

Stirling Aquaculture (STAQ) continues to support the aquaculture industry with its range of knowledge-based and project management services. As the front-office for the Aquaculture Technology Centre (ATC), it also plays a coordinating role in promoting the wider range of commercial services available from the Institute.

Jonathan Grubb, Senior Consultant and Project Manager with Stirling Aquaculture

Trout farming in Papua New Guinea (PNG)

PNG has an abundance of trout streams in the highlands, these are typically fast-flowing soft-water with rocky and stony riverbeds and clear water; and usually with no macrophyte growth. In the tropics, rivers at 1500m above sea level are within the range of 10-15 °C and drop as low as 7 °C in higher altitudes. In 1949 European settlers stocked these for game fishing and since then rainbow trout *Oncorhynchus mykiss* have successfully reproduced in the wild. Small releases of brown trout, *Salmo trutta* and brook trout, *Salvelinus fontinalis* were also introduced but without success. The first commercial trout farm emerged in 1973, yet since then production has been sporadic and the industry has struggled to get established. FAO data for trout production in PNG over this period reflects wild caught fish, as until recently there was no system of data reporting for freshwater fisheries. The first commercial units were reliant on imports of feed and ova that were paid for with a high valued Kina. When international exchange rates fell, imports became prohibitively expensive, the industry faltered and today only one farm is running commercially. Lake Pindi Yaundo Enterprise, also known as 'Betty's Place', built on the boundary of the Mount Wilhelm National Park, Simbu Province, started in 1993 and now produces sufficient ova for third party sales of fingerlings. From this, opportunities have risen for local smallholder farmers to grow trout in earth ponds (commonly 5m x 10m), which rarely produce more than 1 tonne. The difficult terrain determines pond shapes, which sometimes have to be built around boulders that are too large to move. Farms are built on water supplies that vary from small streams (flow rate of < 1m³ per min) to large rivers. A diverse range of water intake designs are employed, ranging from purely natural/bush materials to extensive use of concrete and PVC pipes. Some of the farms visited could be celebrated as organic excellence; stocking levels are low, presently there are no disease



problems, nearly all of the materials used are recyclable, chemicals are not used in the production cycle and the protein source in the feed is a by-product. Farming practices are often mixed with animal husbandry and coffee and banana plantings next to the ponds are aesthetically pleasing (see photograph) and attract insects for the trout to feed on. The University of Goroka is working with the Department of Primary Industry (DPI) to establish an organic certification board to endorse organic marketing in PNG.

Trout farming is supported at Government level as offering significant economic advantages for smallholders for whom diversifying from agriculture, which supports most Highlanders, is difficult. To further this policy, the PNG Department of Trade and Industry requested technical assistance from the Commonwealth Secretariat, who subsequently engaged STAQ to carry out a two-part study to identify the major constraints that the industry faces, and explore its potential and avenues to assist sustainable development. The initial visit to PNG was made by Jonathan Grubb in early 2002 and involved extensive travel within the country to meet farmers, feed producers, processors, education and training establishments and government officers. Jonathan returned in later in the year with

Professor Jimmy Young from the Department of Marketing to examine specific technical, nutritional, marketing and distribution issues that were identified during the first visit.

The embryonic trout industry faces a multitude of challenges, including a lack of human resource skills, problems in fingerling supply and availability, feed quality and cost, poor infrastructure, lack of financial resources, and difficulties with marketing and distribution. However it was considered that the technical issues that constrain current production are surmountable and the national market appears to have potential for growth, having suffered from irregular supply rather than any resistance to the product or market saturation per se. The National Fisheries Authority is tasked with co-ordinating the activities of freshwater fisheries development and about 60 field officers from the Department for Primary Industry (DPI) have been given rudimentary training in trout farming at Betty's under a technical assistance agreement with the Japanese International Co-operation Agency. Local DPI fisheries expert, Peter Minimulu, has gained funding from the British Council to attend the Institute of Aquaculture MSc. Course 2002/03. In PNG Peter plays a key advisory role in aquaculture development and has targeted his MSc.

thesis on a trout related issue. Increasing human resource skills through training and further education was highlighted in the study and it is hoped that other opportunities will be taken up.

As elsewhere, production cost is a key factor in determining the potential size of the industry, with the cost of feed proving especially significant in PNG, accounting for 80-90% of total cost. A local animal feed mill manufactures a basic trout diet to order, but farmers complained of poor fish performance against imported product. The team therefore looked at ways to improve the diet, aiming to satisfy nutrient requirements, minimise feed cost, and where possible utilise locally available ingredients. Samples of local feed and raw materials were processed and analysed at the Institute of Aquaculture, confirming them to be nutritionally deficient and unlikely to promote commercial growth rates. The low volume of feed required is a substantial disincentive to investment, and therefore maximising the use of imported feed seems to be the best alternative in the short term.

Whilst the national GDP is not drastically low (US\$2,367), 37% of the rural population is estimated to live below the poverty level. Migration between rural and urban areas is perpetuated by this inequality (average wages in the capital

are ten times higher than in rural areas). The Simbu Province is the poorest, in terms of natural resources, of the five provinces in the Highland Region and has less potential to achieve economic growth than the others. Within PNG there are over 750 tribal dialects, but 'Pidgin' is widely accepted as the national language. An interesting concept of co-operation that has both positive and negative benefits is deep-seated within the local culture. This is the 'Wantok system', where kinship dictates that help, physical or financial, must be given to kinsmen who request assistance.

The sights, sounds and people make this a rewarding country to work in. Over the next 3-5 years a practical strategy will be implemented encompassing government departments, provincial administrations, commercial organisations and educational establishments. Various models for sector organisation could be adopted; the promotion of "contract production" with linkages to distribution and marketing companies is an attractive option. STAQ looks forward to further opportunities to assist with this development, especially with inputs such as training and technical advice, perhaps involving both public and private sectors.

The study was led by Jonathan Grubb (STAQ) with specialist inputs from Jimmy



Young (Department of Marketing), Kim Jauncey (Nutritionist), Mark Jenner (Accountant), Stuart Bunting (Integrated Systems & Livelihood issues) Alison Graham (Research Assistant) and John Bostock (STAQ Manager). The project was funded by the Commonwealth Secretariat under the overall coordination of Semisi Fakahau.





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