The Journal of Extension

Volume 62 | Number 4 Article 8

11-16-2024

Research Verification is Effective for Extension Programs in Aquaculture

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Recommended Citation

Roy, L. A., Kelly, A. M., Hanson, T. R., Dorman, L., Recsetar, M., & Quintero, H. (2024). Research Verification is Effective for Extension Programs in Aquaculture. *The Journal of Extension, 62*(4), Article 8. https://doi.org/10.34068/joe.62.04.08

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Cover Page Footnote

The authors would like to acknowledge the Alabama and Arkansas commercial catfish and baitfish producers that opened their farms for research verification projects. We would also like to acknowledge USDA NIFA Hatch projects ALA016-1-19053, ALA016-1-16018, and ALA016-1-19075. Finally, we would like to acknowledge Nathan Stone (University of Arkansas at Pine Bluff Cooperative Extension, retired), Matthew Smith (The Ohio State University Cooperative Extension), and David Heikes (Former Extension Aquaculture Specialist, University of Arkansas at Pine Bluff) for reviewing an early draft that contributed greatly to the quality and scope of the article.

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JOURNAL OF Extension Tools of the Trade Volume 62, Issue 4, 2024

Research Verification Is Effective for Extension Programs in Aquaculture

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Abstract. Extension professionals have used research verification programs to evaluate the effectiveness of research-based management recommendations in several different aquaculture species. In addition to providing a platform on which to examine current best management practices and Extension recommendations from Land Grant Universities, research verification is valuable in identifying gaps for further research. Perhaps the best benefit of research verification programs are the comradery and relationships developed between cooperating commercial producers and Extension personnel that can lay the groundwork to facilitate future collaborative efforts related to technology transfer in the aquaculture industry.

INTRODUCTION

Research verification in aquaculture is designed to demonstrate and test research-based, Extension-recommended practices on commercial aquatic animal farms. The premise mirrors verification programs in agriculture, which evaluate whether recommendations from land-grant Institutions (LGIs) are effective on row crop farms. Research verification trials were pioneered in Arkansas in 1980 to identify improvements and refinements in cotton production techniques (Robertson et al., 2021). Over time, these refinements led to documented increases in cotton yields, and additional verification programs were developed for soybean, rice, wheat, and corn (Robertson et al., 2021; Stark & Bryant, 2016). Extension specialists and agents use verification programs to identify future research needs, update Extension recommendations, and collect timely information, including production costs (Bott et al., 2015; Engle et al. 2004; Engle 2007; Hanson et al., 2020). Research verification programs in aquaculture were designed to aid commercial aquaculture producers, based on the success of these programs in traditional row crop agriculture, which are typically larger in scale and more widespread. In addition, research verification programs would apply to other agriculture sectors, such as terrestrial livestock, commercial horticulture, hydroponics, and aquaponics.

RESEARCH VERIFICATION IN AQUACULTURE

Along with on-farm demonstrations (MacGowan et al., 2018; Roy & Davis 2020), research verification is a tool used by Extension professionals to engage directly with stakeholders on commercial aquaculture farms (Mayeaux, 2010). The University of Arkansas at Pine Bluff pioneered research verification in aquaculture in 1993 with channel catfish, *Ictalurus punctatus*, and later developed a baitfish research verification program (Kaliba & Engle, 2005).

For research verification to occur, production research must be available for the culture system used by commercial farmers. This requirement is problematic in smaller sectors of aquaculture, new culture species, or novel production systems, where management recommendations are unavailable due to a lack of production research. Basic production research in aquaculture is no longer widespread at state LGIs, which now often focus programs on genetics, genomics, physiology, animal health, or other laboratory-based research by using aquaria or small

noncommercial-size culture systems as opposed to open ponds that are the most common production system on U.S. commercial farms. However, management recommendations are available in the literature for larger aquaculture sectors, such as catfish, baitfish, or trout industries, making research verification of these established practices valuable to the commercial aquaculture industry. Research verification projects should be funded appropriately, as the effort typically can involve time and travel for Extension personnel involved in the project.

Research verification involves many steps before implementation, as outlined in Engle et al. (2004). This publication by Engle et al. (2004) has served as a useful guideline document for the authors when planning and implementing research verification projects in aquaculture. First, Extension agents, specialists, and faculty on the verification committee must carefully and critically reexamine relevant literature to ensure that existing recommendations are viable and research-based. This step is often overlooked due to the incredible time commitment required. It can be a humbling experience, as the committee might find that recommendations historically offered to producers may have been based more on belief than on scientific evidence. Although time-consuming, this initial step is essential to the process.

The committee must then develop a protocol for which supporting research-based information is available. Verification protocols are typically created from relevant research-based literature (journal articles, textbooks, handbooks), Extension manuals and fact sheets, and published best management practices. The protocol should be extensively discussed and vetted by agents, specialists, and the verification committee. At this point in the project, an Extension agent or specialist is selected to serve as the primary project liaison between land-grant faculty and commercial producers throughout the life of the project.

Next, farmer cooperators are identified and selected. Selecting the best farmer cooperators for research verification protocols is crucial. Experienced agents and specialists are often aware of which farmers would serve as the best potential collaborators for a long-term project, such as research verification, which requires a significant time commitment from the farmers involved in the study. Extension personnel must meet with cooperators to make sure that they approve the protocol and discuss project expectations. The protocol must consider practical aspects of what is feasible and economical on commercial farms and should be routinely evaluated and updated by the verification committee to incorporate the latest research findings and results. Farmers who do not adhere to the protocol must be gently dropped from the program. The authors of this study have typically selected three or more cooperators for aquaculture verification studies. The size of the research verification trial is often governed by the availability of funding, Extension personnel, and other resources needed to complete the project.

Figure 1. In research verification on catfish farms, Extension personnel must meet the fish-hauling truck to sample fingerlings as they are stocked into commercial ponds.

Figure 2. A fish-feed truck distributes feed across a commercial catfish farm in Alabama. Research verification tracks feed inputs to calculate production cost at the end of the study.

Figure 3. Extension personnel must be present in aquaculture research verification at harvest events to sample fish and calculate size distribution at harvest. Harvest events can occur at all hours of the day and night.

Figure 4. Following harvest of commercial ponds, Extension personnel work with producers to obtain harvest weights and prices of fish sold to market to determine receipts for net-return calculations.

In aquaculture research verification, farmers commit to managing several ponds according to Extension recommendations in terms of stocking (Figure 1), feeding (Figure 2), algae management, water-quality management, and harvest (Figures 3 and 4). An active production-focused research program is needed to support verification efforts at LGIs. This program is valuable in testing research needs identified by on-farm verification and for anticipating future research needs.

Proper record-keeping is essential to track costs and determine profitability of management approaches. Because farmer records are imperative to any study's success, commercial producers must be willing to share farm records with Extension agents and specialists, including receipts related to fingerling purchases, feed costs, chemical inputs, labor, electricity related to pond-aerator use, fuel, harvest receipts, and other fixed and variable costs. Extension personnel agree to be present at stocking and harvesting events to sample fish. This time commitment can be massive, as commercial farms are operational at all hours of the day and night (sometimes even before 3:00 A.M.), and work often does not stop on weekends or holidays when university personnel are normally off work. Extension personnel typically sample water quality in ponds weekly throughout the study and collect data regarding feed, energy, and chemical use monthly. Collectively, these data are used to determine cost of production and compare the efficacy of Extension management recommendations. Typically, an Extension economist is included on the team to accurately determine the cost of production.

Following completion of the study, farmers can compare their historical farm records to the performance achieved by using Extension recommendations. This comparison often facilitates further adoption of management recommendations, not only on participating farms but across the region. Verification is a valuable tool for validating production-focused research programs at LGIs. The programs help researchers anticipate future research needs and forge strong relationships between producers, researchers, and Extension personnel.

CONCLUSION

Research verification programs have a proven track record, yet they are still not widely used by Extension practitioners in aquaculture. Many factors contribute to this situation; however, funding and lack of trained Extension personnel in aquaculture are perhaps the most pervasive. The diversity and constant evolution of culture species, production systems, and techniques within the aquaculture sector are problematic for Extension professionals seeking to provide timely recommendations to stakeholders requesting information. Unfortunately, the number of Extension full-time equivalents in aquaculture at LGIs is diminishing. Hence, fewer Extension professionals are available to carry out verification programs. Despite these challenges, research verification programs remain a valuable tool for Extension professionals in aquaculture to show that recommendations from state LGIs are applicable to commercial aquaculture. They provide agents, specialists, and Extension faculty an opportunity to work closely for an extended period with commercial producers, which can lead to future collaborations. Finally, research verification programs grant participating Extension practitioners and research faculty greater credibility because farmers know that these professionals really understand the realities of commercial production.

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