TECHNICAL BRIEF

August 2017
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Knowledge exchange on water resource management for improved integrated aquaculture farming systems

A Water Research Commission (WRC) study has been completed on the process of knowledge exchange to improve existing water resource management principles and practices, as well as creating a better opportunity for sustainability to both aquaculture and agriculture. The project included both small- and large-scale producers.

Background

This project is crucial to the development of the aquaculture sector in South Africa, but more in terms of promoting sustainable multi-utilisation of water resources. The project can present best management guidelines to ensure water resources are utilised and managed to stringent regulations, both for aquaculture and agriculture.

Ultimately, a holistic structure should be presented to the promotion and regulatory authorities whereby most concerns and challenges have been addressed through empirical and descriptive research and investigations. This knowledge exchange project is the third initiative with the WRC towards reaching the goal of sustainable water resource management by the aquaculture in conjunction with the agriculture sector in South Africa.

Method of knowledge exchange

The scope of the study covered fish farming operations in three provinces of South Africa, inter alia, Western Cape, (WC), KwaZulu-Natal (KZN) and Limpopo. The goal was to have in-depth discussions with fish farmers in order to gain an insight into the dynamics surrounding knowledge access, exchange, and the adoption thereof.

The common criteria considered for selecting the participants were: fish farmers with farms where the operation sites and the water sources are used for agricultural irrigation and aquaculture (i.e. fish farming) practices. The current practices and principles were investigated and evaluated to improve the overall management of water.

Investigating what information is available to farmers as local and captive knowledge

The first objective of fish farmer profiling included information on farmer demographics, and the availability of local and captive knowledge. In the WC, farmers are generally more organised with organisational support from a farmers' organisation and regular intervention from the public sector.

The KZN farmers are largely functioning independently, and leverage support from prominent electronic media and one-on-one consultation with prominent aquaculture experts in the industry.

The farmers in north-eastern Limpopo were mostly isolated and indicated a desperate need for assistance with training and intervention to improve and expand their ventures. Emerging farmers were the ones marginalised. Limpopo indicated a lack of support, especially once the farm is operational.

The challenge with the local knowledge systems is not the

abundance of resources, but more the comprehension and application thereof to improve operations. Although there is a myriad of information available on the internet, farmers are still sceptical about it and, in most instances, overwhelmed by the different way of doing things. In these cases, it was found that farmers opted for practices and systems which were demonstrated to them and shown to work.

Evaluating the sources and accessibility of information

The second objective of the project included the evaluation of sources and the accessibility of this information. It covered many related aspects which were considered during the investigation.

Fish farmers are using a range of technology modes to access information that are relevant for their operations, and do not use modes that are considered not to add value. The technology exchange techniques selected and implemented by the project provided valuable insight to the efficacy of such modes.

During the engagement with fish farmers, most of them raised specific concerns and problems they experience on the farm, such as low dissolved oxygen levels, sick fish, and the prevalence of predators. Although these problems were ***ad hoc,*** farmers usually want a rapid response in terms of receiving the relevant information and advice for them to act swiftly.

They also realise that they are dealing with live animals, which require immediate attention, and need to act to minimise losses. Therefore, irrespective of which technology exchange source is available or in use, fish farmers are calling for information on appropriate management to the current situation. The general input received is that the farmers would like to work with the authorities to improve communication.

A key learning from this study is the lack of regular visibility of government extension officers providing information or extension at farm level in all three provinces. In some instances, as in the Limpopo province it has created animosity between fish farmers and extension officers with no apparent solution in the short term.

However, it does present an opportunity to focus on technology modes that farmers currently value, while learning organisations are also granted the chance to play a role in capacity building if this technology mode is found to continue in the future. In the Limpopo province, there is an urgent need for technology exchange skills.

The most cost-effective short-term way to achieve this may be through the placement of post-graduate interns with farmers, the training of farmers in terms of financial management and market requirements, as well as support to encourage more contact sessions between farmers. Given that most fish farmers have internet access it might be of value to consider the option of exploring a voice or Short Message Service (SMS) as a technology mode.

Determining the level of interpretation associated with farming dynamics and context

The third objective of the project was to determine the level of interpretation that is associated with farming dynamics and context. Herewith the constraints to technology exchange, as experienced by the fish farmers, include a range of factors from those associated with lack of ICT (i.e. access to internet) to that of understanding the importance of regular monitoring and evaluation of the water quality on the farm to ensure the long-term sustainability of their fish farming operations.

Most of the farmers have trouble managing predation. Predators such as fish eagles, cormorants, frogs and otters hunt fish, resulting in great losses and damages to the systems. The farmers requested information sessions on the appropriate management and prevention of predation as some of these species are either threatened or protected by law.

Evaluating the impact of applied exchange technology

The fourth objective of the project was to determine the level of interpretation that is associated with farming dynamics and context. Most small-scale fish farmers in the Limpopo have limited access to reliable information regarding the use of improved technology and farming methods.

None of the farmers were informed about the importance of monitoring the water quality in their ponds. They also did not know how to determine it or owned any equipment to test their water.

Commercial farmers present a much better picture of the current status and future expectations. Most of the farmers are aware of the essential farming methods required to

achieve success.

Their technology requirements hinge on market intelligence to diversify products and procurements as well as source funding and investment to expand operations to meet critical economies of scale. The organisational support is also well structured and although there is a shortage in capacity at government organisations, there is a farmer support unit where emerging fish farmers can leverage information and assistance.

Creating a new set of instruction and learning material for academic and development practitioners

The fifth objective of the project included areas to create a new set of instructions and learning material for academics and development practitioners.

As part of the project a new training manual was developed. This training manual for fish farmers provides guidelines for dealing with water quality and improving the success of rainbow trout farming in net cage systems on irrigation dams.

Its aim is to provide a quick reference to procedures and practices for the farmer. Furthermore, it will contribute to the production of quality fish and the maintenance of environmental integrity.

The manual has been written to address aspects of farming that requires hands-on management, namely, site selection, operational procedures (e.g. water and feed management), monitoring and evaluation. It also gives the contact details of persons involved in the aquaculture sector who could assist with inquiries. Fish farmers have to strive to be proactive in management and apply better practices to avoid critical situations that might lead to inferior quality of production or huge fish mortalities. Such occurrences could have a negative effect on the viability of the operation.

Recommendations and future studies

The study concluded that knowledge exchange as encountered in WC, KZN and Limpopo is motivated and driven by several factors involving service delivery through government extension services, accessibility and affordability of ICT (specifically in rural Limpopo) and eventually the cost-benefit of using available information or purchasing specialised equipment to incorporate technical knowledge.

Although the scope of the study was limited to WC, KZN and Limpopo, keen interest was expressed by fish farmers in Mpumalanga and the Eastern Cape provinces to participate in similar studies. Hence, future work could engage these farmers to provide a more comprehensive overview of South Africa's footprint in freshwater aquaculture.

Therefore, the improvement of water resource management in agriculture-aquaculture farming systems is enhanced. It is recommended to focus on:

- The promotion of platforms which provide information for improved water resource management. This can be achieved by optimising the website and extension services to facilitate effective knowledge exchange.
- Monitoring and evaluation of the operational procedures at different farming levels by accounting the continuum of external factors affecting the use-and-loss of aquaculture principles and practices. This can be achieved by qualifying the usage and presenting guidelines to maintain and improve its usage.

The policy environment surrounding fish farmer support and assistance needs to be understood by fish farmers. This can be achieved through the incorporation of regular focus group discussions and smaller group workshops to improve communication and accountability to the farmers.

Related project:

Knowledge exchange on water resource management for improved integrated aquaculture farming systems (**Report No. TT 718/17**) and Training manual for small-scale rainbow trout farmers in net cage systems on irrigation dams with reference to production, fish health and water quality (**Report No. TT719/17**). Contact Publications at Tel: (012) 761 9300; Email: orders@wrc.org.za or Visit: www.wrc.org.za