Aquaculture in Wisconsin

Results from a Statewide Survey of Fish Farmers

Shiyu Yang, Bret Shaw, Laura Witzling, Christopher Hartleb, Kristin Runge, and Deidre Peroff

Aquaculture in Wisconsin

Results from a Statewide Survey of Fish Farmers

Contents

Introduction . . . 3

Report Highlights . . . 4

Methods . . . 5

- Survey Distribution . . . 5
- Respondent Characteristics . . . 6

Motivations for Fish Farming . . . 7
- FIGURE 1 . . . 7

Educational & Informational Needs . . . 8

- Respondents Show Interest in Information from Diverse Sources . . . 8
  - FIGURE 2 . . . 8
- Respondents Show Greatest Interest in Learning about Regulations and Keeping Fish Healthy . . . 8
  - FIGURE 3 . . . 9

Distribution Outlets . . . 10

- Direct-to-Consumer Is Top Outlet to Sell Fish for Human Food . . . 10
  - FIGURE 4 . . . 10
- Lake Associations Are Top Outlet to Sell Live Fish for Stocking . . . 11
  - FIGURE 5 . . . 11

Facilities, Species, & Fish Farm Operation . . . 12

- Most Respondents Use Ponds to Raise Fish . . . 12
  - FIGURE 6 . . . 12
- Rainbow Trout Is the Top Species Raised for Food . . . 13
  - FIGURE 7 . . . 13
- Majority of Wisconsin Fish Farms Are Small Operations . . . 14
  - FIGURE 8 . . . 14

Business Strengths, Constraints, Regulation, & Policy . . . 15

- Respondents See Strengths of Their Businesses . . . 15
  - FIGURE 9 . . . 15
- Input and Regulation Costs Are the Largest Constraints . . . 16
  - FIGURES 10, 11 . . . 16
  - FIGURES 12, 13 . . . 17
- Prediction of Growth in Next Five Years . . . 18
  - FIGURE 14 . . . 18
- Respondents Favor Policies to Invest in the Industry . . . 19
  - FIGURES 15, 16 . . . 19

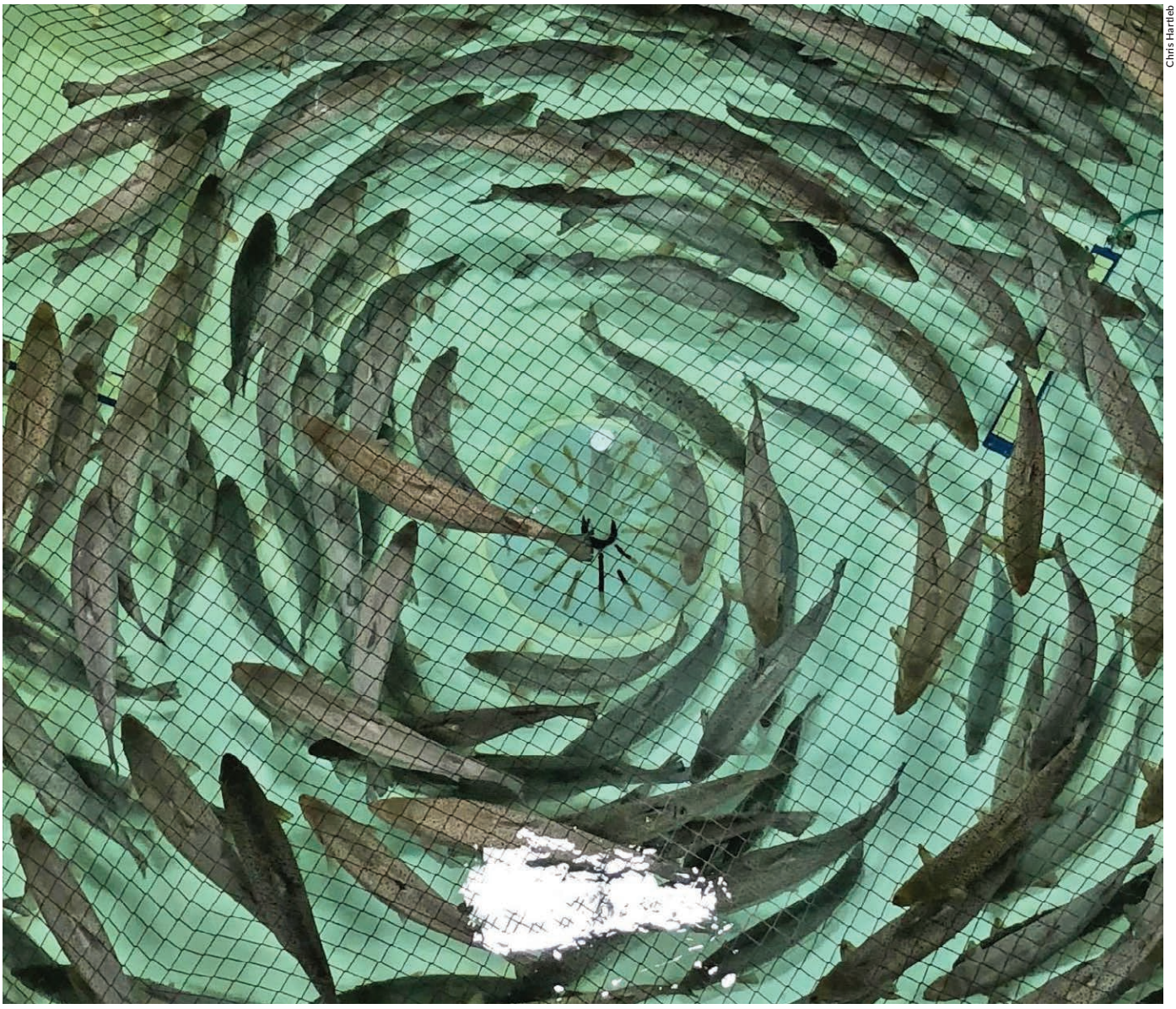
Conclusions . . . Back Page

Cover photos: Emma Wiermaa, University of Wisconsin–Stevens Point Northern Aquaculture Demonstration Facility (UWSP-NADF)

Introduction

Aquaculture, also known as "fish farming," helps meet the world's demand for food, sport, and bait fish. In the United States, aquaculture is also an important part of fostering the domestic supply of seafood and reducing the trade gap between imported and exported seafood. This matters because approximately 90% of the seafood Americans consume is imported from other countries.

The aquaculture industry is still relatively small in Wisconsin, and there is much potential for growth. To help Wisconsin fish farmers expand their businesses and capitalize on the trend for local food while also being responsive to consumer concerns, we surveyed fish farmers to learn more about the Wisconsin aquaculture industry and how to help grow and maintain fish farm businesses in the state. This report describes those results and identifies areas where the industry could be better supported.



Chris Hartleb

Report Highlights

The majority of fish farmers surveyed agreed that their aquaculture businesses are environmentally sustainable and satisfy their existing customers.

- Most fish farmers reported that they pursued their careers in aquaculture out of personal interest and enjoyment as well as for the quality of life the work provides. Communications to recruit the future workforce and attract entrepreneurs into fish farming should emphasize these aspects of working in the aquaculture industry.
- Fish farmers were eager for more information from a variety of sources, especially about regulation and fish health.
- Overall, a majority of Wisconsin's fish farms are small businesses in terms of pounds of fish produced per year (less than 20,000 pounds).
- Rainbow trout is the most commonly farmed food fish in Wisconsin, followed by tilapia, yellow perch, salmon, and sunfish.
- Most respondents use ponds to raise fish. To adopt more complex systems such as aquaponics or recirculation, farmers may need additional training and technical assistance.
- The majority of the fish farmers surveyed agreed that their aquaculture businesses are environmentally sustainable and satisfy their existing customers.
- Over half of respondents agreed that the cost of fish feed, cost of utilities, the risk of changing regulations, and the cost of complying with regulations negatively affected their fish farming businesses.
- Wisconsin fish farmers highly favored the policy of tax breaks for fish farms that use environmentally sustainable methods.
- A majority of fish farmers also favored or strongly favored industry- and government-sponsored research on aquaculture.

Chris Hartleb

The fish fry is an essential part of the state's culinary tradition for many in Wisconsin.

Methods

SURVEY DISTRIBUTION

In order to better understand the constraints on the Wisconsin aquaculture industry and assess what Wisconsin fish farmers need to grow their businesses, we developed a survey instrument, which underwent multiple rounds of reviews and revisions. The final survey was administered through the University of Wisconsin–River Falls Survey Research Center in early October of 2018. To generate a sample of fish farms that commercially produce food fish, we obtained lists of fish farms registered with the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). The farms that were registered through DATCP as Type 1 fish farms were obtained through one list, and farms registered as Type 2 or Type 3 were obtained through a second, combined list. According to DATCP, very few of the Type 1 fish farms commercially produce food fish, whereas a majority of Types 2 and 3 fish farms produce food fish (M. Kebus, personal communication, September 10, 2018).

We removed some entries from the lists for different reasons, such as duplicate entries or entries unlikely to be commercial fish farming businesses such as schools, municipalities, statutorily formed entities, unincorporated nonprofit associations, and individuals raising fish for recreational purposes. The final sample included all 80 fish farms from the Types 2 and 3 list and 220 fish farms randomly sampled from the Type 1 list. The paper survey was mailed to these 300 fish farms. Each mailed packet included the survey questionnaire, an introductory letter to the survey, a two-dollar incentive, and a prepaid self-addressed envelope. Those who did not respond to the survey after two weeks were sent a reminder postcard and a second survey.

Individuals are required to register with the state of Wisconsin as Type 1 fish farms if they raise, move, sell, or distribute live fish. In addition to that, if they distribute fish from inside the state to outside the state, they need to register as Type 2 fish farms. If individuals obtain or distribute fish from a wild source of species susceptible to a deadly fish virus, viral hemorrhagic septicemia, they need to register as Type 3 fish farms.

Source: datcp.wi.gov/Documents/FishFarmRulesQA.pdf

Elenglush/Shutterstock.com

The survey sample was comprised of fish farmers who commercially produce fish for human consumption, such as these tilapia fillets.

RESPONDENT CHARACTERISTICS

Narayan Mahon/Wisconsin Sea Grant

Most fish farmers are in the business because of the enjoyment and the quality of life it provides.

A total of 128 surveys were returned for a response rate of 43%. For Types 2 and 3 fish farms, 43 out of the 80 fish farms returned their surveys for a response rate of 54%. For Type 1 fish farms, 85 out of the 220 fish farms returned their surveys for a response rate of 39%. According to the University of Wisconsin Sea Grant Institute, while most Type 1 fish farms do not commercially produce food fish, farms that raise species such as salmon, shrimp, tilapia, and arctic char are mostly food fish aquaculture (T. Seilheimer, personal communication, December 10, 2018). Because we were primarily interested in responses from fish farmers who commercially grow fish for human consumption, only nine of the 85 returned responses from the Type 1 pool (those that raised salmon, shrimp, and tilapia) were included in our final analyses. Moreover, this report is based only on responses from those who reported being the owner and/or manager at their fish farms. Consequently, a sample size of 49 businesses fitting this criterion were included in our analyses.

This report is based only on responses from those who reported being the owner and/or manager at their fish farms.

In our final sample, 93.8% of the respondents were males. The median age for the sample was closest to the response choice of "55 to 64," which was also the most frequently selected response category. The median number of years that respondents had been producing farm-raised fish was 15. Most respondents, 74.4%, reported registering their fish farms as Type 2 fish farms with the State of Wisconsin, while 4.7% registered as Type 3, 16.3% as Type 1, and 4.7% were unsure. Lastly, turning to employment status, 42.6% of respondents characterized their work on the fish farm as "full-time," while 44.7% reported working "part-time" and 12.8% reported "other."

The finding that much of the work was seasonal makes sense because most of the systems used for fish farming in Wisconsin (e.g., ponds and flow-through systems) are outdoors. Our sample of fish farms on average supported 2.6 year-round positions (median = 1 year-round position) and nearly one seasonal (0.9) position (median = 0.5).

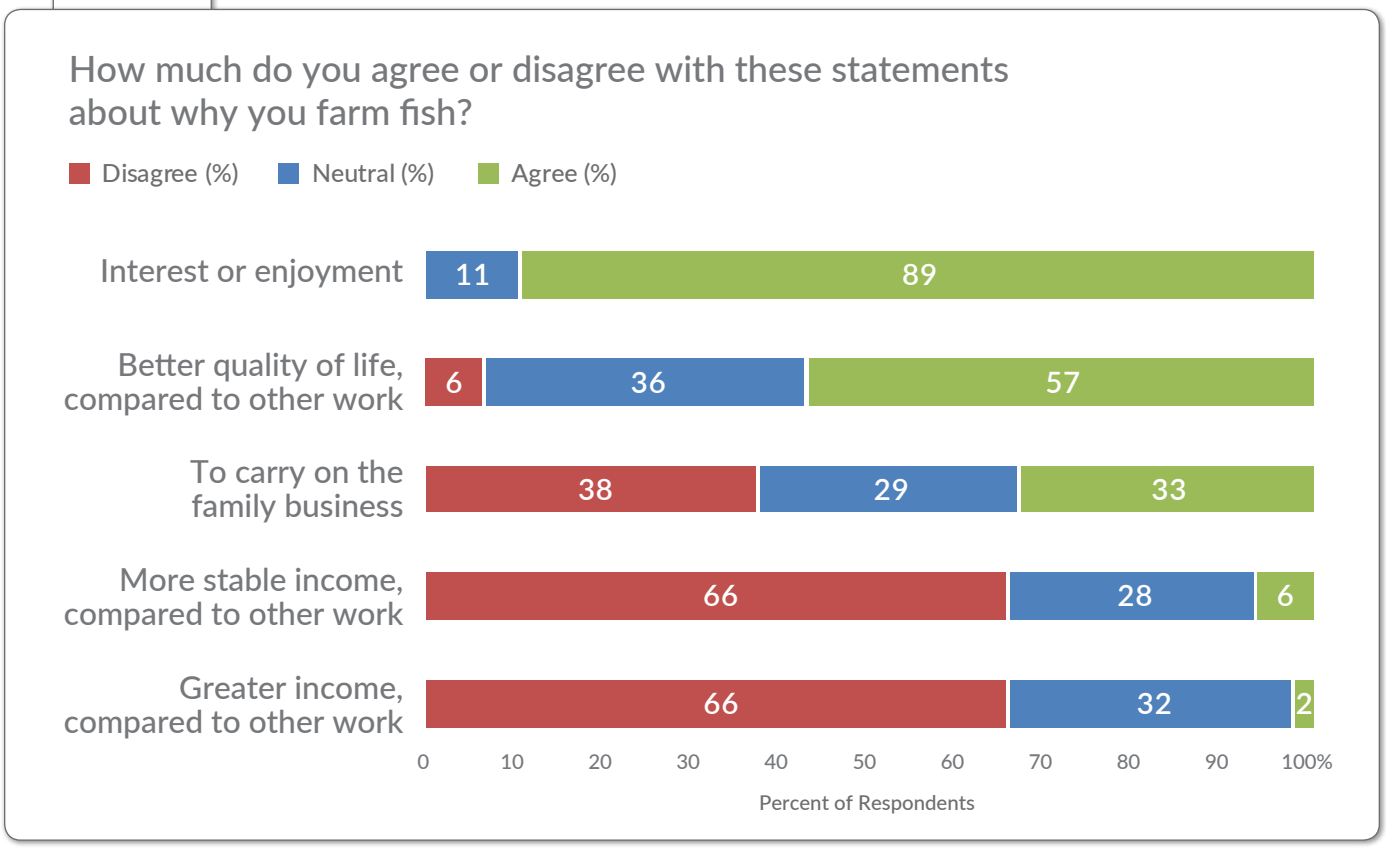
Motivations for Fish Farming

We found that respondents pursued fish farming primarily for reasons related to personal well-being rather than economic incentives. An overwhelming 89% of respondents agreed that they farmed fish due to personal interest or enjoyment. Similarly, 57% of respondents agreed that they farmed fish for a better quality of life. Respondents were fairly evenly split regarding whether they farmed fish to carry on the family business, with 33% agreeing, 29% expressing a neutral opinion, and 38% disagreeing. The majority of respondents disagreed, however, that they pursued a career in the aquaculture industry because their jobs brought about greater income or more stable income (66%). More details can be found in Figure 1.

The fact that most fish farmers pursued a business in aquaculture primarily for enjoyment or better quality of life suggests that future workforce development should highlight these aspects of fish farming. Employers might recruit more workers into the aquaculture industry by emphasizing the high quality of life.

Employers might recruit more workers into the aquaculture industry by emphasizing the high quality of life.

FIGURE 1



Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

Educational & Informational Needs

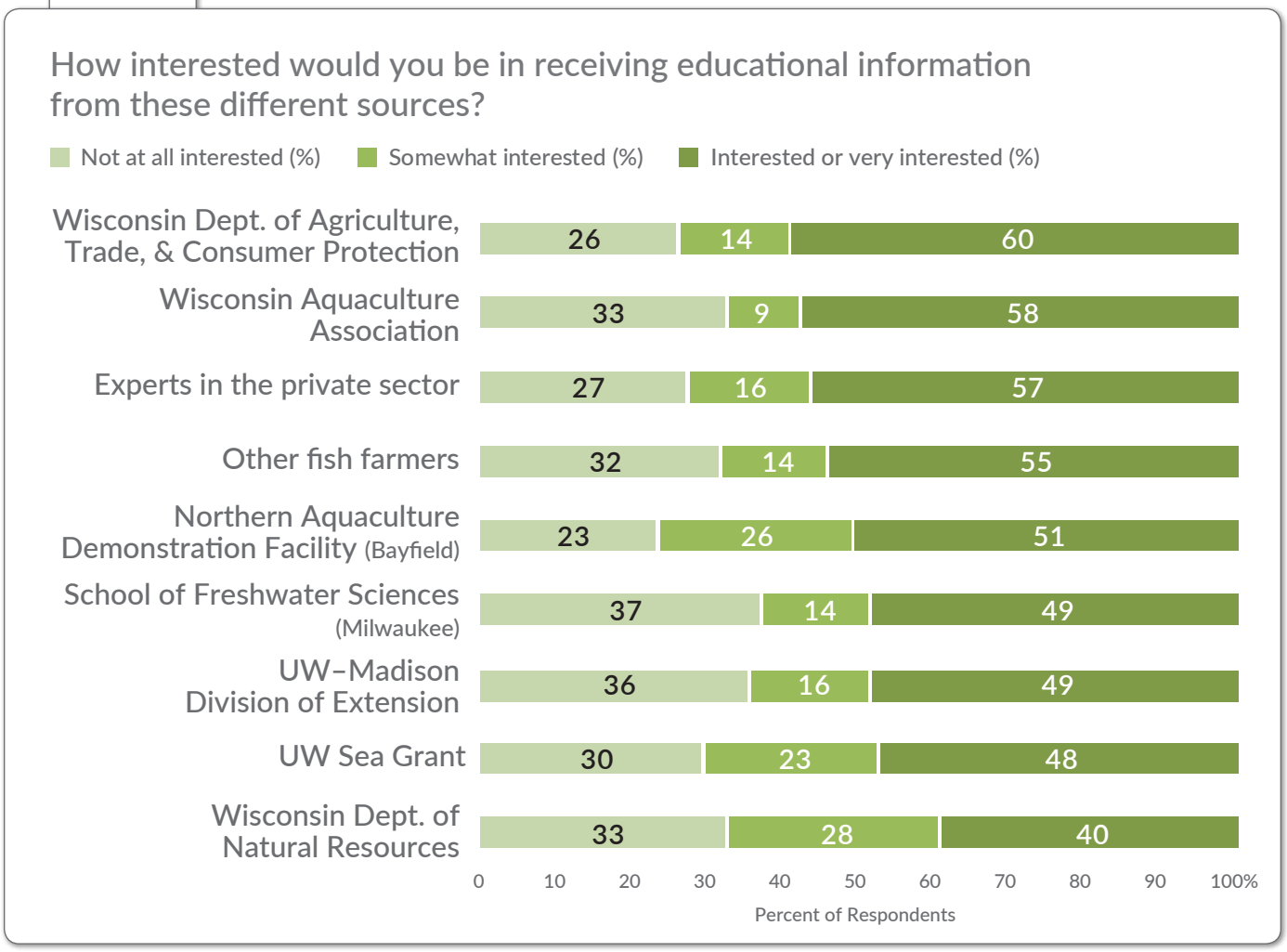
RESPONDENTS SHOW INTEREST IN INFORMATION FROM DIVERSE SOURCES

Fish farmers in Wisconsin are eager for more information from a variety of sources. Figure 2 shows that for each source of information evaluated, a large majority of respondents reported that they were at least "somewhat interested" in receiving educational information from the source and that roughly half of the respondents or more were "interested or very interested." This suggests a broad interest among Wisconsin aquaculture producers for educational information and that the interest in receiving such information through various sources is generally high.

RESPONDENTS SHOW GREATEST INTEREST IN LEARNING ABOUT REGULATIONS AND KEEPING FISH HEALTHY

We asked respondents to rate how interested they were in learning more about different topics related to fish farming. Producers' levels of interest varied greatly

FIGURE 2



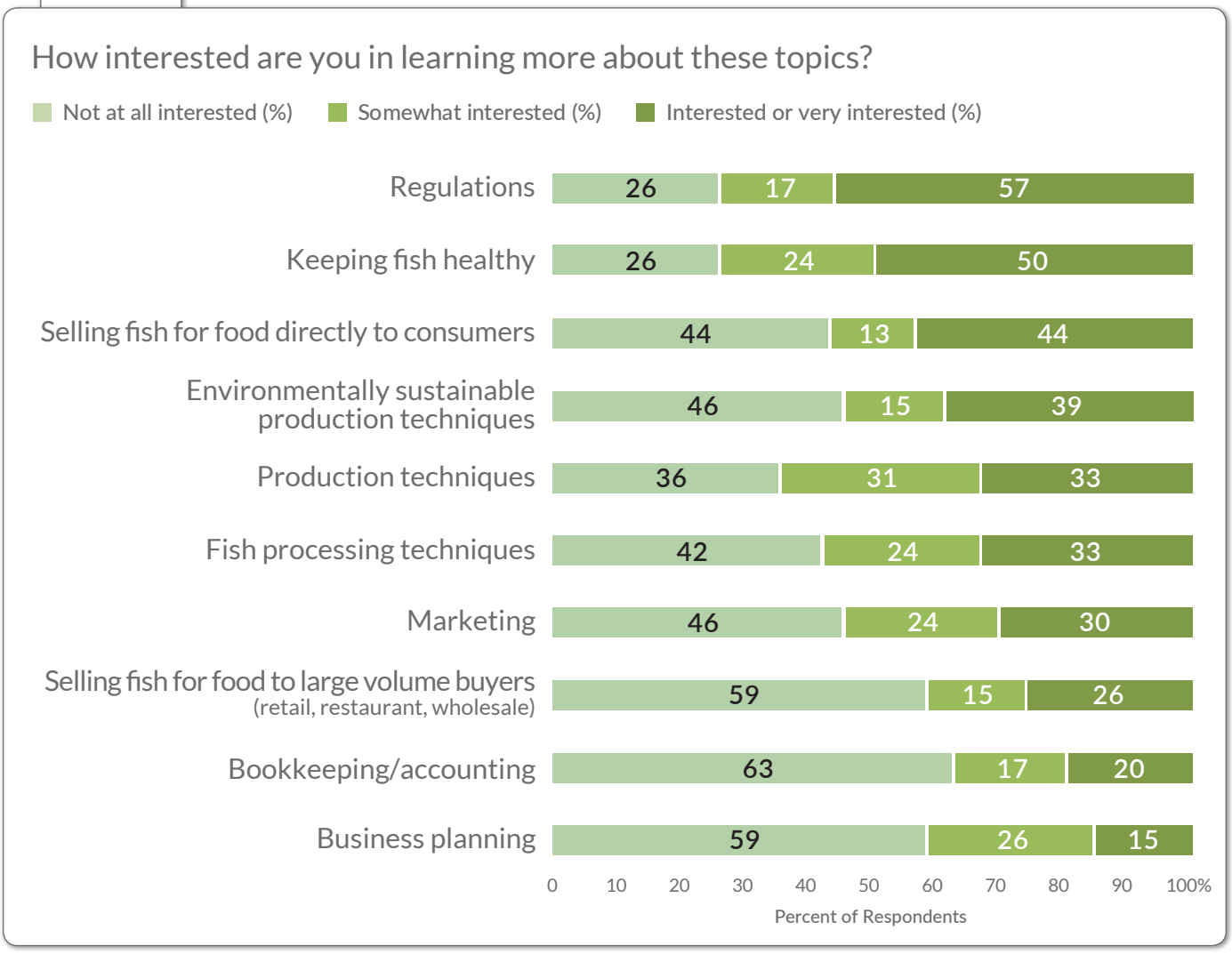
Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

depending on the topic (Figure 3). The topic of "regulations" garnered the most interest, with 74% of respondents reporting they were at least "somewhat interested" in learning more about this topic and over half (57%) of respondents reporting they were "interested" or "very interested" in learning more. Fish farmers were similarly interested in fish health, with 74% of respondents reporting they were at least "somewhat interested" and 50% of respondents expressing they were "interested" or "very interested" in learning more about keeping fish healthy. The next highest categories for which respondents were at least somewhat interested in learning more about included: selling food fish directly to consumers (57%), environmentally sustainable production techniques (54%), fish processing techniques (57%), production techniques (64%), and marketing (54%). Over half of the respondents reported they were "not at all interested" in the topics of business planning (59%), bookkeeping or accounting (63%), and selling food fish to large volume buyers such as retail, restaurants, and wholesale (59%).

Emma Wiemaas/UWSP-NADF

Many fish farmers want to learn more about how to keep fish healthy.

FIGURE 3



Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

Distribution Outlets

About 23% expressed an interest in selling to restaurants if they were not already doing so, followed by 22% showing interest in selling to fish or seafood markets.

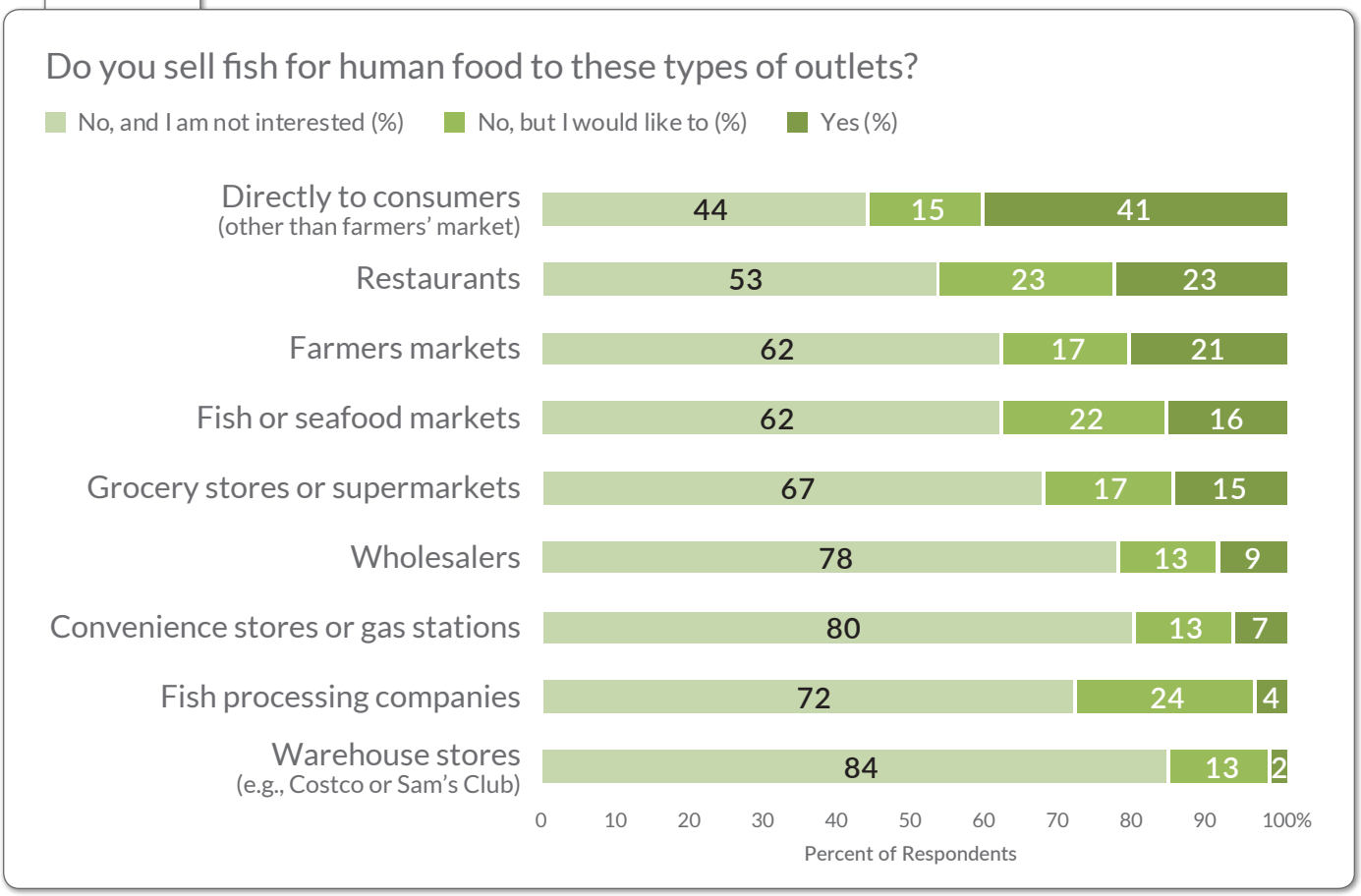
DIRECT-TO-CONSUMER IS TOP OUTLET TO SELL FISH FOR HUMAN CONSUMPTION

We asked respondents what outlets they used to sell fish for human food (Figure 4).

Selling fish directly to consumers (other than farmers markets) was the most common distribution method, with 41% of respondents reporting they sold fish this way, followed by selling to restaurants (23%) and selling to farmers markets (21%). The sizable minority of respondents that sell to farmers markets suggests that Wisconsin farmed-raised fish is seen by some as a local food item, which could potentially elevate its status despite the fact that wild-caught fish is often treated by consumers as a higher quality product. Following farmers markets, 16% of respondents cited distributing to fish or seafood markets and 15% sold to grocery stores or supermarkets. The other outlets where farmers could sell food fish were used less frequently.

Although selling to fish processing companies is still an uncommon practice, it has potential to become a popular outlet for selling fish for human food as the largest number of fish farmers expressed an interest in it (24%). About 23% of respondents expressed an interest in selling to restaurants if they were not already doing so, followed by a 22% of respondents showing interest in selling to fish or seafood markets.

FIGURE 4



Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

LAKE ASSOCIATIONS ARE TOP OUTLET TO SELL LIVE FISH FOR STOCKING

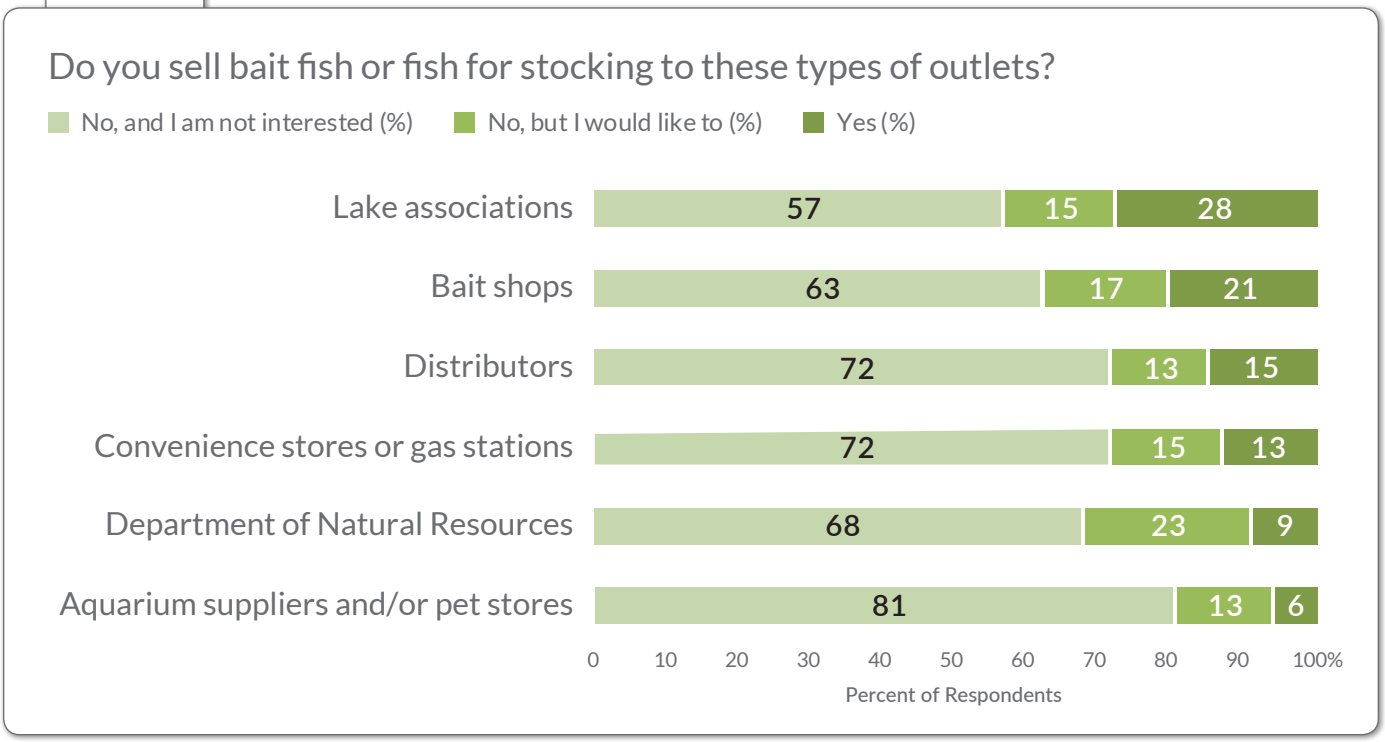
Respondents were also asked where they sold live fish for stocking. Figure 5 shows that roughly 28% of respondents reported selling fish for stocking to lake associations, which is the most common outlet. With over 600 lake associations currently in the state, we expect there to be a continuing demand for stocking farm-raised fish.

At 21%, the next most popular outlet for selling live fish was bait shops. Aquarium suppliers and/or pet stores and the Wisconsin Department of Natural Resources (WDNR) were the least used. However, the WDNR topped the list in terms of the potential to become a popular outlet for selling live fish for stocking. The largest proportion of Wisconsin fish farmers, 23%, expressed an interest in selling their fish to the WDNR if they were not already doing so.

Chris Hartleb

Outlets for selling fish directly to consumers (other than farmers markets) are the most popular among producers.

FIGURE 5



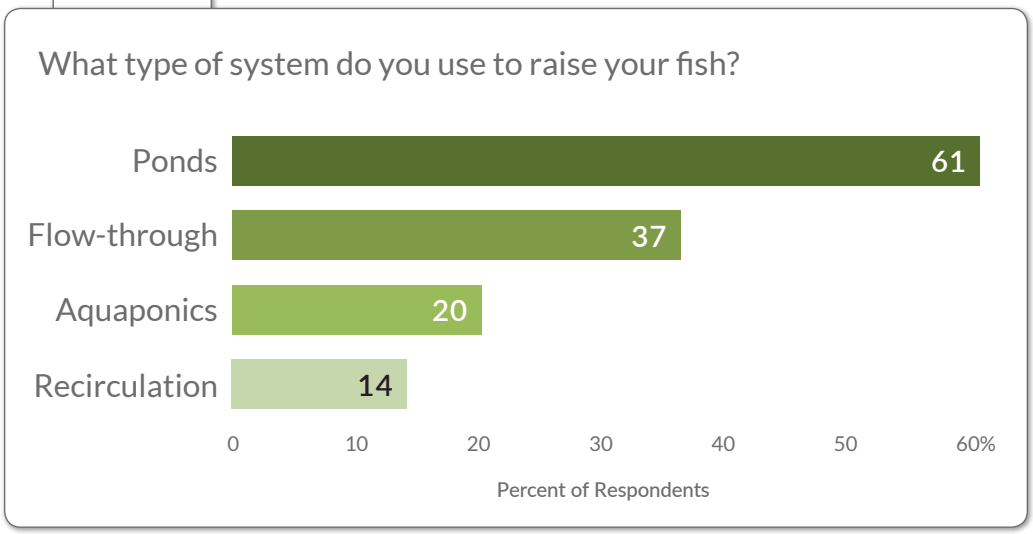
Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

To install, use, or manage more complex aquaculture systems such as aquaponics or recirculation, fish farmers may need training and technical assistance.

MOST RESPONDENTS USE PONDS TO RAISE FISH

Figure 6 shows that ponds were the most common system used for fish farming, as 61% of respondents used this type of system. Flow-through was the next most popular system, with 37% of respondents reporting using it. Aquaponics (20%) and recirculation systems (14%) were the least used. To install, use, or manage more complex aquaculture systems such as aquaponics or recirculation, fish farmers may need training and technical assistance.

FIGURE 6



Respondents could choose more than one option. Thus, the numbers do not necessarily add up to 100% percent vertically.

Emma Wiermaa/UWSP-NADF

Ponds are the most common system used for fish farming.

RAINBOW TROUT IS THE TOP SPECIES RAISED FOR FOOD

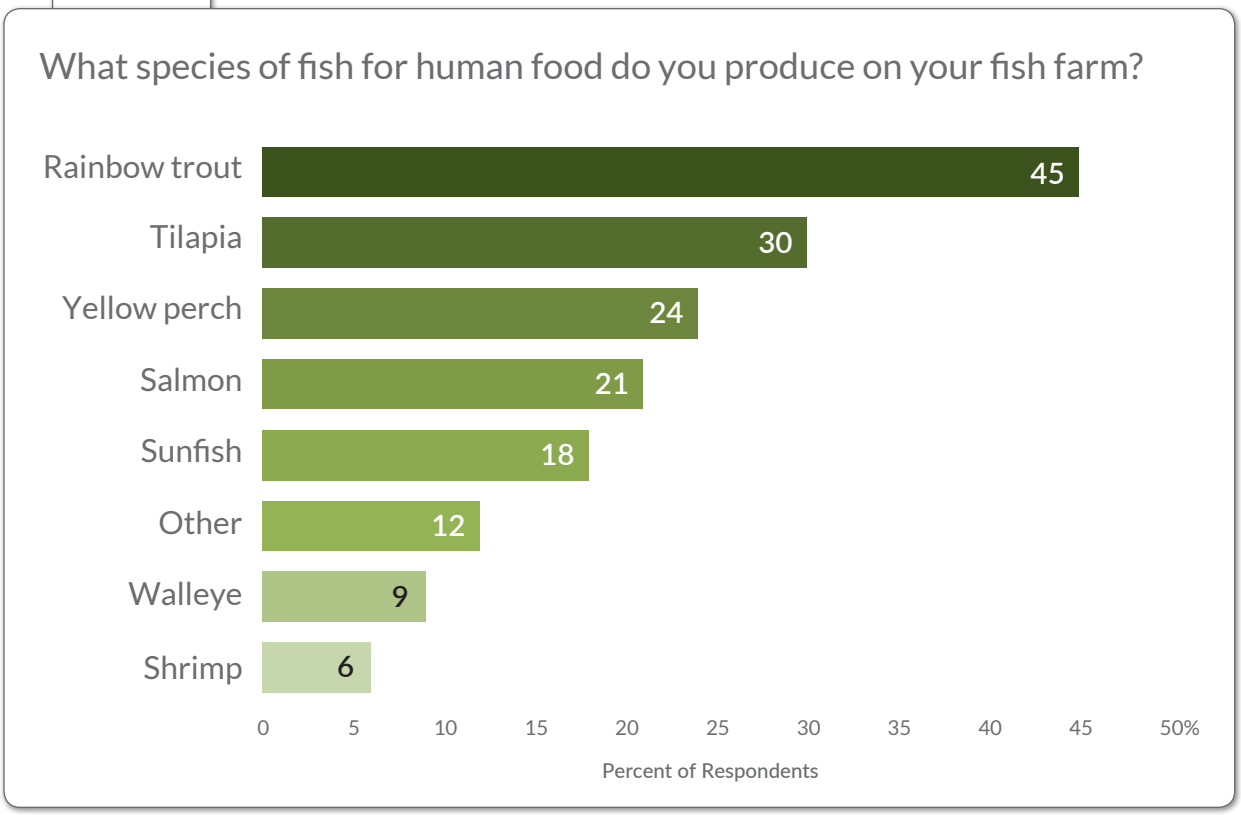
Respondents were asked what species of fish for human food they raised on their farms (Figure 7). Rainbow trout appeared to be the most commonly raised species of fish in Wisconsin, with nearly half (45%) of all respondents reporting raising it.

Second to rainbow trout was tilapia, which is commonly used in aquaponics, with nearly one third (30%) of respondents reporting they raised tilapia for human consumption. The next most common species were yellow perch (24%), salmon (21%), and sunfish (18%). Towards the bottom of the species list was walleye with 9% of respondents saying they raised this species of food fish, followed by 6% stating that they raised shrimp for human consumption. Other species including catfish, bluegill, brown trout, and crappie were raised sporadically on Wisconsin fish farms, and approximately 12% of respondents indicated they raised some other species of fish not listed in the survey.

Jozef Sowa/Shutterstock.com

Rainbow trout is the most commonly raised species of fish in Wisconsin.

FIGURE 7



Respondents could choose more than one option. Thus, the numbers do not necessarily add up to 100% percent vertically.

David Nevala/Wisconsin Sea Grant

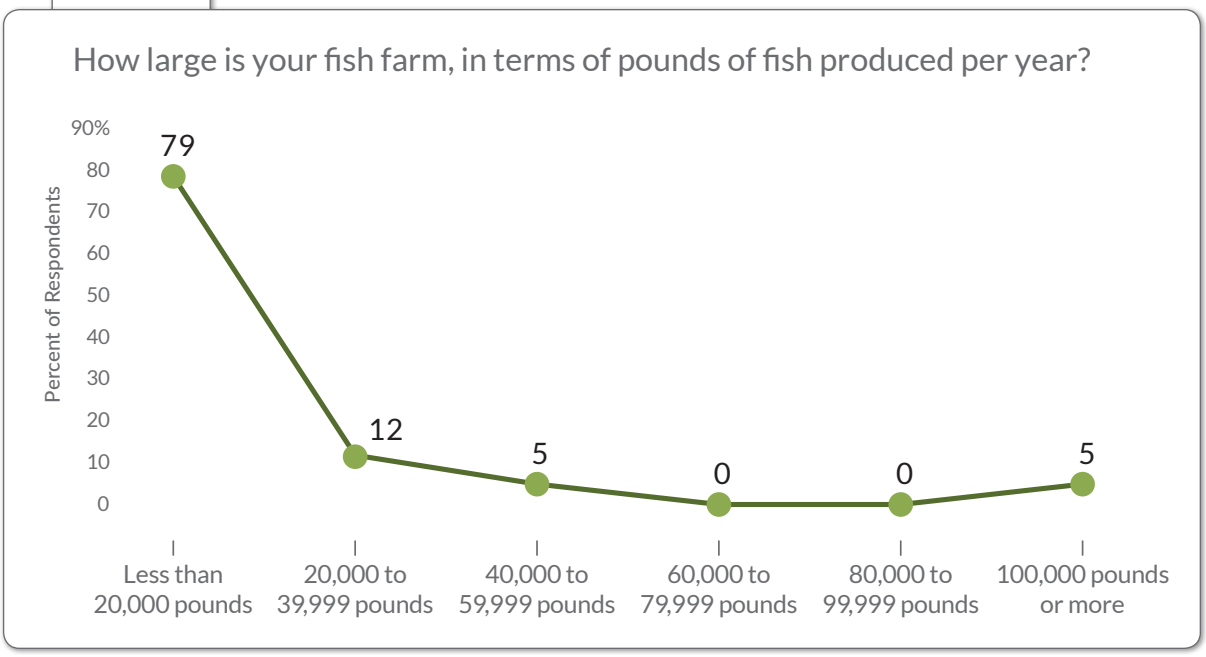
For most fish farmers, fish processing is not part of their businesses, but many are interested in selling to processing companies.

MAJORITY OF WISCONSIN FISH FARMS ARE SMALL OPERATIONS

Trade associations, policymakers, and other stakeholders seeking to promote further growth of the Wisconsin aquaculture industry should consider the importance of supporting small fish farm businesses, as these constitute the bulk of the industry in the state. Wisconsin's aquaculture food fish industry has much room for growth, and our data find that most fish farms in Wisconsin are small businesses in terms of pounds of fish produced per year. Figure 8 shows that an overwhelming 79% of respondents operated farms that produced less than 20,000 pounds of fish yearly. As the size of the business increases, the percentage of fish farms decreases. Only about 12% of respondents said their fish farm businesses produced 20,000 to 39,999 pounds of fish annually, followed by a distant 5% of respondents stating that their fish farms produced 40,000 to 59,999 pounds of fish per year. A notable gap between farms of small-to-moderate scale and farms of very large scale was observed, as none of the respondents fell within the range of 60,000 to 99,999 pounds of annual production. Only a fraction (5%) of respondents reported running businesses that produced 100,000 pounds of fish or more per year.

To better understand fish farming operations in Wisconsin, we asked respondents whether fish processing was part of their businesses. For most respondents (70%), fish processing was not part of their businesses, while 23% of respondents reported fish processing was a component of their businesses, and 6% indicated that fish processing was not an applicable option.

FIGURE 8



Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

Business Strengths, Constraints, Regulation, & Policy

RESPONDENTS SEE STRENGTHS OF THEIR BUSINESSES

Wisconsin fish farmers view their businesses as environmentally sustainable. There is broad agreement about this (83%), as shown in Figure 9. This is a positive sign for the industry, as environmental practices may help increase the appeal of local farm-raised fish among some consumer groups and/or help the industry garner support through public policy.

Communicating about their environmentally friendly practices and other issues, however, may be an obstacle for fish farmers. Many were neutral about the effectiveness of their communication with policymakers (52%) and the public (38%). This suggests that the Wisconsin Aquaculture Association's role in building relationships with policymakers in Wisconsin is important. This also suggests that fish farmers might benefit from connecting with and informing local representatives about the aquaculture practices of their district. The overall communications effort could include education and outreach to help people learn about aquaculture in Wisconsin.

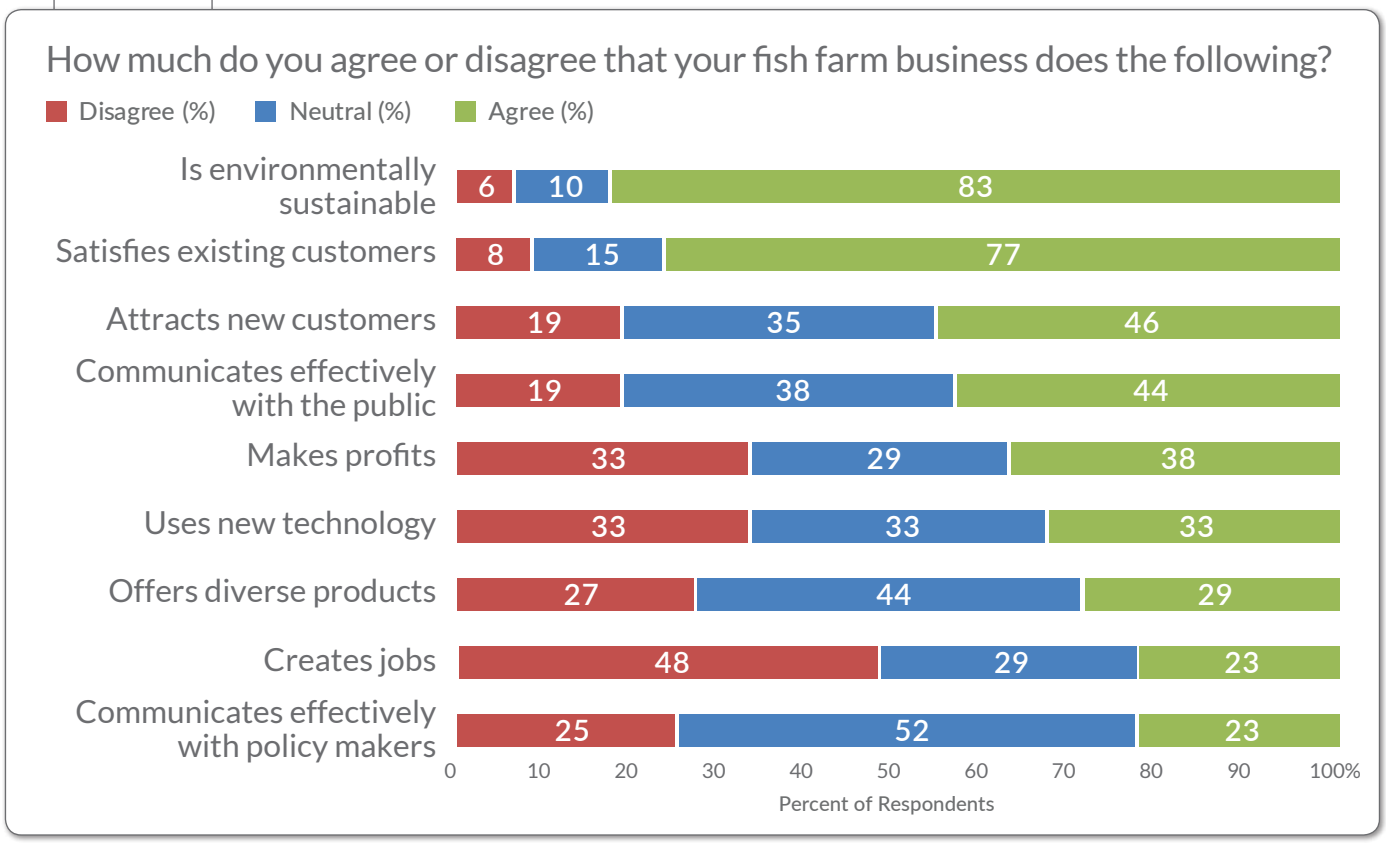
When it comes to existing customers, fish farmers saw another strength. Most agreed that they were able to satisfy existing customers (77%). About half of the respondents agreed that their fish farm businesses attracted new customers (46%). This is a positive sign but also signals room for growth, as many respondents (35%) were neutral about

Emma Wiermaa/UWSP-NADF

Most fish farmers believe that their businesses are environmentally sustainable.

Many were neutral about the effectiveness of their communication with policymakers and the public.

FIGURE 9



Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

Wuttichai Jantarak/Shutterstock.com

The high cost of fish feed and other inputs is a financial burden to most fish farms.

their ability to attract new customers. Other areas for growth include improving profitability, using new technology, diversifying product offerings, and creating more jobs, as fewer than 40% of respondents agreed with each of those categories.

INPUT AND REGULATION COSTS ARE THE LARGEST CONSTRAINTS

To fully understand constraints on the Wisconsin aquaculture industry, we asked respondents how various factors negatively affected their fish farm businesses. These potential constraints were categorized into four groups on the survey: "cost of inputs" (Figure 10), "regulation" (Figure 11), "marketing and distribution" (Figure 12), "competition" (Figure 13), and "other factors" including fish diseases.

Overall, factors related to cost of inputs appeared to be the biggest constraints on the aquaculture industry with the majority of respondents agreeing that cost of utilities (63%), cost of fish feed (58%), and cost of complying with regulations (54%) negatively affected their fish farm businesses (Figure 10). In fact, respondents estimated a median of $600 spent by their fish farms on complying with regulations in 2017. Costs aside, farmers still felt regulation as a whole constituted a large constraint on the industry (Figure 11), with about half or more respondents agreeing that the risk of changing regulations (58%) and difficulty understanding regulations (45%) adversely impacted their fish farms. Though regulation is important to helping the industry grow in a

FIGURE 10

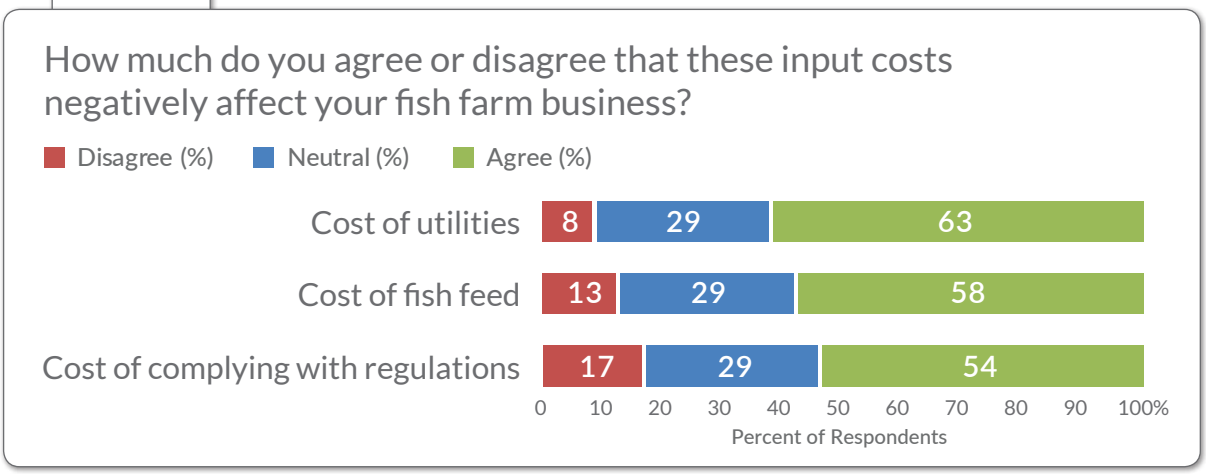
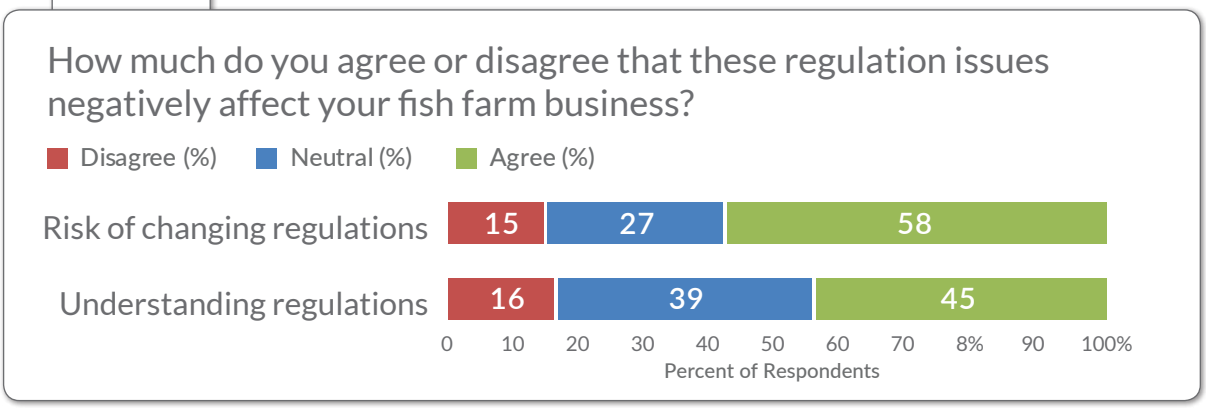


FIGURE 11



Numbers in both charts may not add up to exactly 100% due to rounding to the nearest whole number.

way that is safe for human health and the environment, making compliance less labor-intensive and easier to understand should be a priority.

Notably, more respondents expressed a neutral position about the negative influence of factors related to marketing and distribution (Figure 12) and to competition (Figure 13). Fish diseases were considered to be the least important threat to the industry with 51% of respondents disagreeing and only 15% agreeing that their fish farms were negatively affected by disease. A few respondents identified natural predators such as birds on their farms as a threat to their businesses. Additional limitations identified by respondents included interstate trade barriers, poor agricultural practices affecting their sources of water, lack of knowledgeable labor force, lack of professional training resources for fish farmers, water level fluctuation, lack of processors, lack of research on promoting domestic species, and cost of testing for health certificates.

Making compliance less labor-intensive and easier to understand should be a priority.

FIGURE 12

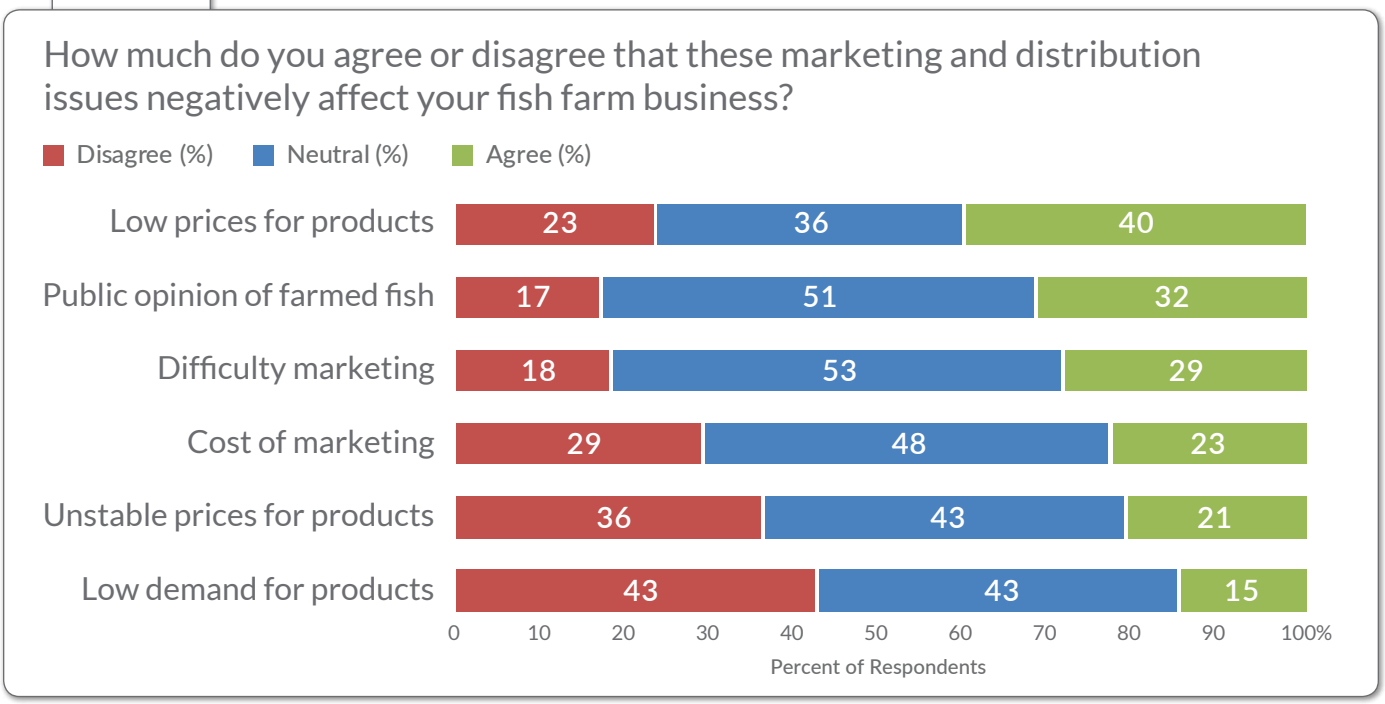
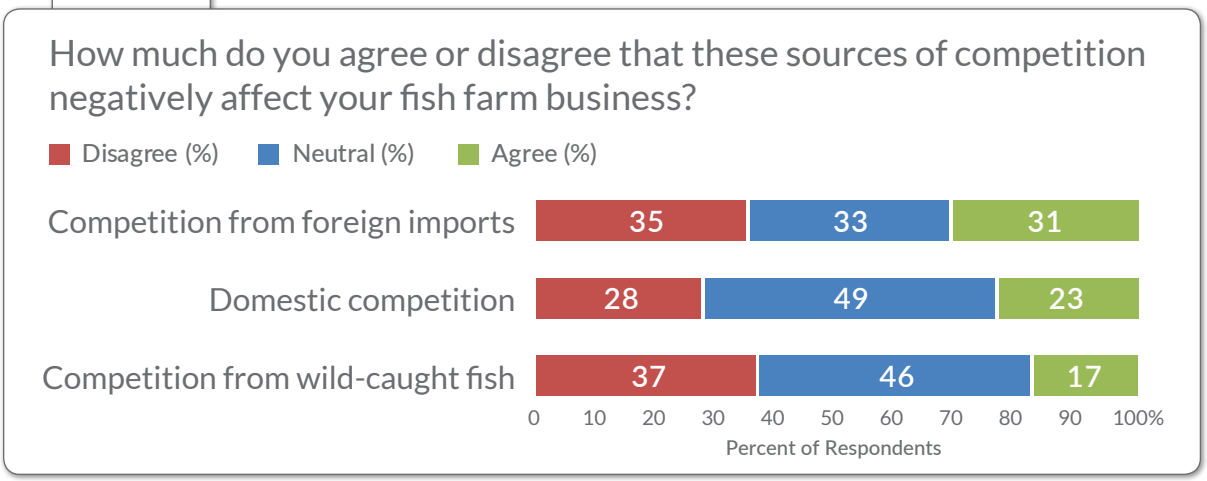


FIGURE 13



Numbers in both charts may not add up to exactly 100% due to rounding to the nearest whole number.

Slightly more fish farmers believed their production would increase rather than decrease in the next five years.

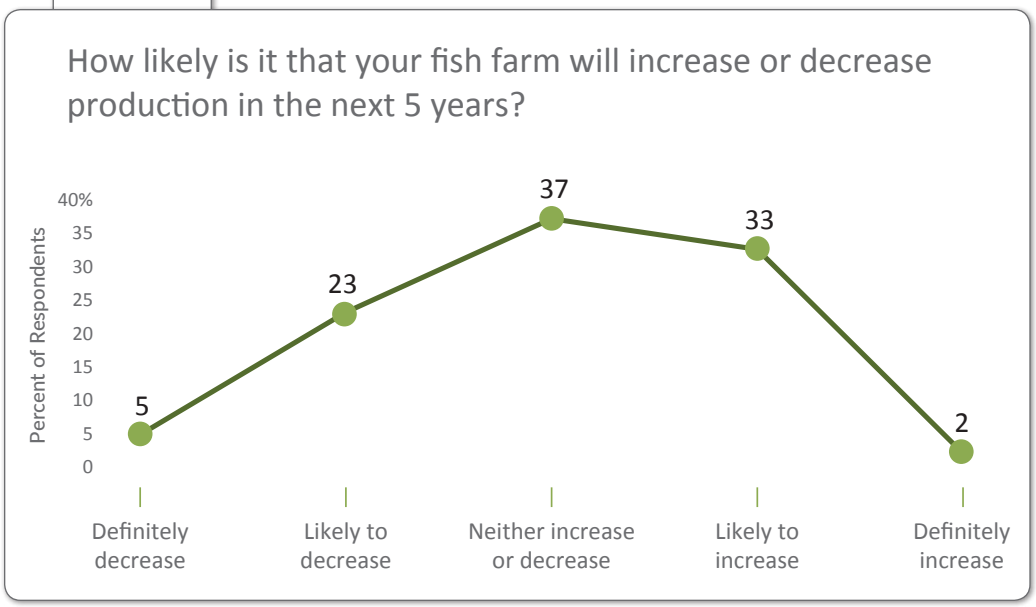
Anna Vel/Shutterstock.com

Farmers support increased industry- and government-sponsored research on fish farming.

PREDICTION OF GROWTH IN NEXT FIVE YEARS

Producers reported mixed perspectives on the outlook of their businesses. Although responses were fairly evenly split among the three conditions (Figure 14), the trend was slightly skewed toward increasing production versus decreasing, with 35% of respondents predicting their farms would be "likely to increase" or will "definitely increase" production in the next five years. On the other hand, 28% of respondents perceived their farms would decrease production in the next five years, and 37% expressed a neutral position.

FIGURE 14



Numbers may not add up to exactly 100% due to rounding to the nearest whole number.

RESPONDENTS FAVOR POLICIES TO INVEST IN THE INDUSTRY

Overall, respondents were highly in favor of policies that encourage more investment into the industry and were averse to policies posing greater regulation. As Figure 15 shows, 75% reported favoring tax breaks for fish farms using environmentally sustainable methods. About 65% of respondents favored industry-sponsored research, and 54% were in favor of government-sponsored research on aquaculture.

Meanwhile, most respondents opposed increasing fish farm regulations related to the environment (63%) and human health (58%). This opposition is likely because producers believe there are already adequate regulations to ensure that their farms are environmentally sustainable and their fish are safe to eat. These findings are supported by other data showing that fish farmers oppose expansion of regulations (Figure 16).

FIGURE 15

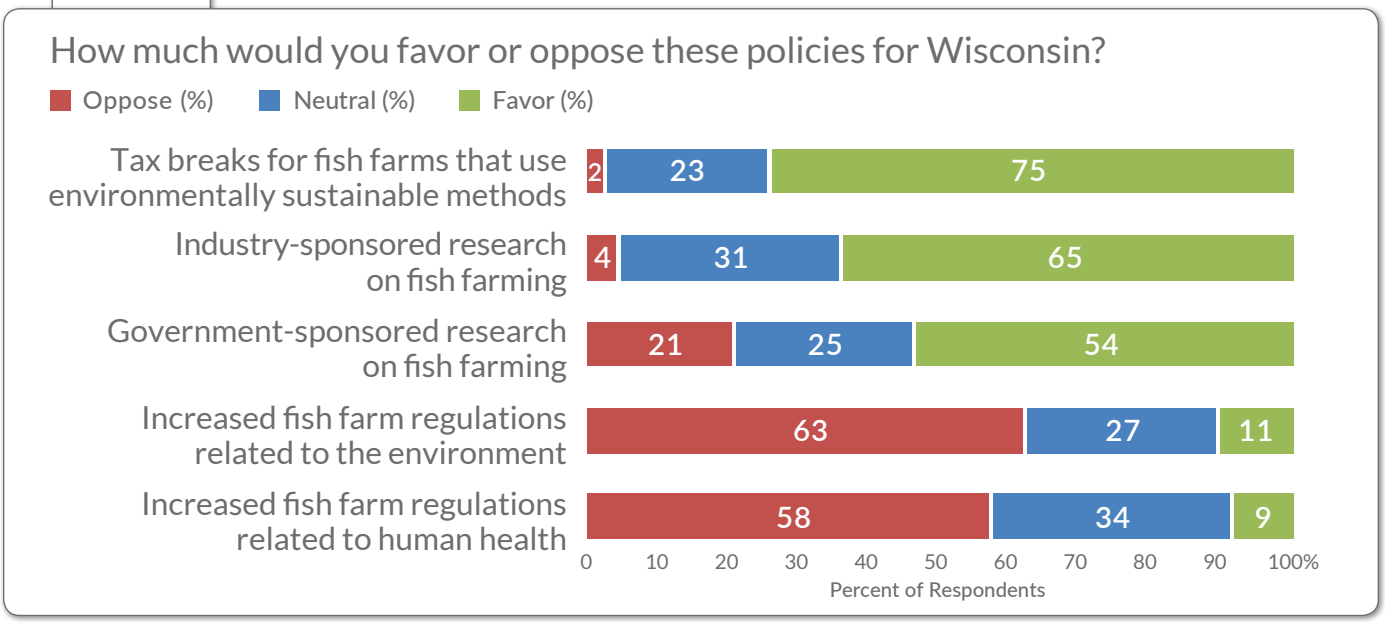
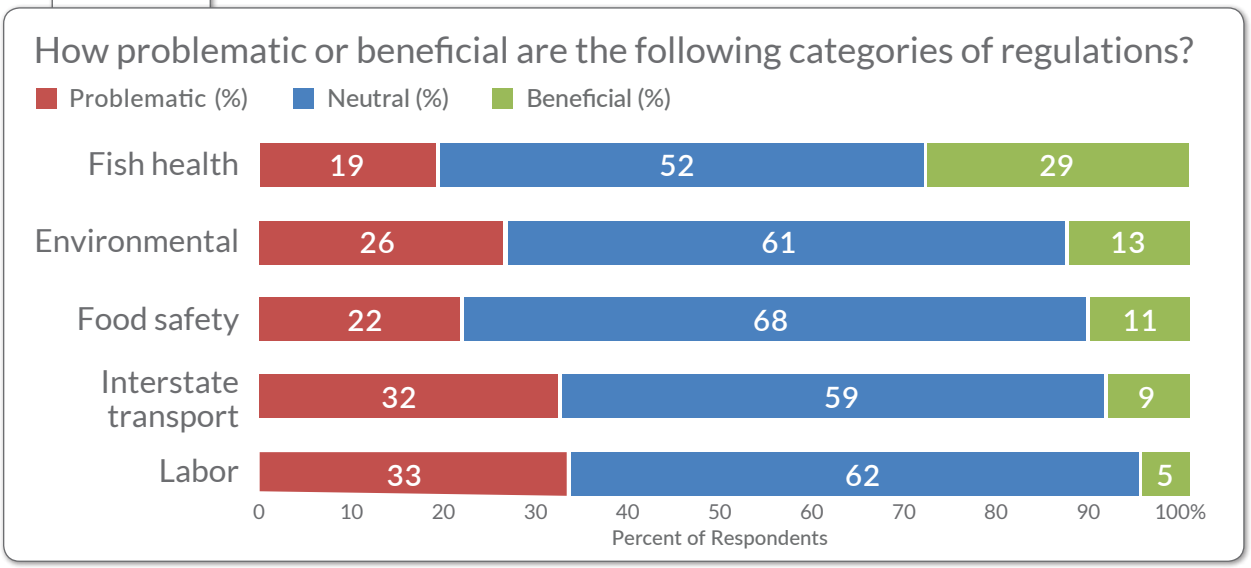


FIGURE 16



Numbers in both charts may not add up to exactly 100% due to rounding to the nearest whole number.

Sara Stathas/Wisconsin Sea Grant

Conclusions

This survey report seeks to provide an understanding of the Wisconsin aquaculture industry from the perspective of fish farmers in the state. A healthy and sustainable Wisconsin aquaculture industry is an important part of fostering a domestic supply of seafood and reducing the trade gap between imported and exported seafood while also offering the potential to improve rural economic development in the state. We hope that fish farmers, policymakers, and other stakeholders use this document to foster productive discussions and implement plans toward supporting these goals.

About the authors:

Shiyu Yang – Doctoral Student, Department of Life Sciences Communication, College of Agricultural & Life Sciences, University of Wisconsin–Madison

Bret Shaw – Associate Professor, Department of Life Sciences Communication and Environmental Communication Specialist, Division of Extension, University of Wisconsin–Madison

Laura Witzling – Assistant Professor, Greenlee School of Journalism and Communication, Iowa State University

Christopher Hartleb – Professor, Department of Biology and Director of Northern Aquaculture Demonstration Facility, University of Wisconsin–Stevens Point

Kristin Runge – Community Development Specialist, Division of Extension, University of Wisconsin–Madison

Deidre Peroff – Social Science Specialist, University of Wisconsin Sea Grant Institute, University of Wisconsin–Madison

Acknowledgments:

This work was funded by the University of Wisconsin Sea Grant Institute under grants from the National Sea Grant College Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and from the State of Wisconsin. Federal grant number NA180AR4170097, project number R/SFA17. In addition, we thank Titus Seilheimer, Tim Simonson, Myron Kebus, Simone Valle de Souza, Tim Campbell, Greg Fischer, Peter Fritsch, and Tim Winkel for reviewing our survey and providing valuable insight and expertise that greatly assisted the research. We also thank the Wisconsin Aquaculture Association for their support of the grant funding this project. We also thank David Trechter and the staff at the University of Wisconsin–River Falls Survey Research Center for reviewing and administering the survey. Finally, we wish to thank numerous others who provided valuable insight into this initiative.

Extension
UNIVERSITY OF WISCONSIN–MADISON

Sea Grant
University of Wisconsin

University of Wisconsin
Stevens Point

SPONSORED BY
UW–Madison Department of Life Sciences Communication