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Warm Water Fish Production as a Diversification Strategy for Arable Farmers

A Rural Economy and Land Use Programme research project investigating the potential for UK farmers to produce warm water fish as a niche market diversification strategy and its implications for sustainability and public health.

Policy and Practice Notes

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The Rural Economy and Land Use Programme is a UK-wide research programme carrying out interdisciplinary research on the multiple challenges facing rural areas. It is funded by the Economic and Social Research Council, the Biotechnology and Biological Sciences Research Council and the Natural Environment Research Council, with additional funding from the Scottish Government and the Department for Environment, Food and Rural Affairs.

The research explored the technical and marketing considerations surrounding the development of a small scale, warm water production system for growing the tropical fish tilapia as a diversification strategy for UK livestock and arable farmers. The system utilises on-farm resources and simplified technology which can be readily adopted as a sustainable and practical approach for farmers unfamiliar with fish production. The project explored niche market opportunities for tilapia, along with public health and sustainability implications, giving a better understanding of the challenges that face UK farmers.

Why should farmers raise tilapia?

Fish is being promoted as a healthy food but wild fish stocks are in decline and conventional fish farming in the UK has attracted criticism on environmental and welfare grounds. Tilapia has been farmed throughout Europe over the last decade with varying success. Previous operations have been large scale, capital intensive commercial ventures often proving not to be viable. The research thus focussed upon a small scale, adaptive approach with lower initial risk but incorporating scope to scale up production over time as markets and husbandry skills were developed. Warm water fish also offer the prospect of a "greener" production system".

What are the technical implications?

Farming tilapia may be daunting for the farmer who is inexperienced in this technology. The team looked at two systems currently in use: activated suspension technology (AST) which is based on retention and reuse of nutrients within the production system, and recirculating aquaculture systems (RAS) which remove nutrients through external filtration.

- AST systems, although offering some advantages in simplicity, potential for using locally grown feed and cost saving, were found to be less robust and efficient than the more conventional RAS for UK tilapia production.
- Economic analysis concluded that AST is not currently a commercially viable option for UK farmers, although both systems produced fish that scored well in terms of taste and welfare indicators.
- **A simplified, recirculating aquaculture system design is likely to be the more sustainable option for UK farmers with little prior experience in fish production.**

What are the environmental implications?

Fish farming in the UK has acquired a bad name in recent years on environmental grounds, but tilapia does not generally pose these kinds of problems.

- Biosecurity risks are lower in on-land, enclosed systems where the fish cannot escape.
- Tilapia do not migrate in the wild and thrive in dense groups so are well suited to this type of farming in welfare terms.
- The energy costs to maintain required temperatures for this warm water species are low. However, the energy required for operational purposes such as pumps and water engineering must be considered and must come from a reliable source as failure of the pumping system may be fatal for the fish.
- Analysis of the 'waste' or bacterial floc from both AST and RAS systems show that they could be useful as fertilizer.
- **Tilapia could be a "green", high-welfare option for consumers.**
- **Re-use of floc as fertiliser could add further sustainability and financial gains for small scale production of tilapia on UK farms.**

Who is likely to take up the option of producing tilapia?

The project identified a disparate range of motivational factors for engagement in diversification. At the core these spanned a continuum from "distress" to "success", but also incorporated features such as novelty, lifestyle, ideology and technical familiarity.

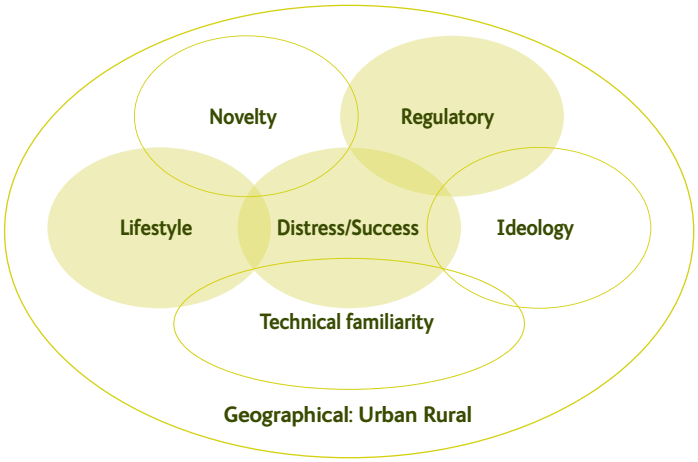
- Although the researchers had envisaged mainstream farmers as the main target, this kind of novel diversification seems to be particularly attractive to entrepreneurs who want to move from urban to rural lifestyles.
- Potential adopters who came forward during the project tended to have a technical focus, with many barely considering marketing or post-harvest options.
- Conversely the farmers who did consider marketing aspects to be of importance, tended to overlook the technical requirements and the health, safety and hygiene implications of post harvest activities.
- **Farmers need a rounded understanding of the factors involved in raising and marketing tilapia if they are to succeed.**
- **The potential urban markets for tilapia, and the small area required to set up farms, also open up the potential for peri-urban developments.**

What markets could farmers exploit?

Consideration of the markets is vital for potential producers of tilapia when taking a decision on whether to proceed with this investment.

- Market testing indicates a demand for fresh, locally produced high quality tilapia. The products currently available tend to be imported and often frozen.
- The relatively small scale of production will favour outlets catering for diners willing to pay higher prices for high quality, more unusual options. Therefore ethnic and speciality restaurants, particularly those making a feature of fish dishes, fishmongers and fish markets in both rural and urban locations, and online fishmongers hold potential for locally produced, fresh tilapia.
- Farmers markets and farm shops may also provide some scope to reach target consumers, but the requirements to build and maintain a customer base at farmers' markets may be demanding for small producers.
- **Farm gate prices for domestically produced tilapia will vary greatly, depending on the market characteristics. This has strong financial implications for the viability of the small scale production model, which is extremely price sensitive.**
- **Farmers should invest time in seeking out and exploiting high value niche opportunities.**
- **Supermarkets may provide a regular basic return for growers, if they are producing at a large enough scale.**
- **UK niche markets, primarily ethnic consumers, green and health conscious consumers and the higher priced end of the food service industry are likely to be the most fruitful.**
- **Organic certification for tilapia as a means to adding value and attracting consumers is not as important as other indicators. Consumers and high-end food service operators are more interested in quality and freshness that local products can provide.**

What motivates tilapia-based diversification?



What changes could help them to take up this option?

No environmental health impact assessments exist for farmed fish or indeed for fishing in the UK and beyond. Consumers need more information about the potential health, as well as the environmental impacts of farming fish.

- Consumers receive a lot of information about healthy diets but this is often contradictory, particularly regarding what options are "green". This applies to information about the health benefits of eating fish and whether farmed fish can be a "green" option. Even different sorts of "eco-labelling" can be confusing.
- Although the importance of multidisciplinary research has been recognised, this needs to be followed through in government incentives and funding opportunities. For example SCORE (SME Collaborative Research) funding from the Scottish Government aims to encourage commercial and academic cooperation in research and development, yet is only concerned with production trials, without including the market assessment which is a fundamental requirement for any commercial investment decision.

- **Data generated by this study provide a basis for developing environmental health and wider public health impact assessment tools.**
- **Consumers need to be more clearly and effectively informed on the full spectrum of issues involved in farming and eating fish.**
- **Research and development investment must include market analysis and assessment of profitability**

Agricultural and fisheries policies are not integrated, which is problematic for grant funding, especially for onshore fish farming.

- The policies applied to tilapia farming tend to be those of fisheries regulation when, in some instances, incorporation with agriculture could be more logical.
- Currently, no agency is charged with responsibility for providing comprehensive, validated and joined-up information on land-based fish production. This makes it difficult and time-consuming to access information. Enquiries addressed to environmental and health agencies tend to result in piecemeal, often conflicting, answers that do not tend to promote enthusiasm for this type of diversification.

- **Agricultural and fisheries policies should be integrated to encourage this type of land-based aquaculture.**
- **There should be better and more joined-up provision of information, with a single agency taking the lead.**

Is the research more widely applicable to diversification strategies?

The research has provided some evidence more widely applicable to novel diversification opportunities.

- When making decisions regarding diversification options some farmers prefer a larger scale investment rather than an incremental approach even though this could reduce the risk.
- Poor access to information and an inadequate knowledge base restricts informed decision making regarding diversification options.

- **There is potential for novel diversification that could be undertaken incrementally, alongside mainstream farming, and this could help to reduce risk.**
- **More information on the range of options available would be helpful for farmers.**

Further information

The research has been carried out at the University of Stirling
Key contact:
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Useful resources:
Project website:
www.aqua.stir.ac.uk/Systems/tilapiaProject.htm

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