

**South-South Exchange: Mexico and Jamaica  
Aquaponics Technology  
March 6-8, 2019**

Mission Report from the South-South Exchange in Mexico  
Aquaponics Technology - A Knowledge-sharing Experience

### **Executive Summary**

After detailed consultations between GEF SGP Jamaica and Mexico, a programme of activities was arranged with a view to gaining first-hand practical experiences on sustainable aquaponics farming at both small and commercial scales. Aquaponics was considered to be a good means for communities to address challenges to food production from climate change impacts given the advantages of soil conservation, recycling of water and the provision of organic nutrients from the fish to the plants.

This exchange engaged participants from the Government, private sector, academia and local communities. The discussions, presentations and site tours were focused on obtaining information on the role/levels of partnerships that communities need to establish to ensure sustainability, understanding the processes involved in setting up and maintaining a viable aquaponics farm and demonstrating how communities can benefit from various products using aquaponics technology. In this regard, there was consideration of the role of Government in formulating the right policy that is needed as well as the role of academia for research, as aquaponics is highly research-based. The exchange provided an interactive platform for participants to think innovatively, share knowledge and experiences and observe successful practices and approaches. Participants had the opportunity to understand the various approaches from different perspectives. The questions below stimulated discussions across the sessions during the exchange, which provided information that was very beneficial to both countries.

1. How was the technology first introduced to Mexico?
2. How was participation of the local community and civil society defined in the process?
3. Are there any legal and policy frameworks (laws, permits,) to support the use of the technology?
4. How were research bodies/academic institutions involved in the technology in terms of its development and the supporting of farmers in its application?
5. What were some of the challenges faced and how were they overcome?
6. Was the private sector engaged in the process and if so, how?
7. What types of crops are produced and what is the market like?
8. What role does the Government of Mexico play in terms of support to aquaponics farming?

This report explains how these key questions were addressed from discussions during the three (3) days of the exchange. It contains further information on partnership building, the role of the academia, importance of local communities in the process, agenda and documents shared as presentations during meetings. The exchange was held on March 6-8, 2019 in Merida and Guadalajara, Mexico. Participants in the exchange were:

- Hyacinth Douglas - GEF Small Grants Programme, Jamaica
- Leonie Barnaby – National Steering Committee (NSC) - GEF SGP, Jamaica
- Karla Black – EarthStrong (NGO) – Jamaica
- Faradaine Forbes - Environmental Health Foundation (NGO) – Jamaica
- Sebastien Proust – GEF Small Grants Programme, Mexico
- Omar Fernandez - GEF Small Grants Programme, Mexico
- Representatives from the Universidad Nacional Autónoma de México (UNAM) (National Autonomous University of, Mexico)
- Representatives from Acuaponia Bofish (Private Sector), Mexico

The GEF SGP in Mexico also included two NGO representatives who were to develop project proposals for submission to their NC and NSC. In addition to the practical information obtained and shared by the participants, a number of recommendations were made, and follow-up actions identified to increase training and development of aquaponics in Jamaica. The exchange was organized by the Central Programme Management Team (CPMT), GEF SGP Jamaica and Mexico teams.

## **Key Messages, Experiences and Lessons from the Exchange**

### **Meeting with the National Autonomous University of Mexico (UNAM), Merida – March 6<sup>th</sup>**

The GEF SGP Jamaica team met with personnel at the Sisal campus of the University which included local community members who work with the University in an effort to learn the scientific nature of aquaponics in the hope of having them start an aquaponics farm in their community. The National Coordinator (SGP Mexico) introduced the groups as well as outlined the purpose of the exchange which he noted could benefit both countries, namely: the sharing of experiences and expectations of Jamaica and Mexico in the context of the work done and the ongoing research in aquaponics. The GEF SGP teams (Jamaica and Mexico) were given a detailed tour of the facilities with opportunities for explanations of the operations and had meetings/discussions with persons from UNAM, the Government and local community members.

The key take-away from this tour was the importance of research in such initiative and participants were able to understand the critical role in partnership with the University and by extension the University partnering with the local community to ensure that the capacities of the local communities are strengthened. This way the University indicated that local community will be able to own and better manage these initiatives at all levels.

### **Meeting with Private Company Bofish in Guadalajara – March 7<sup>th</sup>**

The site visit to the Bofish operations in Guadalajara provided the opportunity to obtain first-hand information on the organization, their operations, processes, challenges and plans. The main economic activity of Bofish is the growing of green leafy vegetables and fish for consumption and aquaculture. Since its start, Bofish has developed from a small scale to a large-scale commercial operation, to the point where the organisation is now offering training and other services to the public.

The field trip to Bofish was conducted in two sessions, first a tour of the facility and then a classroom setting where participants were immersed in information on how Bofish started and got to where they are now as the leading aquaponics farm in the region. This session allowed for a “Q&A” segment and a lot was learnt which benefited our NGOs based on their feedback. One of the main points made by Bofish was the importance of identifying markets for produce.

From the perspective of the GEF SGP team, the South-South Exchange was of great value as it enabled NGOs who are involved in developing aquaponics in Jamaica to benefit from the knowledge and experience of experts at a highly rated research institution and to interact with the experienced operators of a successful commercial aquaponics business. All persons took the time to address all questions and to discuss challenges and lessons learnt. The visit showed the importance of research as being carried out by UNAM at Sisal, as well as the value of the University’s focus on involving communities, responding to their needs and encouraging innovation (one community member had developed a new feed for the fish being reared). The prospects of Jamaicans participating in courses at UNAM and for Bofish to carry out training seminars in Jamaica were also raised and will be followed up.

**Below is feedback from our NGOs who participated in the Exchange**

Faradaine Forbes- Environmental Health Foundation:

Question: What did you like best about this exchange?

- The mission allowed me the opportunity to practically understand the essential resources required to efficiently construct and operate an aquaponics system. What was most interesting for me was how important proper nutrition is to the fishes as that greatly determines the quality of the crops produced. This was emphasized by the two organizations we visited, Bofish in Guadalajara and the University of Mexico's marine facility in Sisal, Merida.
- I also appreciated that the organizers allowed us to visit and interact with the University of Mexico's marine research facility in Sisal. This visit demonstrated the work being done by the university to sustain food security through the protection of certain marine life, especially those that are overfished by fishers. Some of the marine life are being experimented on to determine how they can survive and grow in fresh water to support ornamental fishing. Others are bred, developed and released into the sea to increase their wild-life population.

Question: What did you learn that you did not know prior to your participation?

- While I knew that nutrition is important to the proper growth and development of crops and animals, I had no idea of the level of strategic focus required for this component in aquaculture. The fact that larvae need to have a different diet from the larger fishes to allow for the best possible nutrition and development. Based on this fact, the researchers at the University of Mexico have developed unique feeds for each of the marine life since each creature (octopus, seahorse, shrimp, etc.) requires its own diet.
- I also learned that not every fish can be used for aquaponics. The most popular ones used are the tilapia (globally), but the rabalo (snook) is a very good fish to use as well because of their ability to adapt and grow well in fresh water. They are also more economical than the tilapia and are a better tasting fish.
- There are now aquaponics systems being operated with salt water (about 10grams of salinity). There are new varieties of potato that can grow very well in mild levels of salt water, as well as cherry tomatoes and quinoa. More research is being done to determine the types of crops that are salt-water tolerant to increase production and food security, especially in areas with reduced levels of fresh water.
- Infusion of Biofloc technology with aquaponics creates more sustainable aquaculture through greater efficiency, production and environmental control. The Biofloc system is a wastewater treatment which has gained vital importance as an approach in aquaculture.
- The business of aquaculture is best enhanced by the involvement of females because it requires the level of care, nurturing and attention to details that women generally tend to provide.

Karla Black, Earth Strong

Question: What did you like best about this exchange?

- The level of information shared during the mission was very valuable. The National Autonomous of Mexico's approach to community outreach, women empowerment and use of their research to benefit community members is inspirational and replicable. This exchange was truly beneficial on many levels. It has inspired ideas to implement on a community and national level.

Question: What did you learn that you did not know prior to your participation?

- I learned about the breeding of snook, pompano, yellow snapper, octopus and shrimp as a potential aquaculture component in aquaponics and for market consumption; the production of algae and small plankton as a larvae stage feed of fish and shrimp.

- Biofloc technology method which is the utilization of waste water treatment to add nutritional benefits to feed for fish and cost-effective production. The ability to grow crops such as swiss chard, beets, cherry tomatoes and celery in brackish water.
- Benefit of decoupled aquaponics system which allows for flexible production parameters; application of organic pesticides such as liquid garlic, chili and neem oil in aquaponics and use of garlic in the fish tank to combat any developing diseases.
- Lack of management and marketing as one of the main failures of commercial aquaponics systems. Utilization of plastic domes to house fish tanks to harvest the CO<sub>2</sub> during the night time and use it to provide more oxygen to the fish.
- Fresh water tilapia grows a little better in saline water as it reduces their stress levels; utilization of oasis media in aquaponics; benefit of buying fish fry as opposed to rearing them to promote diversity of the tilapia species.

### Summary/Wrap-up Session – March 7<sup>th</sup>

Integration of community members working with the University indicated the strong partnership that should exist based on the nature of aquaponics which depends heavily on research for sustainability. In order to have a viable/sustainable initiative, operations and marketing must be at the forefront of planning. One key point that was obvious based on information sharing, was the fact that persons without qualification were able to adapt very well thus, building their capacity to the point where they were able to hold high positions at the University.

Involvement of women was obvious as the group indicated that aquaponics requires nurturing and as women are naturally nurturers, they play a critical role in the operations which ultimately contributes to the Sustainable Development Goals (i.e. #5). The University and Bofish indicated their willingness to partner with SGP Jamaica on knowledge sharing and technical expertise.

The participants indicated that they were very grateful to the UNDP/GEF SGP for the opportunity to participate in the exchange. The experience has increased their knowledge on aquaponics and will greatly assist other NGOs/CBOs in expanding their focus on aquaponics as a sustainable farming technique and by extension strengthen and develop the practice across Jamaica. With plans to develop a “train the trainer” manual, we do hope to achieve this.

Special thanks and commendations must be expressed to the SGP Mexico team for the on-the ground logistics planning which resulted in a very successful and worthwhile exchange. Their thoughtfulness and hospitality were much appreciated.

### Recommendations/Follow-up Actions

- Because of the technical nature of aquaponics, Jamaica should pursue the offer from Bofish to have one of the technical experts from Bofish come to Jamaica and work with some of our groups, some of whom are in the process of setting up or plan to start commercial aquaponics.
- This initiative should be promoted among countries, especially in the Latin American and Caribbean regions as this initiative is a win-win for all, based on the benefits it offers in addressing the environment, social and economic issues (e.g. drought, food security, gender equality, etc.)
- UNDP/GEF SGP should continue to increase its support to NGOs/CBOs towards the development of sustainable agriculture, including training in and the development of aquaculture – including aquaponics.
- Going forward, the NGOs indicated their commitment to successfully implement five (5) small-scale aquaponics systems in North Clarendon. Identify a vibrant community-based organization that has the capacity/resources necessary to operate a commercial scale aquaponics system for income generation and seek to secure funding to assist with its establishment. Participate in or facilitate any aquaponics training coordinated by the GEF/SGP.

Establish a partnership with the Ministry of Agriculture to better support these community initiatives and plan a hands-on training in the operational activities of running an aquaponics system

- The prospect of study courses at the National Autonomous University Mexico (UNAM), Sisal campus should be explored
- This exchange opportunity should be used (by key stakeholders, especially the NGO participants) to continue dialogue and exchange of information with UNAM and Bofish.

## Annex 1: Concept Note

### South-South Exchange on Aquaponics Technology – Small and Commercial Scales Mexico – Date: March 5-9, 2019

The Sustainable Development Goal 17 (Partnerships for the Goals) calls for the strengthening of the means of implementation and revitalization of global partnerships for sustainable development. This goal emphasized the importance of South-South Cooperation which the GEF SGP has enhanced through the launch of its South-South Community Innovation Exchange Platform. It is in this context that an exchange is being organized between SGP Jamaica and SGP Mexico regarding the proven experience and knowledge developed in Mexico on the Aquaponics Technology done at the commercial scale. The exchange will include members of the GEF SGP Jamaica country team (NC & NSC) and selected community groups benefiting from SGP Jamaica.

**Rationale for the Exchange:** In Jamaica, the Government of Jamaica has prioritised Climate Change (Adaptation and Mitigation) based on its serious impacts on the environment, development and sustainable livelihoods. The sector that is mostly affected by the impacts of climate change is our agricultural sector. As such local communities who are the main source of production of agricultural products are now forced to implement mitigation measures using sustainable technologies infused with the necessary research among other things.

Aquaponics is considered a good alternative for growing plants and fish, because of the advantages of soil conservation, recycling of water resulting in reduced water demand compared to regular agriculture, provision of organic nutrients from the fish for the plants instead of fertilizer. Additionally, with the use of renewable energy then the energy demand could be reduced as well. More research is needed in the area, however, because of disadvantages such as system failure, unsecured access and very high start-up costs and energy demands. Examples of experiences in addressing some of these issues would be very beneficial for communities venturing into aquaponics.

UNDP is currently working on GEF 6 project that has as strong community involvement with the use of aquaponics technology as one of the livelihood activities. GEF SGP will be working closely with UNDP and the local communities to implement aspects of the projects. Discussions were held with the GEF OFP who has endorsed a South-South exchange on the aquaponics technology with countries such as Mexico and Ecuador, as these countries would have very good knowledge on aquaponics operations on a commercial scale that are sustainable. The NGOs/CBOs once exposed to the level of operations will be able to replicate very sustainable aquaponics projects in Jamaica.

**Objective of the Exchange:** To bring about greater practical knowledge among participants on the processes and implementation activities of the key components of a sustainable, commercial scale Aquaponics Farm. To gain first-hand practical experiences during visits to aquaponic sites on the operations at both small and commercial scales. Our team will be keen on the exchange of information and experiences from the set-up stage to the commercial scale, particularly maintenance and diversity of crop production that are climate resilient and have high market demand.

**Expected Results:** The exchange will contribute to better understanding of the benefits of the technology, especially with Jamaica being a SIDS – very prone to disasters such as drought, flooding, etc.



Overall, the exchange will better help our participants to be more motivated and determined to play their role in ensuring food security, reducing the energy demand, creating jobs, among others, which in effect contribute to SDGs 1, 8, 13, 14, 15, & 17. Based on our experiences with South-South exchanges, we have seen the enormous benefits to countries. Below are some key results expected from the exchange:

- Gaining of better understanding of the processes involved in setting up and maintaining a viable aquaponics farm on a commercial scale (i.e. daily, weekly, monthly activities for optimal operation and maintenance (planting, cleaning, harvesting, processing, measuring dissolved oxygen, Tilapia Feeding regiments and calculating daily feed rate etc.).
- Strengthening of community groups through practical examples of the role they can play in supporting Government’s development and economic priorities as well as the goals of the global agenda for both development and environment.
- Gaining first-hand experience from groups that have and are implementing sustainable and viable small and commercial scale aquaponics farms
- Obtaining information on the role/levels of partnerships that communities need to establish to ensure sustainability
- Demonstration of best practices/examples of how communities are benefiting from products using aquaponics technology.

The exchange could include but not be limited to meetings/site visits with key aquaponics operators. These results could be guided by the following questions.

1. How was the technology first introduced to Mexico?
2. How was participation of the local community and civil society defined in the process?
3. Are there any legal and policy framework (laws, permits,) to support the use of the technology?
4. How were research bodies/academic institutions involved in the technology in terms of its development and the supporting of farmers in the application of it?
5. What were some of the challenges faced and how were they overcome?
6. Was the private sector engaged in the process and if so, how?
7. What types of crops are produced and what is the market like?
8. What role does the Government of Mexico play in terms of support to aquaponics farming?

**Cost of Exchange:** The costs of the exchange will be covered by the GEF SGP Jamaica from OP4 RAF funds. The exchange is planned for execution from **March 5 – 9, 2019** in Mexico, with “on the ground” coordination support from the SGP team in Mexico. See budget below.

Activities		Cost (US\$)
Air Fares (4 participants) – KIN to Mexico		6,930.16
DSA & Terminals (4 participants)		4,664.00
<b>Total</b>		<b>11,594.16</b>
Name of Participants	Organisation	
Hyacinth Douglas, NC	GEF SGP Jamaica	
Leonie Barnaby, NSC Chair	GEF SGP Jamaica	
Karla Black, NGO	Earth Strong	
Faradaine Forbes, NGO	Environmental Health Foundation	

### Agenda

Date: March	Time	Activity	Location
Tues, Mar 5	Morning	<ul style="list-style-type: none"> <li>• Depart Kingston for Mexico through Miami</li> </ul>	Merida
	Late evening	<ul style="list-style-type: none"> <li>• Arrive in Merida</li> </ul>	Merida
Wed, Mar 6	Morning	<ul style="list-style-type: none"> <li>• Formal meeting/presentation with SGP Mexico</li> <li>• Visit native species aquaculture - UNAM - Sisal</li> </ul>	Merida
	Afternoon	<ul style="list-style-type: none"> <li>• Depart Merida for Guadalajara</li> </ul>	Guadalajara
Thurs, Mar 7	Morning	<ul style="list-style-type: none"> <li>• Meeting with Bofish to see and learn first-hand commercial and small-scale aquaponics farms (full day)</li> </ul>	Guadalajara
	Afternoon		
Fri, Mar 8	Morning	<ul style="list-style-type: none"> <li>• Depart Guadalajara for Merida</li> </ul>	Merida
	Afternoon	<ul style="list-style-type: none"> <li>• Meeting with local NGOs and wrap up session at Bofish</li> </ul>	
Sat, Mar 9	Morning	<ul style="list-style-type: none"> <li>• Depart for Kingston through Miami</li> </ul>	Kingston
	Afternoon		



## Annex 2 - Photo Gallery



*Tour of the University Lab and the Bofish facility*



*A glimpse of some of the products from Aquaponics farming*



*L-R: Theme - Eating what we grow from Aquaponics*



*Group photo of participants*