February 2013
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.

TECHNICAL BRIEF

Aquaculture

A manual for rural freshwater aquaculture

A WRC-funded study developed a manual for rural freshwater aquaculture as part of a larger study on the development of participatory provincial aquaculture programmes for improved rural food security and livelihoods.

Fish farming

Aquaculture in sub-Saharan Africa has immense potential as a means of increasing food security, and the aim of this manual therefore is to provide information to prospective local fish farmers. In areas such as the Phillippines and Indonesia, China, Vietnam and Israel, aquaculture now produces a substantial and ever-increasing proportion of the fish consumed by their respective populations, together with a percentage that is exported to other countries.

Aquaculture should not be seen purely as a way of producing food. There are many forms of aquaculture that produce a marketable commodity that is not eaten, but sold for cash, that can in turn be used to purchase food. A flourishing example of this is the ornamental fish trade, where fish are produced for sale to the international pet trade. Another often ignored form of aquaculture is the production of quality seed for sale to other fish farms in the form of fingerlings.

Aquaculture *vs* land farming

If water is available to grow fish, aquaculture offers more choice than farming on land. This is because there is almost always a suitable species of fish that can be cultured in the available conditions. However, it is important that only species with requirements compatible with the region's environmental conditions are cultured.

Types of aquaculture

The practice of aquaculture varies widely and differs in the intensity of culture, level of water exchange and structures used, with each having its own set of benefits and problems. Aquaculture can be broadly grouped into the following three intensities namely:

Commercial trout fishing processing in Mpumalanga.

- ***Extensive*** using large stagnant ponds allowing only low stocking density and natural production to feed the animals with low management and skills input.
- ***Semi-intensive*** is a greater degree of intervention either through feeding and/or improvement of water quality through aeration and partial water exchange allowing an increase in the production of livestock. Management and skills input occur at a medium level.
- ***Intensive*** livestock are maintained at high stocking densities and introduced feeds. The culture systems tend to be highly technical but the space required is relatively small and the system is designed to optimise water use and quality. Management and skills input are high.

History and present status

Various government agencies promoted freshwater aquaculture (1960-80s) and well-equipped hatcheries were constructed in many parts of the country to supply fingerlings to both private and government projects. Only 3 out of 13 government hatcheries are still operating at reduced capacity and efficiency.

Most of the hatcheries and rural projects remain 'mothballed', with the basic infrastructure still remaining, the reasons being little planning and support, lacking of training in basic fish biology, husbandry skills and marketing and stock was randomly selected from locally available fish, with no attention to improved strains or selection for favourable traits such as fast growth or cold tolerance.

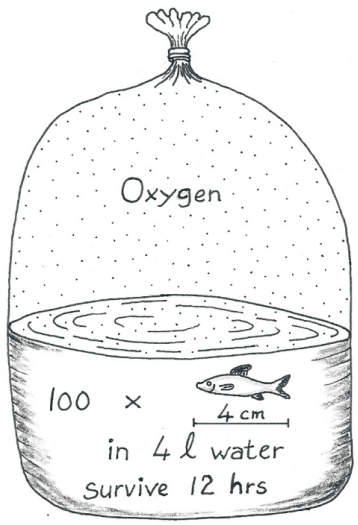
Purpose and development of manual

If these obstacles can be overcome then most of these facilities can be revitalised and made operational without starting from scratch. The purpose of this manual is to avoid the mistakes made in setting up or running these former projects and to guide interested parties along routes that, if followed, will ensure success.

An inclusive process to develop an aquaculture training manual for extension officers was followed and provincial branches of the Department of Agriculture, Forestry & Fisheries (DAFF) made inputs on the content and structure and drafts were sent to the department and other stakeholders for review.

Contents of manual

The user-friendly manual starts by introducing the reader to aquaculture, explaining the types of aquaculture, history and present status of freshwater aquaculture in South Africa. Throughout the manual matters of concern are further explained through most frequently asked questions.



An example of the illustrations found in the manual. This illustrates the best way to transport small fish.

The manual contains self-explanatory sketches, diagrams and photos, which enhance the usefulness of the manual to everybody who would be interested in aquaculture.

Information on fish biology are given followed by a discussion on aquaculture species and the selection of species, with in-depth descriptions of fish husbandry broodstock selection and maintenance of broodstock and breeding techniques of Sharptooth catfish or Barbel (*Clarias gariepinus*), Common carp (*Cyprinus carpio*), and other carp species, Tilapia (*Oreochromis mossambicus*), Rainbow trout (*Oncorhynchus mykiss*) as well as ornamental species.

Types of fish farms, ponds, cages and tank systems are discussed whilst descriptions of pond design and construction, tanks and raceways, cage culture of fish and types of cages and other technical aspects are further enhanced with visual material. This includes either sketches and /or photos of the structures that could be used.

Water quality and the parameters of good water quality are explained. This is followed by production, maintenance and management information with different alternatives.

Transporting, shipping and sizing, the importance of feeds and feeding that include energy and nutritional requirements of particular fish, the feeding habits, harvesting and preserving are extensively explained as well as the harvesting from the different breeding sites and the best preserving practices and methods.

Managing of fish health and diseases and treatment formed another important part of the manual.

Business and financial planning are considered with components of a business plan, financial planning and a checklist for compiling a simple business plan.

Implications

It is envisaged that this manual will continue to be modified and reviewed as aquaculture in South Africa grows in order to reflect the needs of the extension officers over time. The manual is not only intended for the training of extension officers, but is also resource material to be used in the field when interacting with farmers.

Further reading:
To obtain the report, *A Manual for Rural Freshwater Aquaculture* **(Report No: TT463/P/10),** contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; email: orders@wrc.org.za or visit: www.wrc.org.za to download a free copy.