Aquaculture without Frontiers 2003-2012: A Decade of Voluntary Service for the Poor in Developing Countries

Michael Bernard New

I introduced the concept of forming a voluntary organization to contribute to the alleviation of poverty through small-scale aquaculture during a keynote paper given at the World Aquaculture Society (WAS) conference in Salvador, Brazil in 2003 (New 2003). My idea was stimulated by reading about the activities of Médecins Sans Frontières (MSF) and two articles published in the Economist (Anonymous 2003a,b). I ventured the idea that people that had retired from a career in aquaculture might wish to volunteer their experience to help those less fortunate than themselves. In fact, I found that the idea of voluntary service in aquaculture appealed to a wide spectrum of individuals, from students to retirees.

Encouraged by this response, I asked some of my friends and colleagues (Table 1) to help me establish a mission statement and an initial strategy (Box 1) for our group, for which I had proposed

BOX 1. The principles and operational strategies of Aquaculture without Frontiers.

MISSION STATEMENT

Aquaculture without Frontiers is an independent non-profit organization that promotes and supports responsible and sustainable aquaculture in the alleviation of poverty by improving livelihoods in developing countries.

PRINCIPLES

Aquaculture without Frontiers will:

- Provide technical and managerial experience from individuals in the existing aquaculture community, utilizing all age strata, from students to retirees, as appropriate.
- Support responsible and sustainable aquaculture practices[4].
- Pay special attention to forms of aquaculture (and associated activities) that have the potential to alleviate poverty and improve health through the provision of 'home-grown' food and the enhancement of livelihoods.
- Recognize and support the role that women play in aquaculture and linked activities.
- Ensure that its activities are targeted at benefiting 'grass-root' farmers and SMEs[5].
- Be culturally sensitive, and non-discriminatory and non-aligned in religion and politics.
- Carry out projects that are carefully monitored and assessed for efficacy.
- Be transparent and accountable in its work.

AwF will be established as an independent 'stand alone' NGO, although one of its key principles will be to assist existing NGOs, which have a wealth of experience in developing countries. Cooperation need not necessarily be confined to NGOs that already include aquaculture in their portfolio of project work; those that use common resources will also be targeted.

OPERATIONAL STRATEGIES

Aquaculture without Frontiers will support aquaculture development for poverty alleviation through improving livelihoods in developing countries by:

- Promoting and introducing practical techniques for small-scale responsible aquaculture.
- Demonstrating appropriate technology for farm construction and operation, including responsible resource use and integration with other income and food generating activities.
- Assisting in product development for consumption and sale/marketing.
- Providing technical and management training for new and existing small-scale farmers, farm workers, extension workers, and agencies (including other NGOs) working to develop aquaculture.
- Increasing awareness of the importance of the aquatic environment, animal welfare, and the potential of aquaculture[6].
- Helping to build capacity for 'seed' supply.
- Promoting the development of micro-credit schemes to support the purchase of 'seed', and to assist women to establish aquaculture-based activities designed to provide additional family income.
- Recognizing the frequently landless state and lack of legal rights to water use of the economically poor by maximizing the potential of natural productivity.
- Wherever possible, avoiding ecosystem degradation by turning eutrophication into productivity.
- Working for long-term stability, not just short-term relief.

[4] FAO. 1995. Code of Conduct for Responsible Fisheries. Rome, FAO. 41p.; FAO, 1997. Aquaculture development. FAO Technical Guidelines for Responsible Fisheries. No. 5. Rome, FAO. 40p.; NACA/FAO, 2000. Aquaculture development beyond 2000: the Bangkok Declaration and Strategy. Conference on the Third Millennium, 20-25 February 2000, Bangkok, Thailand. Bangkok, NACA and Rome, FAO. 27p. [5] Small and Medium Enterprises. [6] For example, through small-scale demonstration projects in schools, from which harvested products could be sold and/or taken home (indirect education of parents).

TABLE 1. Founding members of Aquaculture without Frontiers.

Name	*Background (2003)*	*Location (2003)*
Geoff Allan	Past-president, international aquaculture society; aquaculture research scientist	Australia
Craig Browdy	Past-president, international aquaculture society; aquaculture professor	USA
Pedro Bueno	Director, aquaculture IGO (NACA)	Thailand
Manuel Carrillo	Aquaculture professor	Spain
John Cooksey	Executive director, international aquaculture society	USA
Claude Forthomme	Regional director, international aid agency (FAO)	Italy
Mauro Doimi	Aquaculture consultant	Italy
Dan Fegan	Aquaculture consultant	Thailand
John Halver*	Emeritus professor, aquaculture nutrition consultant	USA
Yves Harache	Director, government research station	Nouméa
Freddy Ib	Retired from feedstuff industry suppliers; consultant	Denmark
Narayanan Kutty	Retired from international aquaculture public sector; consultant	India
Denis Lacroix	Director, government aquaculture research station	France
Ricardo C. Martino	Aquaculture research scientist	Brazil
Deb Menasveta	Retired from international fisheries aid agency	Thailand
M.C. Nandeesha*	Aquaculture professor	India
Cornelia Nauen	Senior fisheries adviser, regional government (EC)	Belgium
Michael B. New	Retired from aquaculture public & private sectors; president and past-president, international aquaculture societies; consultant	UK
William Northcroft	Retired research scientist, food industry; marketing consultant	UK
Peter Prior*	Former managing director, fishing industry suppliers	UK
Roger Pullin	Retired from international fisheries/aquaculture research organization; environmental consultant biologist	Philippines
François René	Director, government aquaculture research station	France
Ziad Shehadeh*	Retired from aquaculture public sector; consultant	USA
Patrick Sorgeloos	Past-president, international aquaculture society; aquaculture professor	Belgium
Amos Tandler	Director, national aquaculture research organization	Israel
Wagner Valenti	Aquaculture research scientist; aquaculture professor	Brazil
Michel Vincke	Retired senior FAO aquaculturist	Belgium
Ulf Wijkstrom	Fisheries policy service chief, international aid agency (FAO)	Italy
Meryl Williams	Director, international fisheries & research organization (WorldFish Center)	Australia

** Now deceased*

the name Aquaculture without Frontiers (AwF). The development of our initial strategy enabled the launch of AwF during a special session at the WAS conference in Hawai'i in 2004. At the end of this session it was gratifying that one of our original supporters, Dallas Alston, 'passed round the hat', thus obtaining the very first donations from people who were not part of the founding group.

Management and Volunteers

AwF and AwF (UK) were registered as non-profit organizations in 2004. AwF (UK) was absorbed into AwF in 2012 and their remaining funds transferred to the latter's account in California. Many distinguished individuals have served as board members during the first decade (Table 2). All provided their time and energy to AwF as volunteers; it was this that enabled us to claim zero management costs – something very unusual for any charity organization. AwF projects were solicited through our website and reviewed by a voluntary technical advisory group chaired by AwF Director Geoff Allan (Table 3); only those projects meeting specific scientific and practical criteria were referred to board members for approval.

From the inception of AwF, we recruited volunteers who registered for field work. Some even came forward after my 2003 keynote paper in Brazil, before AwF was officially registered. The volunteer database was initially managed by myself, later by AwF board members Joe Tomasso and Dave Conley, and then with the assistance of Cormac O'Sullivan. AwF volunteers have served in a wide range of countries, including those with specific AwF field projects and those involved in the 'Farmer-to-Farmer' programs. Expertise from almost every scientific discipline in aquaculture quickly became available to AwF and the list includes many from the private sector. In 2008 there were 180 AwF volunteers in the database; by the end of 2012 this had grown to nearly 350.

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TABLE 2. Aquaculture without Frontiers Board members (2003-2012).

Name	*AwF*	*AwF (UK)*	*Location*
Geoffrey Allan	+	+	Australia
Charles (Sungchul) Bai	+		Korea
David Conley	+		Canada
John Cooksey	+	+	USA
Barry Costa Pierce*			USA
Pierre Erwes	+		France
Kevin Fitzsimmons*	+		USA
John Forster	+		USA
Lorrae Hayes		+	UK
David Little	+		UK
Kenny McCaffrey	+		UK
M.C. Nandeesha*	+		India
Michael New*	+	+	UK
William Northcroft		+	UK
Roy Palmer	+		Australia
Scott Peddie		+	UK
Jose Fernandez Polanco	+		Spain
Patrick Sorgeloos	+		Belgium
Shakuntala Thilsted	+		Malaysia
Joseph Tomasso	+		USA
Sophie Varley		+	UK
Patricia Moraes-Valenti	+		Brazil

** Served as Chairman*

TABLE 4. Funds administered by other organizations for Aquaculture without Frontiers.

Funding source	*Disbursing agent*	*US$*
European Aquaculture Society-AwF *(Nutreco student funding, Kenya)*	EAS	1,792
AwF-World Aquaculture Society-YSI funding *(Aceh tsunami relief)*	WAS	74,812
AwF-University of Arizona USAID Farmer to Farmer Program *(Program 1)*	UoA	97,528
AwF-University of Arizona USAID Farmer to Farmer Program *(Program 2)*	UoA	89,514
Total (US$)		263,646

TABLE 5. Aquaculture without Frontiers direct income and expenditure summary (2003-2012[1]).

Direct AwF income and expenditure

	Income	*Expenses*	*AwF project funding*
AwF [2]	93,058	17,996 [3]	29,814
AwF (UK)	88,260	1,853	70,191
Total AwF (US$)	181,318	19,849	100,005

[1] Data for AwF and AwF (UK) donations and expenditure are from 2003 to 31 May 2012 in US$.
[2] Registered in California
[3] Until 2010-2011 these were mainly bank and credit card expenses and filing fees. In 2011-2012 a part-time Executive Director received fees of US$ 12,000. No payments were made to other Directors between 2003 and May 2012.

TABLE 3. Aquaculture without Frontiers Technical Advisory Group (2003-2012).

Name	*Location*	*Current affiliation (December 2013)*
Geoff Allan (Chairman)	Australia	Executive Director, New South Wales Fisheries
Claude Boyd	USA	Professor, Auburn University
Craig Browdy	USA	Executive Manager Aquaculture Research, Novus International
Randall Brummett	USA	Senior Aquaculture Specialist, World Bank
Peter Edwards	Thailand	Emeritus Professor, Asian Institute of Technology
Kevin Fitzsimmons	USA	Professor, University of Arizona
Yves Harache	France	Retired Aquaculture Research Scientist, IFREMER
Anita Kelly	USA	Extension Fish Health Specialist, University of Arkansas at Pine Bluff
David Little	UK	Professor, Institute of Aquaculture, University of Stirling
M.C. Nandeesha	India	Dean, Tamil Nadu Fisheries University
Roger Pullin	Philippines	Fisheries Consultant
Sevaly Sen	Australia	Natural resource economics and management consultant
Patrick Sorgeloos	Belgium	Professor, University of Ghent
Meryl Williams	Malaysia	Formerly Director General, WorldFish Center

TABLE 6. Corporate and charitable donors to Aquaculture without Frontiers (2003-2012).

Organization	*Type*	*HQ Location*
American Fisheries Society (Fish Culture Section)	Society	USA
Aquacultural Engineering Society	Society	USA
Aquaculture Communications Group	Supplier	Canada
Aquatic Eco-Systems	Supplier	USA
Asian Fisheries Society	Society	Malaysia
Balanced Food	Supplier	Switzerland
Biomar	Supplier	UK
BIOMIN	Supplier	Austria
British Airways	Airline	UK
CP Prima	Supplier	Indonesia
Dell Computers	Supplier	UK
Essential Live Feeds	Supplier	USA
European Aquaculture Society (EAS)	Society	Belgium
Fjord Seafood Scotland Farming	Producer	UK
Groupe Québécois de Soutien à AwF	Staff charity	Canada
Gippsland Aquaculture Industry Network	Society	Australia
Houghton Springs Fish Farm	Producer	UK
Intervet International	Supplier	Netherlands
INVE Aquaculture	Supplier	Belgium
International Working Group on Crustacean Nutrition	Society	USA
Kerala Live Stock Development Board	Government	India
Kitchen Table Charities Trust	Charity	UK
Landcatch	Producer/ Supplier	UK
Laval University Department of Animal Sciences	University staff	Canada
Marine Harvest (Scotland)	Producer	UK
National Westminster Bank	AwF (UK) Bankers	UK
Novus International	Supplier	USA
Pan Fish (Scotland)	Producer	UK
Panhellenic Society of Technologists Ichthyologists	Society	Greece
Presbyterian churches in Crumlin, Dromore, Mountpottinger & Templepatrick	Church charity	UK
Prilabsa	Supplier	Brazil
"Prince of Wales" Public House	Bar & its customers	UK
Scottish Sea Farms	Producer	UK
Seafood Consulting Associates	Supplier	Thailand
Skretting Aquaculture Research Centre (Nutreco)	Staff charity	Norway
Society for Assistance to Fisherwomen	Charity	India
State Bank of Travancore	Bank	India
St. Dunstan's (RC) Parish, Bourne End	Church charity	UK
Toleo Foundation	Charity	USA
Trans World Aid (formerly Third World Aid)	Church charity	UK
University of Rhode Island/ Rhode Island Sea Grant Program	University/ government	USA
University of Stirling Staff Charities Fund	Staff charity	UK
Visaki Bio Marine	Supplier	India
Winrock International	Charity	USA
World Aquaculture Society (WAS) and its chapters (Asian Pacific; Korean; Latin American and Caribbean; USAS)	Society	USA
University of Ghent University students & staff	University	Belgium
Vet Aqua International	Supplier	Ireland
YSI Foundation	Supplier	USA

During the first ten years of AwF, funding came from multiple sources, including personal donations from AwF directors and their families and friends, and local fund-raising activities.

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FIGURE 1. *Aquaculture without Frontiers fundraising activities. (a) Abseiling in Belfast, Northern Ireland (Photo: Scott Peddie). (b) Art exhibition in Montpellier, France – the organizer Denis Lacroix is shown at left in photo with AwF founder Michael New (Photo: Denis Lacroix). (c) Dragon boat racing on the Thames in Marlow, England. (d) Street party in Marlow, England.*

Patronage

Thanks to one of our chairmen, the late M.C. Nandeesha, we are fortunate to have the patronage of Professor M.S. Swaminathan, FRS, who has been described by Time magazine as one of the twenty most influential Asians of the 20th Century, the only other Indians being Mahatma Gandhi and Rabindranath Tagore. Professor Swaminathan is widely regarded as the scientific leader of the green revolution.

Funding

From 2003 to 2012, AwF raised almost US$450,000 for its work. Nearly $264,000 was administered for AwF by other organizations (Table 4) and over $181,000 was donated to AwF directly (Table 5). All expenditures were destined for project work. Its only expenses were for registration fees, the submission of reports to charity and taxation authorities, and communications. Until mid-2012, management costs were zero – a claim that very few charities can make. These remarkable achievements were made possible by the generosity of its donors and the voluntary work of its directors, its technical advisory group and other supporters.

During the first ten years of AwF, funding came from multiple sources, including personal donations from AwF directors and their families and friends, and local fund-raising activities. Charities and corporate donors were also generous (Table 6). Many donations were in kind, rather than money, including the design and placement of our advertisements. The original advertisement contained a picture from David Little, who later became an AwF director. Further advertisements were designed by Peter Chettleburgh's team in Capamara Publications and are still being used. (See page 23 of this magazine.) Our advertisement campaigns cost us nothing. Many aquaculture magazines and internet sites kindly placed them without charge, including Aquaculture Europe, Aquaculture Asia Pacific, Aquafeed,

FIGURE 2. *Training session in India held by an AwF Chairman, the late Professor M.C. Nandeesha (far left) (Photo: M.C. Nandeesha).*

Aquafilia, Aquafin, Aquaculture Research, AquaTT, Eurofish, Fish Farming International, Fishing Chimes, Growfish (GAIN), Hatchery International, International Aquafeed, IntraFish, Northern Aquaculture, Panorama Acuicola, Panorama da Aquicultura, and World Aquaculture.

A very substantial proportion of our income was obtained by individuals who organized fund-raising activities for AwF (Fig. 1). These included abseiling in Northern Ireland; art exhibitions in France; birthday parties in England and Thailand; dragon boat racing, raffles, bar collections, Santa runs and street parties in England; and student activities in Brazil, Canada, the Czech Republic, India, and the USA.

Field Activities

The work of AwF between 2003 and 2012 was carried out in many countries in Asia-Pacific, Africa and Latin America.

Small-scale Aquaculture Projects

Small-scale projects funded by AwF are summarized in Table 7. Generally local partners were branches of international NGOs, such as Caritas and World Vision, and local NGOs. Some activities were joint projects with other organizations, including the Asian Institute of Technology and the WorldFish Center. Full details of all AwF projects can be found on its website (AwF 2013a); space limitations permit me only to provide a few details about three selected projects in India, Malawi and Nepal.

INDIA: Don Bosco Bishramganj projects

These projects were instigated by one of our founding members (and later an AwF Chairman), the late M. C. Nandeesha (Fig. 2), who had a special relationship with St. Xavier's Bishramganj Vocational Training Centre (Don Bosco Centre).

The original project (Phase 1) concerned the integration of aquaculture in watershed management programs to help very poor and marginal farmers that were cultivating rice, vegetables, potatoes and pineapples. All involved were from tribes such as the Debbarma, Riangs, Jamatia, Tripuri, Notia and Garos. Our aim was to improve their income and family nutrition and to create employment opportunities. At first, 30 poor families were chosen

FIGURE 3. *Aquaculture without Frontiers activities in Tripura, India. (a) The 'South Place Marlow Fish Hatchery'. (b, c) Project beneficiaries (Photos: M.C. Nandeesha).*

to work on this project; in each case both husband and wife were trained in fish culture over two days in a training center. Trained farmers then utilized their knowledge to renovate their own ponds, which had been used for water storage, wild fish capture and in

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TABLE 7. Summary of completed AwF field activities (2003-2012).

Location	*Project title or partner*	*Species & activity*	*Beneficiaries*	*Duration*
BANGLADESH	Caritas	Indian and other carp species; pond culture	14 families (86 members); emphasis on empowerment of women	1 year
	Rangpur Dinajpur Rural Service (RDRS)	Indian and other carps; pond culture	60 farmers and their families and four hatchery operators; also involved training for wider audience	4 years
	Voluntary Organization for Social Development (VOSD)	Tilapia; cage culture	35 rural women and their families	1 year
BURKINA FASO	Local charity	*Clarius gariepinus culture*	Not known	Advice by AwF volunteers
GHANA	Technoserve	Tilapia; cage & pond culture	Small farmers cooperative	E-mail and phone advice by AwF volunteer
HAITI	Dreamspan and Woods Hole Marine Biology Laboratory	Tilapia; pond culture	Small farmers cooperative	E-mail and phone advice and visit by recipients to AwF volunteer's laboratory
INDIA	Bishramganj Phase 1	Indian carps and other indigenous species; improved pond culture technology	30 tribal farmers and their families	1 year
	Bishramganj Phase 2	Continued the work of previous Phase 1 project within integrated watershed management program	30 original tribal farmers and their families, plus 20 more individuals	1 year Activities continuing using local funds
	Bishramganj Phase 3: South Place Marlow Hatchery	Continued earlier work and included 'South Place Marlow Fish Hatchery'	Established hatchery; provided training in seed production; promoted decentralized seed nursing; extended technology	2 years
	AwF- Toleo Foundation Sunderbans Project Joygopalpur Gram Vikash Kendra (JGVK)	Carp-mola; pond culture	Provided training for carp-mola pond culture (100 farmers and their families); made small hatchery; produced fingerlings	2 years
KENYA	Nutreco/Wageningen/ EAS student activity	Survey of aquaculture potential of Lake Naivasha region	Expected to result in the stablishment of hatchery	6 weeks
LIBERIA	FreeTown Orphanage	Tilapia and catfish; pond culture	Orphanage with desire to add fish pond	E-mail, phone and visit by donors to US-AwF volunteer's laboratory

TABLE 7, CONTINUED. Summary of completed AwF field activities (2003-2012).

Location	*Project title or partner*	*Species & activity*	*Beneficiaries*	*Duration*
MALAWI	WorldFish Center-Malawi	Improvement in fingerling availability and capacity building of small-scale fish farmers	Establish core group of fingerling producers and train 350 fish farmers in integrated aquaculture-agriculture	1 year
NEPAL	AwF Nepal Phase 1 Partnering AIT	Empowering women through aquaculture and vegetable gardening	Expansion of earlier AIT activities to new area; training; pond construction; production of fish and vegetables for home consumption; etc. 70 women & 300 direct beneficiaries	2 years
	AwF-Nepal Phase 2 Partnering AIT	Empowering women through aquaculture and vegetable gardening in the mid-hills of Nepal	Expansion of AwF-Nepal project with similar activities in a different location	2 years
PAPUA NEW GUINEA	ACIAR, etc.	Workshop	Training in small-scale poultry & aquafeed manufacturing	Participation by AwF Volunteer
PERU	INADERU	Technical advice	Poverty relief in Andean area	Provided by AwF Volunteer
THAILAND	World Vision	Course in fish breeding (tilapia and catfish)	Expansion of existing World Vision training activities to a new area of NE Thailand; included the provision of a farm-made feed manual in English & Thai	Activity coordinated by an AwF Director
	World Vision	Course on the production of low-cost fish feeds		

some cases the stocking of cultivated varieties of fish without resorting to proper aquaculture practices. Popular carp species and a few self-recruiting species were introduced to ensure sustainability. Integration of fish ponds with other agricultural activities was encouraged.

In Phase 2, our work was expanded to include a further twenty poor, tribal, Muslim (Bengali) and Hindu families. Farmers were given training and follow-up support and some essential inputs such as lime, fish seed and some chemical fertilizers. This enabled them to increase fish production from 500-600 kg/ka to more than 1,200-1,400 kg/ha. Besides fish culture, farmers were also assisted through an integrated approach to improve other farming activities, particularly the production of tuber crops and the supply of good breeds of poultry, pigs and mangos. The activity of farmers from the Bengali community was much greater than those from tribal groups. Some of the beneficiaries of AwF Bishramganj projects are shown in Figure 3.

Project farmers, whose numbers had by this time increased to 75, requested assistance in the production of quality fish seed. This led to Phase 3 of AwF assistance, the establishment of a hatchery to be managed with active participation of the community. Due to the personal fund-raising and keen interest of a particular street in England, the project participants named their new hatchery 'the South Place Marlow Fish Hatchery' (Fig. 3). The hatchery facilities became an additional resource for local youths involved in one-year integrated farming training programs run by the St. Xavier's Vocational Training Centre. These courses provide training in integrated agricultural activities and generally include 50 boys and 50 girls drawn from rural areas. They are generally school dropouts looking for some skills to earn their livelihood. The seed produced was supplied to entrepreneurial farmers within the project operational villages, encouraging them to engage in seed nursing and marketing. Through AwF support, students were also trained in ornamental fish production.

Detailed impacts of our intervention in Tripura through the three Bishramganj projects have been published (AwF 2013b). Surveys conducted by students of the Central Agricultural University College of Fisheries Tripura indicated that farmers were generally happy with the level of production achieved and other benefits received through AwF initiatives. A common hindrance was that they still could not afford any significant capital investment; how-

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BOX 2. Aquaculture without Frontiers Bishramganj Project: A case study.

Mr. Manoranjan Debbarma (42) comes from an agricultural background in paddy rice cultivation. However, he found it difficult to run a family of six through selling paddy alone, so he had to work as wage laborer in the neighborhood whenever it is off-season for paddy. His poor economic condition is reflected everywhere in his house. With only about 0.3 ha of paddy land, apart from a mud-walled house and a small tank, he has no other assets. His living conditions have changed over the last three years since he got in touch with AwF initiatives implemented through the St. Xavier's Vocational Centre. With inputs and technical help from the Centre, he has made significant efforts to improve his relatively unproductive pond, which is situated in a difficult elevation of land vulnerable to many externalities. During 2009 he was able to sell more than 80 kg of fish @ 80 INR/kg [US$ 1.28/kg] from his 0.16 ha pond, which is a large amount of money for him, besides obtaining fish for (family) consumption regularly from his pond. Like many other beneficiaries, he also expects further support from the Centre and desires to expand his aquaculture activities. *Source: AwF 2013b.*

BOX 3. Specific examples of benefits from the AwF-WorldFish Malawi project.

MR. GOODWELL OFFICE, SANTHE VILLAGE

Mr. Goodwell now owns four ponds with a total area of 1,168m2 from one small pond (400 m2) which he had before the project. As an evidence of the profitability of his ponds, Goodwell proudly says that this year (2013), he has so far earned MK 68,000 (US$ 184) from fingerling sales. He also harvested one pond and realized MK 38,000 (US$ 103) from 38 kg. He also uses the water to irrigate leafy vegetables, fruits and bananas.

PHINDU WOMEN'S FISH FARMING CLUB, NKHUMBA VILLAGE

The Phindu women's club still exists and operates its business as a group. The club's fish production has improved. The income from club ponds is over MK 40,000 (US$ 108). Apart from group ponds each member also owns fish ponds as individuals. They have also gone into a village loan savings and loan scheme. Women members contribute cash monthly to share as loans for promoting their small businesses at a lower interest rate compared to commercial banks and micro-finance organizations. The club is also growing vegetables from dimbas (pieces of land for winter cultivation).

BENJAMIN KADZOMBE, MTALI VILLAGE

Benjamin had seven small ponds before the project but fish yields were very low from poor management practices. With training from the AwF project on pond management and integration, Benjamin has improved yields and is now graduating to become a commercial farmer. He has enlarged ponds to 1,500 m2 each and structured his irrigation system to benefit fish farming and crops. He also keeps livestock that are a source of manure for fish ponds and crops. Benjamin now employs five laborers. Benjamin now calls for another AwF and WorldFish project to especially look at marketing, which he thinks is his biggest challenge.

THE SUCCESS STORY FOR OLIVE NJOLOMOLE

Life is now promising for Olive Njolomole, who has been struggling to raise three children, one of whom was born while she was at school. She dropped out of school just after she had started her third year at a secondary school. Nothing was working for her, being a young woman living with only her mother. Her father died several years ago while working in Lilongwe. Olive and her family went home to depend on farming as a coping mechanism. Back home her mother struggled to raise five children on her own. She started growing tobacco, the main cash crop of Malawi. Olive finally opted to marry a man who also depended on small-scale agriculture. Together Olive and her husband supplemented their income from agriculture by selling labor (ganyu) to nearby tobacco estates.

The introduction of "Sustaining famine mitigation through integrated aquaculture agriculture in Traditional Authority Mavwere," with support from AwF made Olive see another side of life. The project made hereconomically independent. "After I had attained my JCE, I tried to apply for several jobs but I could not be employed," lamented Olive, "but now with the IAA technologies that I have learned and the idea of taking fish farming as a business, I call myself now employed. I have two ponds; I am selling fingerlings to different farmers. On average, I earn Mk 12,000/month (~US$ 32/month) from fingerling sales and about MK 3,000 (~US$ 8/month) from table-sized fish. I also sometimes barter fish with anything. Recently I exchanged six table sized fish for a chicken. It was an egg laying chicken and it was worth Mk 1,500 (~US$4)". Olive has realized that indeed nature often offers people true hidden treasures in the form of plants or animals that can be useful in various ways. Fish, for example, are a source of cheap protein, be it to the young or the aged. She has used the income from fish to renovate her house. As part of experience sharing, Olive has turned out to be an extension worker who is helping fellow farmers voluntarily. She that says taking up the challenge of being an extension agent has helped her to learn different farming practices from different farmers. As iron sharpens iron she says this process is helping her to improve her integrated aquaculture agriculture practices.

Source: J. Nagoli and A. Chigere, personal communications, 2013

FIGURE 4. *AwF-WorldFish Malawi project impacts. (a) Children of a project beneficiary ready to eat tilapia. (b) On-farm training of lead farmers. (c, d) An integrated farm belonging to Mr. Goodwill Office (Photos: Joseph Nagoli).*

ever many farmers expected that good-quality larger seed made available through project activities would help them substantially. One example of the case studies reported is provided in Box 2.

MALAWI: AwF-WorldFish project

In Malawi, the number of pond aquaculture farmers grew by over 300 percent from about 2,000 in 1999 to about 6,000 by 2005. This resulted from implementation of the farmer-scientist research partnership approach, which increased technology transfer and increased NGO involvement in the dissemination of Integrated Aquaculture-Agriculture (IAA). However, aquaculture in Malawi was still very small and contributed only about 2 percent to total fish production.

One of the areas where IAA was introduced by the WorldFish Center was the Mavwere Area in Mchinji District. The initiative in this area had started in 2002 with very few farmers but increased to over 350 with over 500 ponds. Because of the large increase in numbers of farmers within a very short period, the availability of fingerlings and extension services had become limiting factors and new ponds were being stocked with slow-growing wild cichlids (*Haplochromis* spp.). Additionally the district had only one extension officer. A project was started to increase the availability of good-quality fingerlings and to institutionalize a reliable community-based extension service in the Mavwere Area.

In the joint AwF-WorldFish Center project, beneficiaries were provided with integrated fish farming training for growing tilapias with various vegetables, crops, poultry and livestock. The aim was to increase farmers' income, thus improving their financial status and well-being. Poor families were included because, in fish farming, total investments and risks were minimal. With improved fingerling quality and accessibility, coupled with a good extension services, the project hoped to increase average yield from 800-1,000 kg/ha/year to 2,500 kg/ha/year. The water surface was also capable of supporting a second production of more than 20 ha of the staple food maize, enough to feed 1,000 people for 4 months. The main goal of the program was to promote sustainable integrated aquaculture-agriculture to help local communities achieve the goal of reducing poverty, improving food security and nutritional status, and increasing household incomes. To achieve this overall objective, work was pursued in two main areas:

- Developing technologies for fingerling production and establishing a core group of fingerling producers among the 500 farmers that had adopted integrated aquaculture in the project area.

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FIGURE 5. *A husband and wife digging a pond as part of the Aquaculture without Frontiers project in Nepal (Photo: Ram Bhujel).*

• Building the capacity of small-scale farmers within a farmer-to-farmer extension concept to improve and sustain extension services at the local level.

Lead farmers in every village of the project area were identified and trained in basic aquaculture techniques, from pond construction to the production of marketable fish. They were also trained in extension delivery skills, including leadership and group dynamics. This arrangement formed the basis for more farmer organization for marketing of their fish and crop products.

The results of this project were remarkable:

• Twenty-one potential fingerling producers were originally identified but 38 eventually participated, producing 218,000 fingerlings.

• Two hundred thirteen new ponds were constructed, of which 152 were stocked with quality fingerlings by year-end.

• Twelve demonstrations were given by several farmers who conducted open field days. Farmers reported achieving tilapia production rates of 1,800-3,200 kg/ha, considerably greater than pre-project rates of 800-1,000 kg/ha.

• A brochure on best practice for quality fingerling production was developed.

• Seventy-one lead farmers were identified and trained in small-scale fish production.

• Two hundred seventy-eight farmers were trained in IAA methodology.

• Nearly 270 ponds were integrated with maize and vegetable production.

• The satisfaction of local demand for fingerlings led to the need for a fingerling marketing system to supply farmers beyond the Mavwere Area.

• An aquaculture production booklet in the Chichewa language was produced.

• A community-based monitoring and evaluation system was established.

Recently I asked the question "*Has our assistance been of lasting impact?*" and received the following response from Malawi[1]. *The availability of improved quality fingerlings has led to improved fish yields in the project area and areas around, a lasting impact greatly appreciated by the beneficiaries. Fish farmers used to catch fingerlings from rivers or recycle the fish which they had in their ponds. This had a negative effect on their fish as they never grew. The AwF helped to train specialized fingerling producers. Another important impact is the out-scaling of the project activities even after the project's life span. Communities around Mavwere and the Eastern Province of Zambia have copied the IAA examples and the empowerment approach through Community-Based Monitoring and Evaluation that the project instituted. The Department of Fisheries has identified the project area as a focal site for developing aquaculture under the Presidential Initiative on Aquaculture Development (PIAD). The department is now establishing a fish farming scheme; so far 15 ponds of 1 ha each have been constructed and given to a women's club for fish production.*

FIGURE 6. *AwF-AIT Nepal project activities. (a) Fry transport. (b) Hapa for nursing fry (Photos: Ram Bhujel).*

Some specific examples about the impact on project beneficiaries are given in Box 3 and illustrated in Figure 4. Olive Njolomole's story provides a thought-provoking example of the powerful effect that modest projects like ours can generate for individuals. Our training has not only provided her with a modest income and a career but also moved her into voluntary extension work – so much more valuable than one-shot food aid. Since the days when I worked in Thailand, I have always believed that the best form of extension is farmer-to-farmer observation.

FIGURE 7. *Difficult terrain for the AwF-AIT projects in Nepal. (a) A farmer and her pond with a scarecrow to frighten away fish-eating birds (Photo: Peter Edwards). (b) Fish fry being transported up a hill. (Photo: Ram Bhujel).*

NEPAL: AwF-AIT projects

The AwF-Nepal project was conducted in conjunction with the Asian Institute of Technology and the Institute of Agriculture and Animal Sciences (IAAS), Nepal. Phase 1 of the AwF-Nepal project was launched in Rainas Tar village of Lamjung, a district in the mid-hills (457.2-609.6 m elevation) of Nepal, and made tremendous impacts on the empowerment of women. Within two years, the project, with a small grant from AwF, had trained more than 70 women and constructed 70 new ponds (Fig. 5). In addition to producing over 500 kg of fish in two seasons through project activities, the project created tremendous awareness about small-scale fish farming among women and families in Lamjung (Fig. 6) and neighboring districts. There was huge interest and scope for small-scale rural aquaculture in these areas of Nepal. The final report of Phase 1 (AwF 2013c) concluded (*inter alia*) that, although the ponds constructed were quite small and the total production of fish was not large, the large proportion of production consumed by families (80 percent) indicated that ponds played a significant role in family nutrition. There were 300 direct beneficiaries in Phase 1 of this AwF project (Bhujel *et al*. 2013).

Phase 2 involved scaling-up the pilot project to two more villages in Lamjung and in two new districts (Gorkha and Kavre) (AwF 2013d). In the first year of project activities, 49 families were supported by forming three women's groups of 20, 15 and 14 families, respectively, in Gorkha (Putlikhet) and Lamjung (Chakratirtha and Dhamilikuwa) districts (AwF 2013e). In the first year of Phase 2, 49 ponds were constructed and 1,275 kg of fish valued at about US$ 3,600 were produced from 2.58 ha of ponds. This project showed that small family ponds with an average size <100 m^2 can produce over 40 kg of fish in a production cycle of about 8 months. Total production from Gorkha was more than double that from Chakratirtha and triple that of Dhamilikuwa. Families consumed quite a high proportion of fish produced; in Chakratirtha it was nearly 90 percent, whereas it was at least 60 percent in other locations. Mean fish consumption per family ranged from 5.6 kg in Dhamilikuwa to 25.8 kg in Gorkha. This demonstrated that a significant increase in production and consumption was possible by launching small-scale aquaculture. Within a year, family fish consumption increased to ~10 kg per capita (assuming 4 members per family) whereas the national average was <2 kg per capita. The project therefore showed good potential to fight malnutrition.

Another important aspect was the income generated from sales of surplus fish. By selling fish, families in Gorkha earned an average of about NR 2,600/family (US$ 26)/family), which was more than adequate to support the education of two children. The project represents a successful model that could be applied throughout the country and there are signs that this may be happening. A visit to the AwF-AIT project was described by AwF technical advisory group member Peter Edwards (Edwards 2011; Fig. 7, Box 4).

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BOX 4. Benefits of the AwF-AIT project in Nepal.

I visited six family level-ponds built in Phase One of the project and briefly interviewed three women pond owners. They all expressed satisfaction at being introduced to the culture of carps and tilapia, being able to consume as well as sell table fish and to sell tilapia fingerlings to neighbors. The opening ceremony of a one-day training program for 15 enthusiastic women from Chakratirtha Village was being held during my visit for Phase Two of the project in a local school. In reply to my question "why are you interested in raising fish?" the women enthusiastically replied:

- To have fish without spending money.
- There's no need to leave the farm to buy fish.
- It's healthy food.
- To resolve child malnutrition.
- To earn income.
- To offer to guests.
- It's nice to be able to observe fish next to the house, especially when guests visit (and) fish 'dance'.
- Women and children can easily feed the fish.
- Some support and information are being provided by the project.

Source: Edwards 2011

TABLE 8. Summary of Aquaculture without Frontiers tsunami relief work.

Location	*Project title & partners*	*Species & activity*	*Beneficiaries*
INDIA	LACC tsunami relief	Marine shrimp	Multiple local farmers
	Tsunami #1/YSI (Tambak) pond rehabilitation	Marine shrimp; districts of Aceh	426 farming households in three
INDONESIA	Tsunami #2/YSI (Hatchery)	Marine shrimp; rehabilitation of hatcheries	Three small-scale shrimp hatcheries rehabilitated, with consequential effect on seed supply
	Tsunami #3/Professionals International	Marine shrimp; pond rehabilitation, etc	Advice to another NGO working on Aceh tsunami relief
	Tsunami #4/YSI (Seaweed)	Gracillaria culture	Demonstration of seaweed culture as an alternative activity for tsunami-affected shrimp farmers (numbers not specifically quantified)
	Tsunami #5/MercyCorps (Technical advice)	Marine shrimp; pond rehabilitation, etc	Advice to another NGO working on Aceh tsunami relief
	Tsunami 6/YSI – AquaFish/CRSP (Sustainable coastal aquaculture)	Gracillaria and marine shrimp polyculture	Continuation and expansion of Tsunami #4/YSI; training in seaweed culture; improved seeds; pilot project of Gracillaria & shrimp polyculture (numbers of beneficiaries not specifically quantified but potentially considerable)

The AwF Nepal project has had very good impacts and Nepal is moving very fast now towards commercial fish farming[2]. One of the project recipients said: *It is a most profitable business because if we invest 1 Rupee (US$ 0.01) to buy a fingerling and stock it in a pond, there is no need of other investment - feeding can be just kitchen wastes - and that fingerling will grow and be ready to sell at minimum of 100 Rupees (US$ 1.0). Is there any other business that gives such a high return?*

Tsunami relief

Aquaculture without Frontiers carried out tsunami relief in Indonesia and India, supported by YSI Incorporated and the Latin American and Caribbean Chapter of WAS (Table 8). AwF work in Aceh included shrimp pond and hatchery rehabilitation and training in the culture of other organisms to diversify production by the local shrimp farming community. In India AwF aid was, unusually, in the form of small grants to specific shrimp farmers that had lost their livelihoods; this program was organized by the Fisheries Department of Kerala Agricultural University[3].

The devastation caused by the tsunami in Aceh was extreme. Shrimp ponds and livelihoods were destroyed (Fig. 8) and many family lives lost. Some of AwF's work in Aceh was coordinated with other organizations, including a cash-for-work program with the Network of Aquaculture Centres in Asia-Pacific (NACA), where farmers who had lost their only source of income were paid to reconstruct their ponds (Fig. 9). The scale of the work can be illustrated by the following cutting from a project report (AwF 2013f): *By early June, 85 farmers in both villages had been working for approximately three weeks, for a total of 1,530 worker-days. During this period they cleared approximately 2,500 m of canals, 78 percent of the original objective, and removed about 1,650m^3 of silt.*

Further AwF work in Aceh expanded into training shrimp farmers to diversify into other forms of aquaculture (Table 8), including polyculture and the culture of red seaweeds (Fig. 10). Some AwF activities in Aceh were supported by the University of Arizona and the Aquaculture Collaborative Research Support Program. One intervention:

- Conducted two workshops with artisanal aquaculture farmers and another for representatives from NGOs, FAO, Indonesian Department of Fisheries staff, and faculty and students from Ladong Fisheries College;
- Visited three hatchery restoration projects partially supported by AwF to observe and consult on progress and future efforts;
- Delivered donated textbooks, reference materials,

TOP, FIGURE 8. *A shrimp hatchery in Aceh destroyed by the tsunami of 2004 (Photo: Kevin Fitzsimmons).* MIDDLE, FIGURE 9. *Shrimp farmers in Aceh restoring ponds and canals through the AwF-NACA cash-for-work program (Photo: Kevin Fitzsimmons).* BOTTOM, FIGURE 10. *Diversification into seaweed farming in Aceh as a result of AwF tsunami relief work. (Photo: Kevin Fitzsimmons).*

laboratory materials and field equipment to the Ladong Fisheries College and the Ujong Battee Aquaculture Research and Extension Center; and

- Visited the Tibang village restoration site supported by Mercy Corps to discuss future options for aquaculture pond restoration with Mercy Corps representatives.

Later, in conjunction with several other organizations, a manual on best management practices for tambaks was produced in Bahasa and English (ADB *et al*. 2007). Recently a retired government official in Indonesia noted that a substantial benefit of the pioneering 'cash for work' intervention of AwF was that it provided assistance within a few days of the tsunami, long before aid from major international organizations arrived[4]. Through subsequent capacity building provided by AwF volunteers, brackishwater aquaculture in the area has become more diversified than before, when it was only shrimp; the farming of milkfish, groupers and red seaweeds now generates income for many families.

Farmer-to-Farmer programs

In conjunction with and administered by the University of Arizona (UoA), AwF conducted two Farmer-to-Farmer programs funded by USAID through the auspices of former AwF Chairman Kevin Fitzsimmons. Support for the first program provided travel funding for 20 AwF volunteer missions to work with farmer collaborators to implement more sustainable farming techniques in Bangladesh, India, Indonesia, Mexico, New Caledonia and Trinidad & Tobago between March 2010 and February 2011 (AwF 2013g). Host farmers provided housing and local transportation. The goal was to improve food safety and environmental protection for small-scale farmers growing fish, shrimp, crabs, bivalves and seaweeds. Improving the quality and marketability of their seafood products were also goals of the program. An example of the work conducted within this program in Thailand (Fig. 11) is given by Fitzsimmons (2011), whose final comments illustrate the difficulties as well as the achievements of this AwF program: *Overall the trip (was) very successful. The farmers in Ranong have reported an increase in survival of soft shell crabs and an increase in income. However, the lack of any written records frustrated the ability to collect any hard data. Production of seaweeds has generated some sales, which are completely new. The seaweeds have also been eaten by some of the farming families as a new vegetable, which should improve household nutrition. Many of the farmers are still surviving on incomes of 150-300 baht (US$5 to $10) per day.*

Based on the success of the first program, further support was obtained from USAID for a second Farmer-to-Farmer program in Kenya and Mexico. The second program began in the fall of 2012 and was on-going at the end of the period covered by this article. In Tabasco and Oaxaca, Mexico, AwF is providing an evaluation of progress from a previous Farmer-to-Farmer Aquaculture niche project[5]. Aquaculture without Frontiers volunteers are providing missing technical expertise and working with the Kenyan government, Moi University, and other NGOs to support the government's intention to build 18,000 small-scale fish ponds. Specifically AwF is building upon a currently supported AwF fish-farming project in the Kisumu and Eldoret areas. Training for all three locations in this second program includes the:

- Manufacture of simple on-farm compounded diets from local ingredients;
- Selection of high-quality fingerlings for stocking;

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LEFT COLUMN, FIGURE 11. *The work of an Aquaculture without Frontiers volunteer in Thailand. (a) Kevin Fitzsimmons describing how to construct bird netting canopy. (b) Red tilapia from cages in a shrimp pond (Photos: Kevin Fitzsimmons John Woiwode).* RIGHT COLUMN, FIGURE 12. *The work of an Aquaculture without Frontiers volunteer in Kenya. (a) Demonstration of a tilapia breeding hapa. (b) Plantain production on pond banks using fish pond water (Photos: Kevin Fitzsimmons).*

- Use of simple feeding trays to better evaluate and manage feed applications;
- Improvements in harvest and handling techniques to enhance shelf life, food safety and traceability; and
- Provision of practical methods for the use of fish farm effluents on vegetable crops.

An excellent example of the type of detailed review and recommendations that are provided by AwF volunteers during this ongoing second Farmer-to-Farmer program can be found in the report of Woiwode (2013), which describes his visit to several private and university facilities in Kenya, mainly concerned with tilapia farming. The typical work of an AwF volunteer working in the Farmer-to-Farmer program is illustrated in Figure 12. Many other AwF-UoA Farmer-to-Farmer trip reports can be accessed from the 'completed projects' pages of the AwF website (www.aquaculturewithoutfrontiers.org).

Conclusions

From 2003 to 2012, AwF raised nearly US$450,000 to alleviate poverty in developing countries through small-scale aquaculture activities and its work was carried out in many locations around the world. Its resources consisted of donations

and grants; the proceeds of local fundraising activities; the voluntary services of its directors and volunteers; and the technical advice of its volunteers and technical advisory group. All income was used for project work; its management costs were zero – a claim that very few charities can make. Substantial benefits to AwF project participants have been recorded and demonstrated in the projects pages of its website and summarized in this article.

AwF is now moving into its second decade and is evaluating its work to date. Revised strategies and field activities are being developed, for which financial support will be sought by members of the current executive committee. The future plans of AwF was the topic of a presentation at the recent WAS-APC meeting in Ho Chi Minh City (Palmer 2014).

Notes

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[1] J. Nagoli and A. Chijere. 2013. Personal communication.

[2] R. Bhujel. 2013. Personal communication.

[3] Now established as the Kerala University of Fisheries and Ocean Studies

[4] Agus Budhiman. 2013. Personal communication.

[5] Kevin Fitzsimmons. 2013. Personal communication.

References

Anonymous. 2003a. The blue revolution: a new way to feed the world (fish farming is a good and promising thing, despite the environmental worries). The Economist 368(8336):10.

Anonymous. 2003b. The promise of a blue revolution (how aquaculture might meet most of the world's demand for fish without ruining the environment). The Economist 368(8336):19-21.

ADB (Asian Development Bank), ACIAR (Australian Centre for International Agricultural Research), AwF (Aquaculture without Frontiers), BRR (Building Resilient Regions), DKB (Deutsche Kreditbank), FAO (Food and Agriculture Organization of the United Nations), GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit), IFC (International Finance Corporation), MMAF (Ministery of Maritime Affairs and Fisheries), NACA (Network of Aquaculture Centres in Asia-Pacific), WWF (World Wildlife Fund). 2007. Practical manual on better management practices for tambak farming in Aceh. ADB, ETESP, ACIAR, FAO, IFC of the World Bank Group, Banda Aceh, Indonesia.

AwF (Aquaculture without Frontiers). 2013a. www.aquaculturewithoutfrontiers.org/projects/completed-projects-and-field-activities/

AwF (Aquaculture without Frontiers). 2013b. www.aquaculturewithoutfrontiers.org/wp-content/uploads/2010/04/INDIA-AwF-Bishramganj-Phase-3-Progress-Report-October-2010.pdf

AwF (Aquaculture without Frontiers). 2013c. www.aquaculturewithoutfrontiers.org/wp-content/uploads/2010/04/AwF-Nepal_Project_Report_Final_Jan_2010_Revision1.pdf

AwF (Aquaculture without Frontiers). 2013d. www.aquaculturewithoutfrontiers.org/wp-content/uploads/2010/04/NEPAL-AwF-AIT-Phase-II-APPROVED-PRODOC-23-3-10.pdf

AwF (Aquaculture without Frontiers). 2013e. www.aquaculturewithoutfrontiers.org/projects/nepal-project_2_report_year-i_april-17-4-2011/

AwF (Aquaculture without Frontiers). 2013f. www.aquaculturewithoutfrontiers.org/wp-content/uploads/2010/04/INDONESIA_Aceh_Tambak_Report_extracted_from_NACA_Newsletter_XX_No_02.pdf

AwF (Aquaculture without Frontiers). 2013g. www.aquaculturewithoutfrontiers.org/wp-content/uploads/2010/04/AwF-UNIVERSITY-OF-ARIZONA-FARMER-TO-FARMER-PROGRAM-PROPOSAL.pdf

Bhujel, R.C., K. Madhav, M.K. Shrestha, H.R. Devkota and A.P. Nepal. 2013. AwF-NEPAL program: a model for rural aquaculture development. Abstracts of the WAS-APC Conference, Ho. Chi Minh City, 10-13 December 2013. p. 42.

Edwards, P. 2011. Rural Aquaculture. Visit to the AwF funded small-scale aquaculture project in Nepal. Aquaculture Asia Magazine XVI(4): 3-11.

Fitzsimmons, K. 2011. Farmer to Farmer Aquaculture Niche Program Trip Report # 22: Ranong, Surat Thani and Bangkok, Thailand, July 28-Aug 3, 2011. www.aquaculturewithoutfrontiers.org/wp-content/uploads/2010/04/THAILAND_AwF-UA-Farmer-to-Farmer-Programme-Trip-Report-July-2011t.pdf

New, M.B. 2003. Responsible aquaculture: is this a special challenge for developing countries? World Aquaculture 34(3):26-30, 60-68, 72.

Palmer, R.D. 2013. AwF – the second decade. Abstracts of the WAS-APC Conference, Ho. Chi Minh City, 10-13 December 2013. p. 352.

Woiwode, J.G. 2013. Kenya Aquaculture Farmer to Farmer Program 31 March – 11 April, 2013: Final Trip Report. www.aquaculturewithoutfrontiers.org/wp-content/uploads/2010/10/Woiwode-Kenya-Farmer-to-Farmer-Trip-Report.pdf