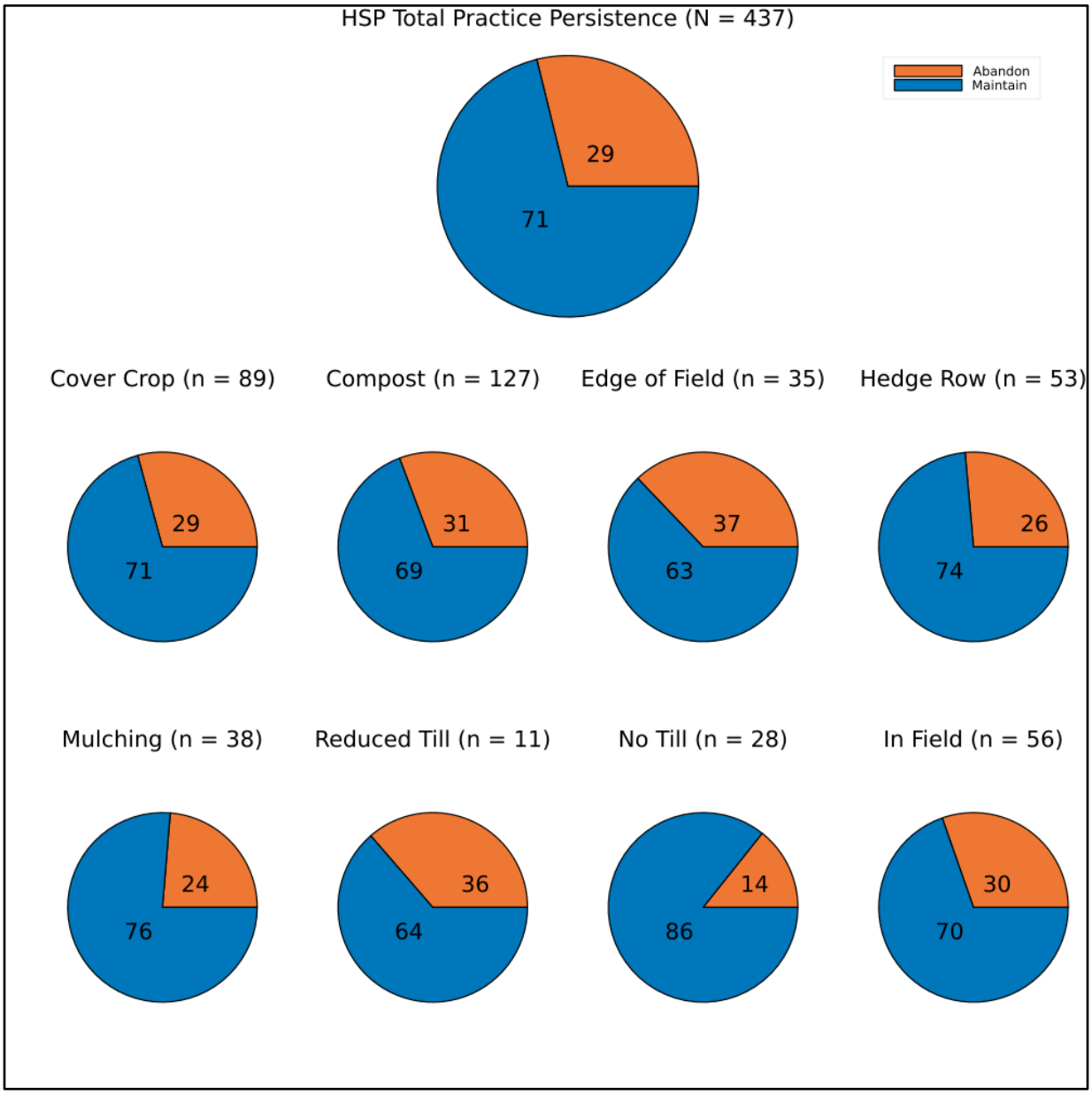

Figure 31. Persistence and abandonment rates (%) of all combined and individual HSP-funded practices. Practice persistence/ abandonment was defined by an affirmative/ negative response to the survey question "Do you intend to use this practice in the next 12 months?" "Edge-of-Field" practices are defined here as: conservation cover, riparian forest buffer, range planting, silvopasture, windbreak/shelterbreak establishment, riparian herbaceous cover, tree/shrub establishment, multi-story cropping, herbaceous wind barrier, grassed waterway, field border, filter strip, and contour buffer strip. Hedgerows were analyzed separately, although they are also edge-of-field practices. "In-field" practices are defined as: nutrient management, range planting, pasture and hay planting, prescribed grazing, conservation crop rotation, strip cropping, whole orchard recycling. Cover crops, compost, mulching and tillage practices were analyzed separately than in-field practices, although they are also in-field practices.

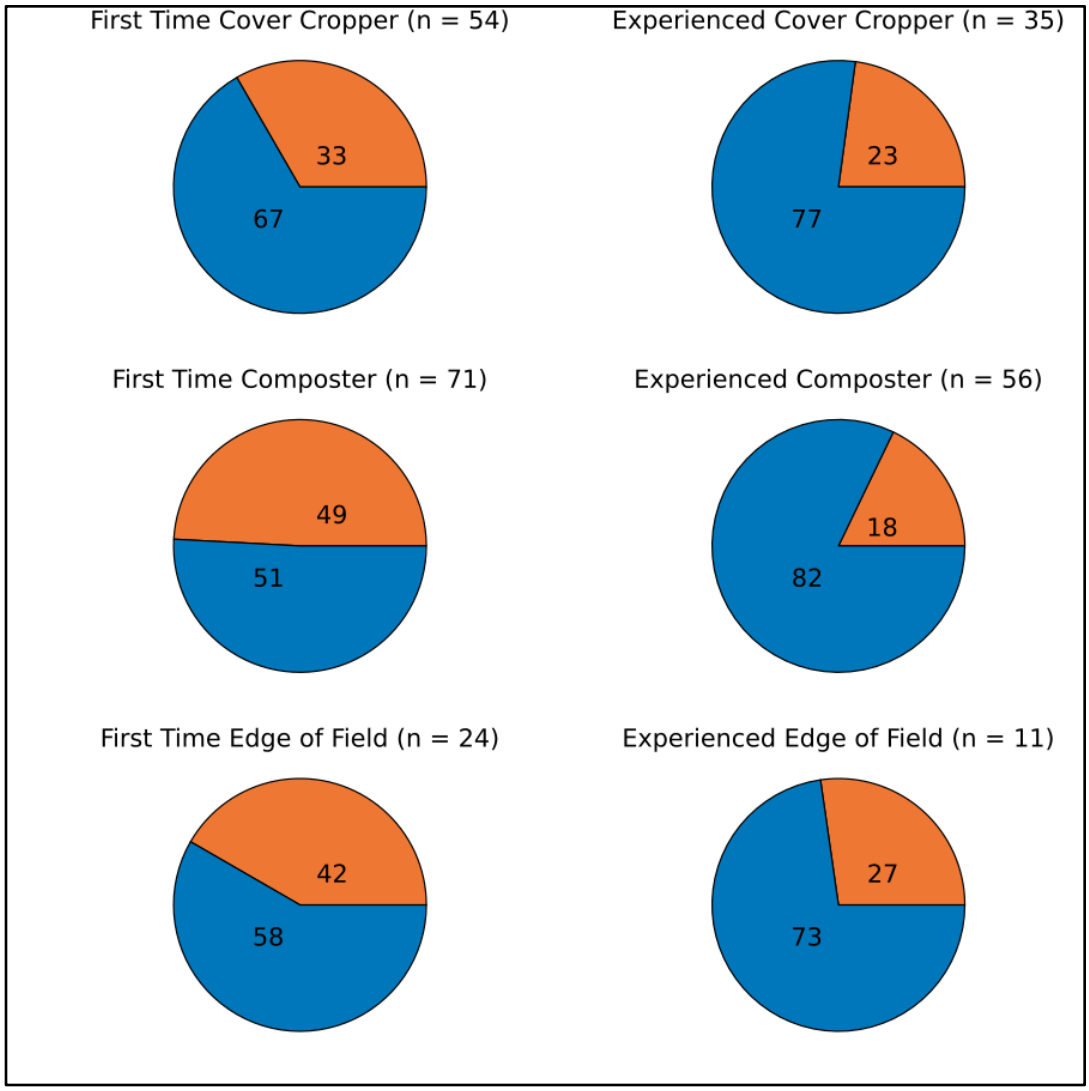

Figure 32. Persistence (blue) and abandonment (orange) rates (%) of HSP funded practices by experience. Experience is defined as a negative response to the question "Was this HSP project your first experience managing (practice) on your farm?"

Table 6. Mean value of continuous farm and farm manager characteristics for HSP respondents who persisted or abandoned practices. Two sample T-test: *p < 0.05, **p < 0.01, *** p < 0.001, ns= not significant.

Variable	Cover Crops			Compost			Hedgerows		
	Persist (n)	Abandon (n)	P	Persist (n)	Abandon (n)	P	Persist (n)	Abandon (n)	P
Operation Acres	1037 (44)	351 (18)	***	543 (66)	306 (25)	***	830 (34)	2558 (10)	***
Project Acres	80 (47)	124 (18)	***	86 (73)	47 (26)	***	28 (33)	63 (11)	***
Employees	6 (46)	3 (19)	*	7 (69)	2 (25)	***	4 (33)	2 (10)	*
Age	54 (45)	57 (18)	*	55 (70)	56 (26)	ns	54 (32)	59 (10)	***
Years in Agriculture	22 (46)	31 (18)	***	24 (72)	25 (25)	ns	23 (34)	27 (10)	***

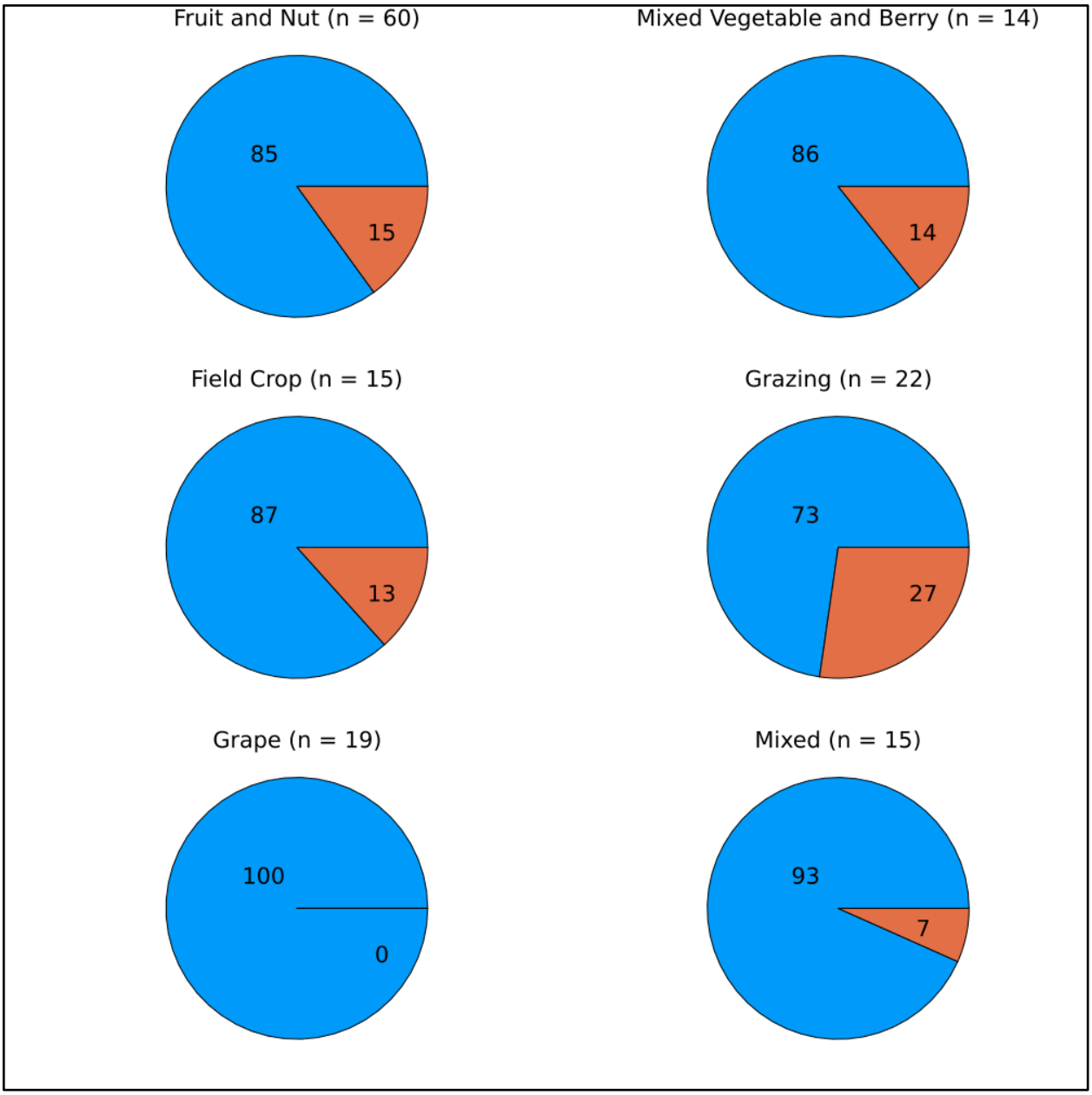

Figure 33. Persistence (blue) and abandonment (orange) rates (%) of HSP-funded practices by cropping system. "Mixed" refers to at least 25% of multiple crop types (fruit and nut, mixed vegetable and berry, field crop, grazing, grape)

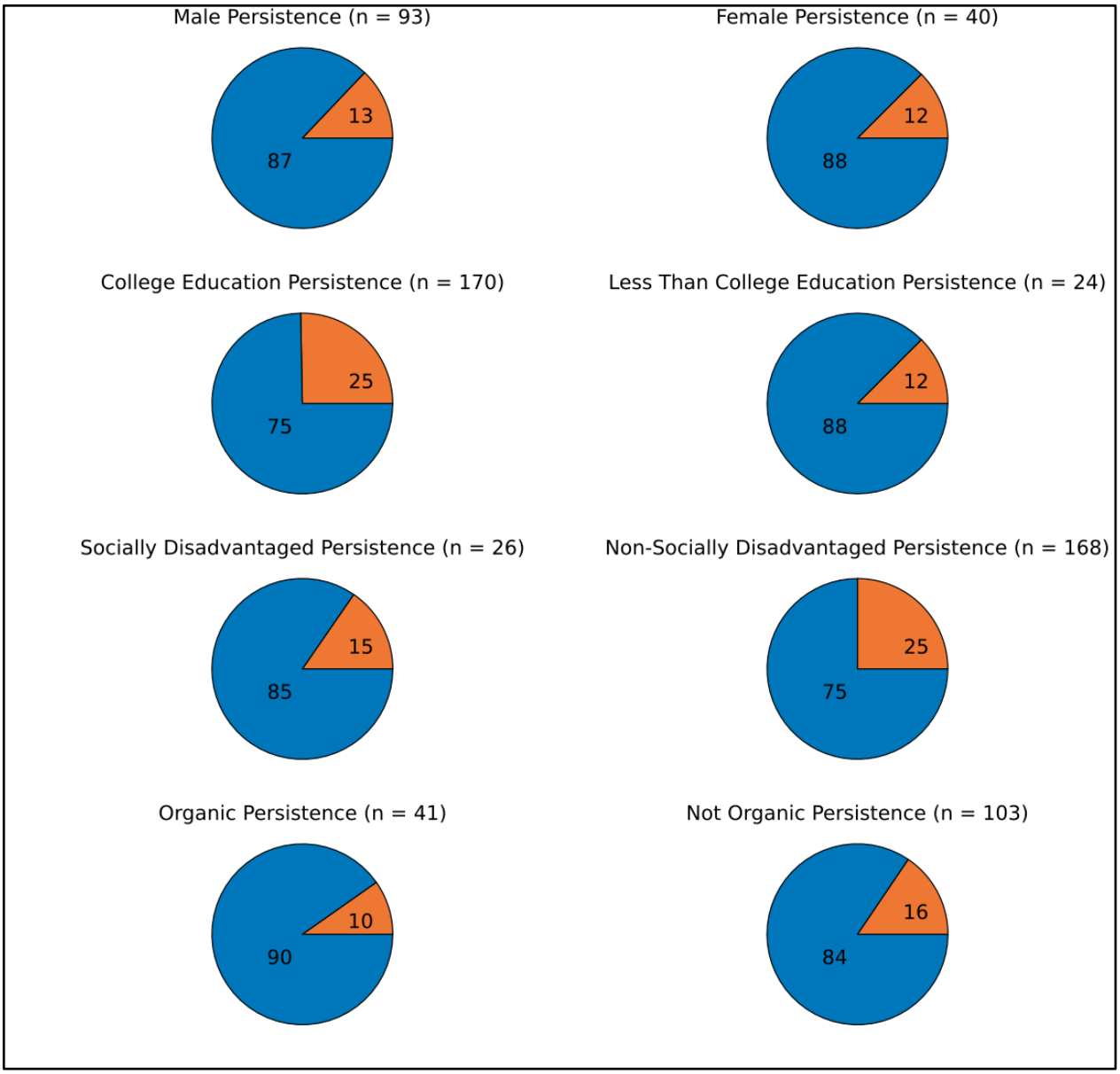

Figure 34. Persistence (blue) and abandonment (orange) rates (%) of all pooled HSP-funded practices by farm characteristics. "Socially disadvantaged" was defined as an affirmative response to the question “Do you belong to any of the following CDFA-designated socially disadvantaged groups? Please check all that apply.” Options included: Hispanic, Asian American, African American, Native American/American Indian (Specify if desired), Alaskan Native (Specify if desired), Native Hawaiian and Pacific Islanders (Specify if desired), None of the above/ prefer not to say.

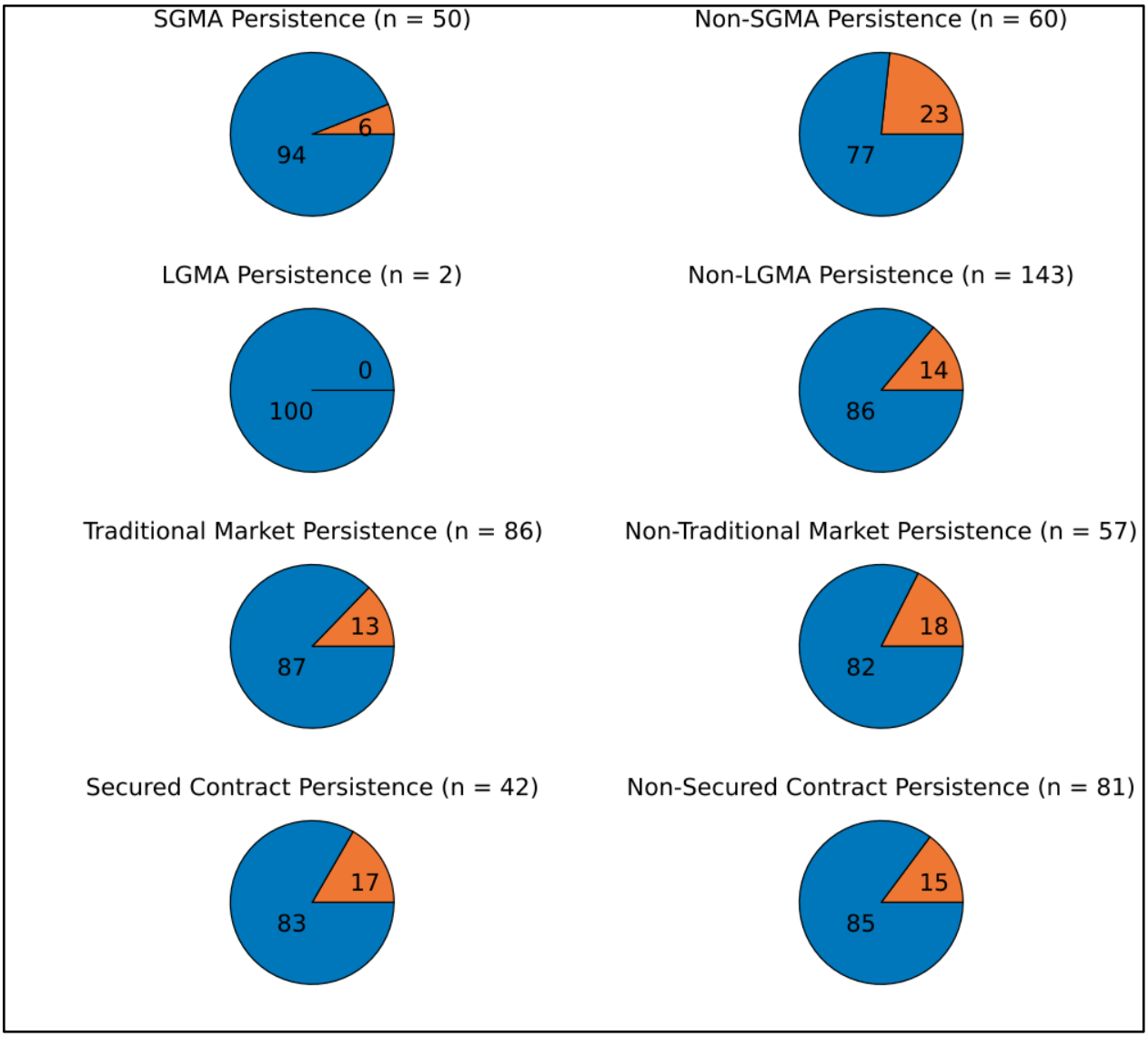

Figure 35. Persistence (blue) and abandonment (orange) rates (%) of all pooled HSP-funded practices by additional farm characteristics. Farms were classified as SGMA with an affirmative response to the question "Did your HSP project take place on farmland located in a Sustainable Groundwater Management Act (SGMA) regulated basin?" Farms were classified as LGMA with an affirmative response to the question "Were any of the lands utilized for the HSP project certified by the Leafy Greens Handler Marketing Agreement (LGMA)?" Traditional market farms responded "Wholesale" to the question "What is the most important market for your agricultural production?" Options included: Wholesale, Online, Farm stand, Community supported agriculture, Direct sales to institutions (restaurants, schools, hospitals, etc.), Farmers markets, Other (please specify), Unsure/Don't know. Non-secured contract farms responded "No contract for the 2023 harvest" to the question "What type of contract best characterizes the majority of your agricultural production?" Options included: No contract for the 2023 harvest, Contract secured for the 2023 harvest, Contract secured for the 2023 and 2024 harvests, Contract secured for the next three harvests or more (at least through 2025), Unsure/Don't know.

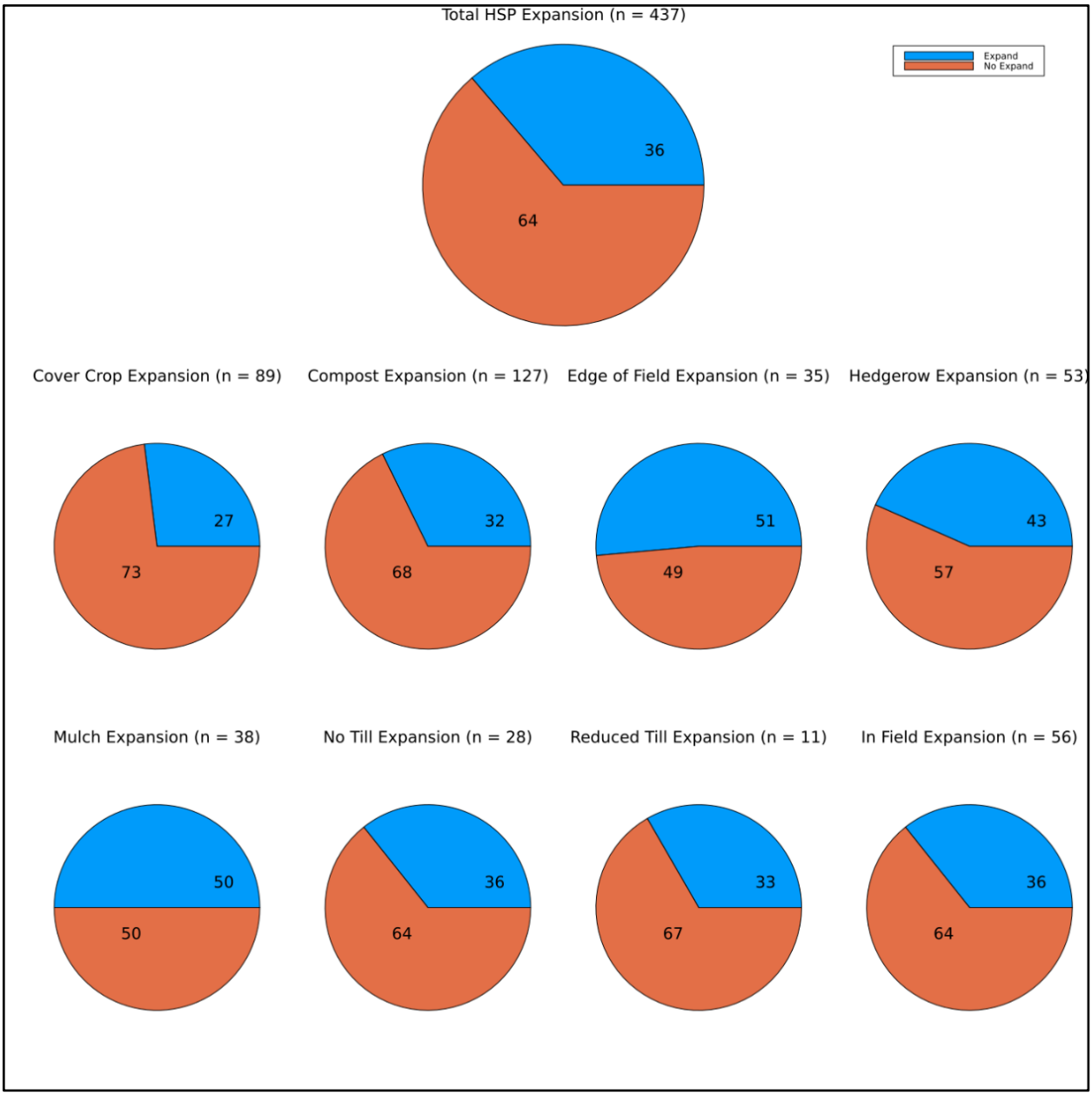

Figure 36. Expansion rates (%) of all combined and individual HSP-funded practices. Expansion is defined by an affirmative response to the question "Do you intend to expand the area dedicated to this practice in the next 12 months?"

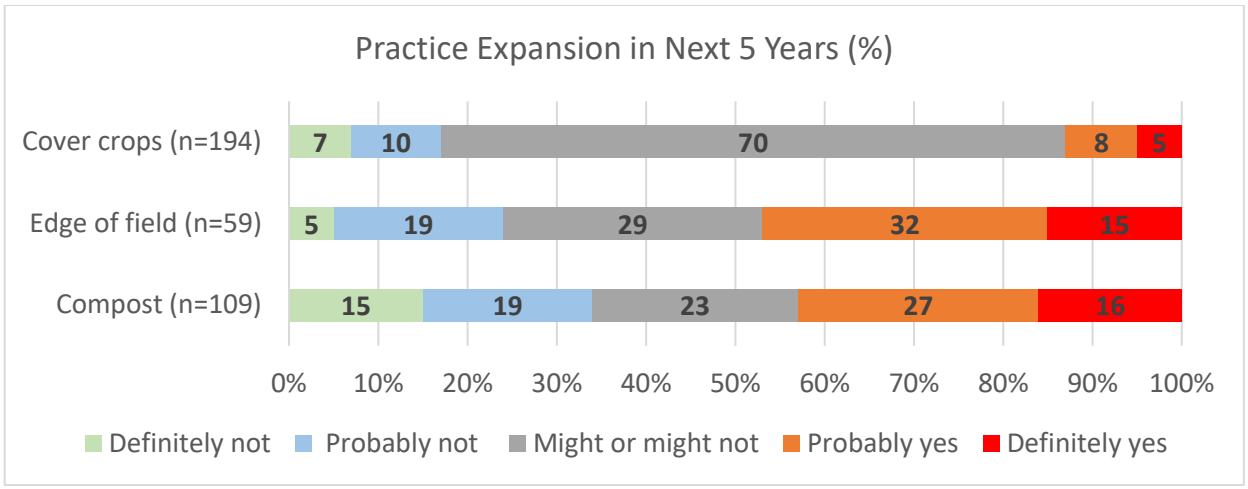

Figure 37. Responses to "In the next five years, will you expand the total acreage where this practice is applied on your farm?" Cover crops, Edge-of-field, and compost are HSP-funded practices.

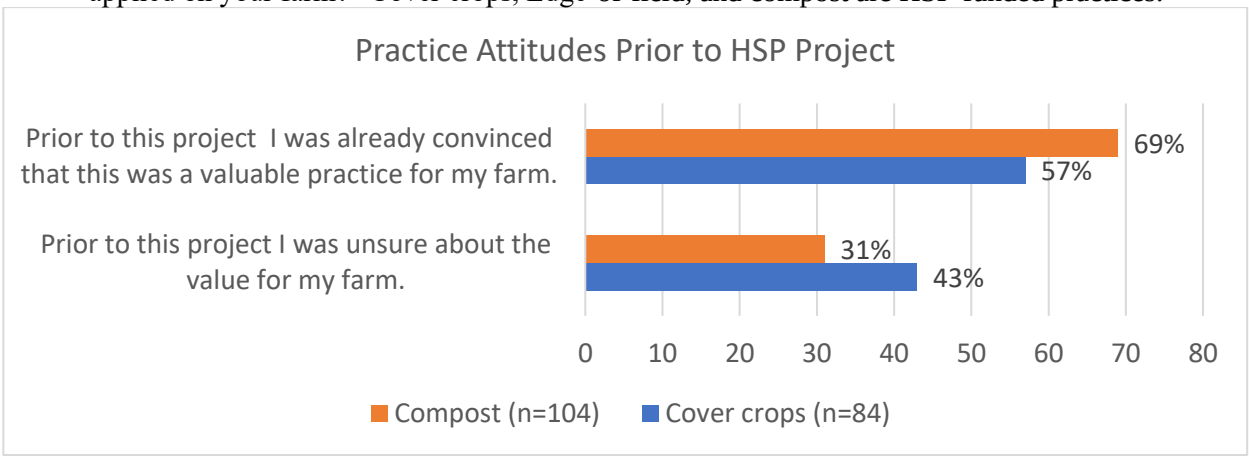

Figure 38. Responses to "Which of the following statements best reflects your attitudes towards this practice prior to your HSP project?"

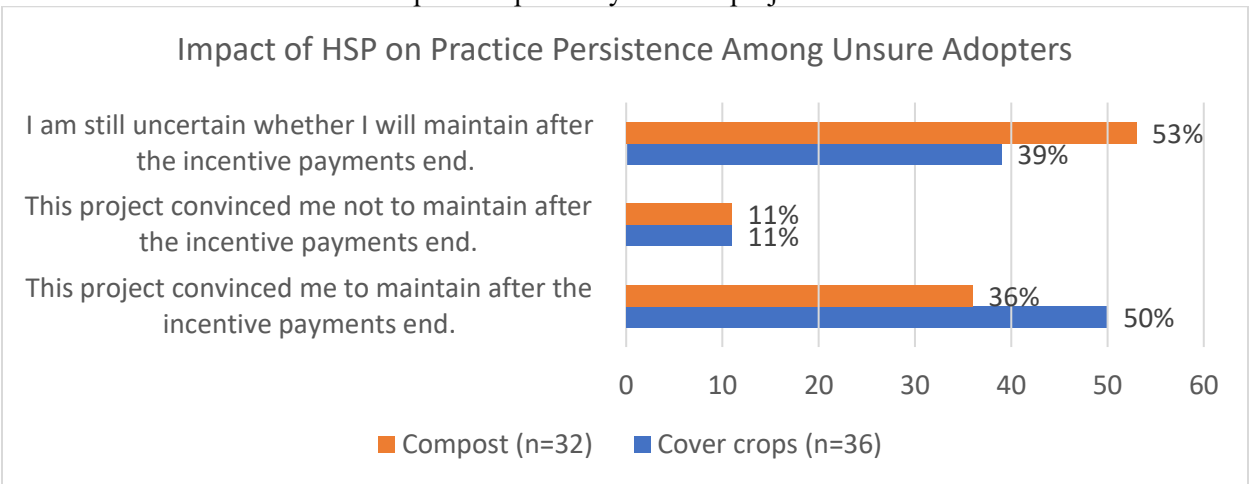

Figure 39. Percentage of responses to "Which of the following three statements best reflects the impact of the HSP program on your decision to maintain this practice after the three-year incentive period has ended?" Only those who responded "unsure" to the previous question (Figure 38) were included.

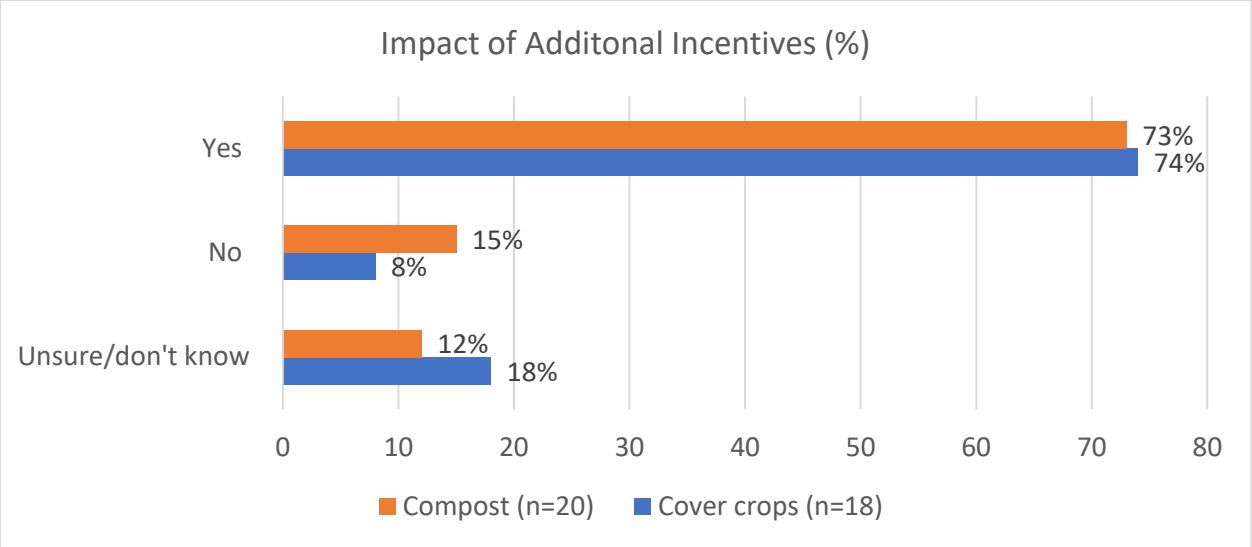

Figure 40. Percentage of responses to "If HSP financial incentives had continued for two additional years would you have been more likely to maintain the practice?" This query included only those who responded as uncertain or negative (Figure 39).

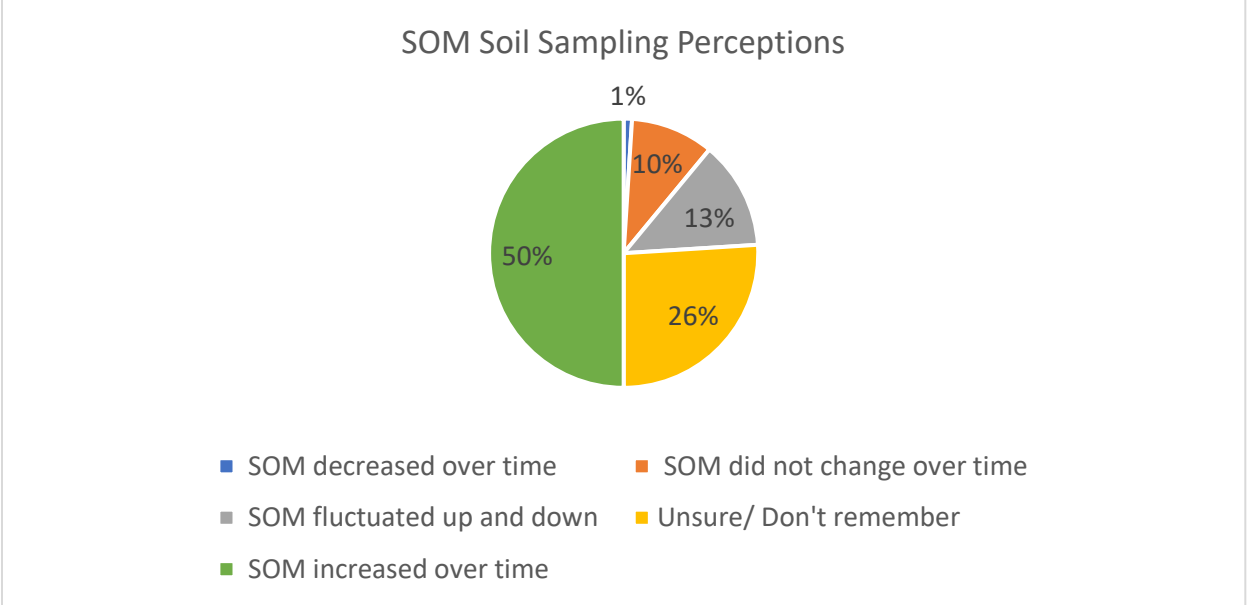

Figure 41. Percentage of responses to the question "The HSP program requires annual soil sampling to monitor soil organic matter (SOM) pools. What did your soil samples reveal about the level of SOM in your HSP-funded project area?" (n=194)

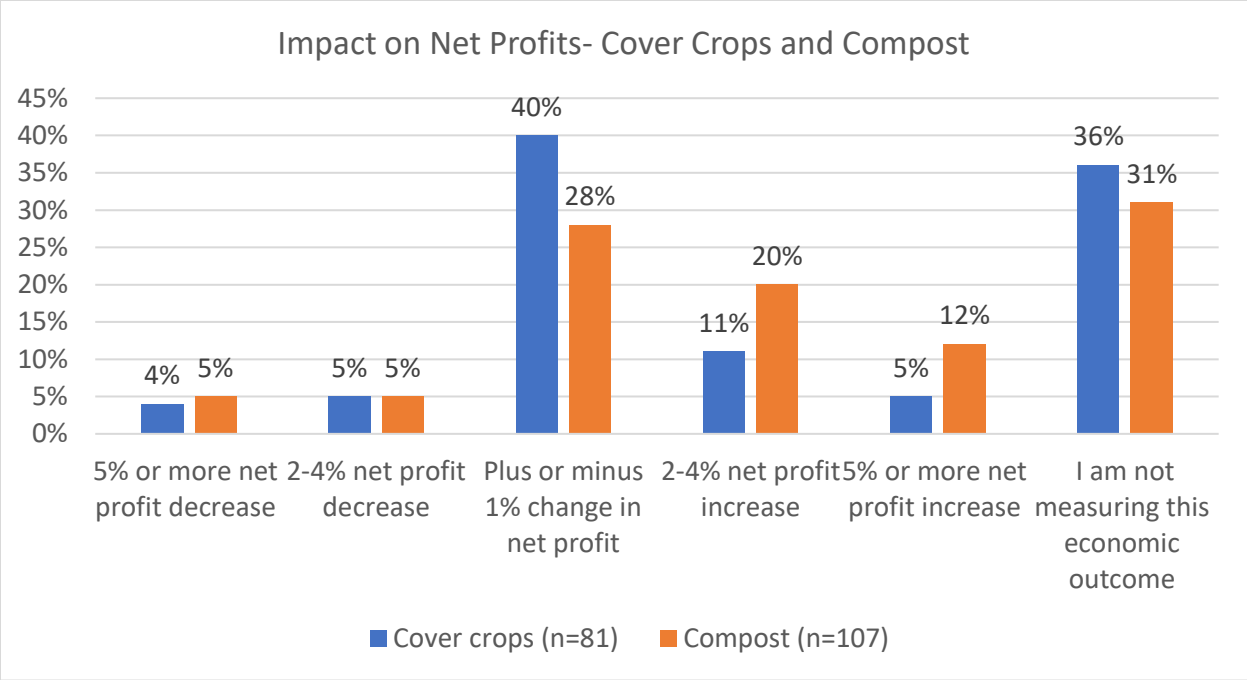

Figure 42. Percentage of responses to the question "What has been the overall impact of cover cropping/ compost application on the profitability of your operation?"

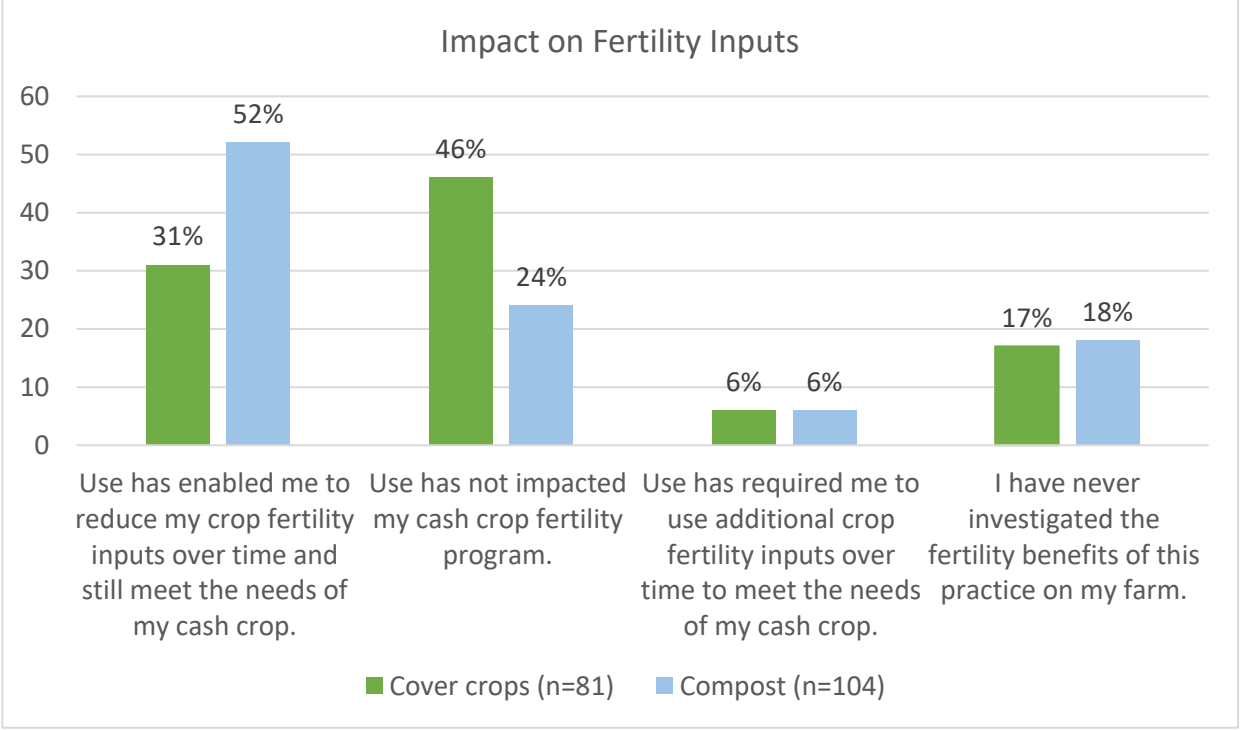

Figure 43. Percentage of responses to the question "Which of the following four statements best reflects your experience with cover crops/ compost?"

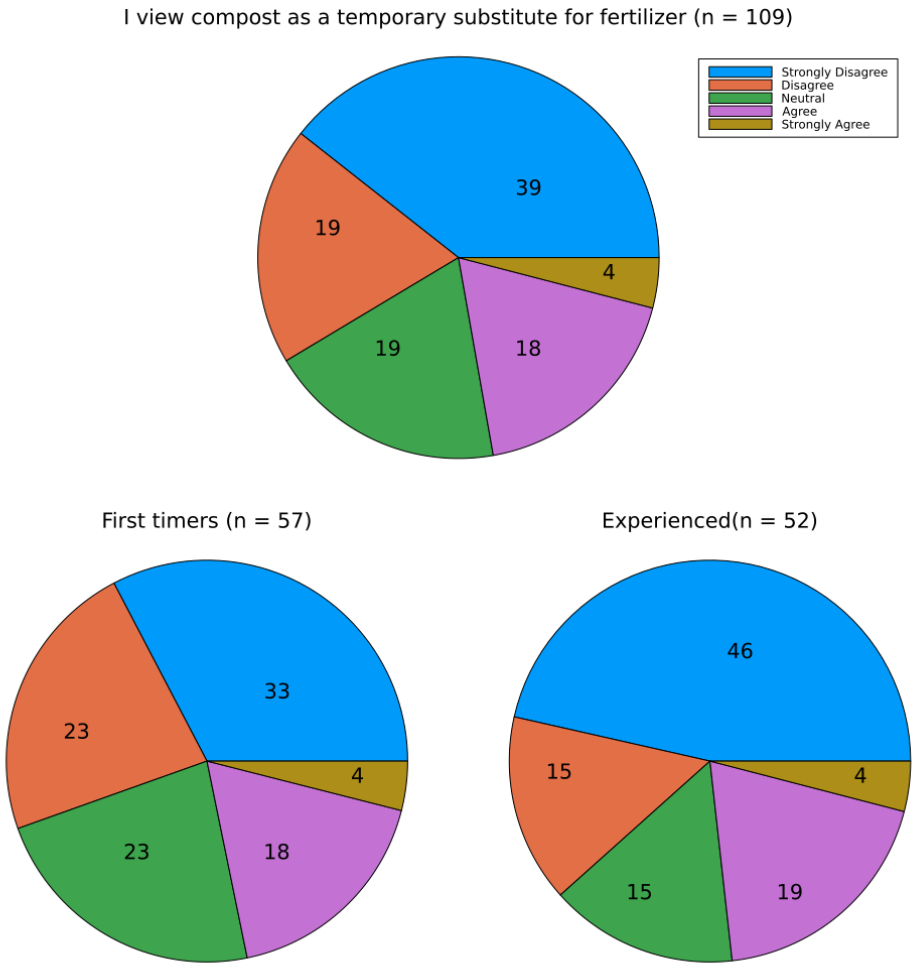

Figure 44. Percentage of responses to the question "Please indicate your level of agreement or disagreement with the following statement. The HSP-funded compost was a temporary substitute for the chemical fertilizer inputs that I have reverted to following the completion of the three-year trial."

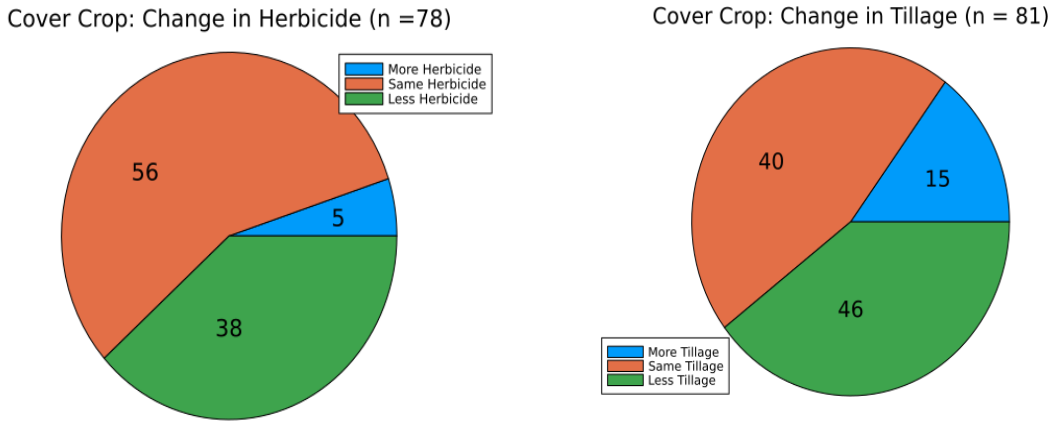

Figure 45. Percentage of responses to questions querying how cover cropping and composting have impacted herbicide and tillage use.

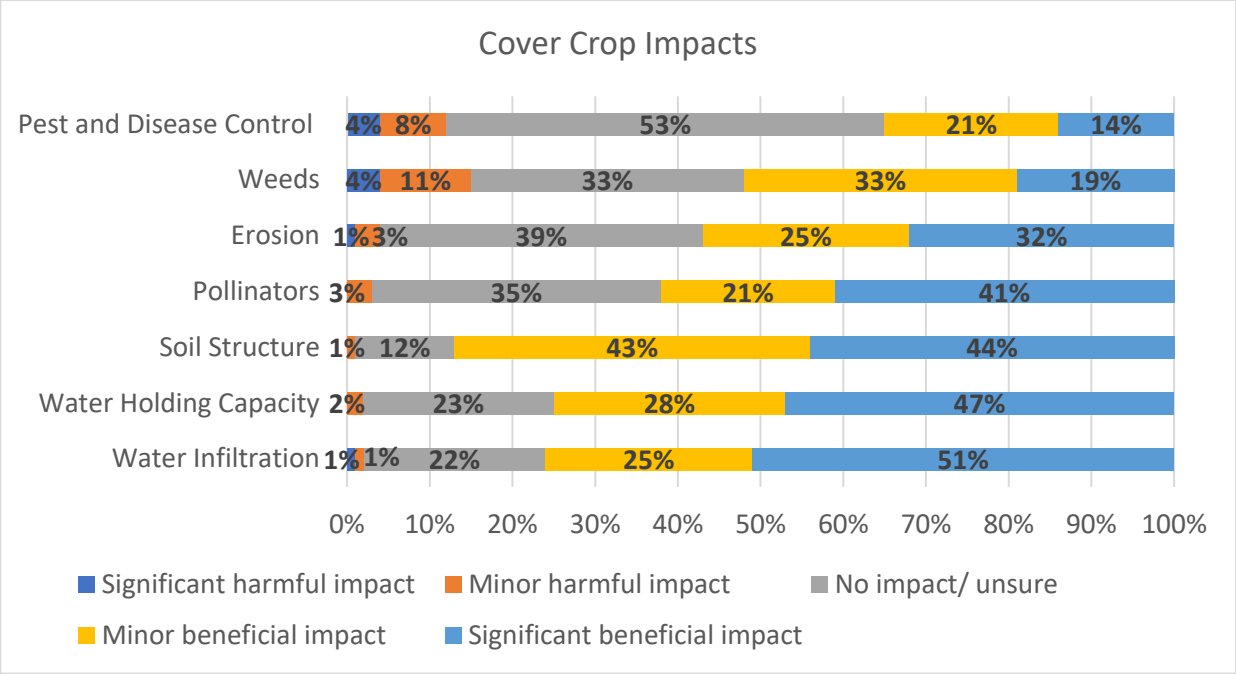

Figure 46. Percentage of responses to the question "The following farming conditions are often impacted by cover cropping. Please rate what type of impact you have seen from cover crops on your farm." Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact (n=107).

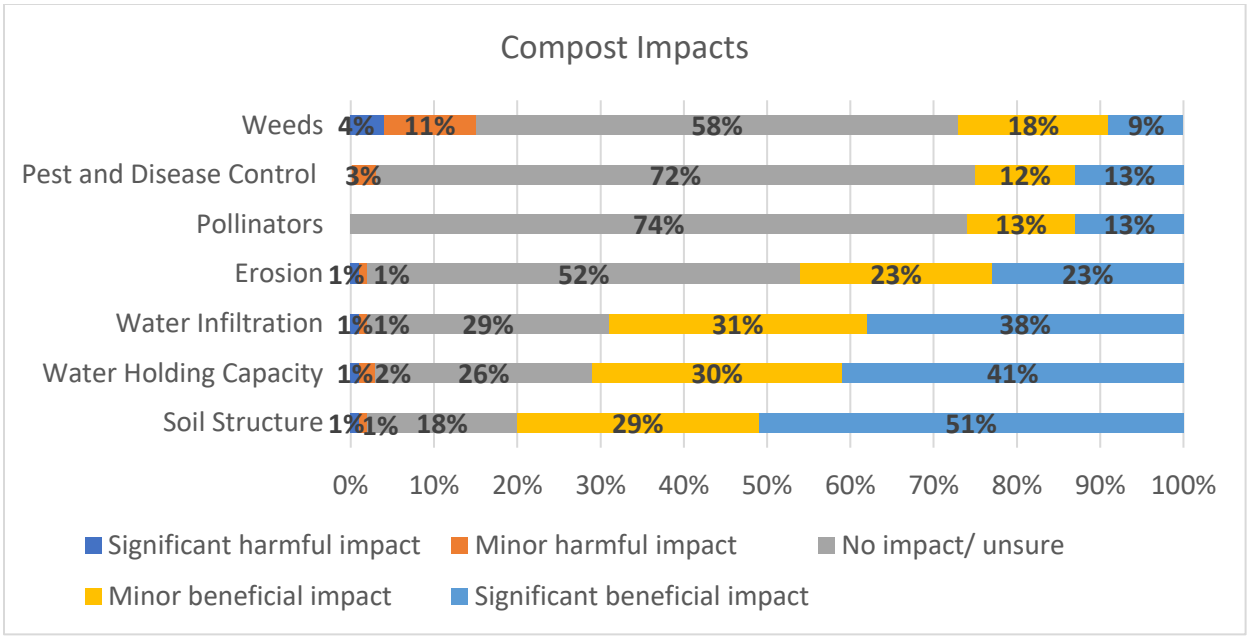

Figure 47. Percentage responses to the question "The following farming conditions are often impacted by composting. Please rate what type of impact you have seen from compost application on your farm." Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact (n=107).

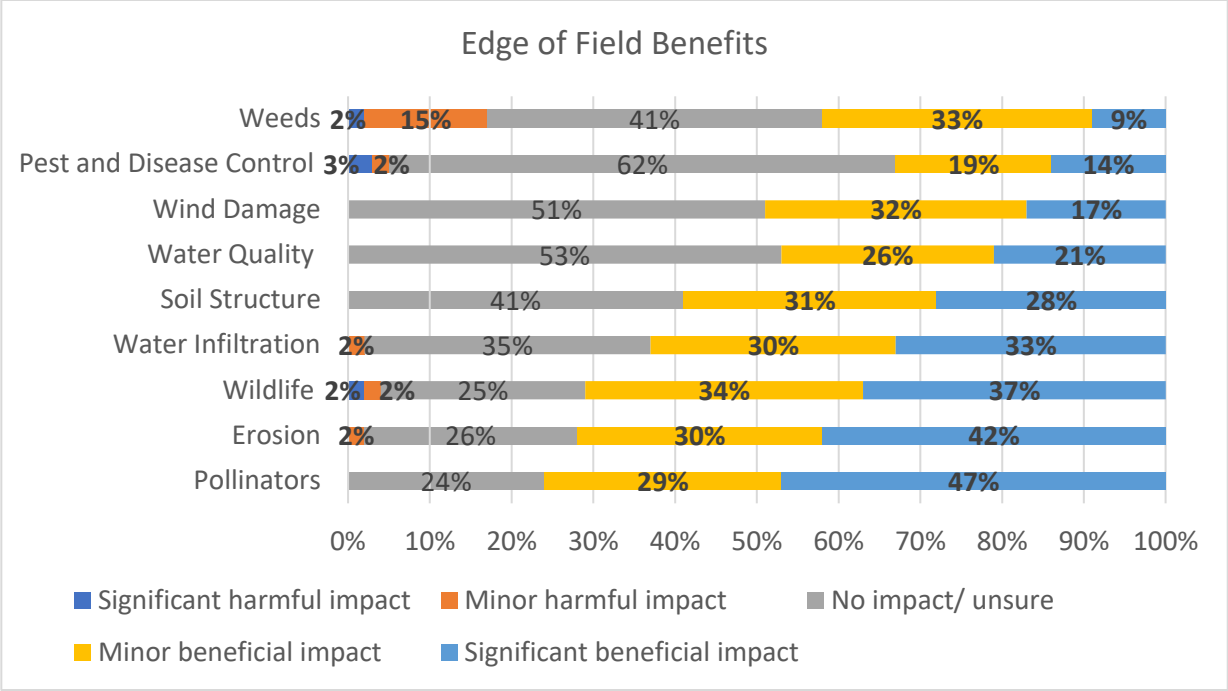

Figure 48. Percentage of responses to the question "The following farming conditions are often impacted by edge-of-field practices, including hedgerows. Please rate what type of impact you have seen from edge-of-field practices on your farm." Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact (n=73).

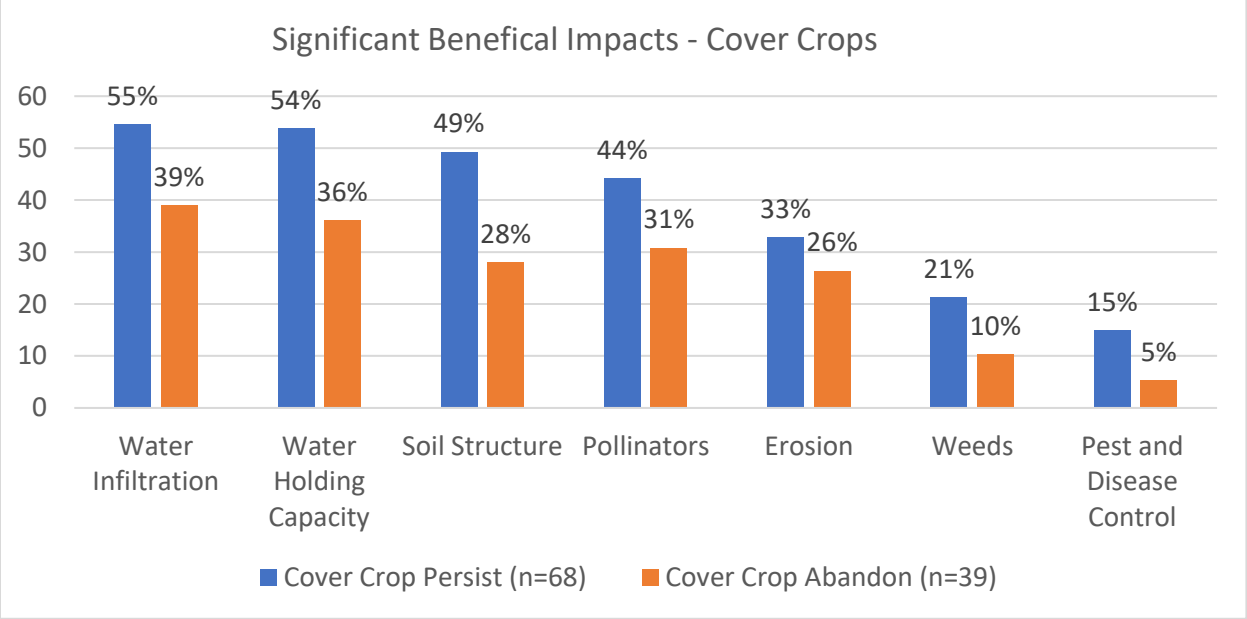

Figure 49. Percentage of responses indicating "Significant beneficial impact" to the question "The following farming conditions are often impacted by cover cropping. Please rate what type of impact you have seen from cover crops on your farm." Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact.

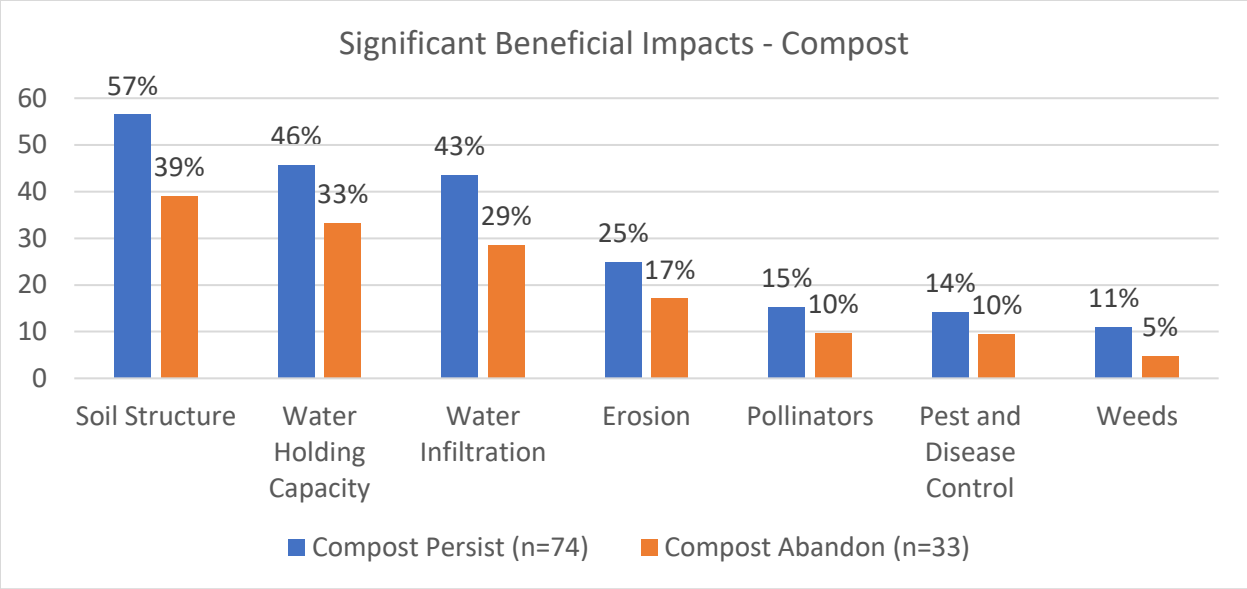

Figure 50. Percentage of responses indicating "Significant beneficial impact" to the question "The following farming conditions are often impacted by composting. Please rate what type of impact you have seen from compost application on your farm." Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact.

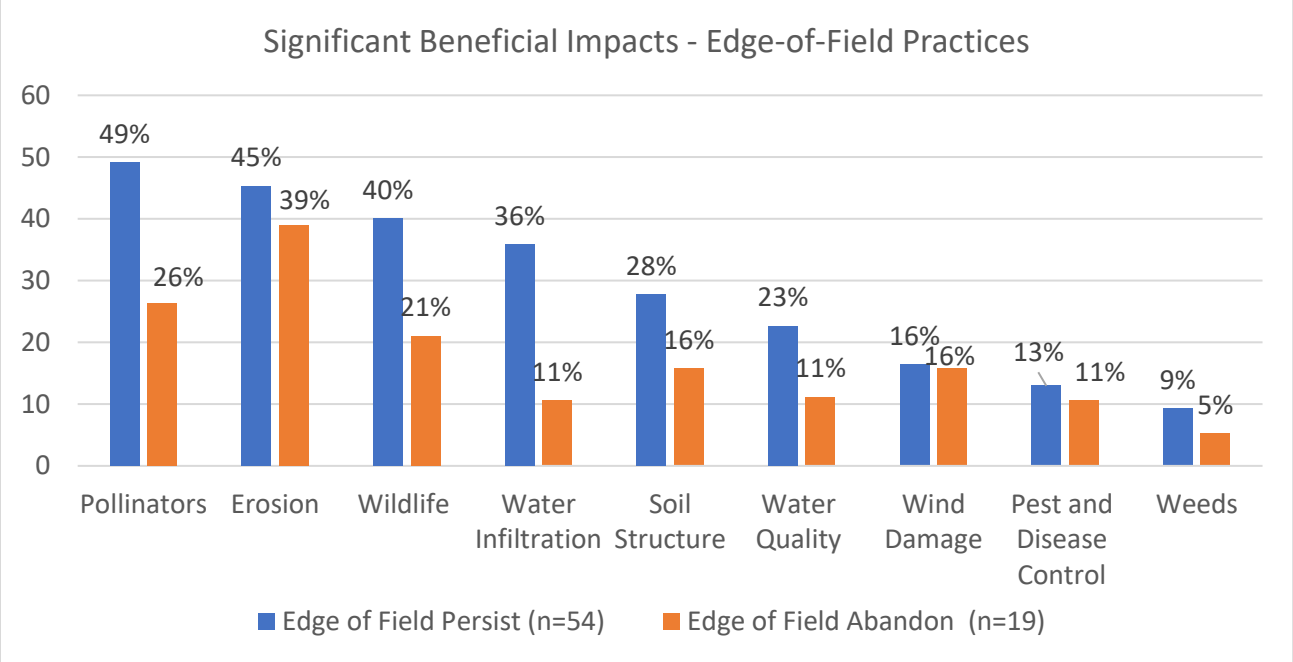

Figure 51. Percentage of responses indicating "Significant beneficial impact" to the question "The following farming conditions are often impacted by edge-of-field practices. Please rate what type of impact you have seen from edge-of-field practices on your farm." Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact.

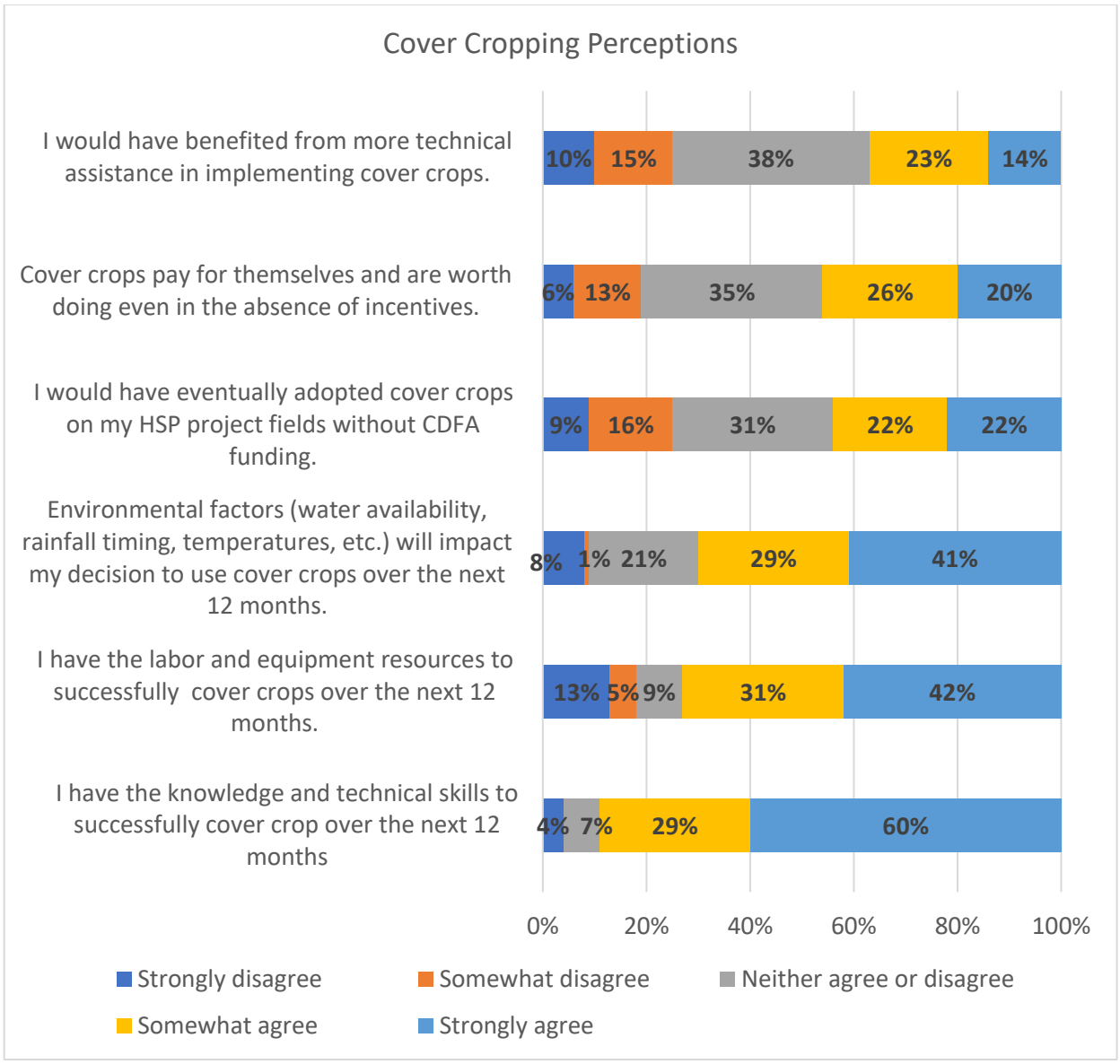

Figure 52. Percentage of responses to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=108).

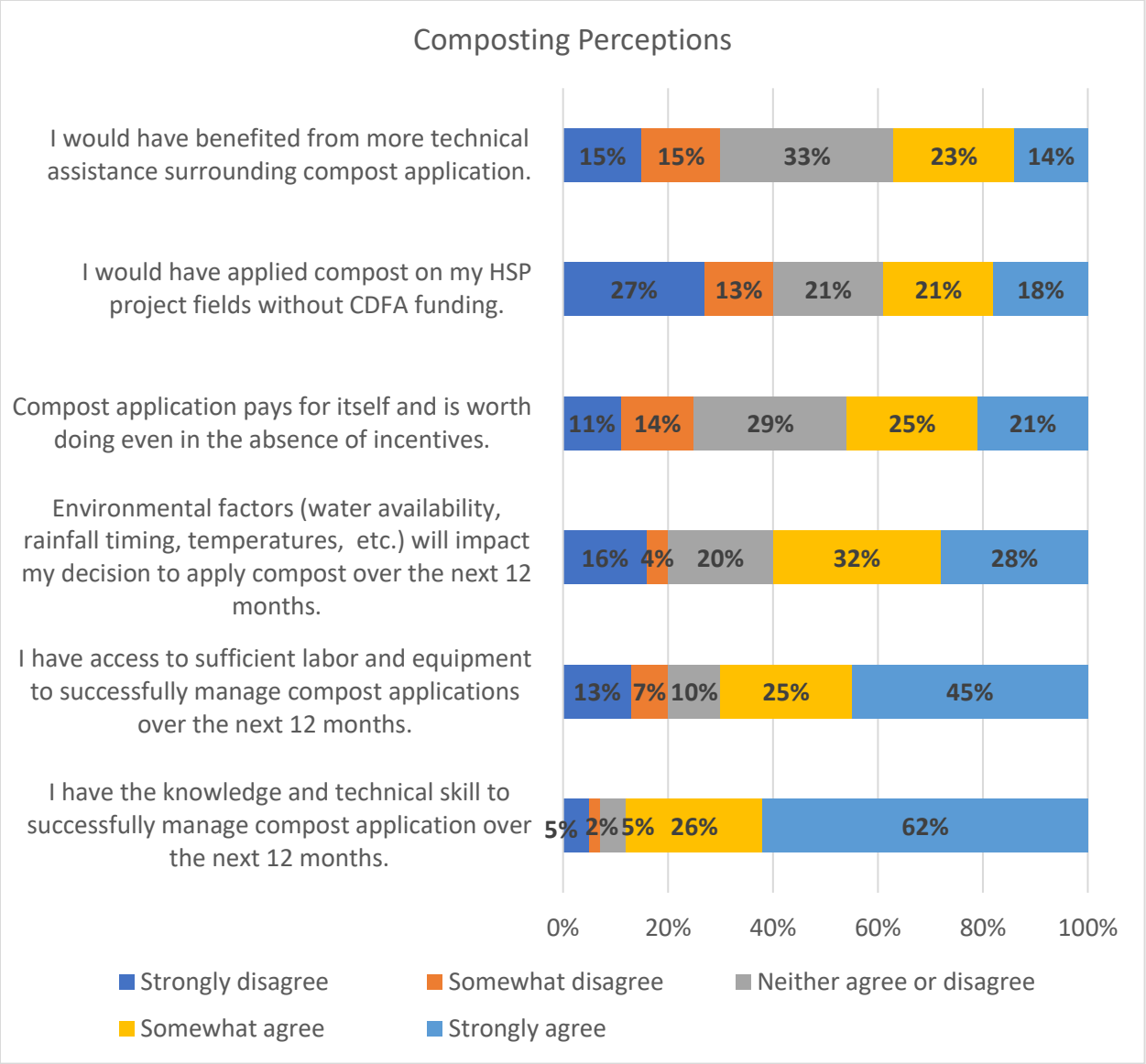

Figure 53. Percentage of responses to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=107).

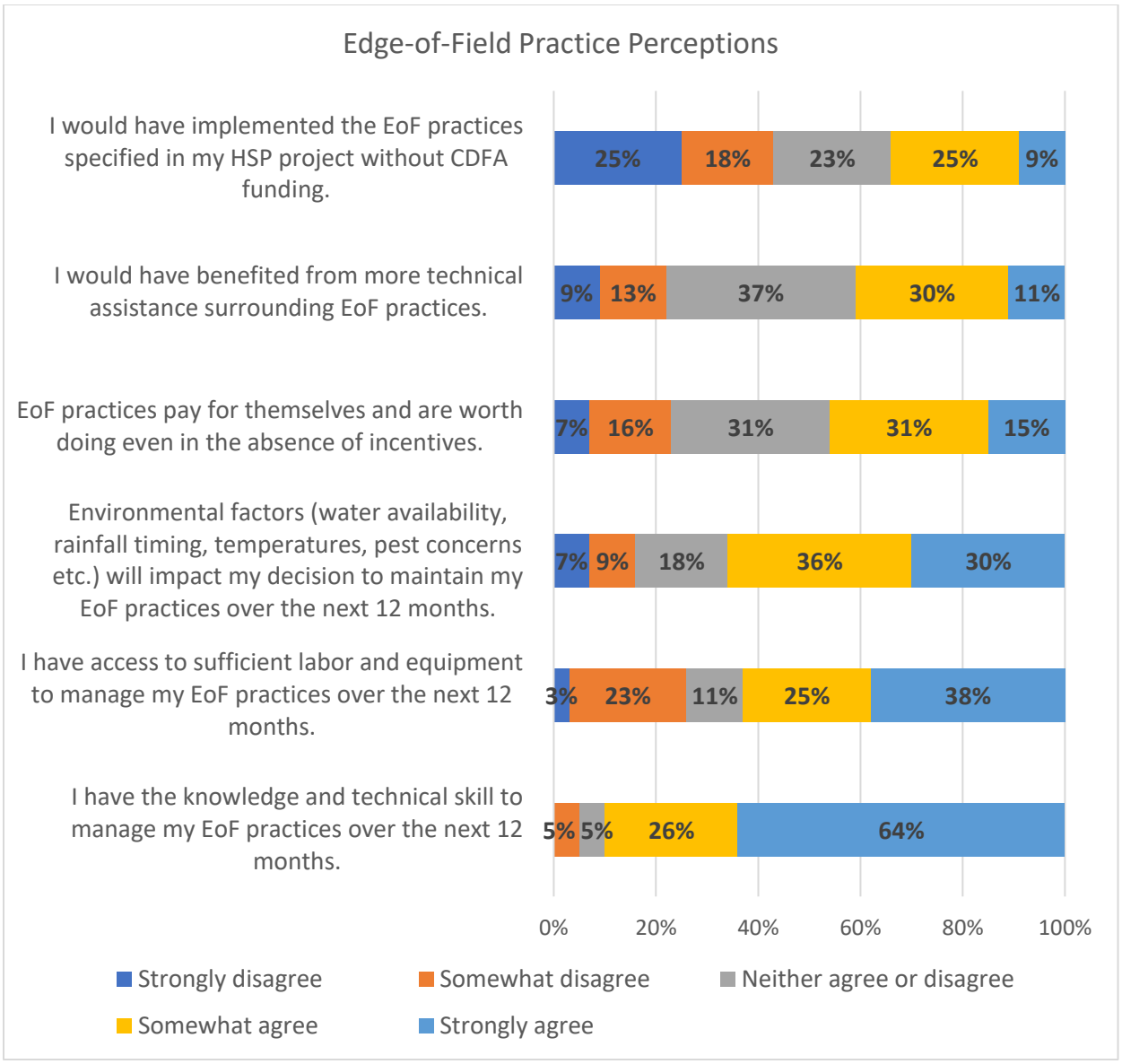

Figure 54. Percentage of responses to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=56). Includes hedgerows.

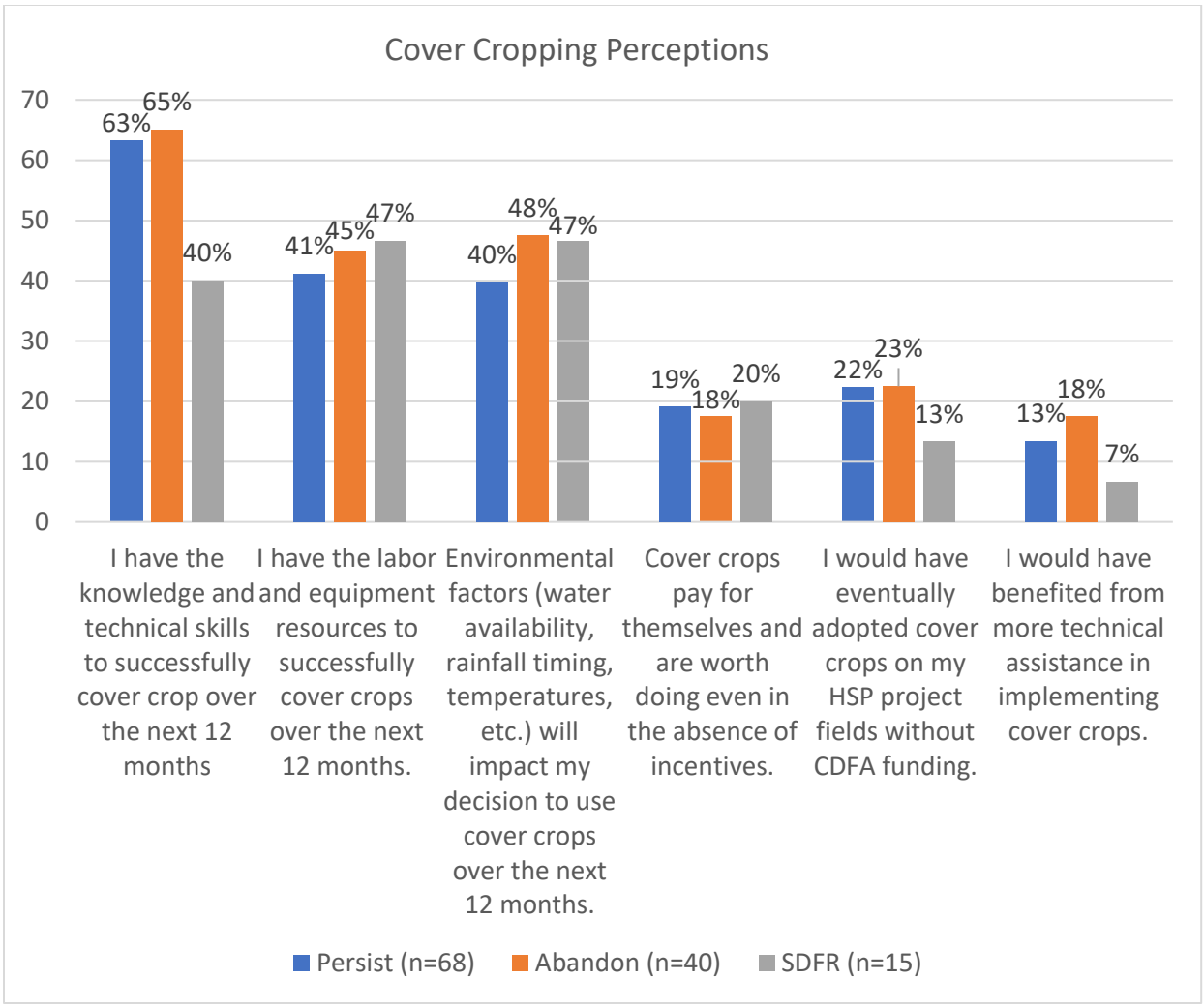

Figure 55. Percentage of responses "Strongly agreeing" when asked "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree. Note that SDFR respondents are double-counted as they are included also in the "Persist" and "Abandon" categories.

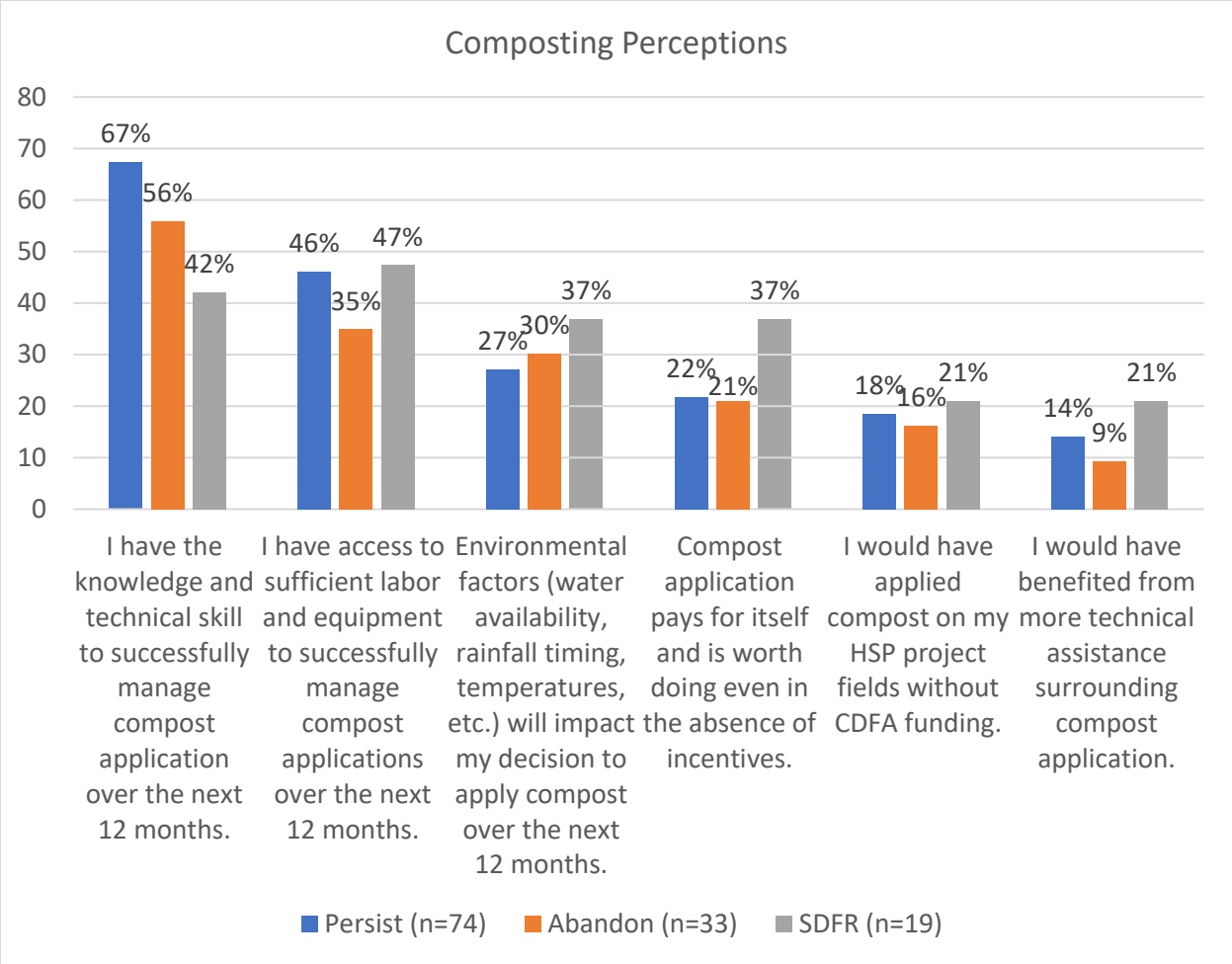

Figure 56. Percentage of responses "Strongly agreeing" when asked "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree. Note that SDFR respondents are double-counted as they are included also in the "Persist" and "Abandon" categories

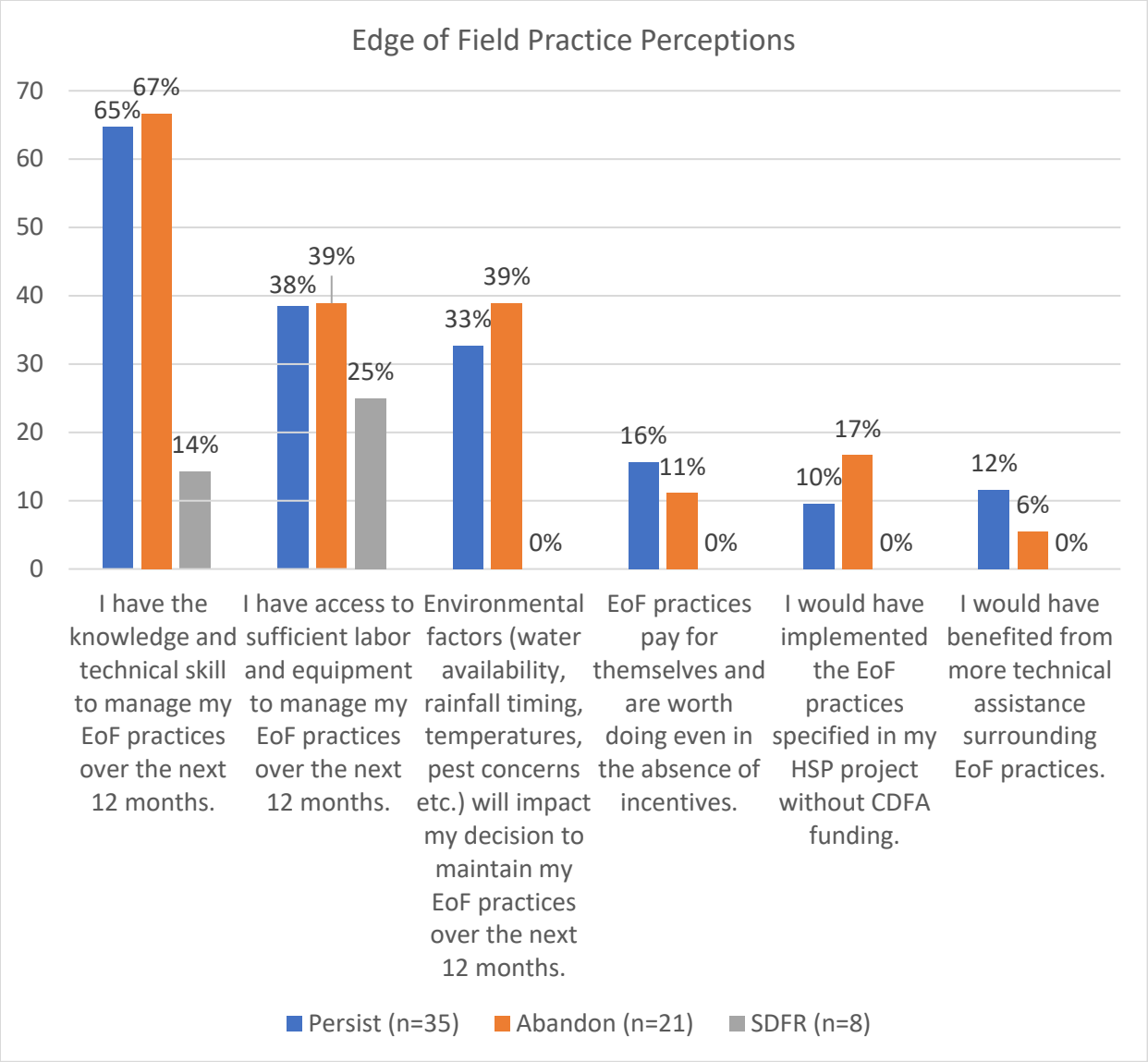

Figure 57. Percentage of responses "Strongly agreeing" when asked "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree. Note that SDFR respondents are double-counted as they are included also in the "Persist" and "Abandon" categories.

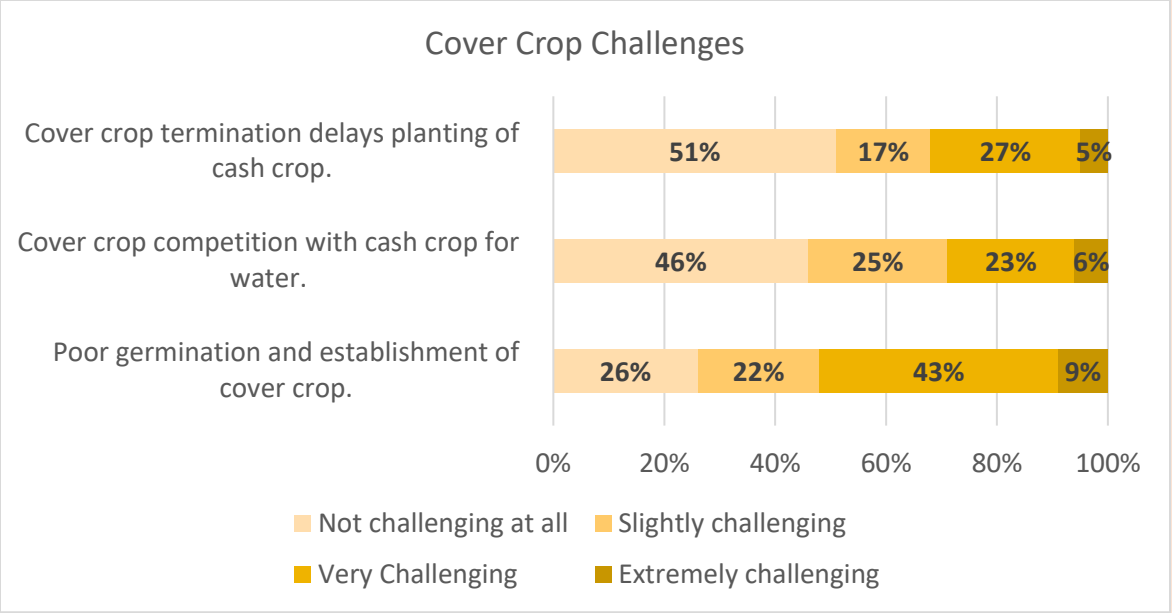

Figure 58. Percentage of responses to the question "The following are some challenges that growers often experience when using cover crops. Please rate how challenging each issue has been for the management of the cover crops planted as part of your HSP project." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging (n=77).

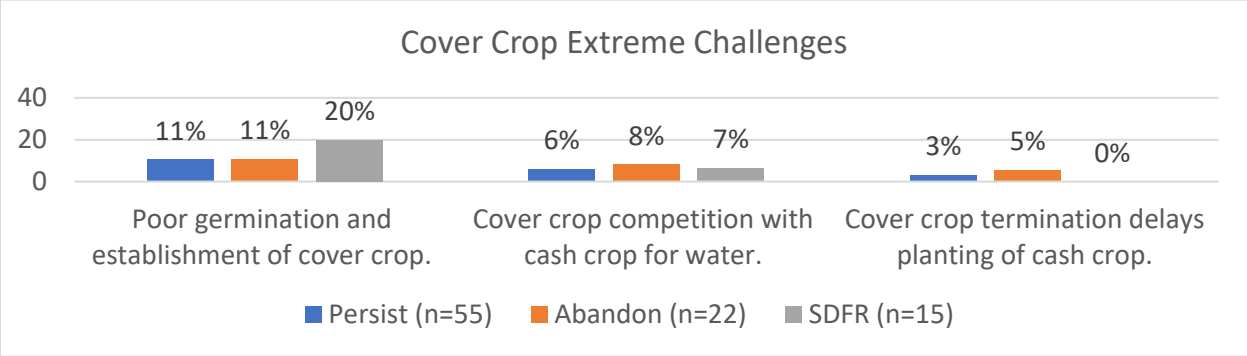

Figure 59. Percentage of responses indicating "Extremely challenging" to the question "The following are some challenges that growers often experience when using cover crops. Please rate how challenging each issue has been for management of the cover crops planted as part of your HSP project." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging.

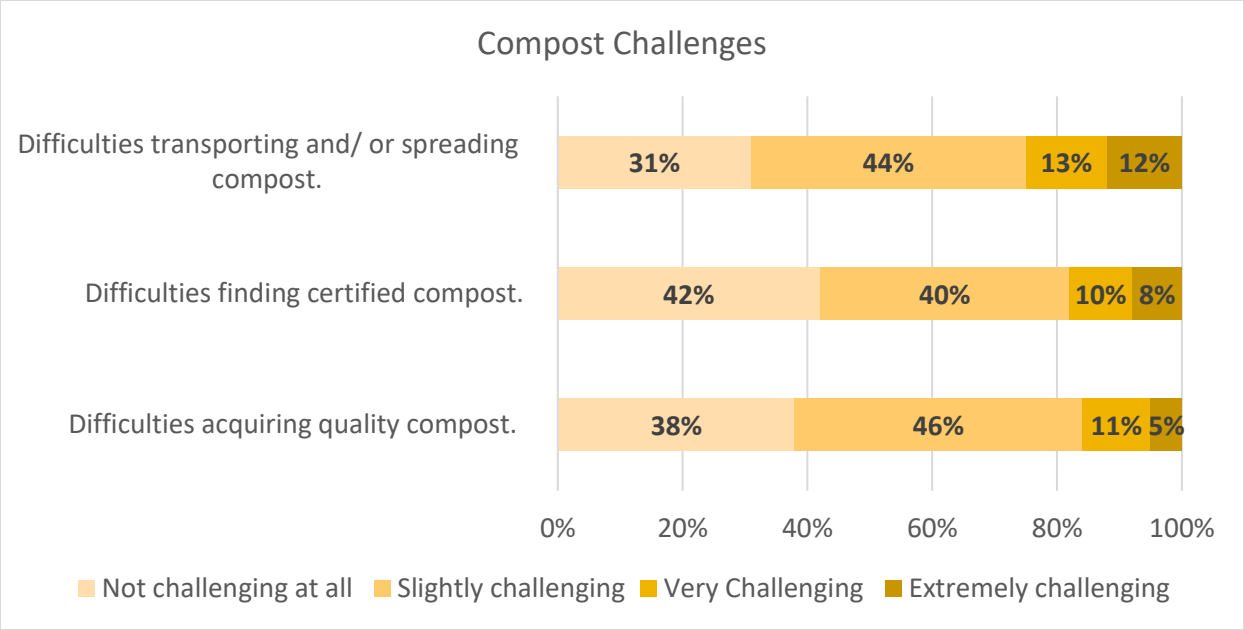

Figure 60. Percentage of responses to the question "The following are some challenges that growers often experience when using compost. Please rate how challenging each issue has been for compost application on your farm." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging (n=106).

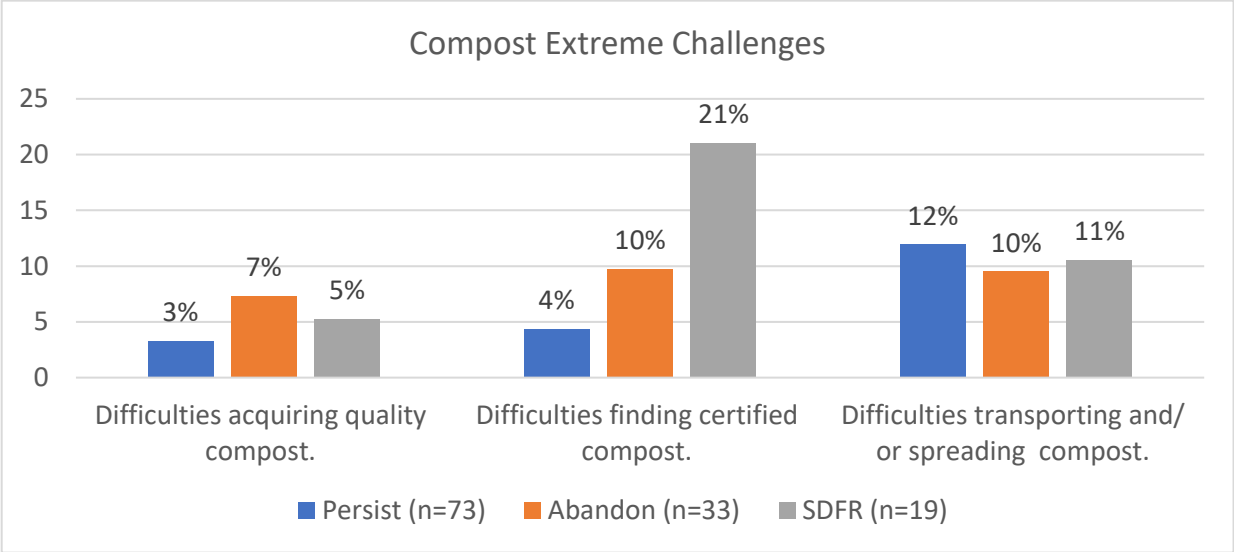

Figure 61. Percentage of responses indicating "Extremely challenging" to the question "The following are some challenges that growers often experience when using compost. Please rate how challenging each issue has been for compost application on your farm." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging.

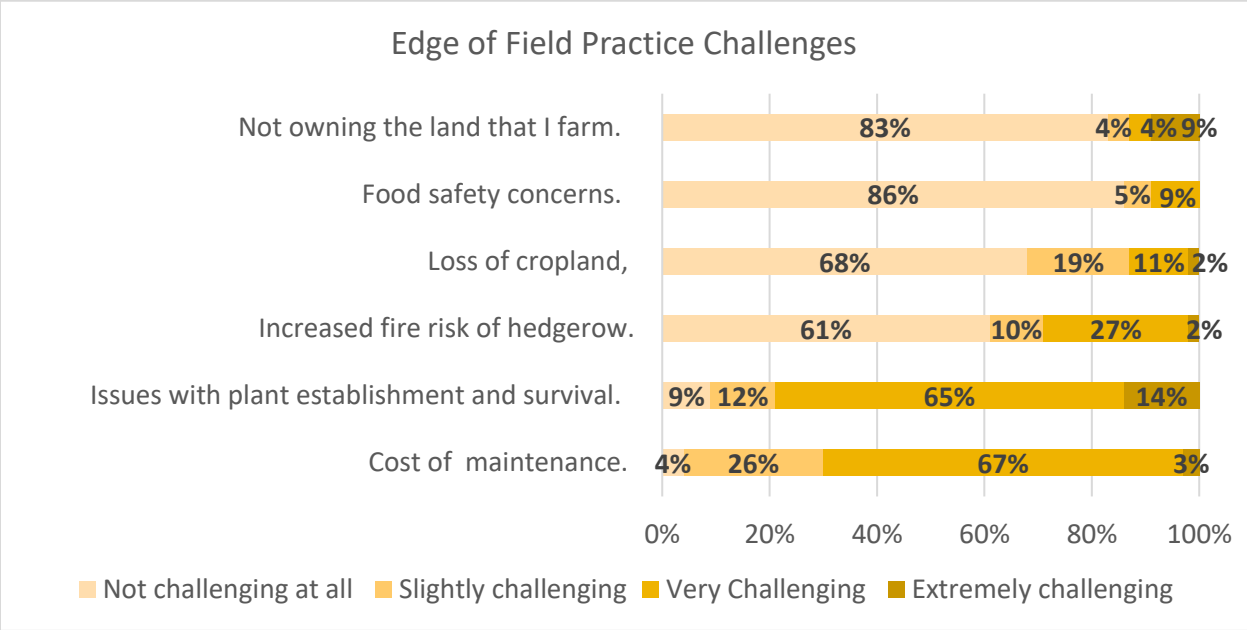

Figure 62. Percentage of responses to the question "The following are some challenges that growers often experience with edge-of-field practices. Please rate how challenging each issue has been for you in managing edge-of-field practices." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging. Edge-of-field practices here include hedgerows as well as conservation cover, riparian forest buffer, range planting, silvopasture, windbreak/shelterbreak establishment, riparian herbaceous cover, tree/shrub establishment, multi-story cropping, herbaceous wind barrier, grassed waterway, field border, filter strip, and contour buffer strip (n=57).

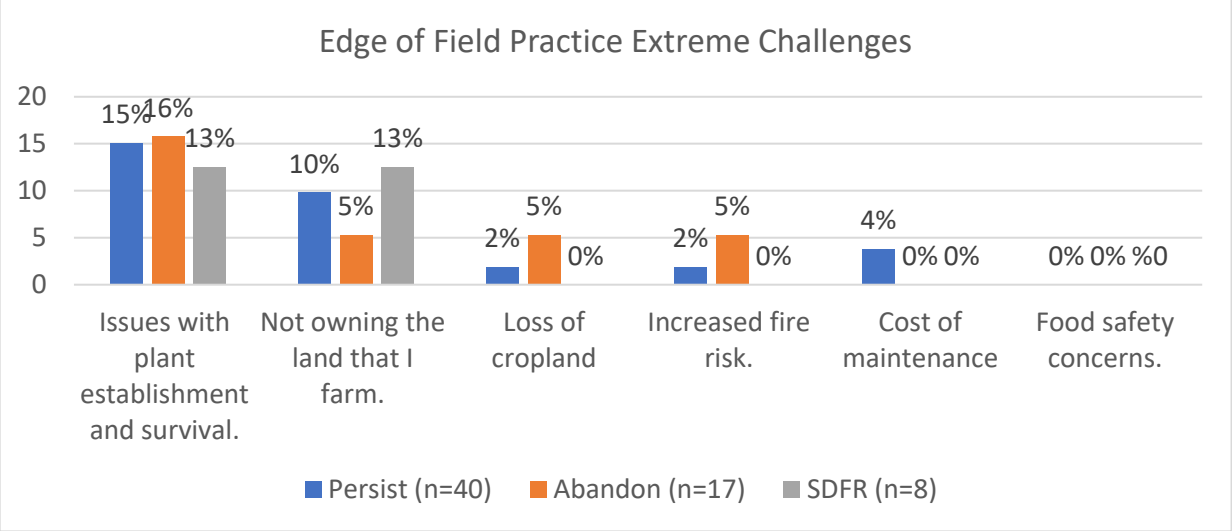

Figure 63. Percentage of responses indicating "Extremely challenging" to the question "The following are some challenges that growers often experience with edge-of-field practices. Please rate how challenging each issue has been for you in managing edge-of-field practices." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging.

6. SWEEP

Section 6 Key Findings:

- **Risks and motivations- navigating inflation, regulation, and water supply:** Inflation, regulation, and water supply were the most concerning risks for SWEEP respondents (Figure 64). Meanwhile, the primary motivations for program participation were improving water efficiency, closely followed by improving energy efficiency (Figure 65).
- **Persistence rates of SWEEP practices:** Micro irrigation (84%) had the highest persistence rate among SWEEP practices, while web-based subscriptions for irrigation water management platforms (67%) had the lowest (Figure 66). VFD pumps (79%) and solar (81%) had relatively low persistence rates, given they are fixed infrastructure practices.
- **Low distribution uniformity testing:** Only 50% of respondents had tested the distribution uniformity of their irrigation system in the previous two years (n=116).
- **Land and labor factors influencing persistence:** Abandoners had larger farms with fewer employees and larger SWEEP projects (Table 7). Projects may have been abandoned due to the lack of labor to aid in the management of these larger projects.
- **Farm type factors influencing persistence:** Mixed vegetable and berry growers and grazing operations (100%) had the highest rates of persistence while field crops (71%) and grape growers (77%) had the lowest rates (Figure 67).
- **Demographic factors influencing persistence:** Women, non-college-educated, socially disadvantaged, and organic growers had significantly higher persistence (Figure 68).
- **Grant recipients embrace expansion:** Approximately 30% of grant recipients chose to expand the practices that were funded, contributing to high additionality within the grant programs. This ranged from a low of 22% for subscription to irrigation management platforms to a high of 35% for micro irrigation (Figure 70).
- **Policies and markets:** Regulatory pressures, market type, and contract insecurity did not significantly impact the rates of persistence among SWEEP grant recipients (Figure 69).
- **Soil moisture co-benefits:** Water usage and irrigation efficiency were by far the most significant beneficial impacts reported by soil moisture monitoring grants, followed by crop yields and quality (Figure 71). Persisters were much more likely than abandoners to perceive water usage and crop yields as significant beneficial impacts (Figure 72).
- **Soil moisture monitoring challenges:** Financial expense was the largest challenge faced by soil moisture monitoring grantees (Figure 74). Fewer than two-thirds 63% and 64% of respondents agree that they have enough understanding of the data produced by weather stations (63%, n=66) and soil moisture sensors (64%, n=103) to effectively plan irrigation events.
- **SDFR challenges:** While the majority of grantees feel they have the resources to implement soil moisture sensors to schedule irrigation, SDFRs were almost twice as likely to agree that they would have benefited from additional technical assistance (Figure 76).

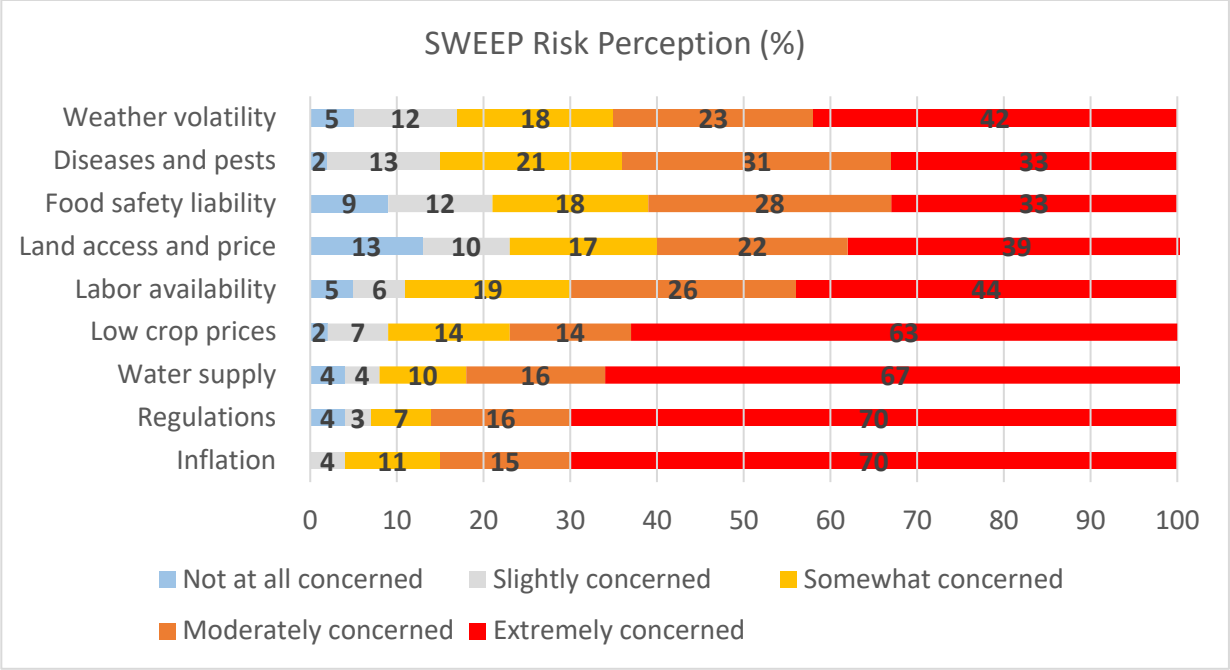

Figure 64. Percentage responses to the question "Adoption of conservation practices is often motivated by a desire to manage risk. How concerned are you about the impact of the following risks on the viability of your farming operation" (n=111)

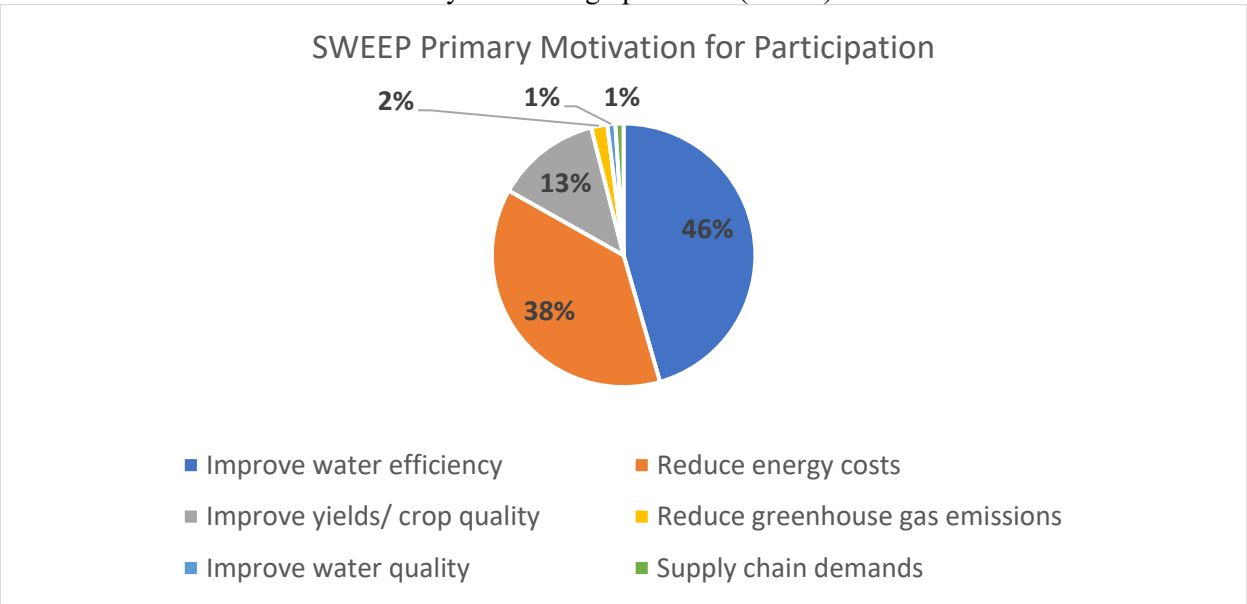

Figure 65. Percentage responses to the question "Please select your single most important motivation for participating in SWEEP." (n=111)

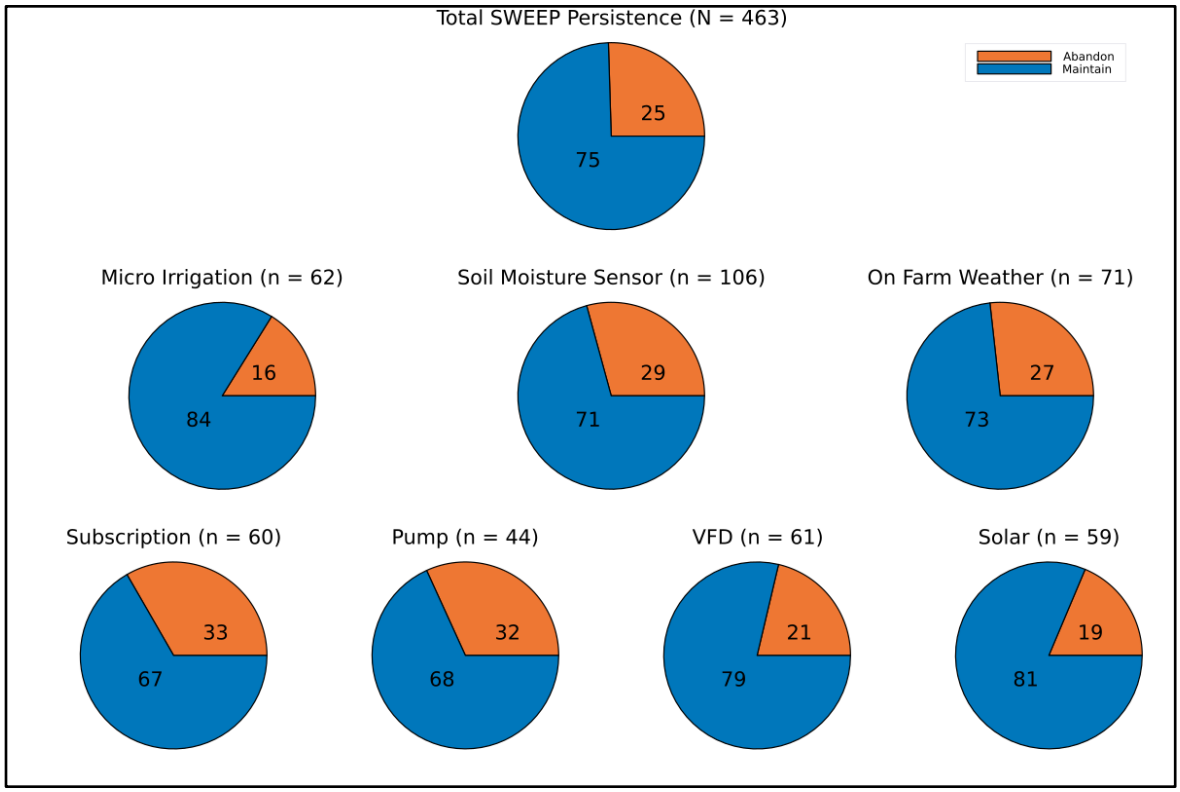

Figure 66. Persistence and abandonment rates (%) of all combined and individual SWEEP-funded practices. Soil moisture refers to the installation of soil moisture sensors. On Farm Weather refers to the installation of a weather station. Subscription refers to a web-based subscription for an irrigation water management platform. Pump refers to a pump replacement or conversion. VFD refers to a variable frequency drive pump.

Table 7. Mean value of continuous farm and farm manager characteristics for SWEEP respondents who persisted or abandoned practices. Two sample T-test: *p < 0.05, **p < 0.01, *** p < 0.001, ns= not significant. ± Responses to "What percentage of the croplands you manage are irrigated?"

Variable	**Soil Moisture Sensors**			**Weather Station**		
	Persist (n)	**Abandon (n)**	**P**	**Persist (n)**	**Abandon (n)**	**P**
Operation Acres	1159 (64)	6606 (24)	***	1490 (46)	11249 (14)	***
Project Acres	144 (62)	268 (26)	***	165 (44)	393 (16)	***
Employees	43 (62)	36 (26)	***	62 (44)	45 (16)	***
Age	53 (60)	53 (25)	ns	51 (41)	50 (16)	ns
Years in Agriculture	29 (66)	31 (27)	ns	29 (47)	30 (17)	ns

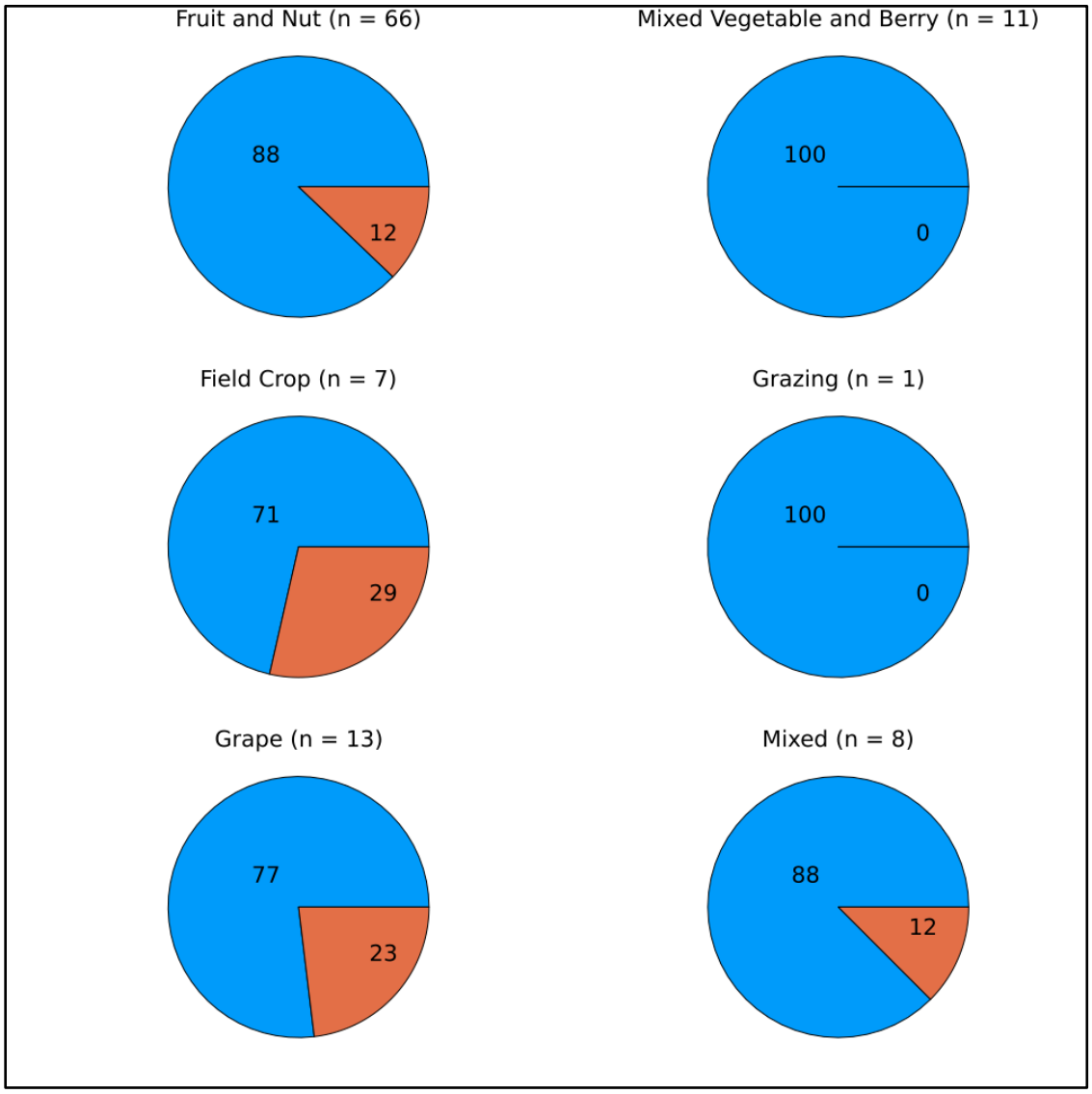

Figure 67. Persistence (blue) and abandonment (orange) rates (%) of SWEEP funded practices by cropping system. Field crops refer to cotton, alfalfa, corn, rice, beans, and winter wheat. Mixed refers to at least 25% of multiple crop types (fruit and nut, mixed vegetable and berry, field crop, grazing, grape)

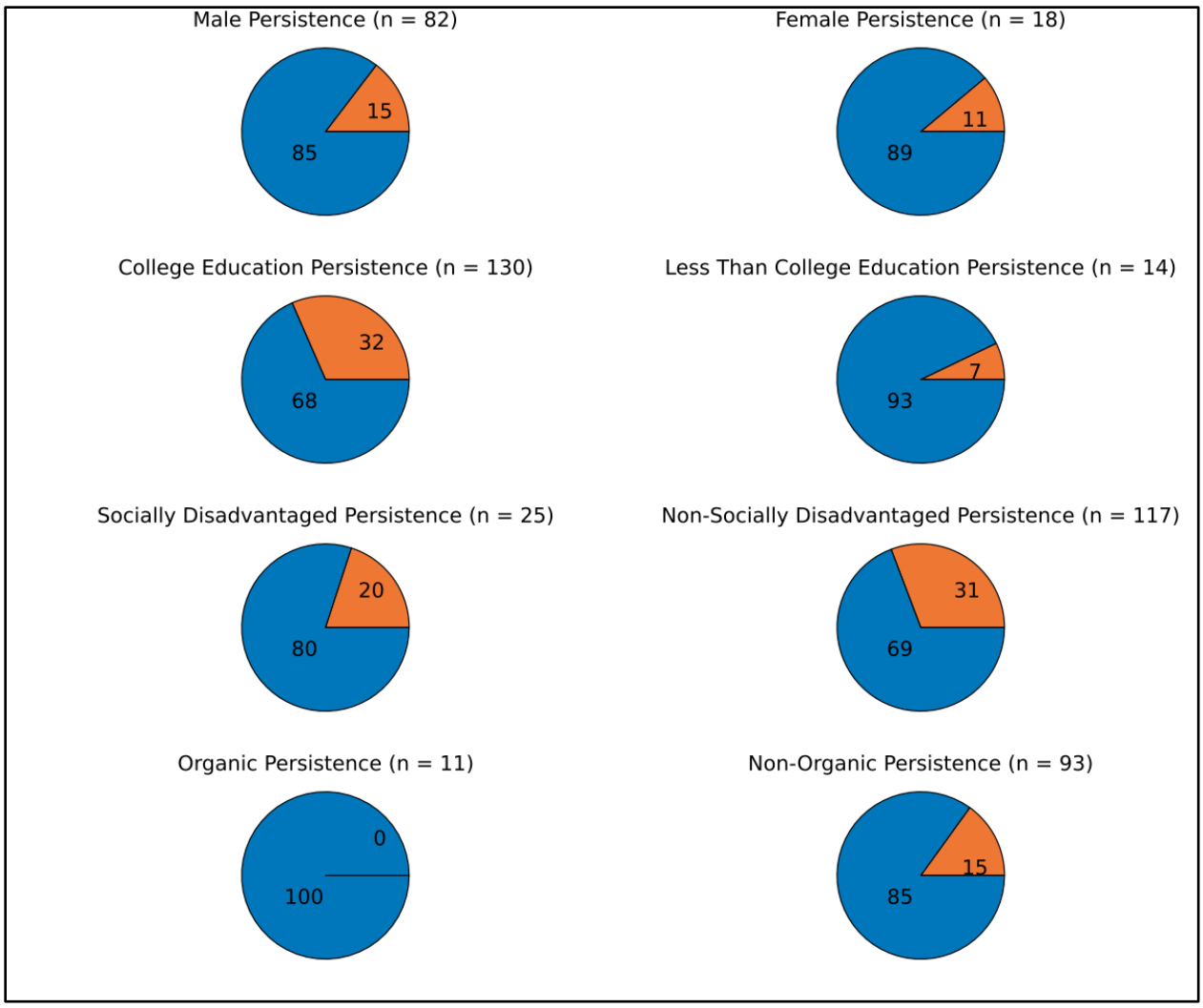

Figure 68. Persistence and abandonment rates (%) of all combined SWEEP-funded practices by additional farm characteristics.

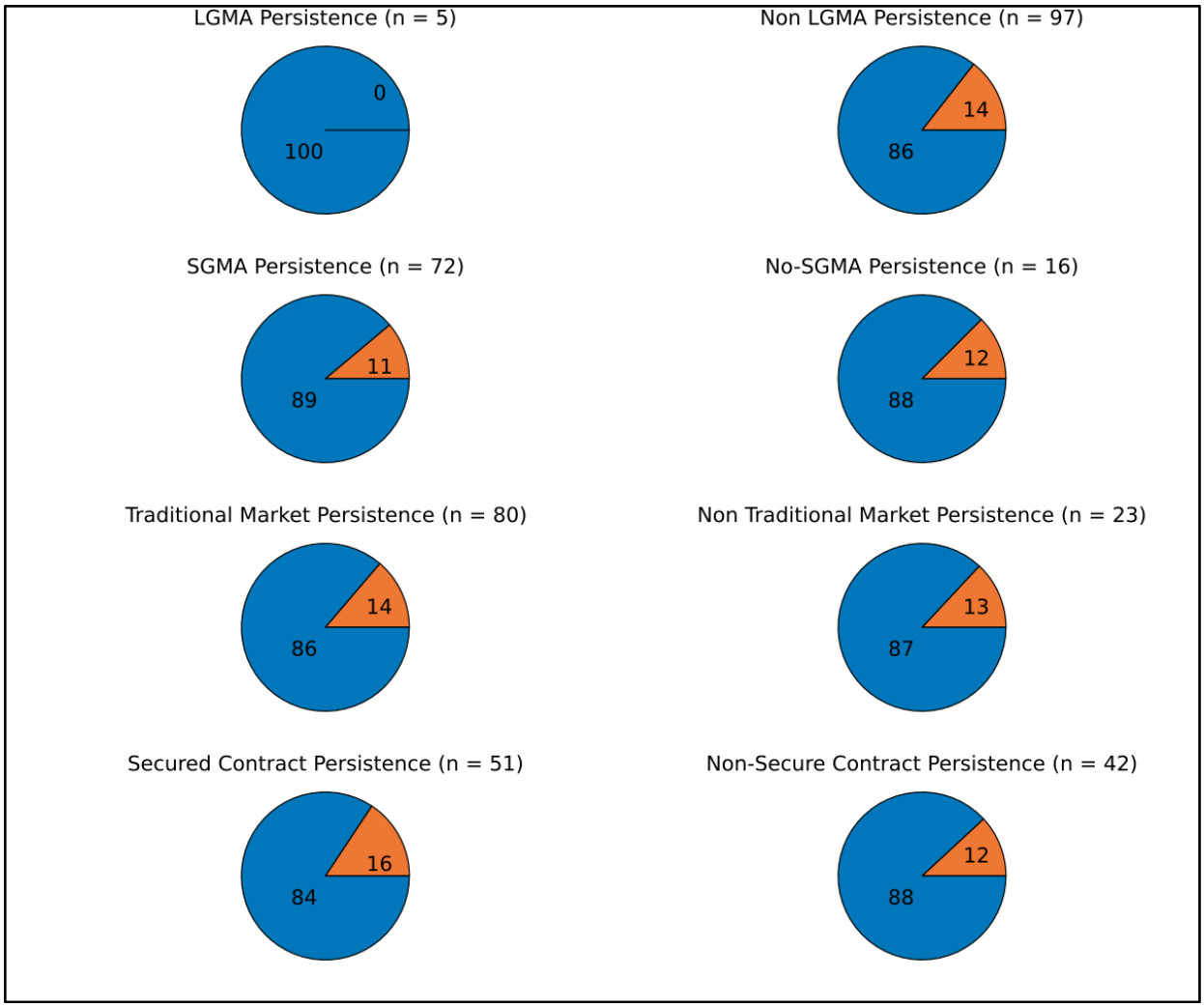

Figure 69. Persistence and abandonment rates (%) of all combined SWEEP-funded practices by additional farm characteristics.

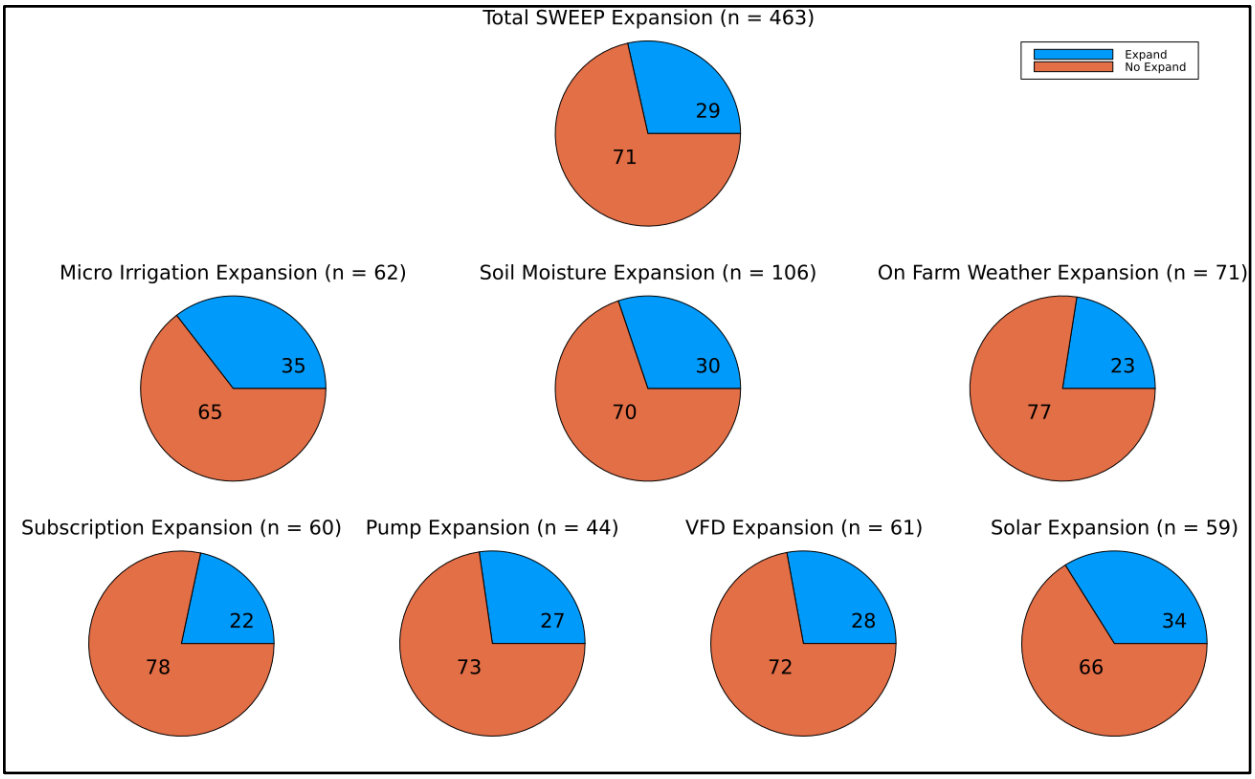

Figure 70. Expansion rates (%) of all combined and individual SWEEP-funded practices. Expansion is defined by an affirmative response to the question "Do you intend to expand the area dedicated to this practice in the next 12 months?"

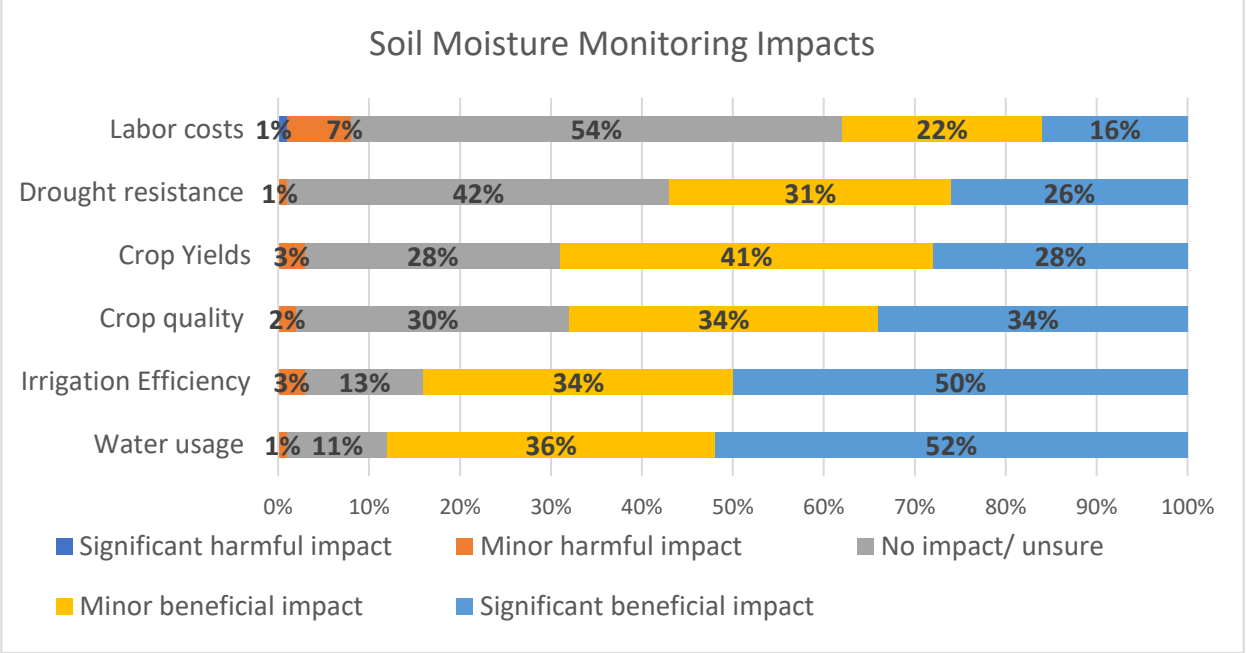

Figure 71. Percentage of responses to the question "The following farming conditions are often impacted by soil moisture monitoring. Please rate what type of impact you have seen from soil moisture monitors on your farm". Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact.

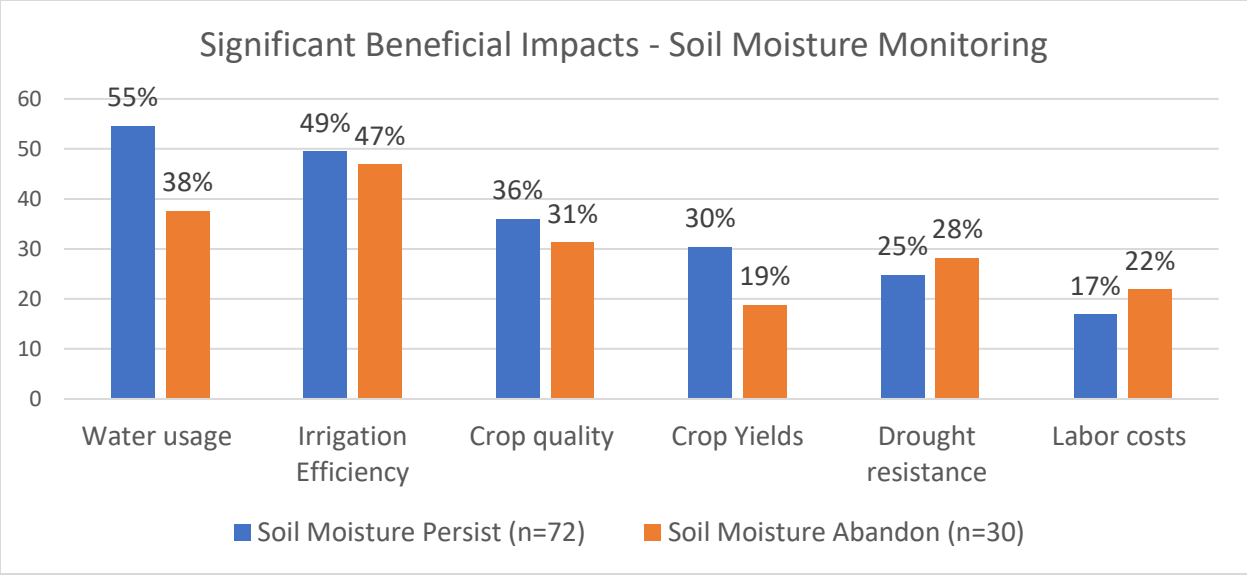

Figure 72. Percentage of responses indicating "Significant beneficial impact" to the question "The following farming conditions are often impacted by soil moisture monitoring. Please rate what type of impact you have seen from soil moisture monitors on your farm". Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact.

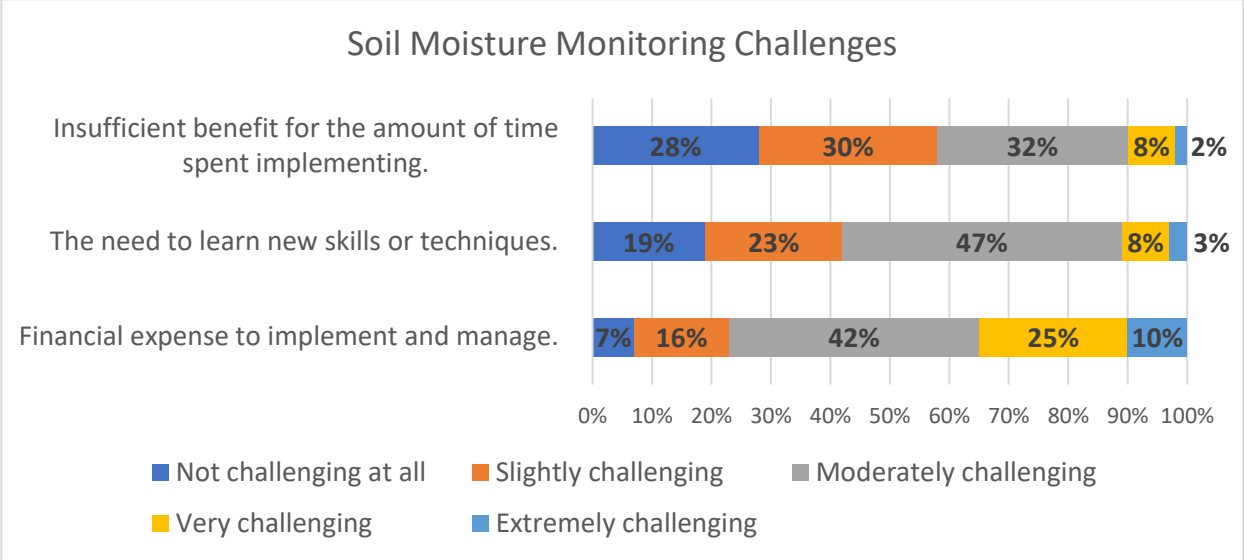

Figure 73. Percentage of responses to the question "The following are some challenges that growers often experience when using soil moisture monitoring. Please rate how much of a challenge these issues were for you." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging (n=99).

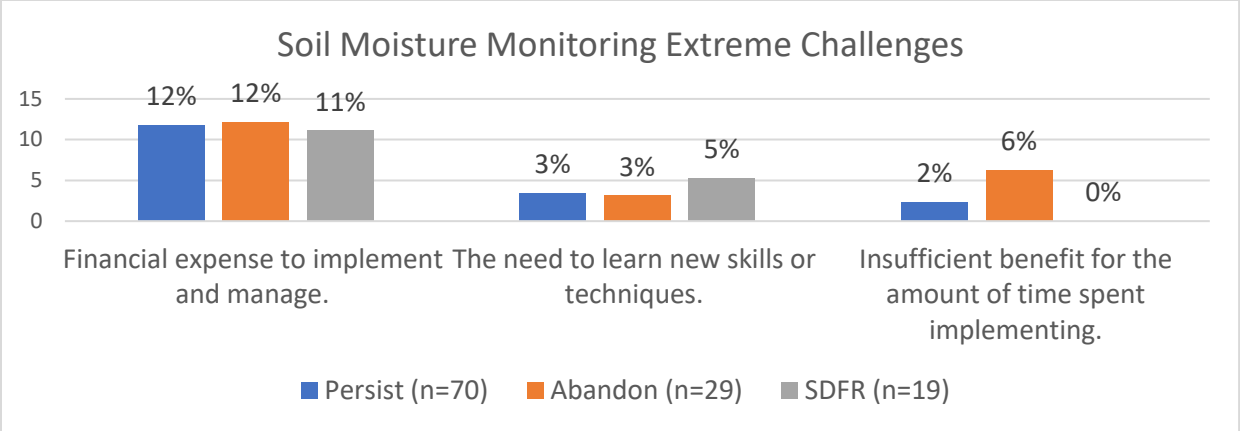

Figure 74. Percentage of responses indicating "Extremely challenging" to the question "The following are some challenges that growers often experience when using soil moisture monitoring. Please rate how much of a challenge these issues were for you." Five-point scale with options of: Not challenging at all, Slightly challenging, Very challenging, Extremely challenging.

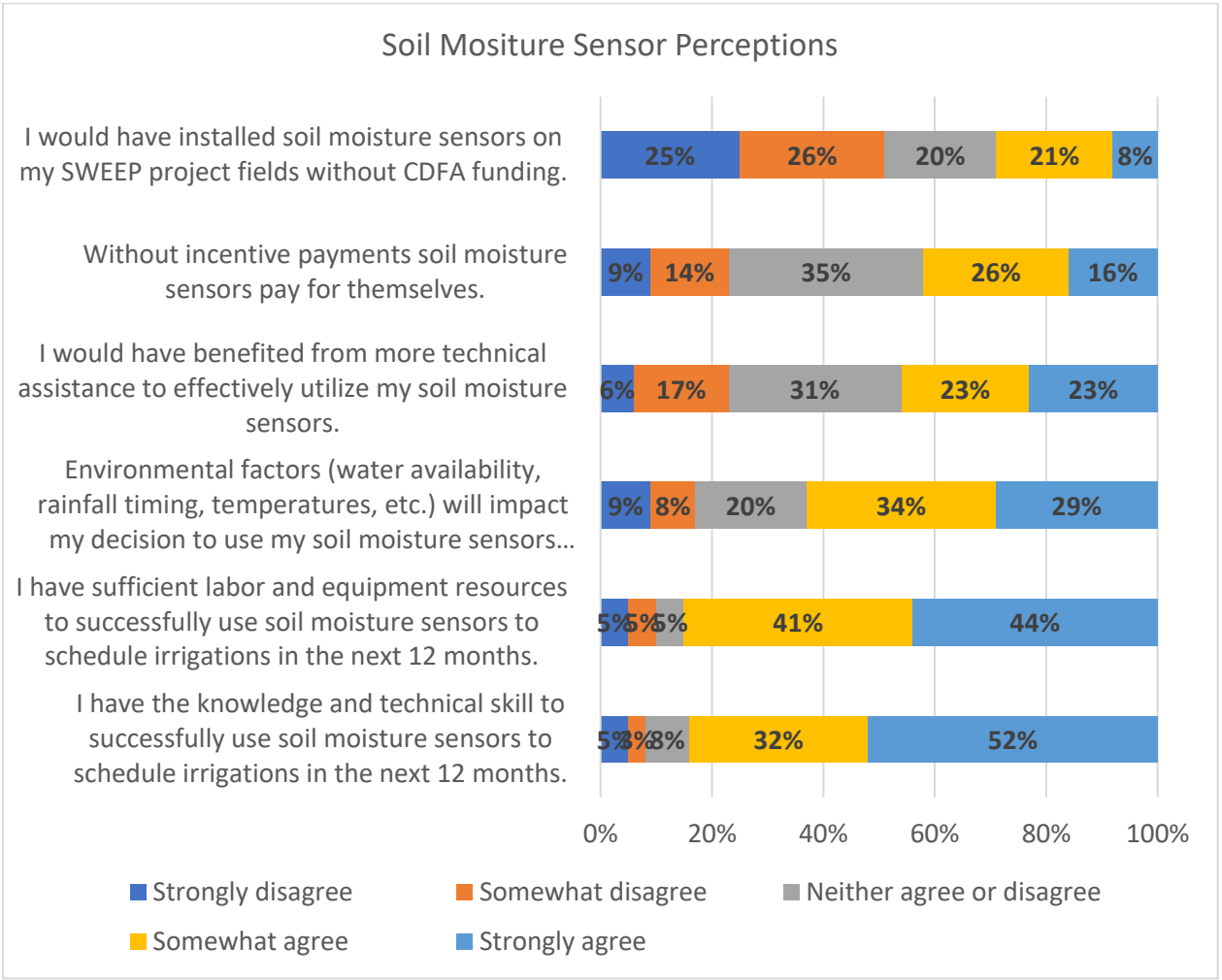

Figure 75. Percentage of responses to the question "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree (n=45).

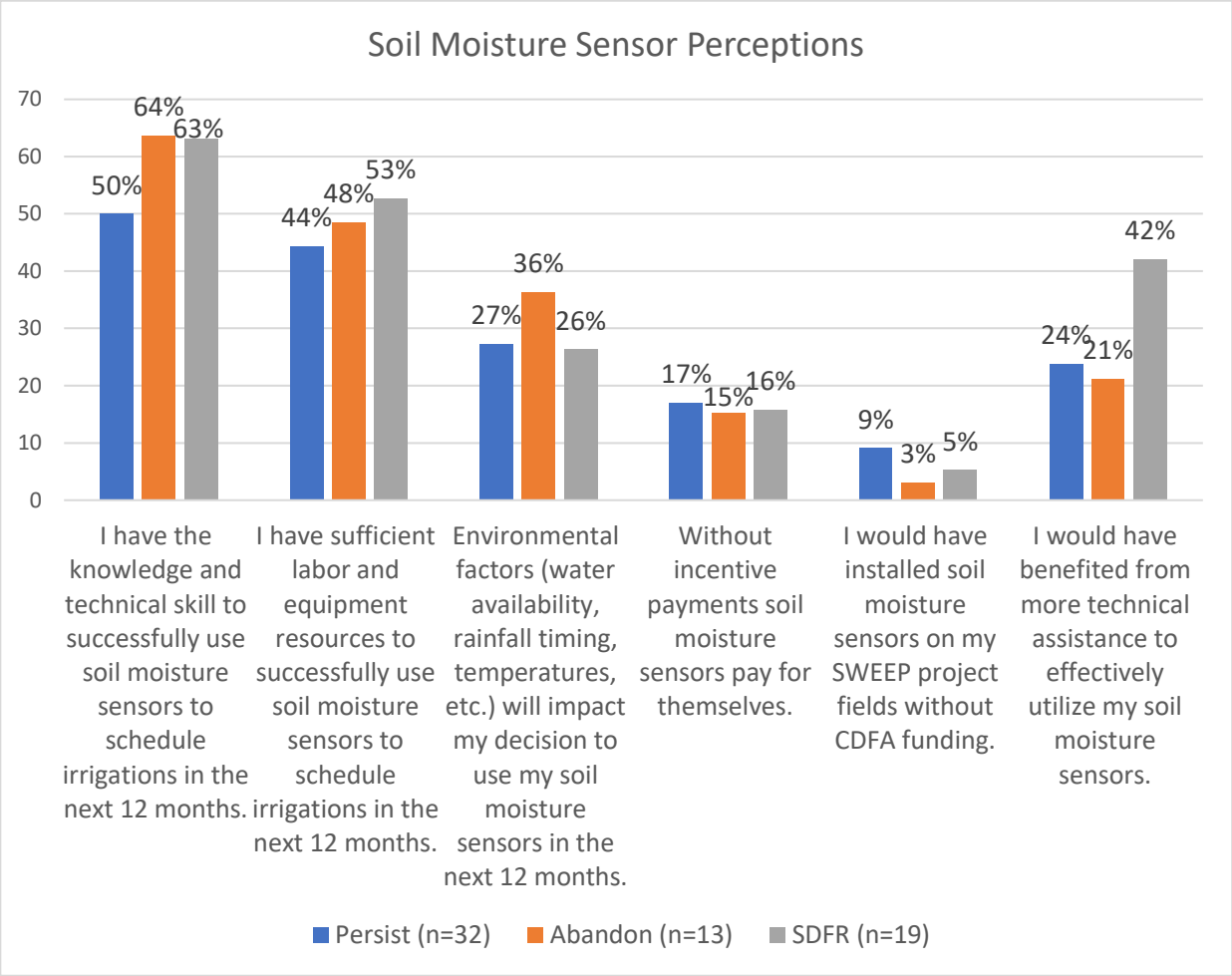

Figure 76. Percentage of responses "Strongly agreeing" when asked "Please indicate your level of agreement or disagreement with the following statements." Five-point scale with options of: Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree.

7. AMMP/DDRDP

Section 7 Key Findings

- **Risk perceptions:** Inflation, water supply, regulations and low milk prices are the most important risks facing AMMP and DDRDP grantees (Figure 77 and Figure 78).
- **Motivations for AMMP and DDRDP participation:** AMMP participants aimed to enhance manure handling/storage infrastructure (Figure 79), while DDRDP participants sought to diversify income through biogas sales (Figure 80). Both programs shared motivations to capture/reduce methane emissions to mitigate climate change and address regulatory concerns related to cattle farming.
- **Persistence and abandonment of practices:** The majority of AMMP and DDRDP practices were maintained, aligning with the high maintenance rates observed in large, structural Best Management Practices (BMP) in existing literature (Table 8). Compost-bedded pack barns were the most likely practice to be abandoned, with some grantees opting to add stalls to the pack barns (Figure 81).

- **Benefits realized:** AMMP grantees experienced primary benefits related to reducing solids in manure ponds, reduced lagoon cleaning costs, and improved cow health (Figure 82). DDRDP participants reported fewer benefits compared to AMMP, primarily concerning odor reduction, lagoon cleaning costs, reduced solids in manure ponds, and water efficiency (Figure 83).
- **Challenges faced:** DDRDP grantees faced challenges related to lagoon cleaning costs, solids in manure ponds, and manure handling costs. 23% of DDRDP respondents agreed that the benefits of their project digester don't outweigh the costs.
- **AMMP practices more profitable:** AMMP practices led to a 2% or more increase in farm profitability for 35% of grantees, compared to only 10% for DRDDP (Figure 84). 25% of DDRDP grantees experienced a 5% or more decrease in profitability as a result of their digester installation.

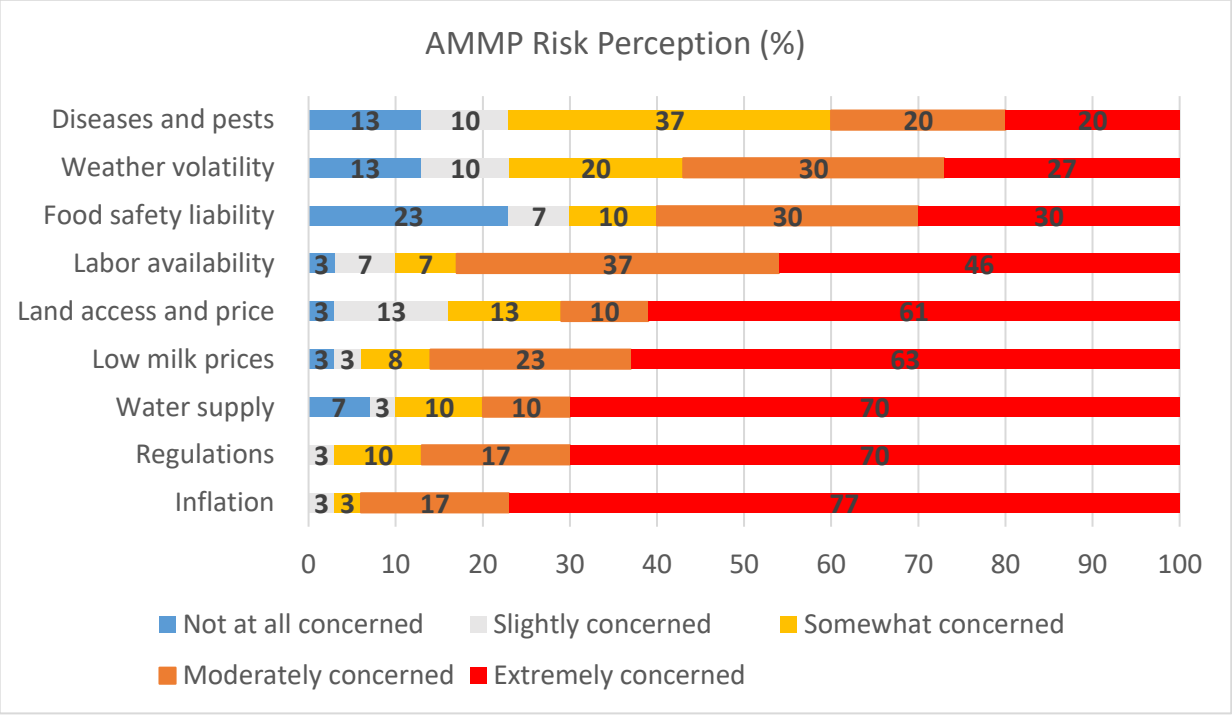

Figure 77. Percentage responses to question "Adoption of conservation practices is often motivated by a desire to manage risk. How concerned are you about the impact of the following risks on the viability of your farming operation" (n=30)

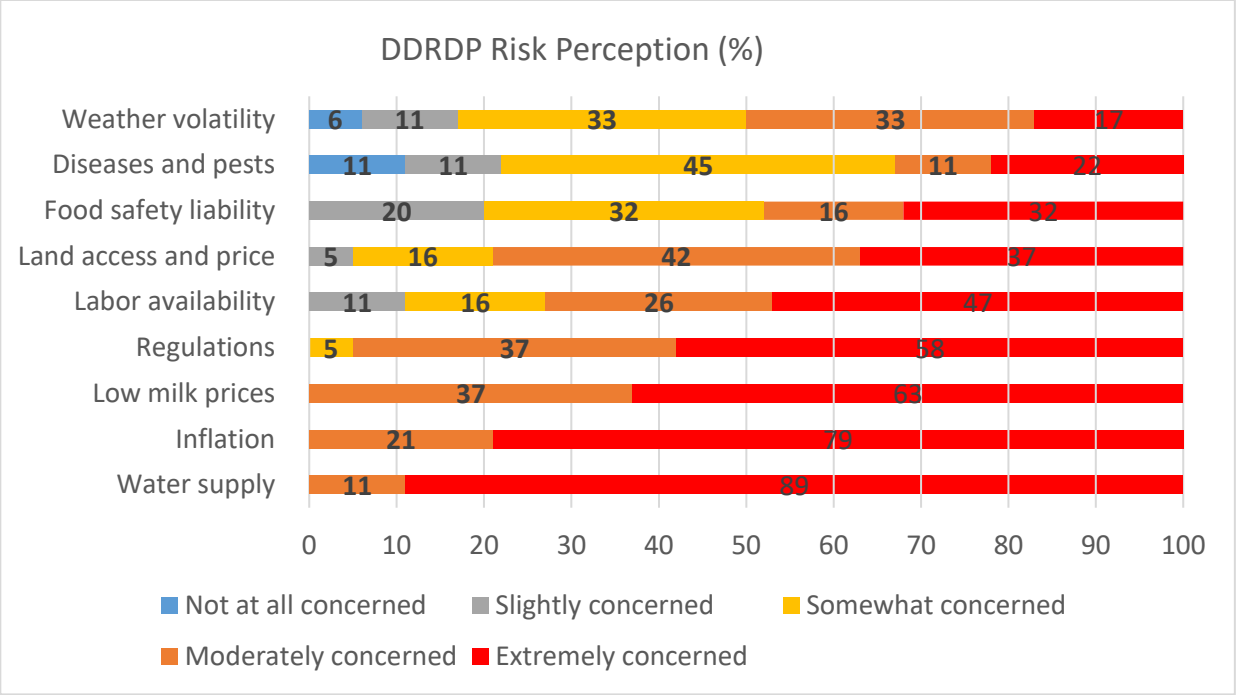

Figure 78. Percentage responses to question "Adoption of conservation practices is often motivated by a desire to manage risk. How concerned are you about the impact of the following risks on the viability of your farming operation" (n=19)

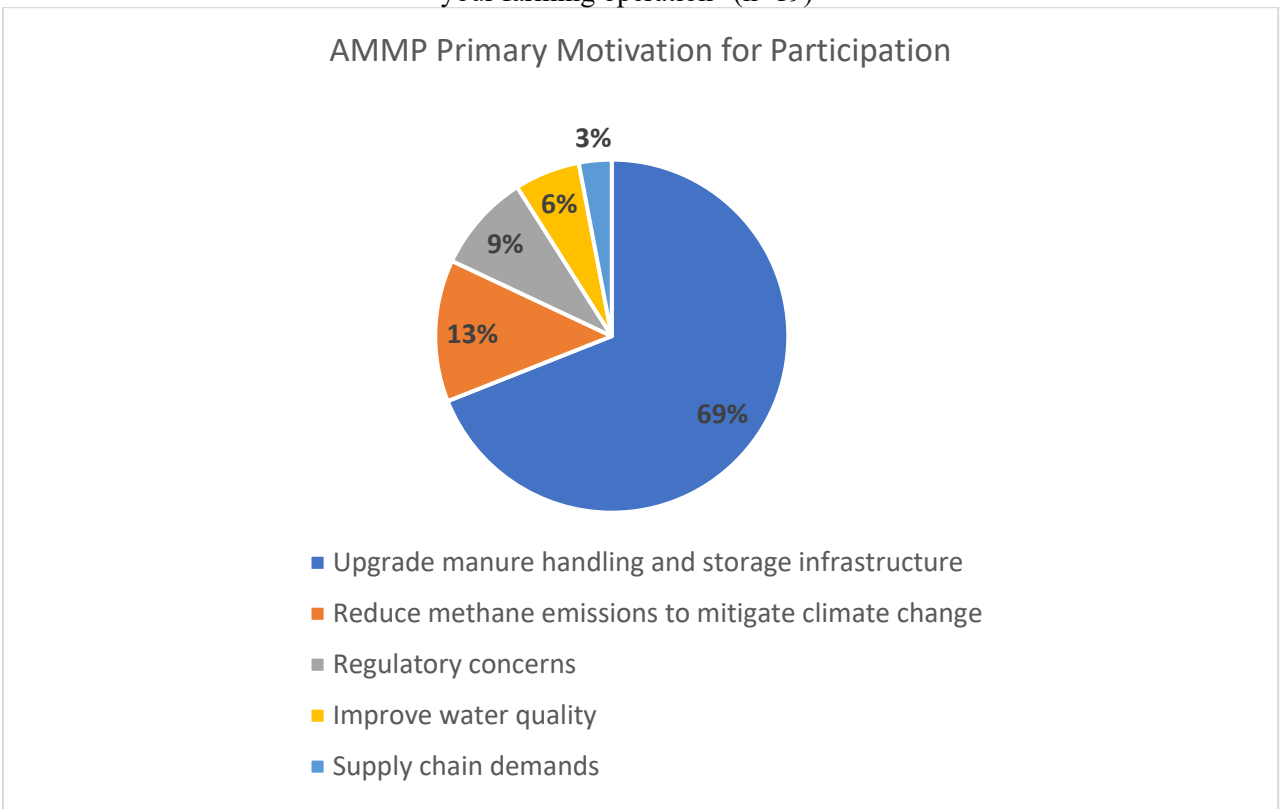

Figure 79. Percentage responses to the question "Please select your single most important motivation for participating in AMMP." (n=32)

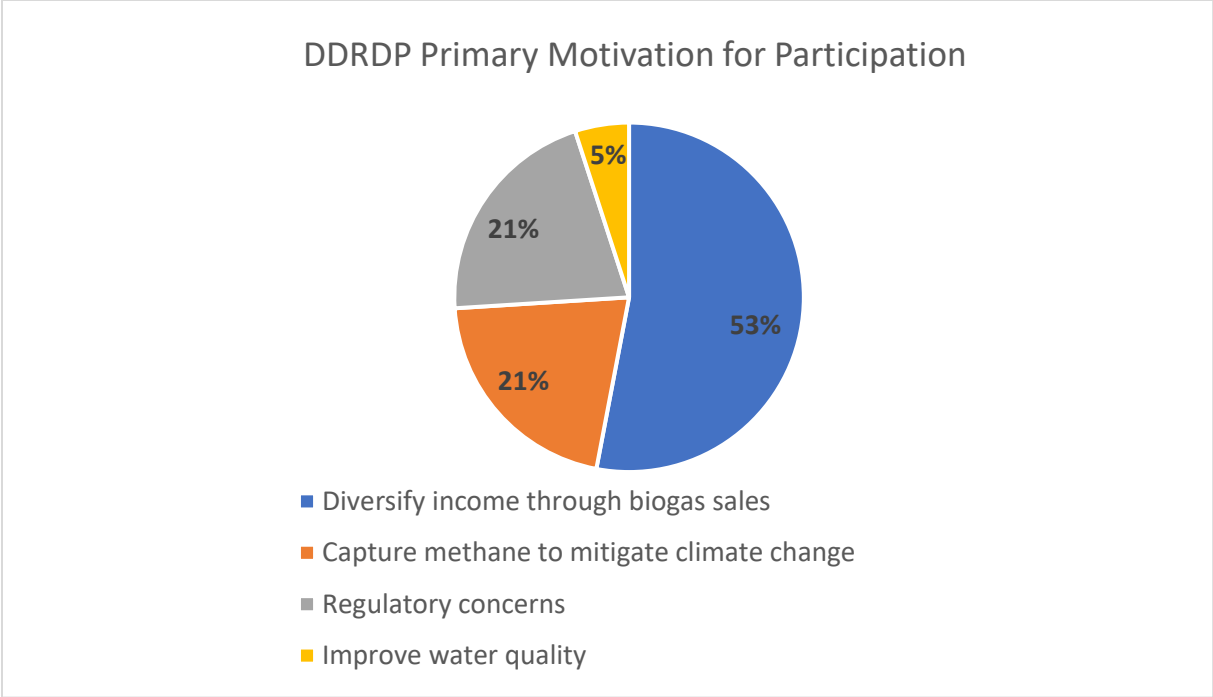

Figure 80. Percentage responses to the question "Please select your single most important motivation for participating in DDRDP." (n=19)

Table 8. Persistence and abandonment rates (%) of AMMP and DDRDP funded practices.

AMMP/ DDRDP Practice	Maintain (n)	Abandon (n)
Solid separation system (n=25)	96% (24)	4% (1)
Flush to scrape system (n=6)	100% (6)	0% (0)
Compost bedded pack barn (n=14)	86% (12)	14% (2)
Dairy digester (n=22)	100% (22)	0% (0)

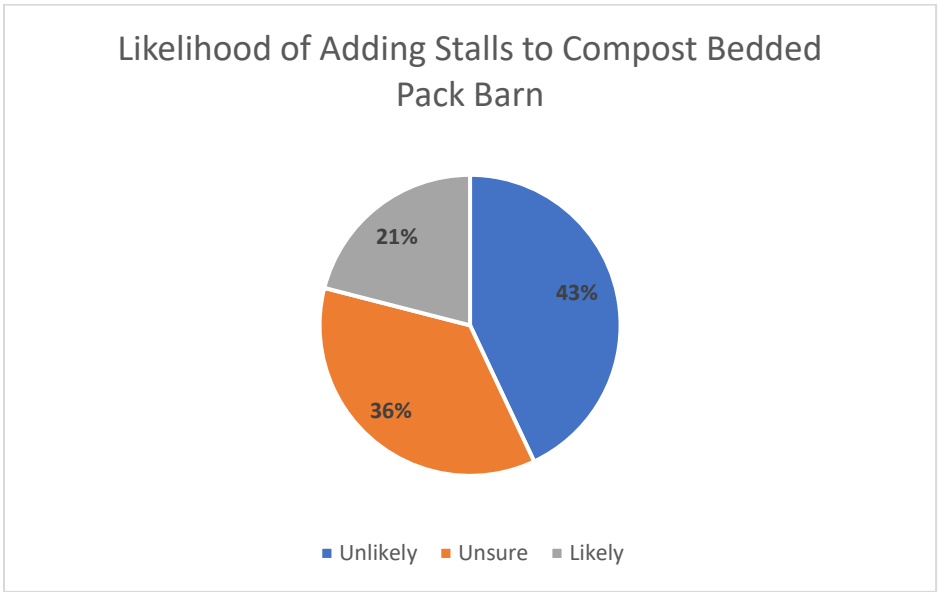

Figure 81. Responses to "What is the likelihood that you will eventually add stalls to your compost bedded pack barn?" (n=14)

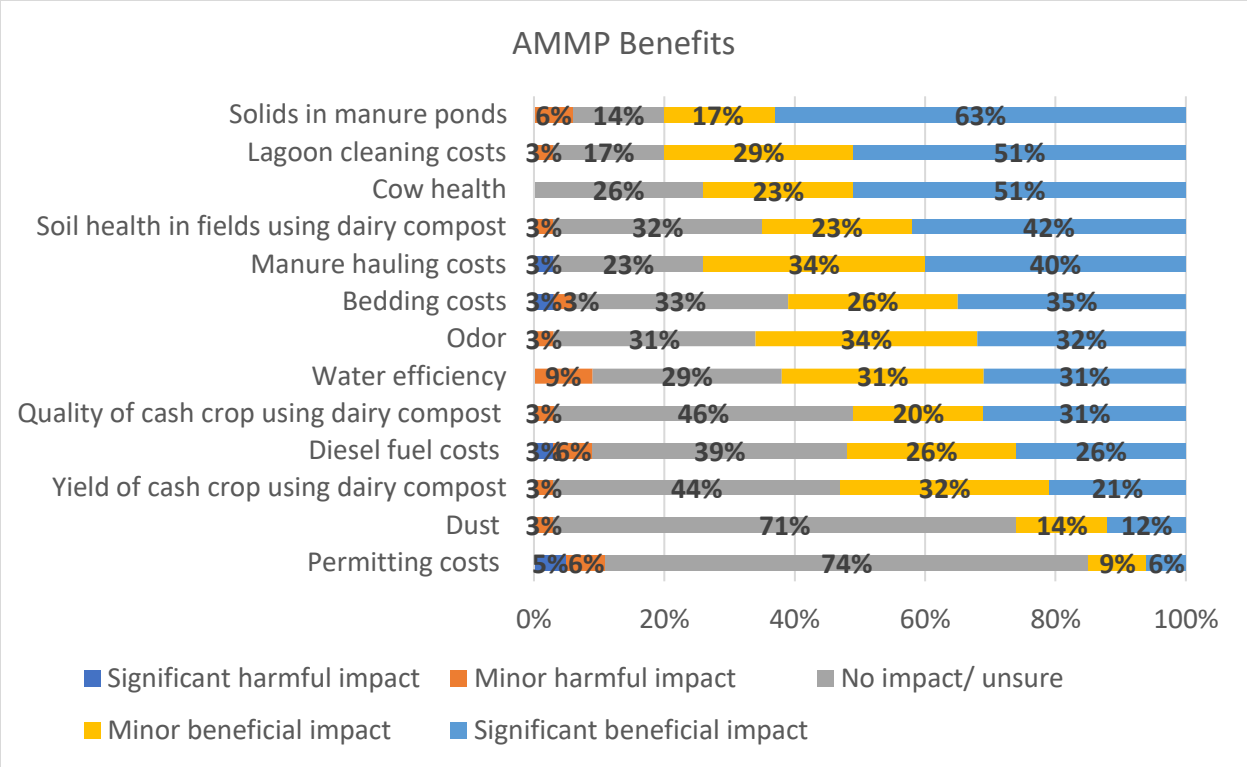

Figure 82. Percentage of responses to the question "The following farming conditions are often impacted by alternative manure management practices. Please rate what type of impact you have seen from your AMMP project". Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact (n=34).

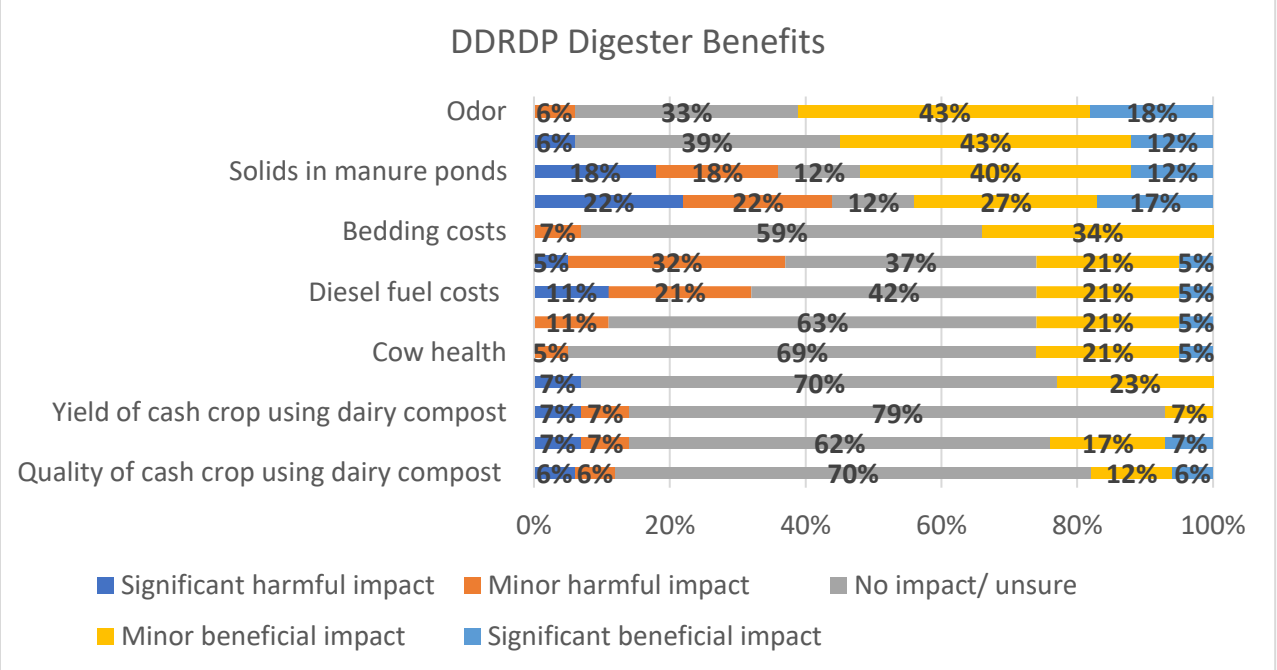

Figure 83. Percentage of responses to the question "The following farm conditions are often impacted by new manure management practices associated with dairy digester installation. Please rate what type of an impact you have seen from your DDRDP project. "Five-point scale with options of: Significant harmful impact, Minor harmful impact, No impact, Minor beneficial impact, Significant beneficial impact (n=19).

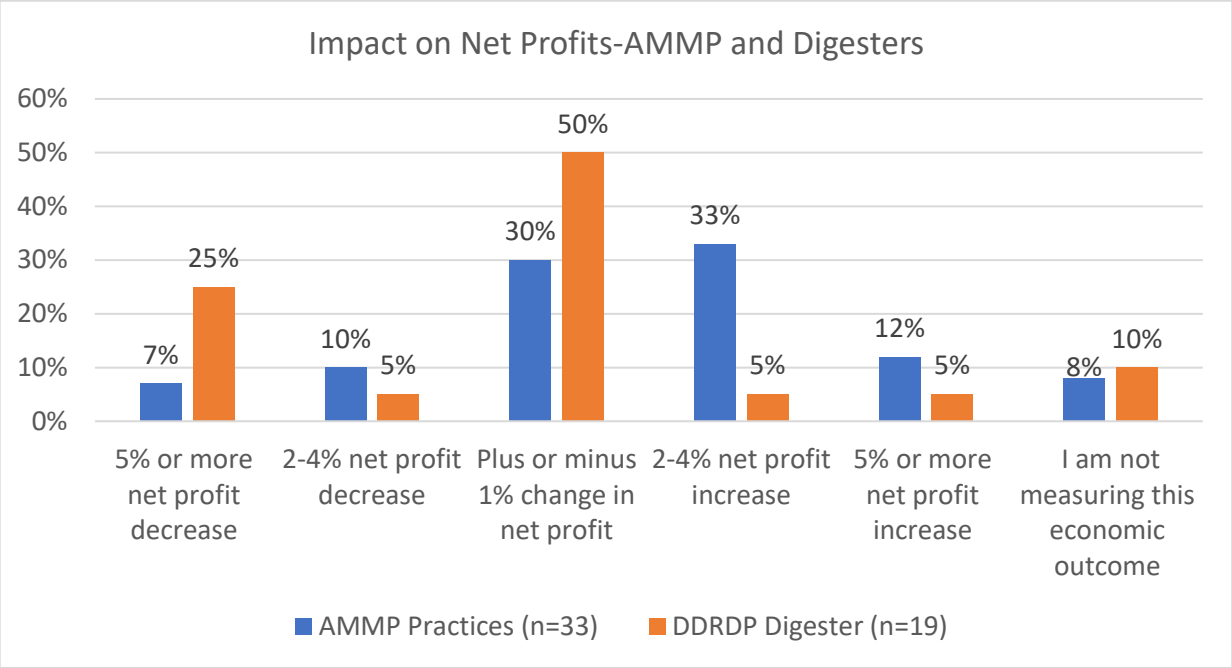

Figure 84. Percentage of responses to the question "What has been the overall impact of AMMP practices/ Dairy digester on the profitability of your operation?"

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Appendix

Appendix A. Interview Guide

This research evaluates the CDFA's climate-smart incentive programs. The knowledge we gain from this interview will help shape and improve our evaluation process. Your participation in this interview is completely voluntary. If you choose to participate in this interview, your responses will remain confidential, and your name will never be used in any report or publication. You may skip any questions you do not want to answer, and you can stop the interview at any time. Are you willing to participate in the interview? Do you mind if I record this interview for transcription purposes?

1. What is your current position? How long have you worked in your current position? How long have you worked at this agency?
2. What is your history of involvement/ interest in the CDFA climate-smart incentive programs? Which program(s) in particular have you been most involved with?
3. Ask questions (a-h) for programs (i-v) in which the interviewee has experience:
    a. Can you please explain the goals of the program, as you understand them?
    b. How is the program structured to interact with growers and other stakeholders? What kinds of activities are involved?
    c. Do you believe the program is achieving its goals? Why/why not?
    d. What challenges has the program faced?
    e. What kinds of program evaluations have been conducted?
    f. How has this program changed since its inception in response to evaluation/ issues/ challenges/ opportunities?
    g. What, if anything, should change about these programs in the future?
    h. Any relevant records, reports, or datasets to share?
        i. State Water Efficiency and Enhancement Program
        ii. Healthy Soils Program
        iii. Manure Management Program
        iv. Dairy Digester Research and Development
        v. Technical Assistance Program.
4. Are some programs having more success/ challenges than others? Why/ why not?
5. What are your perceptions of the effectiveness/ challenges of CDFA program administration:
    a. application process
    b. grant administration

    c. project implementation and monitoring
    d. reporting
6. What specific challenges have arisen during program administration?
7. How are award decisions made? E.g. first come first served, minimum qualifications, ranking? How, if at all, could the decision process be improved?
8. What are the main reasons why applicants are rejected?
9. What specific challenges related to participating in CDFA climate-smart incentive programs have been faced by grower participants?
10. What barriers have been encountered in implementing program practices?
11. Could you tell me about how the process works for underrepresented growers? Do you think they have advantages or disadvantages through this process? Why/why not?
12. What do you perceive as the key grower benefits of program participation?
13. We are interested in documenting potential co-benefits of these programs like broader economic, environmental, and social impacts of participation in program activities. *E.g. increased market access, change in grower or public attitudes towards climate change and GHG monitoring, non-carbon/ non-climate related ecosystem services.*
    a. What, if any, examples of co-benefits come to mind that have been seen in specific programs?
    b. What about the impacts on non-agricultural audiences of this program? E.g. Changed understating of agriculture's role in conservation? Improved relationship between ag and non-ag constituencies?
    c. Were any of the co-benefits you mentioned intended during program design? How did they emerge?
14. We are also interested in your organization's efforts towards promoting landscape-level biodiversity conservation. E.g. *connectivity for migrating wildlife.*
    a. Where does biodiversity conservation rank as an outcome in the work you do, compared with carbon sequestration/water conservation/soil health?
    b. Is this an intended or unintended outcome of the climate-smart incentive programs?
15. What are the key risks for the growers you work with? Do you think climate-smart practices reduce or increase vulnerabilities/ resilience to these risks?
16. How likely do you think it is that practices will be maintained after the funded project lifespan?
17. How might the structure and activities of the programs be improved to support the long-term implementation of practices?
18. Do you think these programs have led to the expansion of climate-smart agriculture practices outside of those funded by these programs? What supports/ limits the potential to do this?
19. Are there any other challenges that have impacted the success of the programs? *E.g. organizational structure, politics, and financial support.*
20. What aspect (s) of program design or administration could most benefit from changes?
21. What is most important to consider in evaluating the effectiveness of these programs? Are any metrics/ outputs/ indicators that your organization is tracking that are especially important to include?
22. How do you think CDFA climate-smart incentives programs will move forward in the future?
23. What actions would you like to see the state of California take related to climate-smart agriculture?
24. Can you share reports/ related documents/ datasets?
25. Who else should we talk to at this phase of research?
26. What is your favorite thing, and the most challenging thing about your job?

Appendix B. Interview Coding Framework

1. Type of interviewee - code the whole interview
    a. CDFA
    b. TA providers
    c. Grantee

   d. NGO
   e. EFA-SAP (science advisory panel)
   f. State/federal agency (outside of CDFA)
   g. Application reviewer
   h. Other
2. Primary program – primary program(s) being discussed by the interviewee; code the whole interview with this code
   a. AMMP
   b. DDRDP
   c. HSP
   d. SWEEP
   e. TAP
   f. All/general
3. Secondary program – other programs mentioned briefly by interviewee; only code at the sentence/paragraph level where other programs are being discussed
   a. AMMP
   b. DDRDP
   c. HSP
   d. SWEEP
   e. TAP
   f. All/general
4. Backgrounds/agendas – what do individuals/organizations focus their work around and what topics might they advocate for; code at sentence/paragraph level when agendas are being discussed
   a. Conventional agriculture
   b. Sustainable agriculture (including organic agriculture)
   c. Environmental justice
   d. Other

Codes relating more to program eval requirements – code at sentence/paragraph level

5. Program goals – what are the goals of each program?
   a. Environmental/ecological (e.g., reduce greenhouse gas emissions)
   b. Agronomic/economics (e.g., increase crop yield, get money to growers/dairies)
   c. Social/political (e.g., change grower attitudes towards sustainable agriculture)
   d. Other
6. Challenges – challenges and/or limitations related to programs
   a. Program practices – challenges related to climate-smart agricultural practices (e.g., cover crops, hedgerows, digesters, etc.) implemented under programs
   b. Application process – challenges related to applying to programs
      i. Application materials
      ii. Not enough time
      iii. Other
   c. Grant administration
      i. Invoicing
      ii. Inflexibility
      iii. Monitoring and reporting
      iv. Other
   d. Program outcomes– challenges related to assessing program outcomes (e.g., goals aren't being achieved, CDFA won't share outcome data with other stakeholders because it's bad data)
   e. Maintenance – challenges related to maintenance of program climate-smart agricultural practices (e.g., cover crops, hedgerows, digesters, etc.)

   f. SDFR/ Environmental justice – challenges related to SDFR access to and participation in programs and environmental justice issues related to programs
   g. Biodiversity – challenges related to biodiversity management under programs
   h. Other
7. Opportunities/recommendations – improvements and/or recommendations for the future related to programs
   a. Program practices – improvements related to the climate-smart agricultural practices (e.g., cover crops, hedgerows, digesters, etc.) growers/dairies can use under the programs
   b. Application process – improvements related to applying to programs
   c. Grant administration – improvements related to the management of individual farmer/dairy projects
   d. Program outcomes (e.g., partner with other stakeholders to obtain data on outcomes!) – improvements related to assessing outcomes of programs
   e. Technical assistance – improvements specifically related to the technical assistance that growers/dairies receive
   f. Maintenance – improvements related to post-grant maintenance of program practices on grower/dairy operations
   g. SDFR – improvements related to SDFR access to and participation in programs
   h. Biodiversity – improvements related to biodiversity management under programs
   i. Other
8. Motivations for participation – what factors are motivating participation among growers/dairies/TA providers
   a. Environmental/ecological (e.g., greenhouse gas emissions reductions)
   b. Agronomic/economic (e.g., increased yields from growers)
   c. Social/political (e.g., changing grower attitudes towards climate-smart agriculture)
   d. Other
9. Co-benefits – what are the other benefits from the programs besides greenhouse gas emissions reductions?
   a. Environmental/ecological (e.g., enhance water quality, more pollinators)
   b. Agronomic/ economic (e.g., increased yield, decreased on-farm labor)
   c. Social/political (e.g., changing attitudes towards climate-smart agriculture)
   d. Other
10. Biodiversity – how is biodiversity discussed by interviewees?
   a. Conceptualization - what do people think about when they hear "biodiversity"
   b. Management
      i. Integrative – biodiversity is considered in the management of farm/other natural resources
      ii. Siloed – biodiversity is not considered in the management of farm/natural resources, is treated as a separate environmental issue
11. Metrics/indicators/survey question recommendations – what metrics/indicators are interviewees/organizations tracking that we should also track, and what survey questions did they recommend?
   a. Environmental/ecological (e.g., on-farm water efficiency)
   b. Agronomic/economic (e.g., labor savings, time savings)
   c. Social/political (e.g., changing attitudes about climate-smart agriculture)
   d. Other

Codes getting more at program history; collaboration; power

12. Perspective – when an individual or organization is discussed/described in the interview, whose perspective is reflected in the discussion?
   a. Internal – the interviewee is part of the same organization as the individual/organization being discussed

    b. External – the interviewee is not part of the same organization as the individual/organization being discussed
        i. Collaborator – the interviewee collaborates with the individual/organization being discussed
        ii. Non-collaborator – the interviewee does not collaborate with the individual/organization being discussed
13. Human actors (stakeholder groups) – who is involved in (who influences) the creation/adaption of programs and their implementation? Note: these categories may be coded together (e.g., a TA provider could also be a vendor)
    a. CDFA
    b. TA providers (includes universities, extension) – organizations that provide technical assistance to growers/dairies who participate in programs, excluding developers and vendors
    c. Vendors or developers – organizations that are providing/selling equipment/materials (e.g, soil moisture monitors, digesters, compost) to growers/dairies
    d. Non-governmental organizations
    e. State/federal agencies
    f. Policymakers
    g. Other
14. Non-human actors – what legislation, processes, events, etc., are involved in (what non-human things influence) the creation/adaptation of programs and their implementation?
    a. Environmental/ecological events, processes, or phenomena (e.g., drought, fire, flooding, etc.)
        i. Drought
        ii. Fire
        iii. Other
    b. Social/political/economic events, processes, or phenomenon
        i. Legislation
        ii. Cap and trade carbon market
        iii. Markets
        iv. Other
15. Actor involvement in programs – how are the discussed actors involved in the programs? (does not include interviewees)
    a. Legislation – involvement in lobbying, policymaking, and other processes related to legislation creation and adaptation
    b. Administration – involvement in implementation of programs
        i. Application assistance – helping growers/dairies apply to programs
        ii. Application review and decision-making – review of applications and making funding decisions
        iii. Project implementation – helping growers/dairies with the technical aspects of implementing projects
        iv. Tracking program outcomes – monitoring the results of individual and collective projects
        v. Program evaluation – assessing any sort of success, challenge, and recommendation of individual/collective programs
        vi. Other
    c. Other
16. Program history – track different aspects of the programs over time to understand the history and future trajectories of programs
    a. Creation – anytime the creation of programs is mentioned in interviews
    b. Adaptations – changes to programs

c. Achievements/successes (e.g., program goals, legislation goals) – achievements of programs
d. Policy process - anytime policy is mentioned in program history
e. Controversy– contestations over program purpose/function/outcomes (e.g., environmental justice concerns related to air and water quality from DDRDP digesters on dairies)
f. Other

17. Power dynamics in decision-making throughout program history and implementation (code w/human and non-human actors so we can track who is using power and how that power is being used). Only sub-subcodes (e.g., 17ai, 17bii, etc.) should be coded here.
    a. Enablement – is someone or something using their power to constrain or enable human and non-human actors' abilities to influence programs? Should be coded with power faces (17bi, 17bii, 17bii)
        i. Enabling – catalyzing or making it more possible to do something (e.g., the annual allocation of funds through legislation enables CDFA to make annual adaptations to programs)
        ii. Constraining – preventing or limiting the possibility of doing something (e.g., the type of funding allocated through legislation constrains CDFA from being able to fund certain sustainable agricultural practices)
    b. Power faces – in what ways is power being used to constrain/enable something? Should be coded with enablement (17ai and 17aii)
        i. Power to – actors using power to enable/constrain a decision (e.g., environmental justice organizations use their power to enable evaluation of EJ claims from programs)
        ii. Power over – actors using power over others to enable/constrain (e.g., policymakers use legislation as power over state agencies to enable climate change management through programs)
        iii. Power with – actors using power together to enable/constrain (e.g., California Farm Bureau and individuals at CDFA use their power together to influence how programs get adapted over time)

Appendix C. HSP Survey

Cal Poly and the California Department of Food and Agriculture are conducting this survey in order to evaluate the impact and effectiveness of the Healthy Soils Program (HSP). If you received a HSP grant we'd greatly appreciate your input.

The benefits of your voluntary completion of this survey include:
- A $20 eGift card.
- Helping improve the HSP program.
- Voicing the needs, concerns, and achievements of California farmers.

This survey includes questions about your personal experiences and opinions and takes approximately 20 minutes to complete. You may skip any questions you choose not to answer. There are no anticipated risks with your participation in this study, as any information you provide is confidential and will not be linked to your name or company.

If you have questions regarding this study or would like to be informed of the results when the study is completed, please contact Dr. Babin at 805-756-2373, nbabin@calpoly.edu. If you have any concerns about the conduct of the research project or your rights as a research participant, you may contact Dr. Michael Black, Chair of the Cal Poly Institutional Review Board, at (805) 756-2894, mblack@calpoly.edu, or Ms. Trish Brock, Director of Research Compliance, at (805) 756-1450 or

pbrock@calpoly.edu.

If you are 18 years of age and agree to voluntarily participate in this research project as described, please indicate your agreement by clicking "I agree" below. You may stop and quit the survey at any time but your $20 eGift card will only be disbursed if you complete the survey. If you are not 18 years of age or would not like to participate, please click "I disagree".

Were you awarded more than one Healthy Soils Program (HSP) grant between 2018-2020?

How many HSP grants were you awarded between 2018-2020?

When responding to the rest of the survey, please sum together the practices implemented, and your overall experiences with them, across your different HSP awards between 2018-2020.

What year was your Healthy Soils Program (HSP) project funded?
2018, 2019, 2020, Unsure/ Don't remember

What is the status of your project?
Completed, Will complete in 2023, Will complete in 2024

For each HSP practice listed below (Cover crops, Compost, Hedgerows, Mulching, Reduced-till, No-till) please read all four questions and check the box when the answer is yes.

1. *Was this practice included in your HSP project?*
2. *Do you currently use this practice on your farm?*
3. *Do you intend to use this practice in the next 12 months?*
4. *Do you intend to **expand** the area dedicated to this practice in the next 12 months?*

For each group of HSP practices listed below (**In-field practices:** Nutrient management, range planting, pasture and hay planting, prescribed grazing, conservation crop rotation, strip cropping, whole orchard recycling; **Edge of field practices:** Conservation cover, riparian forest buffer, silvopasture, windbreak/shelterbreak establishment, riparian herbaceous cover, tree/shrub establishment, multi-story cropping, herbaceous wind barrier, grassed waterway, field border, filter strip, contour buffer strip), read each question 1-4 and check the box if the answer is yes.

1. *Were any of these practices included in your HSP project?*
2. *Do you currently use any of these practices on your farm?*
3. *Do you intend to use any of these practices in the next 12 months?*
4. *Do you intend to expand the area dedicated to any of these practices in the next 12 months?*

As a result of my HSP project ____ (true or false)

1. *I have gained new knowledge and experience about the management of healthy soils.*
2. *I have implemented other conservation practices not funded by my project.*
3. *I have applied for other grants to fund conservation practices on my farm.*
4. *My farming network has expanded.*
5. *I have received preferential treatment from buyers and/or processors.*
6. *I have received a price premium for my crops.*

Please indicate your level of agreement or disagreement with the following statements. (5 point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *Improving soil health is an urgent problem for agriculture.*
2. *This project has improved public perception of my agricultural operation.*

3. *Programs like the HSP are important for improving the public's perception of agriculture.*
4. *My farm is more resilient following the HSP project.*
5. *I would recommend my HSP practices to a friend.*

The HSP program requires annual soil sampling to monitor soil organic matter (SOM) pools. What did your soil samples reveal about the level of SOM in your HSP-funded project area?
SOM increased over time, SOM decreased over time, SOM did not change over time, SOM fluctuated up and down, Unsure/ Don't remember

Have you talked with other growers about your experiences with the HSP?
No, Yes, Unsure/Don't remember

About how many people have you spoken with about your experience?

Do you think that your project has had a significant impact on the adoption of healthy soils practices by other growers?
No, Yes, Unsure/Don't remember

About how many growers do you estimate have adopted healthy soils practices, at least partially because of your project?

CDFA contracts Technical Assistance Providers (TAPs) to provide free support to HSP grant recipients. These TAPs are often based out of Resource Conservation Districts, UC Cooperative Extension offices, and nonprofit organizations. Did you work with a TAP at any time during your HSP Project?
No, Yes, Unsure/Don't remember

Check all boxes in which TAPs offered support to your HSP project.
Exploration: Explaining the HSP program and application process. Exploring the technical attributes of HSP practices
Proposal: Vision and design of HSP project scope. Writing and submission of the HSP grant application.
Implementation: Selecting plants/seeds and other supplies. Coordinating with vendors and regulators. Installation and troubleshooting of HSP practices after implementation.
Reporting: HSP mandated soil sampling. Reporting and invoicing to CDFA
Other (please specify)

How important was TAP support in carrying out your HSP project?
Not at all important, Slightly important, Moderately important, Very important, Extremely important

In this section, we will assess your experience with the cover crops included in your HSP project.

Was this HSP project your first experience managing cover crops on your farm?
No, Yes

How many years of experience did you have with cover crops prior to your HSP project?

During which three-year time period were cover crops planted as part of your HSP project?
2018-2020, 2019-2021, 2020-2023, 2021-2024, Other period (please specify:)

How many acres of cover crops were included in your HSP project?

About how many ***total*** acres of cover crops were planted on your farm in each of the following years?
2021 acres, 2022 acres, 2023 (planned acres)
Expand In the next five years, will you expand the total acreage of cover crops planted on your farm?
Definitely not, Probably not, Might or might not, Probably yes, Definitely yes

Which of the following statements best reflects your attitude towards cover crops before this HSP project.
Prior to this project I was unsure about the value of cover cropping for my farm.
Prior to this project I was already convinced that cover crops were a valuable practice for my farm.

Which of the following three statements best reflects the impact of the HSP program on your decision to maintain cover cropping after the three-year incentive period has ended?
This project convinced me to maintain cover crops after the incentive payments end., This project convinced me not to maintain cover crops after the incentive payments end., I am still uncertain whether I will maintain cover crops after the incentive payments end.

Which of the following three statements best reflects the impact of the HSP program on your decision to maintain cover cropping after the three year incentive period has ended?
This project reinforced my commitment to maintain cover crops after the incentive payments end., This project convinced me not to maintain cover crops after the incentive payments end., This project has made me uncertain whether I will maintain cover crops after the incentive payments end.

If HSP financial incentives had continued for two additional years would you have been more likely to maintain cover cropping?
No, Yes, Unsure/don't know

In 2018, HSP paid $126/acre for single-species cover crops and $147/acre for multiple-species cover crops. Please use the slider to indicate what you would consider a fair payment rate for cover cropping on your farm.
(Option also given for: Not Applicable- The HSP price was fair enough.)

The following farming conditions are often impacted by cover cropping. Please rate what type of an impact you have seen from cover crops on your farm (5 point Likert: Significant harmful impact, Minor harmful impact, No impact/ unsure, Minor beneficial impact, Significant beneficial impact)
Soil Structure, Water Infiltration, Water Holding Capacity, Erosion, Weeds, Pollinators, Pest and Disease Control, Other (please specify):

Please fill in the blank: My using cover crops in the next 12 months would be_____.
Very harmful for my farm, Somewhat harmful for my farm, Neither beneficial or harmful for my farm, Somewhat beneficial for my farm, Very beneficial for my farm

How has cover cropping impacted your use of herbicides?
I apply less herbicides, I apply about the same amount of herbicides, I apply more herbicides

How have cover crops impacted your use of tillage?
I use less tillage, I use about the same amount of tillage, I use more tillage

Please fill in the blank: My using cover crops in the next 12 months would be_____.
Very unenjoyable for me, Somewhat unenjoyable for me, Neither enjoyable nor unenjoyable for me, Somewhat enjoyable for me, Very enjoyable for me

Please indicate your level of agreement or disagreement with the following statements: (5-point Likert, Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *My decision to use cover crops in the next 12 months is completely up to me.*
2. *Most people whose opinions I value would approve of me using cover crops in the next 12 months.*
3. *Most farmers like me will use cover crops in the next 12 months.*
4. *Most farmers I respect and admire will use cover crops in the next 12 months.*

Which of the following four statements best reflects your experience with cover cropping?
The use of cover crops has enabled me to reduce my crop fertility inputs over time and still meet the needs of my cash crop., The use of cover crops has not impacted my cash crop fertility program., The use of cover crops has required me to use additional crop fertility inputs over time to meet the needs of my cash crop., I have never investigated the fertility benefits of cover crops on my farm.

What has been the overall impact of cover cropping on profitability of your operation?
Moderate decrease in net profit (5% or more decrease), Minor decrease in net profit (2-4% decrease), No significant change in net profit (plus or minus 1% change in net profit),minor increase in net profit (2-4% increase), Moderate increase in net profit (5% or more increase), I am not measuring economic outcomes

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert, Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *I have the knowledge and technical skills to successfully cover crop over the next 12 months.*
2. *I have the labor and equipment resources to successfully cover crops over the next 12 months.*
3. *Environmental factors (water availability, rainfall timing, temperatures, etc.) will impact my decision to use cover crops over the next 12 months.*
4. *Cover crops pay for themselves and are worth doing even in the absence of incentives.*
5. *I would have eventually adopted cover crops on my HSP project fields without CDFA funding.*
6. *I would have benefited from more technical assistance in implementing cover crops.*

The following are some challenges that growers often experience when using cover crops. Please rate how challenging each issue has been for management of the cover crops planted as part of your HSP project. (5-point Likert, Not challenging at all, Slightly challenging, Moderately challenging, Very challenging, Extremely challenging)

1. *Poor germination and establishment of cover crop.*
2. *Cover crop competition with cash crop for water.*
3. *Cover crop termination delays planting of cash crop.*
4. *Other (please specify):*

How much control do you have over your use of cover crops in the next 12 months.
None at all, A little, A moderate amount, A lot, A great deal

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert, Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *It would be difficult to manage my farm without cover crops.*
2. *Cover crops are now part of my farm management routine.*
3. *Cover crops no longer require much thought to implement and manage.*
4. *I like the way that cover crops make my fields look.*
5. *Leaving soil bare and without cover crops hinders the optimal operation of my farm.*
6. *Planting cover crops protects my farm's soil.*
7. *In my experience with cover crops, the benefits outweigh the costs.*

Please fill in the blank: For me to use cover crops in the next 12 months will be_____.
Extremely difficult, Somewhat difficult, Neither easy nor difficult, Somewhat easy, Extremely easy

In this section, we will evaluate your experiences with compost in your HSP project.

Was this HSP project your first experience applying compost on your farm?
No, Yes

How many years of experience did you have with compost prior to your HSP project?

Over what three year time period did you apply compost as part of your HSP project?
2018-2020, 2019-2021, 2020-2023, 2021-2024, Other period (please specify):

How many acres did you apply compost to as part of your HSP project?

About how many ***total*** acres of compost were applied on your farm in each of the following years?

1. *2020*
2. *2021*
3. *2022*
4. *2023 (planned)*

In the next five years, will you expand the total acreage where compost is applied on your farm?
Definitely not, Probably not, Might or might not, Probably yes, Definitely yes

Which of the following statements best reflects your attitude towards compost application before this HSP project.
Prior to this project I was uncertain about the value of compost applications for my farm., Prior to this project I was already convinced that compost application was a valuable practice for my farm.

Which of the following three statements best reflects the impact of the HSP program on your decision whether to maintain compost applications after the three-year incentive period has ended?
This project convinced me to maintain compost applications after the incentive payments end., This project convinced me not to maintain compost applications after the incentive payments end., I am still uncertain whether I will maintain compost applications after the incentive payments end.

Which of the following three statements best reflects the impact of the HSP program on your decision whether to maintain compost applications after the three-year incentive period has ended?
This project reinforced my commitment to maintain compost applications after the incentive payments end., This project convinced me not to maintain compost applications after the incentive payments end., This project has made me uncertain whether I will maintain compost applications after the incentive payments end.

If HSP financial incentives had continued for two additional years would you have been more likely to maintain compost applications?
No, Yes, Unsure/Don't Know

The HSP payment rate for compost application was $50 per ton.

Please use the slider to indicate what you believe to be a fair HSP payment rate for the initial three year trial of compost application on your farm.

HSP compost application rates varied between 2-8 tons per acre depending upon crop type and compost composition.

What was the compost application rate utilized in your HSP project fields?
(Option given: Unsure)

What do you believe would have been an optimal compost application rate for your HSP project fields?
(Option given: Unsure/ Don't remember)

How did you apply your compost?
Spread it using equipment and labor from my farming operation, Hired someone outside my farming operation, Other (please specify):

Do you currently produce compost on your farming operation?
No, Yes

This project led me to consider producing more of my own compost.
No, Yes

This project has led me to consider producing my own compost in the future.
No, Yes

How much do food safety concerns impact your ability to use compost?
None at all, A little, A moderate amount, A lot, A great deal

Which of the following four statements best reflects your experience with compost?
The use of compost has enabled me to reduce my crop fertility inputs over time and still meet the needs of my cash crop., The use of compost has not impacted my cash crop fertility program., The use of compost has required me to use additional crop fertility inputs over time to meet the needs of my cash crop., I have never investigated the fertility benefits of compost on my farm.

Please fill in the blank: My using compost in the next 12 months would be_____.
Very harmful for my farm, Somewhat harmful for my farm, Neither beneficial or harmful for my farm, Somewhat beneficial for my farm, Very beneficial for my farm

The following farming conditions are often impacted by composting. Please rate what type of an impact you have seen from compost application on your farm. (5-point Likert, Significant harmful impact, Minor harmful impact, No impact/unsure, Minor beneficial impact, Significant beneficial impact)

1. *Soil Structure*
2. *Water Infiltration*
3. *Water Holding Capacity*
4. *Erosion*
5. *Weeds*
6. *Pollinators*
7. *Pest and Disease Control*
8. *Other (please specify):*

About how long did it take for you to begin seeing soil benefits on your farm from using compost?
(Option given: I have seen no benefits)

How has compost application impacted your use of tillage?

Less tillage, About the same amount of tillage, More tillage

Please fill in the blank: My using compost in the next 12 months would be_____.
Very unenjoyable for me, Somewhat unenjoyable for me, Neither enjoyable nor unenjoyable for me, Somewhat enjoyable for me, Very enjoyable for me

Please indicate your level of agreement or disagreement with the following statements: (5-point Likert, Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *Most people whose opinions I value would approve of me using compost in the next 12 months.*
2. *Most farmers like me will use compost in the next 12 months.*
3. *Most farmers I respect and admire will use compost in the next 12 months.*

What has been the overall impact of compost on profitability of your operation?
Moderate decrease in net profit (5% or more decrease), Minor decrease in net profit (2-4% decrease), No significant change in net profit (plus or minus 1% change in net profit), Minor increase in net profit (2-4% increase), Moderate increase in net profit (5% or more increase), I am not measuring economic outcomes

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree).

1. *I have the knowledge and technical skill to successfully manage compost application over the next 12 months.*
2. *I have access to sufficient labor and equipment to successfully manage compost applications over the next 12 months.*
3. *Environmental factors (water availability, rainfall timing, temperatures, etc.) will impact my decision to apply compost over the next 12 months.*
4. *Compost application pays for itself and is worth doing even in the absence of incentives.*
5. *I would have applied compost on my HSP project fields without CDFA funding.*
6. *I would have benefited from more technical assistance surrounding compost application.*

The following are some challenges that growers often experience when using compost. Please rate how challenging each issue has been for compost application on your farm. (5-point Likert, Not challenging at all, Slightly challenging, Moderately challenging, Very challenging, Extremely challenging)

1. *Difficulties acquiring quality compost*
2. *Difficulties finding certified compost*
3. *Difficulties transporting and/ or spreading compost*
4. *Other (please specify):*

How much control do you have over your use of compost in the next 12 months.
None at all, A little, A moderate amount, A lot, A great deal

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *It would be difficult to manage my farm without compost.*
2. *Compost application is now part of my farm management routine.*
3. *Compost application no longer requires much thought to implement and manage.*
4. *I like the way that compost make my fields/soils look.*
5. *Using chemical fertilizers hinders the optimal operation of my farm.*
6. *Applying compost protects my farm's soil resources.*
7. *In my experience with compost, the benefits outweigh the costs.*

Please indicate your level of agreement or disagreement with the following statement. The HSP funded compost was a temporary substitute for the chemical fertilizer inputs that I have reverted to following the completion of the three year trial.
Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree

Please fill in the blank: For me to use compost in the next 12 months will be_____.
Extremely difficult, Somewhat difficult, Neither easy nor difficult, Somewhat easy, Extremely easy

Earlier in the survey you indicated that your HSP project featured Edge of field (EoF) practices. EoF practices refer to plantings or structures which support the delivery of key ecosystem services like soil stabilization, water filtration, carbon storage and pollinator and wildlife habitat.

The HSP recognized EoF practices include: hedgerow planting, conservation cover, riparian forest buffer, range planting, silvopasture, windbreak/shelterbreak establishment, riparian herbaceous cover, tree/shrub establishment, multi-story cropping, herbaceous wind barrier, grassed waterway, field border, filter strip, and contour buffer strip.

In this section we will be asking you questions about your experiences with EoF practices.

Was this HSP project your first experience with EoF practices on your farm?
No, Yes

How many years of experience did you have with EoF practices prior to your HSP project?

How many acres of EoF practices were included in your HSP project?

In the next five years, will you expand the total acreage dedicated to EoF practices on your farm?
Definitely not, Probably not, Might or might not, Probably yes, Definitely yes
Please fill in the blank: Maintenance of my EoF practice in the next 12 months would be_____.
Very harmful for my farm, Somewhat harmful for my farm, Neither beneficial or harmful for my farm, Somewhat beneficial for my farm, Very beneficial for my farm

The following farming conditions are often impacted by EoF practices. Please rate what type of an impact you have seen from EoF practices on your farm. (5-point Likert, Significant harmful impact, Minor harmful impact, No impact/unsure, Minor beneficial impact, Significant beneficial impact)

1. *Soil Structure*
2. *Erosion*
3. *Water Infiltration*
4. *Water Quality*
5. *Wind Damage*
6. *Weeds*
7. *Pollinators*
8. *Pest and Disease Control*
9. *Wildlife (quail, pheasants, etc.)*
10. *Other (please specify):*

About how long did it take for you to begin seeing benefits on your farm from EoF practices? *(Option given: I have seen no benefits)*

Please fill in the blank: Maintenance of my EoF practice in the next 12 months would be_____.
Very unenjoyable for me, Somewhat unenjoyable for me, Neither enjoyable nor unenjoyable for me, Somewhat enjoyable for me, Very enjoyable for me

Please indicate your level of agreement or disagreement with the following statements: (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *My decision to maintain my EoF practice in the next 12 months is completely up to me.*
2. *Most people whose opinions I value would approve of me maintaining my EoF practice in the next 12 months.*
3. *Most farmers like me will use EoF practices in the next 12 months.*
4. *Most farmers I respect and admire will use EoF practices in the next 12 months.*
5. *The HSP payment for EoF practices was sufficient.*

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *I have the knowledge and technical skill to manage my EoF practices over the next 12 months.*
2. *I have access to sufficient labor and equipment to manage my EoF practices over the next 12 months.*
3. *Environmental factors (water availability, rainfall timing, temperatures, pest concerns etc.) will impact my decision to maintain my EoF practices over the next 12 months.*
4. *EoF practices pay for themselves and are worth doing even in the absence of incentives.*
5. *I would have implemented the EoF practices specified in my HSP project without CDFA funding.*
6. *I would have benefited from more technical assistance surrounding EoF practices.*

The following are some challenges that growers often experience with EoF practices. Please rate how much of a challenge these issues have been for you in managing EoF practices. (5-point Likert, Not challenging at all, Slightly challenging, Moderately challenging, Very challenging, Extremely challenging)

1. *Cost of maintenance.*
2. *Loss of cropland.*
3. *Issues with plant establishment and survival.*
4. *Increased fire risk.*
5. *Food safety concerns.*
6. *Not owning the land that I farm.*
7. *Other (please specify):*

How much control do you have over your maintenance of your EoF practice in the next 12 months.
None at all, A little, A moderate amount, A lot, A great deal

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *It would be difficult to manage my farm without my EoF practice.*
2. *EoF practices are now part of my farm management routine.*
3. *EoF practices no longer require much thought to implement and manage.*
4. *I like the way that EoF practices make my farm*
5. *Maintaining my EoF practices protects my farm's soil.*
6. *Maintaining my EoF practices supports local biodiversity.*
7. *In my experience with EoF practices, the benefits outweigh the costs.*

Please fill in the blank: For me to maintain my EoF practice in the next 12 months will be_____.
Extremely difficult, Somewhat difficult, Neither easy nor difficult, Somewhat easy, Extremely easy

Many of the practices funded under the Healthy Soils Program have impacts on native biodiversity. In the following questions, we would like to learn more about how you manage non-crop native species on your farm and how you think about your farm system.

Do you manage for the following types of native biodiversity? (2 Options, Yes, I do., No, I don't.)

1. *Plant species (e.g. oaks, wildflowers)*
2. *Pollinator species (e.g., bees, bats, songbirds)*
3. *Game species (e.g., duck, deer, elk)*
4. *Endangered species (e.g., Monarch butterflies, California Tiger Salamander)*
5. *Other (Please specify):*

In 1-2 sentences, please describe why you do or do not manage for the species included in the previous question.

Please indicate your level of agreement or disagreement with the following statements about biodiversity. (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *I am concerned about the potential impacts of biodiversity loss on my farm.*
2. *I consider biodiversity an important part of my farm.*
3. *I consider biodiversity an important part of my farm.*
4. *The risks of implementing biodiversity practices on my farm (e.g. food safety and endangered species concerns) outweigh the benefits.*

Please indicate your level of agreement or disagreement with the following statements about farm systems management. (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *When I make decisions on my farm, I tend to see all kinds of possible consequences for each decision.*
2. *By making plans and controlling my farm operations, I can accurately predict how successful my farm operation will be.*
3. *When I have problems on my farm, I think about how I can change my operations to help reduce those problems in the future.*
4. *I always look at the interconnections and mutual influences between all the decisions that go into my farm management.*
5. *I think continuously about how to improve my farm operations.*

Please select your single most important motivation for participating in the HSP.
Improve soil health, Improve yields, Reduce external input costs, Improve water quality, Sequester carbon to mitigate climate change, Support biodiversity, Adapt to a changing climate, Other (Please specify)

Adoption of conservation practices is often motivated by a desire to manage risk. How concerned are you about the impact of the following risks on the viability of your farming operation? (5-point Likert, Not at all concerned, Slightly concerned, Somewhat concerned, Moderately concerned, Extremely concerned)

1. *Market oversupply and low crop prices*
2. *Inflation and rising business costs*
3. *Labor availability*
4. *Regulations*

5. *Land access and price*
6. *Food safety liability*
7. *Water supply*
8. *Weather volatility*
9. *Diseases and pest*

People get information about soil health from a number of different sources. How often do you use the following sources of information about soil health? (4 options, Never, Rarely, Sometimes, Often)

1. ***Ag media:*** *Magazines, radio, TV, social media, podcasts, etc.*
2. ***Private consultants:*** *Certified crop advisors, pest control advisors, farm management companies*
3. ***Governmental sources:*** *Resource Conservation Districts, UC Cooperative Extension, USDA NRCS, CDFA*
4. ***Non-governmental organizations:*** *American Farmland Trust, CalCan, Farm Bureau*
5. ***Other farmers***

In this section we will be asking about the application process and your experience with CDFA administration of HSP grants.

Did anyone help you with your HSP program application?
No, Yes, Unsure/Don't remember

Select all that helped with the application process.
Co-worker/employee, Company/developer/vendor/consultant, HSP Technical Assistance Provider, Family member, Friend, Another farmer, Other (please specify):

Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *The application was clear and easy to understand.*
2. *The application window (time between solicitation issued and application deadline) was too short.*
3. *I reduced the complexity/ number of practices in my application in order to submit on time.*
4. *I had difficulty acquiring supporting information like bids and tests in a timely manner.*
5. *The lag between initial project approval and contract signing hindered optimal project implementation.*

Based on your experience with the CDFA climate-smart application process, please provide your opinions on the following statements (5-point Likert Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree)

1. *My invoices were paid in a timely manner.*
2. *The CDFA program staff assigned to my project responded to questions and requests in a timely manner.*
3. *The CDFA program staff assigned to my project were professional and knowledgeable.*
4. *This project improved my perception of CDFA.*
5. *I would apply to this program again, knowing what I know now.*

Did your project feature a budget change?
No, Yes, Unsure/Don't remember

Did you feel the budget change process was overly complicated and hindered the timely completion of your project?
No, Yes

Did your CDFA contact person change over the course of the project?
No, Yes, Unsure/Don't remember

Did changing your CDFA contact person negatively impact your experience with the HSP?
No, Yes

Did you obtain a portion of your funding before your project began?
No, Yes, Unsure/Don't remember

What percentage of the funding did you obtain before your project began?

Would you have liked more funding available before your project began?
No, Yes

How much funding would you have liked to be available before your project began?

How many times did you apply for an HSP grant before receiving funding?

In this final section, we ask you a few questions about yourself and your farming operation. This demographic information helps us understand the makeup of who responded to this survey, which helps give a fuller picture of what groups participate and what voices may be missing in our data. *Please note you may skip any question in this section you do not want to answer.*

What year were you born?

What is your gender identity?
Male, Female, Non-binary, Prefer not to say, Prefer to self specify

Do you belong to any of the following CDFA-designated socially disadvantaged groups? Please check all that apply.
Hispanic, Asian American, African American, Native American/American Indian (Specify if desired), Alaskan Native (Specify if desired), Native Hawaiian and Pacific Islanders (Specify if desired), None of the above/ prefer not to say

How many total acres is your farming operation? Please estimate how many of these acres are owned versus leased from others.

1. *Total Acres*
2. *Acres Leased*
3. *Acres Owned*

How many total acres were included in your HSP project?
How many acres of your HSP project were on leased land?

What is your farm's principal crop type.
Fruits and nuts, Mixed vegetables and berries, Field crops: cotton, alfalfa, grains (corn, rice, beans, winter wheat, etc.), Grazing pasture, Grape vineyards, Mixed (at least 25% of multiple of the above crop types)

Please select the county where the majority of your HSP project occurred.

What was your net household income from agriculture in 2022? *If you prefer not to respond you may skip to the next question.*

What were your gross receipts from farming in 2022? *If you prefer not to respond you may skip to the next question.*

Approximately what proportion of your total household income comes from agriculture?

What is the highest level of school you have completed?
Some formal schooling, High school diploma / GED, Some college, 2-year college degree, 4-year college degree, Graduate/professional degree
How long have you worked in agriculture?

How many full-time employees does your farming operation employ?

Were any of the lands utilized for the HSP project certified Organic?
No, Yes

Were any of the lands utilized for the HSP project certified by the Leafy Greens Handler Marketing Agreement (LGMA)?
No, Yes

Please estimate the average annual rainfall at your HSP project site (inches).

What percentage of the croplands you manage are irrigated?

What percentage of this irrigation is from groundwater?

Did your HSP project take place on farmland located in a SGMA regulated basin?
No, Yes, Unsure/Don't know

What type of contract best characterizes the majority of your agricultural production?
No contract for the 2023 harvest, Contract secured for the 2023 harvest, Contract secured for the 2023 and 2024 harvests, Contract secured of the next three harvests or more (at least through 2025), Unsure/Don't know

What is the most important market for your agricultural production?
Wholesale, Online, Farm stand, Community supported agriculture, Direct sales to institutions (restaurants, schools, hospitals, etc.), Farmers markets, Other (please specify):, Unsure/Don't know

Please use the box below to share any additional comments about the HSP program or survey.

Appendix D. SWEEP Survey[7]
Cal Poly and the California Department of Food and Agriculture are conducting this survey in order to evaluate the impact and effectiveness of the State Water Efficiency & Enhancement Program (SWEEP). If you received a SWEEP grant we'd greatly appreciate your input!

[7] Includes only SWEEP Specific Questions, see HSP for biodiversity through administrative questions

The benefits of your voluntary completion of this survey include:
- A $20 eGift card
- Helping improve the SWEEP program.
- Voicing the needs, concerns and achievements of California farmers.

This survey includes questions about your personal experiences and opinions and takes approximately 20 minutes to complete. You may skip any questions you choose not to answer. There are no anticipated risks with your participation in this study, as any information you provide is confidential and will not be linked to your name or company.

If you have questions regarding this study or would like to be informed of the results when the study is completed, please contact Dr. Babin at 805-756-2373, nbabin@calpoly.edu. If you have any concerns about the conduct of the research project or your rights as a research participant, you may contact Dr. Michael Black, Chair of the Cal Poly Institutional Review Board, at (805) 756-2894, mblack@calpoly.edu, or Ms. Trish Brock, Director of Research Compliance, at (805) 756-1450 or pbrock@calpoly.edu.

If you are 18 years of age and agree to voluntarily participate in this research project as described, please indicate your agreement by clicking "I agree" below. You may stop and quit the survey at any time but your $20 eGift card will only be disbursed if you complete the survey. If you are not 18 years of age or would not like to participate, please click "I disagree".

I agree, I disagree

Were you awarded more than one SWEEP grant between 2014 and 2019?

No, I was awarded only one SWEEP grant between 2014 and 2019., Yes, I was awarded more than one SWEEP grant between 2014 and 2019.

How many SWEEP grants were you awarded between 2014 and 2019?

When responding to the rest of the survey, please sum together the practices implemented, and your overall experiences with them, across your different SWEEP awards between 2014-2019.

What year was your SWEEP project funded?

2014, 2015, 2016, 2017, 2018, 2019

What is the status of your project?
Completed, Will complete in 2023, Will complete in 2024

For each SWEEP (micro-irrigation, soil moisture sensors, on-farm weather station, irrigation water management platform, pump conversion, VFDs, solar) practice below, please read all four questions and check the box when the answer is yes.

1. *Was this practice included in your SWEEP project?*
2. *Do you currently use this practice on your farm?*
3. *Do you intend to use this practice in the next 12 months?*
4. *Do you intend to **expand** the use of this practice in the next 12 months?*

As a result of my SWEEP project ____. (true or false)

1. *I have gained new knowledge about the efficient management of water and energy on my farm.*
2. *I have implemented other conservation practices not funded by my project.*
3. *I have applied for other grants to fund conservation practices on my farm.*
4. *My farming network has expanded.*
5. *I have received preferential treatment by buyers and/or processors.*
6. *I have received a price premium for my crops.*

Please indicate your level of agreement or disagreement with the following statements: (5-point likert, strongly disagree to strongly agree)

1. *Improving water use efficiency is an urgent problem for agriculture.*
2. *Water conserved by SWEEP practices should be re-allocated to to crops instead of being released into natural ecosystems.*
3. *My SWEEP project makes my farm more resilient.*
4. *This project has improved the public's perception of my agricultural operation.*
5. *Programs like the SWEEP are important for improving the public's perception of agriculture.*
6. *I would recommend my SWEEP practices to a friend.*

Which of the following soil management practices were implemented alongside your SWEEP project? Check all that apply.

Cover cropping, Compost application, Mulching, Reduced-till/ No-till, None of the above

Have you talked with other growers about your experiences with SWEEP?
No, Yes , Unsure/Don't Remember

About how many people have you spoken with about your experience?

Do you think that your project has had a significant impact on the adoption of water and energy efficient practices by other growers?
No, Yes

How many growers do you estimate have adopted water and energy efficiency practices as at least a partial result of your project?
Distribution uniformity tests can ensure that a drip irrigation system delivers water uniformly throughout farm blocks. Has your irrigation system been tested for distribution uniformity within the last two years?

No, Yes

CDFA contracts Technical Assistance Providers (TAPs) to provide free support to SWEEP grant recipients. These TAPs are often based out of Resource Conservation Districts, UC Cooperative

Extension offices and nonprofit organizations. Did you work with a TAP at any time during your SWEEP Project?
No, Yes

Check all boxes in which TAPs offered support to your SWEEP project.

Exploration:*: Explaining the SWEEP program and application process. Exploring the technical attributes of SWEEP practices.,* ***Proposal:*** *Vision and design of SWEEP project scope. Writing and submission of the SWEEP grant application.,* ***Implementation****: Selecting supplies. Coordinating with vendors and regulators. Installation and troubleshooting of SWEEP practices after implementation.,* ***Reporting:*** *Reporting and invoicing to CDFA. ,Other (please specify)*

How important was TAP support in carrying out your SWEEP project?
Not at all important, Slightly important, Moderately important, Very important, Extremely important

In this section we will asses your experience with soil moisture sensors funded by SWEEP.

Was this SWEEP project your first experience managing soil moisture sensors on your farm?
No, Yes

How many years of experience did you have using soil moisture sensors prior to your SWEEP project?

How many acres of your farm were monitored by the soil moisture sensors included in your SWEEP project?

About how many ***total*** acres of your farm were monitored by soil moisture sensors in each of the following years?
2020 acres, 2021 acres, 2022 acres , 2023 (planned acres)

In the next five years, will you expand the total acreage monitored by soil moisture sensors on your farm?

Definitely not, Probably not, Might or might not, Probably yes, Definitely yes

How often do you alter irrigation ***intervals*** (time between irrigation sets) based off of soil moisture monitoring?

How often do you alter irrigation **duration** (length of irrigation sets) based off of soil moisture monitoring?

My understanding of the data produced by my soil moisture sensors is sufficient to effectively plan irrigation events.
Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree , Strongly agree

The following farming conditions are often impacted by soil moisture monitors. Please rate what type of an impact you have seen from soil moisture monitors on your farm. (5-point Likert, significant harmful impact to significant beneficial impact)

1. *Irrigation efficiency*
2. *Water usage*
3. *Drought resistance*
4. *Crop quality*
5. *Crop yields*
6. *Labor costs*
7. *Other (please specify)*

Which of the following four statements best reflects your experience with soil moisture monitoring?
The use of soil moisture sensors has enabled me to reduce my crop water inputs., The use of soil moisture sensors has not impacted my overall water use., The use of soil moisture sensors has led me to use more water inputs over time., I have never investigated the water-use impacts of soil moisture sensors on my farm.

What has been the overall impact of soil moisture monitoring on profitability of your operation?
Moderate decrease in net profit (5% or more decrease), Minor decrease in net profit (2-4% decrease), No significant change in net profit (plus or minus 1% change in net profit), Minor increase in net profit (2-4% increase), Moderate increase in net profit (5% or more increase), I am not measuring economic outcomes

Please indicate fill in the blank: My using soil moisture sensors to schedule irrigations in the next 12 months would be_____.
Very harmful for my farm, Somewhat harmful for my farm, Neither beneficial nor harmful for my farm, Somewhat beneficial for my farm, Very beneficial for my farm

Please fill in the blank: My using soil moisture sensors to schedule irrigations in the next 12 months would be_____
Very unenjoyable for me, Somewhat unenjoyable for me, Neither enjoyable nor unenjoyable, Somewhat enjoyable for me, Very enjoyable for me
Please indicate your agreement or disagreement with the following statements: (5-point Likert, strongly disagree to strongly agree):

1. *My decision to use my soil moisture sensors over the next 12 months is completely up to me.*
2. *Most people whose opinions I value would approve of me using soil moisture sensors over the next 12 months.*
3. *Most farmers like me will use soil moisture sensors over the next 12 months.*
4. *Most farmers I respect and admire will use soil moisture sensors over the next 12 months.*
5. *Not using soil sensor data to schedule irrigations would hinder the optimal operation of my farm.*

Please indicate your agreement or disagreement with the following statements. (5-point Likert, strongly disagree to strongly agree):

1. *I have the knowledge and technical skill to successfully use soil moisture sensors to schedule irrigations in the next 12 months.*
2. *I have sufficient labor and equipment resources to successfully use soil moisture sensors to schedule irrigations in the next 12 months.*
3. *Environmental factors (water availability, rainfall timing, temperatures, etc.) will impact my decision to use my soil moisture sensors in the next 12 months.*
4. *Without incentive payments soil moisture sensors pay for themselves.*
5. *I would have installed soil moisture sensors on my SWEEP project fields without CDFA funding.*

6. *I would have benefited from more technical assistance to effectively utilize my soil moisture sensors.*

Please indicate your agreement or disagreement with the following statements. (5-point Likert, strongly disagree to strongly agree):

1. *It would be difficult to manage my farm without soil moisture sensors.*
2. *Soil moisture sensors are now part of my farm management routine.*
3. *Soil moisture sensors no longer require much thought to implement and manage.*
4. *Using soil moisture monitoring conserves my farm's water supply.*
5. *In my experience with soil moisture monitors, the benefits outweigh the costs.*

The following are some challenges that growers often experience when using soil moisture monitoring. Please rate how much of a challenge these issues were for you. (5-point Likert, not challenging at all to extremely challenging)

1. *Financial expense to implement and manage.*
2. *The need to learn new skills or techniques.*
3. *Insufficient benefit for the amount of time spent implementing.*
4. *Other (please specify):*

How much control do you have over your use of soil moisture sensors in the next 12 months.
None at all, A little, A moderate amount, A lot, A great deal

For me to use soil moisture sensors to schedule irrigations in the next 12 months will be_____.
Extremely difficult, Somewhat difficult, Neither easy nor difficult, Somewhat easy, Extremely easy

In this section we will asses your experiences using evapotranspiration (ET) data from the on-farm weather station installed as part of your SWEEP project.

Was this SWEEP project your first experience using ET data to schedule irrigation?
No, Yes

How many years of experience did you have using ET data to schedule irrigation?

How often do you alter irrigation ***intervals*** (time between irrigation sets) based off of ET data from your SWEEP funded weather station?

How often do you alter irrigation ***duration*** (length irrigation sets) based off of ET data from your SWEEP funded weather station?

I have a sufficient understanding of the ET data produced by my on-farm weather station.
Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree

Irrigation water management platforms were incorporated into many SWEEP projects. These web-based platforms require annual subscription payments that SWEEP covered in the initial years.

Did you continue to pay the subscription fee for the irrigation water management platform after SWEEP payments ceased.
No, Yes

Please rate the utility of the irrigation water management platform included in your SWEEP project:
Not at all useful, Slightly useful, Moderately useful, Very useful, Extremely useful

In this section we will asses your experiences with the SWEEP solar energy generation program.

In 2022, what percentage of your well pump electricity was offset by the SWEEP funded solar array?

In 2022, what percentage of your total electrical demand was offset by the SWEEP funded solar array?

Appendix E. AMMP Survey[8]
Cal Poly and the California Department of Food and Agriculture are conducting this survey in order to evaluate the impact and effectiveness of the Alternative Manure Management Program (AMMP). If you received an AMMP grant we'd greatly appreciate your input!

The benefits of your voluntary completion of this survey include:
- A $20 eGift card.
- Helping improve the AMMP program.
- Voicing the needs, concerns and achievements of California farmers.

This survey includes questions about your personal experiences and opinions and takes approximately 15 minutes to complete. You may skip any questions you choose not to answer. There are no anticipated risks with your participation in this study, as any information you provide is confidential and will not be linked to your name or company.

If you have questions regarding this study or would like to be informed of the results when the study is completed, please contact Dr. Babin at 805-756-2373, nbabin@calpoly.edu. If you have any concerns about the conduct of the research project or your rights as a research participant, you may contact Dr. Michael Black, Chair of the Cal Poly Institutional Review Board, at (805) 756-2894, mblack@calpoly.edu, or Ms. Trish Brock, Director of Research Compliance, at (805) 756-1450 or pbrock@calpoly.edu.

If you are 18 years of age and agree to voluntarily participate in this research project as described, please indicate your agreement by clicking "I agree" below. You may stop and quit the survey at any time but your $20 eGift card will only be disbursed if you complete the survey. If you are not 18 years of age or would not like to participate, please click "I disagree".
I agree, I disagree

Were you awarded more than one AMMP grant between 2017-2020?
No, I was awarded only one AMMP grant between 2017 and 2020., Yes, I was awarded more than one AMMP grant between 2017 and 2020.

How many AMMP grants were you awarded between 2017-2020?

When responding to the rest of the survey, please sum together the practices implemented, and your overall experiences with them, across your different AMMP awards between 2017-2020.

What year was your AMMP project funded?
2017, 2018, 2019, 2020

What is the status of your project?
Completed, Will complete in 2023, Will complete in 2024
For each AMMP practice (solid separation system, flush to scrape manure collection system, compost

[8] Includes only AMMP Specific Questions, see HSP for biodiversity through administrative questions

bedded pack barn) listed below, please read all three questions and check all that apply.

1. *Was this practice included in your AMMP project?*
2. *Do you currently use this practice on your farm?*
3. *Do you intend to use this practice in the next 12 months?*

As a result of my AMMP project ____. (true or false)

1. *I have gained new knowledge about alternative manure management strategies.*
2. *I have implemented other conservation practices not funded by my project.*
3. *I have applied for other grant incentives for my farm.*
4. *My farming network has expanded.*
5. *I have received preferential treatment by buyers and/or processors.*
6. *My relationships have improved with my neighbors.*
7. *My dairy is more financially viable.*
8. *I have received a price premium for my production.*

Please indicate your level of agreement or disagreement with the following statements: (5-point Likert, strongly disagree to strongly agree)

1. *Improving dairy manure management is an urgent problem for agriculture.*
2. *My AMMP practices make my farm more resilient.*
3. *This project has improved the public's perception of my agricultural operation.*
4. *Programs like AMMP are important for improving the public's perception of agriculture.*
5. *I would recommend my AMMP practices to a friend.*

Please indicate your level of agreement or disagreement with the following statements:

1. *I have the knowledge and technical skill to use my AMMP practices in the next 12 months.*
2. *I have sufficient labor and equipment resources to implement my AMMP practices in the next 12 months.*
3. *Environmental factors (water availability, rainfall timing, temperatures, etc.) will impact the decision to use my AMMP practices in the next 12 months.*
4. *Without additional funding my AMMP practices will pay for themselves eventually.*
5. *I would have benefited form more technical assistance in implementing my AMMP practices.*
6. *I would have adopted the AMMP practices in my project without CDFA funding.*

Have you talked with other farmers about your experiences with the AMMP?
No, Yes, Unsure/Don't remember

About how many farmers have you spoken with about your experience?

Do you think that your project has had a significant impact on the adoption of sustainable manure management practices by others?
No, Yes, Unsure/Don't remember

How many other farms do you estimate have adopted alternative manure management strategies as at least a partial result of your project?
CDFA has agreements with Technical Assistance Providers (TAPs) to provide free support to AMMP grant recipients. Did you work with a TAP at any time during your AMMP Project?
No, Yes

In which phases did TAPs work with you? Check all that apply.
Exploration: *Explaining the AMMP program and application process. Exploring the technical attributes of AMMP practices.,* ***Proposal:*** *Vision and design of AMMP project scope. Writing and submission of the grant application.,* ***Implementation****: Coordinating with vendors and regulators. Installation and troubleshooting of AMMP practices after implementation.,* ***Reporting:*** *Reporting and invoicing to CDFA.*

How important was TAP support in carrying out your AMMP project?
Not at all important, Slightly important, Moderately important, Very important, Extremely important

What is the likelihood that you will eventually add stalls to your compost bedded pack barn?
Extremely unlikely, Somewhat unlikely, Neither likely nor unlikely, Somewhat likely, Extremely likely

In this section we will asses your experiences with the AMMP funded solid separation system.

What type of solid separation system did you implement as part of your AMMP project? (select all that apply)
Weeping Wall, Stationary Screen, Vibrating Screen, Screw Press, Centrifuge, Roller Drum, Belt Press/Screen, Advanced solid-liquid separation assisted by flocculants and/or bead filters , Vermifiltration

In what month and year did your solid separator become operational?

How often does it operate on average?
Daily, Weekly, Bi-weekly, Monthly, Less often then monthly

Has your solid separator been inoperable at any time due to a malfunction?
No, Yes, Unsure/Don't remember
For about how many days in total has your solid separator been inoperable since it became operational?

In this section we will assess your experiences with your scrape manure collection system.

In what month and year did your scrape system become operational?

Has your scrape system been inoperable at any time due to a malfunction?
No, Yes, Unsure/Don't remember

For about how many days in total has your scrape system been inoperable?

What is the most important manure treatment or drying method for your AMMP project?
Open solar drying of manure, Closed solar drying (drying of manure in an enclosed environment), Solid Storage (storage of manure, typically for a period of several months, in unconfined piles or stacks), Composting in vessel (composting in an enclosed vessel, with forced aeration and continuous mixing), Composting in aerated static pile (composting in piles with forced aeration but no mixing), Composting in intensive windrows (with regular turning for mixing and aeration), Composting in passive windrows (with infrequent turning for mixing and aeration)

In this section we will asses compost usage and your overall experience with the AMMP practices implemented on your operation.

Is your finished compost used to spread in agricultural fields?
No, Yes, it is mainly sold or gifted to other farms., Yes, it is mainly used to spread in our pastures., Yes, it is mainly used to spread in our other croplands.

How many acres were applied with compost from your AMMP project in each of the following years?
2020 acres, 2021 acres, 2022 acres, 2023 acres (planned)

Approximately what percentage of your total cropland was applied with compost from an AMMP project in 2022?

Is your finished compost used as a bedding product?
No, Yes

If yes, has this reduced bedding costs?
No, Yes

Which of the following four statements best reflects your experience with compost?
The use of compost has enabled me to reduce my crop fertility inputs over time and still meet the needs of my cash crop, The use of compost has not impacted my cash crop fertility program.. The use of compost has required me to use additional crop fertility inputs over time to meet the needs of my cash crop.. I have never investigated the fertility benefits of compost on my farm.

Please fill in the blank: My using the AMMP practices implemented as a result of this project in the next 12 months would be_____.
Very harmful for my farm, Somewhat harmful for my farm, Neither beneficial or harmful for my farm, Somewhat beneficial for my farm, Very beneficial for my farm

The following farming conditions are often impacted by alternative manure practices. Please rate what type of an impact you have seen from your AMMP project. (5-point Likert, significantly harmful impact to significant beneficial impact)

1. *Bedding costs*
2. *Cow health*
3. *Diesel fuel costs*
4. *Dust*
5. *Lagoon cleaning costs*
6. *Manure hauling costs*
7. *Odor*
8. *Permitting Costs*
9. *Quality of cash crop using dairy compost*
10. *Soil health in fields using dairy compost*
11. *Solids in manure ponds*
12. *Water efficiency*
13. *Yield of cash crop using dairy compost*
14. *Other (please specify):*

How have AMMP practices impacted your use of tillage?
I use less tillage, I use about the same amount of tillage, I use more tillage

Please fill in the blank: My using AMMP practices in the next 12 months would be_____.
Very unenjoyable for me, Somewhat unenjoyable for me, Neither enjoyable nor unenjoyable for me, Somewhat enjoyable for me, Very enjoyable for me

Please indicate your level of agreement or disagreement with the following statements: (5-point Likert, strongly disagree to strongly agree)

1. *My decision to use AMMP practices in the next 12 months is completely up to me.*
2. *Most people whose opinions I value would approve of me using alternative manure management strategies in the next 12 months.*
3. *Most dairymen I respect and admire will use alternative manure management strategies in the next 12 months.*
4. *Most dairymen like me will use alternative manure management strategies in the next 12 months.*

What has been the overall impact of the AMMP funded practices on the profitability of your operation?
Moderate decrease in net profit (5% or more decrease), Minor decrease in net profit (2-4% decrease), No significant change in net profit (plus or minus 1% change in net profit), Minor increase in net profit (2-4% increase), Moderate increase in net profit (5% or more increase), I am not measuring economic outcomes

How much control do you have over your use of the AMMP initiated practices in the next 12 months.
None at all, A little, A moderate amount, A lot, A great deal

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert, strongly disagree to strongly agree)

1. *It would be difficult to manage my farm without alternative manure management strategies.*
2. *Alternative manure management strategies are now part of my farm management routine.*
3. *Alternative manure management strategies no longer require much thought to implement and manage.*
4. *I like the way that alternative manure management strategies makes my farm look.*
5. *I believe that the traditional method of managing dairy manure hindered the optimal operation of my farm.*
6. *In my experience with AMMP practices, the benefits outweigh the costs.*
7. *AMMP practices improve environmental quality (soil, water, air).*

For me to use the AMMP initiated practices in the next 12 months will be_____.
Extremely difficult, Somewhat difficult, Neither easy nor difficult, Somewhat easy, Extremely easy

Appendix F. DDRDP Survey[9]

Cal Poly and the California Department of Food and Agriculture are conducting this survey in order to evaluate the impact and effectiveness of the Dairy Digester Research and Development Program (DDRDP). If your dairy received a DDRDP grant we'd greatly appreciate your input!

The benefits of your voluntary completion of this survey include:
- A $20 eGift card.
- Helping improve the DDRDP program.

[9] Includes only DDRDP Specific Questions, see HSP for biodiversity through administrative questions

- Voicing the needs, concerns and achievements of California farmers.

This survey includes questions about your personal experiences and opinions and takes approximately 15 minutes to complete. You may skip any questions you choose not to answer. There are no anticipated risks with your participation in this study, as any information you provide is confidential and will not be linked to your name or company.

If you have questions regarding this study or would like to be informed of the results when the study is completed, please contact Dr. Babin at 805-756-2373, nbabin@calpoly.edu. If you have any concerns about the conduct of the research project or your rights as a research participant, you may contact Dr. Michael Black, Chair of the Cal Poly Institutional Review Board, at (805) 756-2894, mblack@calpoly.edu, or Ms. Trish Brock, Director of Research Compliance, at (805) 756-1450 or pbrock@calpoly.edu.

If you are 18 years of age and agree to voluntarily participate in this research project as described, please indicate your agreement by clicking "I agree" below. You may stop and quit the survey at any time but your $20 eGift card will only be disbursed if you complete the survey. If you are not 18 years of age or would not like to participate, please click "I disagree".
I disagree, I agree

Did your dairy receive more than one DDRDP grant between 2015-2020?
No, we were awarded only one DDRDP grant between 2015 and 2020., Yes, we were awarded more than one DDRDP grant between 2015 and 2020.

How many DDRDP grants were you awarded between 2015-2020?

When responding to the rest of the survey, please sum together the practices implemented, and your overall experiences with them, across your different DDRDP awards between 2015-2020.

What year was your DDRDP project funded?
2015, 2016, 2017, 2018, 2019, 2020

What is the status of your project?
Completed, Will complete in 2023

As a result of my DDRDP project ____. (true or false)

1. *I have gained new knowledge about manure management.*
2. *My farming network has expanded.*
3. *I have received preferential treatment by buyers and/or processors.*
4. *I have received a price premium for my production.*
5. *I have implemented other manure management practices not funded by my project.*
6. *I have applied for other grants to fund conservation practices on my farm.*
7. *My relationships have improved with my neighbors.*

Please indicate your agreement with the following statement: I intend to use my digester in the next 12 months.
No, Yes

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert, strongly disagree to strongly agree)

1. *Improving dairy manure management is an urgent problem for agriculture.*
2. *My digester practice make my farm more resilient.*
3. *This project has improved the public's perception of my agricultural operation.*
4. *Programs like the DDRDP are important for improving the public's perception of agriculture.*
5. *I would recommend digesters to a friend.*
6. *I am satisfied with the digester developer I worked with on this project.*

Please indicate your level of agreement or disagreement with the following statements. (5-point Likert, strongly disagree to strongly agree)

1. *I have the knowledge and technical skill to operate my digester in the next 12 months.*
2. *I have sufficient labor and equipment resources to operate my digester practice in the next 12 months.*
3. *Economic factors (energy prices, herd size etc.) will impact my decision to use my digester in the next 12 months.*
4. *Without additional funding my digester will pay for themselves*
5. *I would have benefited in more technical assistance in implementing my digester practice.*

Have you talked with other dairymen about your experiences with the DDRDP?
No, Yes, Unsure/Don't remember

About how many people have you spoken with about your experience?

Do you think that your project has had a significant impact on the adoption of digestors by other dairymen?
No, Yes, Unsure/Don't remember

How many dairymen do you estimate have adopted digestors as at least a partial result of your project?

In this section we will asses your experience with the dairy digester included in your DDRDP project.

In what month and year did your digester become operational?

Has your digester been inoperable at any time due to a malfunction?
No, Yes, Unsure/Don't remember

For about how many days in total has your digester been inoperable since it became operational?
What is the bio-gas end use of your digester?
Electric, LNG, EV-fuel cell, RCNG (trucking), Other (please specify):

Did you convert your manure ponds from single to double lined beds as a result of the DDRDP project?
No, Yes, Unsure/Don't remember

Did you implement a solid separation system as part of your DDRDP project?
No, Yes, Unsure/Don't remember

What month and year did your solid separator become operational?

How often does it operate on average?
Daily, Weekly, Bi-weekly, Monthly, Less often then monthly

Has your solid separator been inoperable at any time due to a malfunction?
No, Yes, Unsure/Don't remember

For about how many days in total has your solid separator been inoperable?

What is your manure treatment or drying method for your digestor project?
Open solar drying of manure, Closed solar drying (drying of manure in an enclosed environment), Solid storage (storage of manure, typically for a period of several months, in unconfined piles of stacks), Composting in vessel (composting in an enclosed vessel, with forced aeration and continuous mixing), Composting in aerated static pile (composting in piles with forced aeration but no mixing), Composting in intensive windrows (with regular turning for mixing and aeration), Composting in passive windrows (with infrequent turning for mixing and aeration), Other (please specify):

Is your finished compost used to spread in agricultural fields?
No., Yes, it is mainly sold or gifted to other farms., Yes, it is mainly used to spread in our pastures., Yes, it is mainly used to spread on our other croplands.

On about how many acres did you apply compost from your DDRDP digester project in each of the following years?
2020, 2021, 2022, 2023

Approximately what percentage of your total cropland did you apply compost from your DDRDP project in 2022?

Is your finished compost used as a bedding product?
No, Yes

Has this reduced bedding costs?
No, Yes, Unsure/Don't remember

The following farm conditions are often impacted by new manure management practices associated with dairy digester installation. Please rate what type of an impact you have seen from your DDRDP project. (5-point Likert, significant harmful impact to significant beneficial impact)

1. *Solids in manure ponds*
2. *Lagoon cleaning costs*
3. *Manure hauling costs*
4. *Diesel fuel costs*
5. *Water efficiency*
6. *Odor*
7. *Permitting costs*
8. *Cow health*
9. *Dust*
10. *Bedding costs*
11. *Quality of cash crop using digestor compost*
12. *Yield of cash crop using digestor compost*
13. *Soil health in fields using digestor compost*
14. *Other (please specify):*

Please indicate your agreement or disagreement with the following statements: (5-point Likert, strongly disagree to strongly agree)

1. *My decision to use my digester in the next 12 months is completely up to me.*
2. *Most people whose opinions I value would approve of me using my digester in the next 12 months.*
3. *Most dairymen like me will use a dairy digester in the next 12 months.*
4. *Most dairymen I respect and admire will use a dairy digester in the next 12 months.*

What has been the overall impact of your DDRDP dairy digester on profitability of your operation?
Moderate decrease in net profit (5% or more decrease), Minor decrease in net profit (2-4% decrease), No significant change in net profit (plus or minus 1% change in net profit), Minor increase in net profit (2-4% increase), Moderate increase in net profit 5% or more increase), I am not measuring economic outcomes

Please indicate your agreement or disagreement with the following statements. (5-point Likert, strongly disagree to strongly agree)

1. It would be difficult to manage my farm without the digester.
2. The digester is now part of my farm management routine.
3. Using the digester no longer requires much thought to implement and manage.
4. I like the way that the digester make my farm look.
5. I believe the traditional method of managing dairy manure hindered the optimal operation of my farm.
6. The amount of bio-gas that I sell is smaller than I anticipated.
7. In my experience with dairy digesters, the benefits don't outweigh costs.
8. Dairy digesters improve environmental quality (soil, water, air).

For me to use the DDRDP initiated practices in the next 12 months will be.
Extremely difficult, Somewhat difficult, Neither easy nor difficult, Somewhat easy, Extremely easy