Aquaculture, Women and Climate Change Adaptation

Mia Avril

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Registered offices
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EU-GIZ ACSE (Adapting to Climate Change and Sustainable Energy) Programme
FNPF DownTown Blvd, Plaza 1, Level 3
Suva, Fiji
T +679 3305 983
F + 679 3315446
info@acsepacific.org
www.acsepacific.org

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Greenhouse Studio
Mia Avril

Front page photo credit
Craig Bohm/GIZ

Text
Mia Avril

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Introduction

Aquaculture is a food production sector that is rapidly spreading. It has proven to be a means of alleviating poverty and enhancing food security and global nutrition (Bostock et al., 2010), particularly in light of the negative impacts of *climate change* on global food security (Godfray et al., 2010). In order to meet growing demands for food globally, food production sectors such as aquaculture require further development. The contribution of *women* to the sector is typically not included in official data, and so, is highly unrecognized[1]. Development of the aquaculture sector would inherently involve the official involvement of women.

This report explores the nexus of aquaculture, gender and climate change, by looking briefly at aquaculture development in Pacific Island Countries (PICs), women's involvement in the sector, and their significance in aquaculture as climate- change adaptation strategy.

First, the report outlines the history and importance of aquaculture in PICs, and some of its characteristics. It then goes on to focus on the role of women in aquaculture. The question of aquaculture with a gender-sensitive approach, as a strategy for climate change adaptation is then addressed, with a few examples and their success.

Aquaculture Development in Pacific Island Countries

The history of aquaculture in the Pacific Island Countries (PICs) dates back to the 1950s when tilapia was first introduced as a protein source for pig farming (Adams et. al, 2001). Since then, the sector has grown to include a variety of flora and fauna species that support local and export food and ornamental markets. The species cultured in the region include varieties of tilapia, freshwater prawns, marine prawns, milkfish, carp, mud crabs, pearl oyster, giant clams, coral, seaweed, trochus, sandfish, trout, sea grapes, mangrove crabs, sponges and ornamental reef fish. Due to the wide range of species cultured throughout the region, the nature of aquaculture production varies from coastal mariculture (the cultivation of marine plants and animals[2]) of seaweed and pearl oysters, to freshwater pond and tank culture of tilapia and prawns. The scale of production also varies from larger commercial farms to the more common backyard or community subsistence ventures. The governments of the various PICs have developed plans regarding aquaculture enhancement, which are outlined below.

Mariculture

The development of hatcheries for the various marine aquaculture species is a priority for the governments of the Solomon Islands, Vanuatu, Tuvalu, Papua New Guinea and Samoa,

[1] http://www.spc.int/coastfish/en/publications/bulletins/women-in-fisheries/237-women-in-fisheries-information-bulletin-14.html

[2] https://en.oxforddictionaries.com/definition/mariculture

according to the SPC Aquaculture Portal[3]. This was highlighted for pearl oyster spat, trochus, giant clam, green snail and sea cucumber. Where hatchery development is not possible, improvements in spat collection techniques is required. Overall, there is the need to develop facilities to comprehensively improve aquaculture support through spat/ fry production, training and technical assistance. Particularly with respect to pearl oyster production, there is a desire to enhance the production quality through research in the refinement of rearing and grafting techniques. Overall, the countries plan to maintain a close collaboration between the producers, dealers/ vendors of products and the government to improve the success and profitability of the entire sector.

Freshwater aquaculture (the culture of aquatic plants and animals in freshwater environments[4])

As inshore fisheries resources become limited, PICs aim to develop aquaculture in rural areas as an alternative source of protein. There is an interest in the enhancement of milkfish farming techniques. Hatcheries for freshwater species, such as tilapia, are required particularly for fingerling distribution to remote rural areas.

Currently, the quantity and quality of feed available for aquaculture production in the region is a major constraint. Feed cost is the most expensive component of aquaculture production (sometimes exceeding 30%), and the countries have identified the need to produce a more reasonably priced feed using locally sourced ingredients such as fishmeal (e.g. by-product of canneries), meat, bone meal, and copra. The SPC Aquaculture Portal has reported that countries have also identified the need to explore and refine integrated fish farming methods.

Naturally, the local economies of the countries will benefit from development in the aquaculture sector. Increased production would reduce the import requirement for aquatic products, thereby reducing national spending. In fact, aquaculture could supply an export market, which would increase foreign exchange. Aquaculture development can improve food security and provide local employment.

As it relates to the overall health of persons in the countries, access to affordable fresh fish can help to address medical complications that have been associated with the consumption of imported and canned food. Furthermore, *Ciguatera* poisoning is a regular occurrence and becomes avoidable through the consumption of aquaculture-produced fish. *Ciguatera* is a foodborne illness resulting from the consumption of fish contaminated with the ciguatera toxin from marine plankton (dinoflagellates), commonly occurring in reef fish[5].

Ultimately, providing an alternative source of fresh fish would supplement the fish market to meet the growing consumer demands, while potentially alleviating the pressures placed on wild stocks in open and protected areas, thereby allowing marine fish species to regenerate their populations.

[3] http://www.spc.int/aquaculture/

[4] http://www.nmfs.noaa.gov/aquaculture/what_is_aquaculture.html

[5] https://www.emedicinehealth.com/wilderness_ciguatera_toxin/article_em.htm

Women and Aquaculture

FAO's The State of World Fisheries and Aquaculture report of 2012 highlighted *gender* mainstreaming as a key issue facing the sector. In accordance with the Millennium Development Goal 3 (MDG3) established by the United Nations, in all sectors, including fisheries and aquaculture, it is imperative, that men and women have equal rights to participate and their interests and needs are protected (FAO, 2012). While women remain marginalized, their participation as equal and productive partners in the aquaculture sector impacts on household nutrition and overall standard of living (FAO, 2012). Women's contributions to the sector have been highly understated particularly because data collection focused on productivity, while women's involvement is primarily during the post-harvest and marketing stages of production. Recent changes in the definition of poverty and heightened focus placed on vulnerability reduction has made gender an important consideration in fisheries policy and general development (FAO, 2012). Fisheries management is directly related to the "fish value chain", which ultimately aims to increase the profitability of the sector; and it has been recognised that this, therefore, requires looking beyond men as the producers and to consider the integral part women play in the sector at both pre and post production stages.

When provided with the opportunity to enhance socio-economic empowerment, women make significant differences to food security, poverty alleviation and boost general well-being of themselves, their families and wider communities. Consequently, a proposed solution to the lack of gender mainstreaming in the fisheries and aquaculture sector is through the development of policies ensuring equitable access for men and women to aquatic resources, and markets.

Women's involvement in the PICs' aquaculture sector

Traditionally, women play an active role in fisheries in PICs, dominating the coastal/inshore and freshwater fisheries, where minimum equipment is required. Apart from this role, women are actively involved in the post-harvest stages of the industry, which are processing and marketing. Similar trends have been observed in other parts of the developing world, such as the Caribbean region and Africa. As it relates to aquaculture, while it can be perceived as women's work, it is predominated by men who are attracted to the potential profitability. There are several successful aquaculture ventures operated by women, and although women make very committed and diligent farm managers, their involvement in aquaculture remains understated.

The main problems faced by women in aquaculture are social, particularly cultural and social norms. Globally, in more than 70% of countries[6], the secondary status of women denies them the access to opportunities. Women are customarily not included in decision-making. In most countries, a male-focused power structure prevails, and land ownership and access to financial support are more easily, and in some instances, only awarded to men. Despite the fact that aquaculture typically occurs in coastal and freshwater regions, which are considered the fishing zones of women, and the work involved considered women's work, the sector is still dominated by men because aquaculture is deemed a modern and profitable venture and attracts male interest. In Vanuatu, for instance, the Ministry of Women has indicated an interest in aquaculture ventures; however, they lack the empowerment and financial ability to proceed further.

Another issue faced by women is the lack of efficient research and data collection for policy development as it relates to female participation in fisheries activities. There is a need to train women and build their capacity towards bridging the gender gap in fisheries, and by extension, aquaculture.

Aquaculture with a gender-sensitive approach as a strategy for climate change adaptation

Aquaculture and Climate Change

Of all the impacts of climate change, one of the most profound is the threat to food security (Brown & Funk, 2008). This is a direct result of the general increases in temperature, coupled with reductions in precipitation occurring in food production systems, such as crop and livestock farming and fishing. Economic analyses conducted in the Pacific Coral Triangle (Fiji, Solomon Islands, Timor-Leste and Vanuatu) determined that, left unchecked, climate change would have severe food security implications, resulting in the islands to become large net importers of fish (Dey et al., 2016b). The food security concerns are particularly alarming because many poor households, particularly in coastal regions, rely on declining inshore fisheries for daily consumption. Among the proposed solutions to climate-induced threats to food security, was the development of aquaculture to provide more affordable coastal invertebrates and freshwater fish, and to increase the per capita income of the countries (Dey et al., 2016a, Rosegrant et al., 2016).

Pond aquaculture has been identified as a means of filling the gap in fish needs for food security in PICs resulting from the impacts of overfishing, pollution and climate change on marine fisheries. Although tuna has the potential to supply the residents of PICs with adequate fish protein, availability, accessibility and affordability cannot be guaranteed for all persons. Pond aquaculture development in peri-urban and inland areas can significantly

6 http://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/PB2_Africa_Gender-and-Adaptation.pdf

enhance the availability of healthy food options. Many other regions, such as the Caribbean, Africa and Asia have reported success in aquaculture, particularly with the use of the Nile tilapia, carp and milkfish (U.N., 2015).

Enhancing livelihood sustainability is another adaptation strategy to cope with climate change impacts. Developing aquaculture has been identified as a means of granting access to increased options for income generation and diversify livelihood towards greater resilience (U.N., 2015). This can be done through improving technical skills of communities, thereby granting access to increased options for income generation. Additionally, making investment capital more accessible to new farmers, particularly female, would foster sustainable livelihood enhancement.

Women and Climate Change

Women's vulnerability to climate change, as explained by U.N. Watchwomen (2015), is primarily a result of women accounting for two thirds of the world's poor population[7], and thus being more dependent on the natural environment for their livelihoods. An environment, which is threatened by climate change. Additionally, women face more social, political, and economical marginalization than their male counterparts do.

Women bring a wealth of knowledge and expertise to climate change adaptation and mitigation actions. Being the domestic stewards of household and natural resources, for example, they are well positioned to contribute to strategies that adapt to the changes in the environment, such as aquaculture. An example of this was seen in the Federates States of Micronesia, during a drought, when the knowledge of the hydrology of the island by the women allowed for the suitable placement of a well to access potable water[10].

As it relates to food security, traditional food sources are becoming increasingly unpredictable and scarce due to threats of climate change. This is unfortunate since, despite cultural preferences, poor persons resort to consume what is available (Brown & Funk, 2008). This scarcity leads to an increase in importation, which is inevitably more expensive. Coupled with reduced income (from scarce resources), food becomes inaccessible to the poor, resulting in a decline in health, which has been seen to occur more in women and children than in men (U.N., 2015). Compounding this situation is women's exclusion from decision making on the management of natural resources and land, highlighting the importance of empowering of women in skills, such as aquaculture, to enhance their ability to generate incomes and produce food.

Addressing climate change requires adaptation and mitigation, and improved financial and technological initiatives (U.N., 2015). These should address gender- specific effects of climate change and should be flexible enough to account for the needs of women. Government and

7 http://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/PB2_Africa_Gender-and-Adaptation.pdf

other leading bodies should be encouraged to incorporate gender into policies and other initiatives relating to climate change in order to ensure the participation of women.
According to Musinguzi (2017), climate change disproportionately affects marginalized groups, especially women. Women typically have lower participation than men have in pre-harvest fishing activities. Men have more experience and spend a longer part of their lives involved in fishing. Women, however, worked longer hours and engaged in higher levels of multitasking of activities, with the income generated by women going directly to household support.

Why and how can women's involvement in aquaculture help adapting to climate change?

Gender is a central concern for many developmental issues, such as the under-developed aquaculture sector. This is thought to be, to some extent, the result of the lack of involvement of women, who are crucial to food production and rural economies (Das & Khan, 2016).
An assessment of aquaculture and food security in Nigeria acknowledged that growth in the sector was largely due to the official involvement of women, particularly in the non-traditional roles of research and extension (Olufayo, 2012). It was noted that the involvement of women in the aquaculture sector resulted in increased availability of fish, employment, diversification and sustainability of food production in the country, and reduced constraints (social, economic and cultural) that women faced regularly (Olufayo, 2012). This diversification and sustainability of food production directly increases resilience to climate change.

The experience from Nigeria can be replicated in other developing regions of the world, such as the PICs, and has been observed at the community level in some of the islands. Governments, non-governmental organizations and other development organizations and agencies have recognised this and have begun investing in aquaculture development. increase in diversification and sustainability of food production directly increases resilience to climate change.

An example of this can be seen within the EU-GIZ Adapting to Climate Change and Sustainable Energy (ACSE) programme, where one of the projects aims to increase climate change resilience through the development of freshwater aquaculture in Vanuatu[8]. This project has recognized the importance of women to the development of aquaculture, and has planned to allocate 50% of the trial farms that will be established to women's groups, for management and operation[9].

[8] http://acsepacific.org/project/vanuatu-aquaculture-livestock/

[9] http://acsepacific.org/wp-content/uploads/2017/09/VU35-PDD-final_05042016.pdf

Highlighted below are some examples of how women becoming involved in aquaculture impacted positively on their livelihoods.

Examples from Pacific Island Countries: How can aquaculture help adapt to climate change in a gender-sensitive manner?

Example 1- Pearl Oyster Mariculture in Fiji[10]

Women in PICs are resourceful and dedicated, and this extends to their involvement in aquaculture. In the PICs, the role of women traditionally is to support the household tasks such as cooking, cleaning and fishing. Women are also responsible for fundraising for the village and manage domestic and environmental resources.

The Raviravi Women's Group, Macuata, in the Northern Division of Fiji, after discussing the idea of pearl farming for years, the group of less than 40 women were able to secure private funding from Australia as well as some governmental support to establish a pearl farm. The women were motivated to pursue pearl farming because of its perceived profitability and desired to help the men uplift the standard of the village. The farm, established in 2004, is still operational today. The pearls produced are sold to the nearby Nukubati Island Resort, and to the J Hunter Pearl farm in Savusavu. In an effort to reduce costs, one of the villagers has trained herself in the culturing of the pearls so that external technicians would no longer be required. This has effectively enhanced the productivity of the farm. Other members of the group have also attended training sessions hosted by the Fiji Fisheries department. Harvests occur twice annually and the village earns up to 10,000 FJD per harvest. The village chief, during an interview with a representative from the GIZ Marine and coastal Biodiversity Management in Pacific Island Countries (MACBIO) project, stated that the pearl farmers have contributed significantly to the village.

Women's groups in Navidamu, Lakeba and Nakalou villages in Fiji have been able to develop their communities and raise funds towards building kindergartens for the children, footpaths and community halls through seaweed farming ventures. The government, through the provision of farming material, technical advice, capacity building and transportation, supports seaweed farming significantly.

Example 2- Freshwater pond Nile Tilapia culture in Fiji[11]

In 2014, the women from the Rewasau village in the highlands of Monasavu, with the support of the Ministry of Fisheries, made the decision to establish tilapia ponds as a means of income generation. While the farming efforts are shared between men and women, the women make the decisions concerning the farm. The first harvest from the pond was used as payment to

[10] http://fijisun.com.fj/2017/07/19/seaweed-farming-empowers-women/
http://www.pireport.org/articles/2005/04/27/raviravi-women-tend-pioneer-pearl-farm
http://fijisun.com.fj/2010/12/01/raviravi-pearls-shine/

[11] https://womeninfisheriesfiji.org/taking-the-fish-to-the-mountains-tilapia-fish-farming-and-the-women-of-rewasau-village-monasavu/

the youth for their assistance in digging the pond. The second harvest was used, again as payment, for rebuilding homes, the community hall and the church after TC Winston in February 2016. As it relates to climate change adaptation, the aquaculture farm has been able to provide the villagers with resources to rebuild after an extreme weather event, and providing fresh, nutritious fish protein to a remote village.

Summary

Climate change is a multi-tiered global issue, resulting in a variety of impacts on the environment, and therefore requires a range of approaches to adaptation, and mitigation where possible. One universal threat of climate change is to food security, which is particularly crucial in developing regions. Most of the world's poor reside in the developing world and they have been identified as being most vulnerable to climate change and food insecurity. Through promoting sustainable and diverse food-production in these areas, the availability and accessibility to food by persons is enhanced, thereby increasing resilience to climate change. Among food production strategies identified, aquaculture was highlighted as a means of adapting to climate change by not only providing food for persons, but also reducing the pressure placed on wild fish stock to meet protein requirements of populations. Currently, the aquaculture sector is male dominated, but it has been noted that since women are the stewards of the natural environment in developing rural areas, and are traditionally responsible for domestic and community-level food management, their involvement in aquaculture would significantly enhance the sector. The involvement of women in aquaculture ventures has been seen to significantly improve their everyday lives, and that of their wider communities.

Consequently, there is a need to enhance female participation in the sector. In the context of the PICs, an ideal approach to promoting the involvement of women in aquaculture would be by providing them with a sense of ownership through outreach exercises geared at making investment capital and land more accessible to women.

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acsepacific
info@acsepacific.org
www.acsepacific.org

EU-GIZ ACSE
Module 2, Level 3, Plaza 1
Downtown Boulevard
33 Ellery St, Suva
P.O. Box 14041
Suva, Fiji Islands.
T (+679) 3305982 or 3305983