

DIALOGUES IN GENDER & COASTAL AQUACULTURE

Gender and the Seaweed Farming Value Chain

FINAL REPORT


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The project coordinator, ICAR-Central Institute of Fisheries Technology also thanks the site leaders and teams for the timely completion of the project despite the challenges.

The assistance rendered by the Directors and management of the ICAR-CIFT, KMFRI and ICAR-CMFRI for facilitating the project implementation is gratefully acknowledged.

All state and non-state actors, seaweed farmers and the community at large are greatly appreciated for providing information useful during the implementation of the project.

TERMS OF REFERENCE

The overall aim of the project is:

The aim is to conduct two dialogues on local gender issues in seaweed production to enhance understanding of how gendered roles and capacities are being constructed in society, the community and the fisheries economy including the post-harvest activities such as processing and trade

Specific Objectives

1. To find or create the motivation(s) at each site for holding the dialogues.
2. To promote engagement of fishers, farmers, researchers, policymakers, NGOs and industry representatives in participatory and interactive collaborations on gender and policy implications, including actors from outside the traditional fisheries/aquaculture field.
3. To elucidate how the impacts of globalized markets; small-scale fisheries guidelines implementations and contextualised institutions (formal and informal) determine conditions for exclusion and struggles of women at local levels.
4. To share views and experiences on how distribution of benefits and quality of participation affect social and economic advancement.
5. To indicate emerging areas of gender and environment policy inquiry.

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ABOUT THE PROJECT

In many impoverished coastal communities in Southeast Asia and the Western Indian Ocean, aquaculture is proposed as an alternative income-generating activity, aimed at improving local economies and enhancing food security. While aquaculture and fisheries management tend to focus on production, which is male-centric, women are important actors in certain types of small scale aquaculture production (shrimps, mussel, seaweed, crab fattening) and they are major participants along aquaculture value-chains. For women, aquaculture is sometimes promoted as an empowerment strategy but tends to focus on enabling poor women to operate low technology and low input systems most appropriate for their limited resource base.

Despite the hopes that women will benefit from coastal aquaculture, however, women's specific rights and needs are missing in almost all global normative aquaculture or fisheries policies, thus weakening their opportunities and failing to protect their rights. Guidelines for implementing gender equality in the fisheries sector are lacking, actions are unfunded, and officials do not know what to do. The assumption that impacts of women-focused projects, if successful will lead to greater women's empowerment and economic status is more complex in reality.

Women's work is often part of a global value chain in which the women hold little power. Furthermore, fisheries policy boundaries themselves are very narrow and specific, having little sway over many of the activities that women perform. To overcome this, the Gender in Aquaculture and Fisheries

Section (GAFS) has argued for gender analyses covering the whole value chain, since this makes visible activities that are at the fringe of fisheries/aquaculture policies and should help expand the policy coverage.

We proposed to conduct two gender policy dialogues on women in seaweed value chains, to highlight the problem of policy boundaries issues, and explore how such narrow policy definition may create problems not only for women but for the aquaculture and fisheries field in general.

Women's low levels of social, organizational or governance capacities are major obstacles to their advancement. Global and regional markets for profitable and sustainable aquaculture can look very different to different stakeholders in the value chain. For one example, the large numbers of small scale local growers, many of whom are women, may view widely cultured seaweed species in Asia and East Africa as of low value. Despite the considerable labour inputs, the seaweed farms are run, in technology terms, on low input—low output systems, with little consideration of the large, highly concentrated global value chains, or opportunities to add value locally to the products. The seaweed farmers have low profit margins in comparison to international buyers who do not invest in the production process and are not bound by agreements. Growers are not supported by governments on contractual arrangements. Growers in different countries compete on global markets but with little say in or knowledge of the process. Though the interest in seaweed culture began with the demand from private industry, there

is increasing government support for seaweed culture ventures and this is being propagated actively in various coastal states, e.g., in India and Kenya.

Although interest in gender issues in coastal aquaculture is increasing, many studies and projects are low level, providing reference to women's activities but rarely going beyond a description of the gender division of labour. Also, gender studies often remain at the project level, rarely becoming institutionalised as core programs with staff and resources to ensure their continuity. The problem of superficial treatment of gender is that government policies and projects, as well as aquaculture industry efforts, remain gender blind, and would not be able to identify the impacts – positive and negative – that they have on women and on gender relations. They miss out on opportunities of changing the way that both women and men become involved in the activities.

To start to address these oversights, the project was proposed to initiate dialogues on local gender issues, contextualised within the global aquaculture value chain for seaweeds, to enhance understanding of how gendered roles and capacities are being constructed in society, the community and the fisheries economy including the post-harvest activities such as processing and trade. We note that fishers/farmers will benefit only through post-harvest activities that depend heavily on women's labour, since these activities are needed to translate the fish resources into consumption goods.

To conduct these dialogues entails considering the dialogue approaches and the local context within which they may be legitimated. The context of the dialogue is given little attention. Often multiple evidence based (MEB) approaches are convened because dominant knowledge systems need to become more inclusive. Although such approaches acknowledge the imbalances of power, the main focus is on the knowledge systems and their integration, cross- fertilisation and co-production. Women may be doubly disadvantaged in multiple evidence based or multi stakeholder dialogues as they lack power and voice in the sector and their knowledge is considered marginal and local at best.

This situation wherein women are known as locally relevant yet considered marginal in development discussions is a challenge for creating dialogues

among equals. The stakeholder model of collaboration will help to suggest the populations from which dialogue members can be invited but, additionally, the dialogue facilitators will need to be cognizant of how intersectional variables may influence standpoints, e.g., if only elite women fishers are invited, or junior women policy makers sent. By being cognizant of intersectionality factors, however, we expect that the dialogues can expand the policy boundaries in aquaculture, providing wider options in policy approaches to benefit aquaculture households.

Each of the gender dialogues were to explore viewpoints on who controls what resources and the political and economic relations that cause and are caused by the distribution of these resources. Gender dialogues would allow the participants to better understand the labour allocations for seaweed aquaculture and post-harvest, and provide a wider and hopefully joint understanding of livelihoods and the households' priority on labour distribution around different production as well as reproductive activities. Attention was also paid to markets as critical to the seaweed value chain, and as institutions embedded in the aquaculture political economy.

Intersectionality is an essential consideration not only in the selection of dialogue participants but also in the dialogues, taking into consideration the differences in sex, age, class, ethnicity, location, organisational position, etc. An intersectional approach introduces different dimensions in aquaculture policy discussion, be they on trade, working conditions, governance of natural resources, ecosystem, climate, etc.

The project titled "Dialogues in Gender and Coastal Aquaculture: Gender and the Seaweed Farming Value Chain" was funded through the Asian Fisheries Society (AFS) under an agreement with SwedBio, and implemented by project and in-kind contributions by partners from Kenya (Kenya Marine and Fisheries Research Institute (KMFRI)) and India (ICAR- Central Marine Fisheries Research Institute) in close collaboration with the IACR-Central Institute of Fisheries Technology, India responsible for overall coordination of the project and the Asian Fisheries Society, through its Gender in Aquaculture and Fisheries Section (GAF).

AFS

The Asian Fisheries Society (AFS) is a non-profit scientific society aims at promoting networking and co-operation between scientists, technicians and all stakeholders involved in fisheries (including aquaculture) production, research and development in Asia. Its ultimate objective is to enhance food security and income generating opportunities for fisheries workers via sound management practices, environmentally sustainable development and efficient utilization of the aquatic resources.

GAFS

The Gender in Aquaculture and Fisheries Section (GAFS) of the Asian Fisheries Society was founded in January 2017, based on nearly 20 years of activities led by the informal network on, originally, Women in Fisheries, and later Gender in Aquaculture and Fisheries. The objectives of GAFS are to: (1) promote cooperation among experts involved in gender in fisheries and aquaculture issues and advance research and practice in Asia-Pacific and other regions of the world; (2) increase awareness of the importance of incorporating gender and more particularly women in fisheries and aquaculture interventions and research and to contribute to their development; (3) advocate for the advancement of women within the fisheries and aquaculture sectors; and (4) promote the establishment of local networks and organizations involved in gender issues and collaborate with other similar networks and civil society organizations.

ICAR

The Indian Council of Agricultural Research (ICAR) is an autonomous organisation under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India. The Council is the apex body for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country. It has played a major role in promoting excellence in higher education in agriculture. It is engaged in cutting edge areas of science and technology development and its scientists are internationally acknowledged in their fields.

ICAR-CIFT

The Central Institute of Fisheries Technology (CIFT) set up in 1957 is the only national center in the country where research in all disciplines relating to fishing and fish processing is undertaken. Headquartered in Kochi, it has research centers at Veraval (Gujarat), Visakhapatnam (Andhra Pradesh) and Mumbai (Maharashtra). The institute functions with the mandate of conducting basic and strategic research in fishing and processing; designing and developing energy efficient fishing systems for responsible fishing and sustainable management; Developing implements and machinery for fishing and fish processing; developing human resource through training, education and extension.

ICAR-CMFRI

The Central Marine Fisheries Research Institute was established in 1947 under the Ministry of Agriculture and Farmers Welfare and later it became part of ICAR in 1967. The institute functions with the mandate to monitor and assess the marine fisheries resources of the Exclusive Economic Zone (EEZ) including the impact of climate and anthropogenic activity and develop sustainable fishery management plans; conduct basic and strategic research in mariculture to enhance production; act as a repository of geo-spatial information on marine fishery resources and habitats and consultancy services; and develop human resource through training, education and extension.

KMFRI

Kenya Marine and Fisheries research institute was established in 1979 as a result of an enactment of the Science and Technology (Amendment) Act, and was charged with the responsibility of conducting research and making management recommendations essential for the national exploitation of living and non-living aquatic resources in the ocean waters, as well as the fresh water in the hinterland. KMFRI's mandate is to undertake research in "marine and freshwater fisheries, aquaculture, environmental and ecological studies, and marine research including chemical and physical oceanography", in order to provide scientific data and information for sustainable development of the Blue Economy.

The objectives of the project were:

- To find or create the motivation(s) at each site for holding the dialogues.
- To promote engagement of fishers, farmers, researchers, policymakers and NGOs in participatory and interactive collaborations on gender and policy implications, including actors from outside the traditional fisheries/aquaculture field.
- To elucidate how the impacts of globalized markets; small-scale fisheries guidelines implementations and contextualized institutions (formal and informal) determine conditions for exclusion and struggles of women at local levels.
- To share views and experiences on how distribution of benefits and quality of participation affect social and economic advancement.
- To indicate emerging areas of gender and environment policy inquiry.

Project Team

GAFS of the AFS:

*Dr. Meryl J Williams, Dr. Kyoko Kusakabe,
Dr. Kafayat Fakoya.*

Project Coordination:

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ICAR-Central Institute of Fisheries Technology,
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Project Site Teams:

Kenya

*Dr. Betty Nyonje, Project Site Leader,
Ms Fridah Munyi, Project Coordinator.
Mr Francis Okalo, Project Field Assistant,
Kenya Marine & Fisheries Research Institute,
Kenya.*

India

*Dr. P. S. Swathi Lekshmi, Project Site Leader
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Cochin, Kerala, India.*

EXTENDED SUMMARY

We present the short narrative report for SwedBio/SRC project dnr SU 481 6.1.1-0034-19, for the period 1 January 2020 to 31 December 2020, of the project "Dialogues in Gender and Coastal Aquaculture: Gender and The Seaweed Farming Value Chain". This report will be subsequently followed up with the detailed full report of the project. This short report chiefly covers the major activities taken up during the year 2020 and summarizes the lessons learnt from the project which were discussed during the synthesis workshop held during 5-6 March 2021.

The project is being implemented through the Asian Fisheries Society (AFS), under which it is being led by the Gender in Aquaculture and Fisheries Section of AFS, in partnership with the Indian Council of Agricultural Research - Central Institute of Fisheries Technology (ICAR-CIFT) as coordinator, and two partners conducting gender dialogues, namely the ICAR- Central Marine Fisheries Research Institute (ICAR-CMFRI) and the Kenya Marine Fisheries Research Institute (KMFRI).

The project objectives and expected outcomes are reiterated from the project contract.

Objectives

- To find or create the motivation(s) at each site for holding the dialogues.
- To promote engagement of fishers, farmers, researchers, policymakers and NGOs in participatory and interactive collaborations on gender and policy implications, including actors from outside the traditional fisheries/

aquaculture field.

- To elucidate how the impacts of globalized markets; small-scale fisheries guidelines implementations and contextualised institutions (formal and informal) determine conditions for exclusion and struggles of women at local levels.
- To share views and experiences on how distribution of benefits and quality of participation affect social and economic advancement.
- To indicate emerging areas of gender and environment policy inquiry.

Expected Outcomes

- Better understanding of policies and trade-offs that result in gendered inclusion or exclusion.
- Enhanced policy understanding for environmentally sustainable and socially just coastal aquaculture.
- Improved and more gender equitable value-chain governance and value-chain performance.
- Improved coherence in alignment of industry-policy-research interface resulting in stronger linkages and coordination among stakeholders for improved implementation in policy and best practices.

PHYSICAL ACHIEVEMENTS

The project on "Dialogues in Gender and Coastal Aquaculture: Gender and the Seaweed Farming Value Chain- Asian and African Partners" aims to bring gender and other researchers into dialogues with the coastal groups, industry, government

policy makers and NGOs to formulate policy recommendations for environmentally sustainable, socially and economically justifiable coastal seaweed aquaculture with major thrust areas in Tamil Nadu State, India and Kenya of Africa.

The major virtual activities that were taken up during the year were as follows:

Activity 1:	Virtual Meetings of the Project Team (2 May 2020; 28 May 2020; 4 June 2020; 25 July 2020; 14 August 2020; 10 October 2020; 21 December 2020)
Activity 2:	Project Review Meeting- India on 19 October 2020; 16 December 2020
Activity 3:	Meeting with SwedBio (23 October 2020; 30 October 2020; Annual Review (16 January 2021, 3 February 2021)
Activity 4:	Synthesis Workshop 5-6 March 2021

Dialogues: The field work for the conduct of the dialogues was taken up at the project sites in Kenya and India during the last quarter of the year following considerable earlier preparation; Capacity building on use of mobile phones; Small dialogues; large dialogues, virtual dialogues and validation workshops were held in both sites, depending on on-the- ground situation.

Activity 1:

Virtual Meetings of the Project Team

The initial months of 2020 were the time of spread of the COVID-19 pandemic in the project sites (as in other parts of the world) and measures including lockdowns were enforced by the Governments for containing spread. Work during this period could not be taken up. However, the project teams kept the momentum going by trying to identify stakeholders through secondary sources and contacting seaweed farmers wherever possible using mobile phones. In India, using snowball technique lists of names and phone numbers of stakeholders in the study site, Ramanathapuram district of Tamil Nadu, India were collected. In Kenya the villages were selected for work to start when the pandemic was in control.

To assess the work and to keep the project teams motivated several virtual meetings were held. The meetings were formatted in such a way that the project site leaders presented the progress of work which was followed by discussions on the work done. This kept then teams conscious of the timelines and the activities that need to be completed. During the discussions, the methods of conducting the dialogues in the prevailing situations were discussed in detail and ways identified to carry out the same. The meetings were held on the following dates:

1. 2 May 2020
2. 28 May 2020
3. 4 June 2020
4. 25 July 2020
5. 14 August 2020
6. 10 October 2020
7. 21 December 2020

Activity 2:

Project Review Meeting- India

The Deputy Director General (Fisheries), Indian Council of Agricultural Research had two meetings on 19 October 2020 and 16 December 2020 with the Project Team in India to assess the status of work in India. Directors of both the Indian Institutes participating in the project (ICAR-CIFT and ICAR-CMFRI) and Dr. Meryl J Williams attended the second meeting.

Activity 3:

Meeting with SwedBio

Review meetings with the participation of SwedBio representatives were held 23 October 2020; 30 October 2020; 16 January 2021 and 3 February 2021. The work done in the time prior to the meetings were presented and feed back obtained. The meetings in 2021 also discussed some of the lessons learnt and future program.

Activity 4:

Synthesis Workshop 5-6 March 2021

The project synthesis meeting was held on 5 and 6 March 2021, virtually. On 5 March 2021, the Indian and Kenyan teams presented the project outcomes. The meeting on 6 March 2021, commenced with welcome and introductory remarks by Dr. Meryl J Williams. Brief presentations were made by Dr. Betty Nyenje and Dr. Swathi Lekshmi P.S.

Dr. Erick Okuku, Ag. Deputy Director (Marine &

Coastal Systems) and Centre Director- Mombasa, KMFRI, Kenya; Dr. A. Gopalakrishnan, Director, ICAR-CMFRI, Kochi; and Dr. Ravishankar C N, Director, ICAR-CIFT, Kochi offered comments on the project. After a brief vote of thanks by Dr. Nikita Gopal, discussions on the country presentations ensued which was led by Dr. Kyoko Kusakabe.

Activity 5:

Development of the website for the project

An exclusive webpage for the project is being created embedded in the parent site of the GAF Section. The page will be populated with products emanating for the project which includes reports, commissioned popular writing, other relevant data like photos/ videos generated by the project teams. The link to the project page is will be widely disseminated thorough the GAFS email group as well as social media handles of GAFS and AFS.

SYNTHESIS OF WORK DONE IN THE PROJECT SITES

The two site summaries from the Gender Dialogues provide accounts of the work done in Tamil Nadu, India and southern Kenya, and the outcomes of the different levels of dialogues. Here, we present the synthesis of issues and insights that emerged from the project, focusing on gender issues and related issues that need further discussion as seaweed farming develops.

The dialogue process and methodology

A systematic approach of 'starting small' and building on each step was used in both sites. In India the initial identification of stakeholders and contacting them was through snowball technique based on earlier data set of farmer groups by ICAR-CMFRI. This was followed by training the women in ICT tools (using the mobile phones) for enabling them to participate in virtual dialogues. About 100 seaweed farmers were trained in the use ICT tools in order to equip them for virtual dialogues and 500 farmers participated in the same. After the inter-state lockdown rules were relaxed, face to face meetings, focus group discussions and validation workshop were convened. Besides

seaweed farmers, seaweed collectors, other stakeholders in the sector including the private industry, State Fisheries Department, State Forest Department, NGOs, local leaders, representatives from the Blue economy, scientists and researchers from Central Marine Fisheries Research Institute, (CMFRI), Central Salt and Marine Chemical Research Institute CSMCRI) were contacted through phone surveys and virtual dialogues. The validation workshop was held in a face to face dialogue mode, wherein 40 stakeholders comprising of women and men seaweed farmers, seaweed collectors, government officials, researchers, NGOs, industries, officials representing the blue economy were called forth at a common platform. The issues raised by women were put across as discussion points and the concerned stakeholder group were called to address the same. Accordingly, low yield, poor quality of planting material, low prices, inclement climate, lack of proper infrastructure, and weather, lack of training and infrastructure and markets for value added products such as sap were listed as the foremost problems flagging immediate attention.

In Kenya creating motivation for dialogue called for holding small dialogues within three seaweed farming communities of Kibuyuni, Mkwiro and Nyumba Sita. The need to include extra villages was informed by the site scoping visit which revealed difference in the socio-cultural set-up amongst these communities. This was done separately for group leadership, men, women and youth to promote free expression amongst peers. Focus Group Discussions (FDGs) of 10-12 participants were held with discussion revolving around; general outlook of seaweed farming sector, involved stakeholders, gender-related enablers and hindrance to involvement in seaweed farming, knowledge of existing laws and policies related to seaweed farming, sectoral needs, effect of Covid-19 on seaweed value-chain. A separate workshop was held for other stakeholder as having them in the seaweed farmers' FGDs could have prevented open discussions. Combining State and Non-state actors in one forum was meant to bring out any conflict of interests amongst them and agree on a win-win situation. They included representatives from KMFRI, County Government of Kwale Fisheries Department and Department of Trade and Cooperatives, The Nature Conservancy (TNC), Seacology, Coastal Marine Resource Development (COMRED), Coastal Oceans Research and Development-Indian Ocean (CORDIO) East Africa and a private entrepreneur.

Farmers, State and Non-state actors were lastly brought together in the big dialogue where each party was encouraged to openly articulate to issues from a personal perspective. Aspects of gender considerations on institutional programs or future initiatives, emerging areas of gender and environment policy, small-scale fisheries guideline and the influence on gender inclusivity, and market dynamics were discussed.

GENDER ISSUES

Four gender issues identified during the field work and dialogues are: the prevailing invisibility of women and their needs; the stigma attached to seaweed farming; women need access to new knowledge and technology; and the gendered issues of negotiations with large companies.

Women farmers did not speak out before (or their voices not heard) so their needs were not visible

How women's voices were used and received by others has been a constant theme. Before the dialogues started in Kenya, the project team found that women were not even talking among themselves and internal governance was not working. Disputes and grievances were not being raised because women feared being labelled as trouble-makers. Through the dialogues, when the disputes between people were surfaced, they could be solved (in Kenya for eg.).

The dialogues also created a forum for expressing preferences in seaweed farming modes. In Kenya, where generally seaweed farming is done in groups, some women were able to express their preference for having their own farms rather than working in groups.

In India, when the project started, women could not speak directly to the project team because smart phone access was controlled by men. Women leaders were the exception, showing that the practice was not a cultural barrier but one that could be changed for the non-leader women, at least in Tamil Nadu. The project dialogues catalyzed this change.

Both across countries and across sites within countries, particularly the three different Kenyan sites, big differences were found in how women are vocal, with some self-confident and women in other sites very restrained. This was irrespective of apparent religious and cultural similarities.

A universal result was that as the project teams held repeated meetings and contacts, the more the women spoke up. Another universal result was the importance of creating opportunities/forums to give women importance, to show that everyone matters. Small meetings were particularly critical to the process of enabling all to speak and starting to allow women to build their confidence.

Perceived image of seaweed farming

Although seaweed farming gives significant income for households, it is "ridiculed" in Kenya for cultural reasons. Seaweed farming was given importance in the economy from 2004, but at first only women were involved. When they showed they could earn a good income and have improved lives, men felt challenged and jealous because this outcome challenge gender norms. But men also took up farming, and then they were laughed at. Noticing the good income, however, other men joined and it is now considered a serious activity that is even included in the Blue Economy discussions. In fact, the Government of Kenya consider it a "low hanging fruit", requiring low investment and having high returns. The perceptions have changed but they do differ by community.

Women's need for access to new markets/new technologies

The perceptions of women can belittle their needs for new markets and R&D on what women can do with seaweed. In Tamil Nadu, sap extraction was undertaken by a women entrepreneur but her initiative was blocked after only one batch of product was sold, apparently through an intervention by a company. Research institutes are providing equipment with the possibility of higher income and women are being trained in such more profitable technologies but to whom do they sell?

In India, women want to sell to government agencies only because they perceive that the Government protect women's group from a large company's monopoly power. Still because their negotiation

/ competing power vis-à-vis companies is weak, women want to keep their market options open by doing both extraction of sap plus producing dry seaweed. Women are not willing to be confined to a certain section of seaweed industry and are trying to use their agency to prevent this.

One seaweed farming community in Kenya is using seaweed in soap making and making cosmetic products (with support from the government). This was the women's initiatives and women want equipment to access different markets. They do know the markets and can take initiatives. Women feel that product standards and certification would help.

The seaweed market needs to develop and new buyers are needed. Can the governments be pushed to find a buyer? This is not a woman-only strategy but as women dominate the production in Kenya, they are finding that the production is too low for commercializing the products. Low production also means low prices, especially as both Kenya and Tamil Nadu each have a monopoly buyer. The price conundrum is complicated by price competition with imported seaweed.

In both project countries, women seem to have become the testing grounds for seaweed farming as an alternative livelihood activity which has now become a main income source for most of the women led households in Kenya. When it succeeds will men take over?

Negotiation with large companies

Despite the apparent simplicity of seaweed farming, it is more complex than fish farming because of the product processing and market chains. Negotiating with large companies is not just an issue for women but for all the seaweed farmers. However, a critical question is whether gender differences are important in the negotiations such as in terms of how women argue/ negotiate/ highlight the problems/ solutions?

The farmers see government acting as a mediator but how can women farmers be assured that governments will mediate to make sure that women's role is acknowledged?

When payments and investments are made to farmers, issues arise as to whether women have

access to the joint accounts of women and men and how can women's access to income from seaweed be secured (recognizing women's contribution to seaweed activities)? If payments are made to a household in general, women might not have access to the benefit/ income.

During our interactions with men and women seaweed farmers in Tamil Nadu, it could be learnt that the subsidies of seaweed programmes were deposited either in joint/single account based on the requests of the individuals. (Man or woman) In families where there were difficulties for women in accessing the funds, the provision for joint accounts were created based on the requests of the woman in the family.

In India a subsidy scheme by National Fisheries development Board (NFDB) targets have 60% women farmers as recipients but women may be named on applications as a front, while still achieving little access to the family accounts. After the 2004 Indian Ocean tsunami recovery efforts in Tamil Nadu, the government learned that tsunami support had to be in joint names, not just the man's, in order to benefit both women and men. Also in some states in India, ration cards (through which subsidized food material is provided by the Government) are under women's names.

LESSONS LEARNT

Power of dialogue

How dialogue can be useful to bring out the different needs of people and lead to better negotiations? What were the success factors of our dialogue? Some key observations were as follows:

- Everyone was made to feel important
- Body language, emotions were important elements of the dialogue
- Exchange of ideas happened with no inhibitions on what to discuss
- Points that could have been dismissed as marginal cases, eliciting no empathy – which could be discouraging – were allowed and the dialogue process gave much more importance to each. The settings stressed that everyone's view is significant, everyone's point is valid. As a result, individual feelings influenced other people.

- Everyone felt that they have to do something for the farmers – no one could be a spectator
 - * As different stakeholders came together, they could hear for themselves and this helped make all stakeholders ready to go to help farmers. This was an attitude change – government felt the need to work to change how the seaweed farming should change (market orientation, etc).
- Farmers brought up issues
- An NGO said “this is the first forum that brought together all people concerned”
- Small dialogues were held first and the stakeholder workshop later
 - * Small dialogue outputs were presented to other groups, causing “opening the heart”
 - * During the price discussion, the monopoly company could also justify why the price was set like this. In Kenya, a woman leader convinced other farmers and defended the buyer (to enable the farmers to focus on the production bottleneck and not to target this particular buyer so everyone could move forward). The government came in to support to need to come up with long term support and development
 - * Previously, farmers never had a chance to talk directly to buyer
 - * Farmers were convinced that they need to focus on production (not only grievances about the low price).
- A major NGO said that they will replicate in Kenya what they have been doing in Tanzania.

ICT training and use of ICT as a methodology

- In India and Kenya, seaweed farmers are now using ICT (smart phones) including for exchanging views. Women are happy to learn new things.
- Women have been using the smart phones taking pictures – women in water, sun, limb pain, no structure - documenting their work difficulties, and showcasing their skills.
- Access to smart phones has been a breakthrough. Most women only had ordinary phones. When

they meet ecological challenges in farming, they say they can now take photos and report to the situation to the experts for advice, showing them what is actually happening on the ground.

- After a cyclone in Tamil Nadu, they were able to report damage to rafts to the government, and insurance companies.
- Via social media platforms women can do marketing themselves, such as for value added products. They now have new access to customers/ new market, and the women are excited about the new possibilities.
- In Kenya, the seaweed farmers have set up WhatsApp groups through which they make decisions very quickly.

Concern for marginalized people

- A point needed to be probed further was whether any group of people would drop out in the dialogue process if we are not careful? Caste considerations would play a part in India or religious factors may influence dialogue participation in Kenya.
- Seaweed farmers are already vulnerable groups and the Government of India is focusing on this group for upliftment. In groups, we must be mindful of those who do not talk and make sure they are invited to talk. This is where small dialogues are important.

Blue Economy

- How is the Blue Economy policy affecting women seaweed farmers? Are they likely to be replaced? Marginalized? Or does it give them opportunities?
- In Kenya, decent lives is a government policy for affirmative action, trying to ensure that no one is left behind. This is the 8th pillar of Kenya's Development Blue Print; Vision 2030. Kenya also has a saying – “when you educate the girl, you empower the whole community.” In public participation generally, a rule mandates for at least one-third women.
- In India, female headed households and widows are a focus. Seaweed farming assistance is targeted 60% to women beneficiaries.
- Through capacity building, women have the

opportunity to express themselves and gain and express skills in leadership. When women can express themselves, they can participate in different situations.

Some specific recommendations

- Capacity building for women to help them adapt to change. Training Basic Sea Survival, as farming might evolve from intertidal to deeper waters.
- Blue economy policy/ coastal mariculture policy and a seaweed sector development strategy
- Redesign the business model: Identify champion farmers and use them as a model. Provide technical and material support and monitor production to influence others into joining the sector.



A seaweed farmer from Kenya



A seaweed farmer from India

INTRODUCTION

Seaweed farming has been strongly promoted in several developing countries because it requires a low level of technology and investment, can be operated at the family level, has relatively little environmental impact, does not require refrigeration or high-tech post-harvest processing and is compatible with traditional fishing and other subsistence near-shore activities like gleaning for shell-fish (Bryceson, 2002; Pickering, 2006; Msuya et al., 2007). The demand for seaweed based products like agar, alginates, carrageenan and the numerous other secondary by products sourced from it make it a valuable product for seaweed based industries, the benefits of which often however does not accrue to the people involved in production. Seaweeds are also important dietary constituents in South East Asian countries being widely used in soups, salads, and other food preparations, though in India and Kenya it is yet to gain popularity as food.

The world production of seaweeds is 32.4 mt, of which farmed seaweeds represent 97.1 % by volume (REF). Production of seaweed, has increased threefold, from 10.6 million tons in 2000 to 32.4 million tons in 2018. This has been attributed to the rapid growth in the farming of mainly *Kappaphycus alvarezii* and *Eucheuma* spp.

The seaweed industry has an estimated market value of 12 billion USD/annum (FAO, 2019), with Asia accounting for 99.51% of the world's seaweed production. China, Indonesia, South Korea and Philippines lead, contributing 57.36%, 28.78%, 5.28% and 4.56% of the global production respectively (FAO, 2020)

Seaweed farming is a source of income and employment in rural areas with few income-generating opportunities, especially for women (Wallevik and Jiddawi 2001; Bryceson, 2002; Wakibia et al 2006). Seaweed farming perhaps is the only aquaculture activity largely depending and dominated by women's labour, across the world. In addition to income provision, it has also increased the economic purchasing power as well as created more social empowerment for women (Ako 1997).

The focus of seaweed farming has been mainly on *Kappaphycus alvarezii* commercially known as "cottonii" which commands a higher farm gate price than *Eucheuma denticulatum*, commercially known as "spinosum" (Msuya et al., 2007). However, spinosum is widely grown since cottonii is more environmentally sensitive, and hence prone to disease problems (Doty and Alvarez 1975, Uyenco et al. 1981, Collén et al. 1995, Largo 1998).

SOME TRENDS ON SEAWEED ECONOMY

Kenya

Seaweed farming was introduced in Kenya through experimental works by Kenya Marine and Fisheries Institute in the mid-1990s. The practice was perceived to be an alternative source of income to the fishing communities considering the dwindling fisheries resources and as a way of reducing pressure on the already overexploited fish stocks. Seaweed farming was believed to be an activity of last resort, thus left to women with men preferring other labor-intensive and more lucrative activities such as fishing. Women still dominate the

industry but men have also embraced seaweed farming considering the benefits derived by those involved. Despite being regarded as an alternative source of income to the fishing community at the coast, farming remained at a small scale up to 2010 before attempts to expand to commercial scale were actualized. Seaweed aquaculture has however been restricted to the South Coast of Kenya with a fair share of success and challenges.

Low prices and lack of immediate market for dried seaweed has been seen as a hindrance to the growth of seaweed farming in the country. Prices have been fluctuating between 0.15-0.30 USD/kg of dried seaweed, and according to farmers, this isn't a reflection of the labor and time invested in the farming exercise but it has led to exit by a number of individuals. Farmers have also in some instances been forced to stay with dried seaweeds in their homes for long periods with the hope of finding a buyer. Market has remained as one of the biggest challenges for the seaweed farming sector in Kenya. Farmers have mainly relied on the sale of dried seaweeds to exporting companies. This has led to exploitation by the companies who offer low prices. The industry has seen entry and exit of several companies. Zanzibar C-Weed Corporation is the latest entrant in the seaweed market with a different formula which includes provision of farming implements to farmers as a form of subsidy to enhance production. Farmers sell seaweeds at 0.25 USD per kilogram of dried seaweed to the company who stores it onsite in a warehouse before export.

Efforts to minimize overdependence on export companies as the only market outlet led to the development of other value added products such as cosmetics and food products. A seaweed soap processing plant which deals in production of value-added products such as bath soap and shampoo was also established at Kibuyuni through the intervention on the Government of Kenya and the UN Food and Agricultural Organization. The Kibuyuni seaweed soap (KISEFA soap) has received the S-Mark of certification from Kenya Bureau of Standards and is in the process of being fully introduced in to the market. Production is however ongoing and the proceeds from the sale of these products goes to Kibuyuni Seaweed Farmers Association (KISEFA), a registered Community Based Organisation.

KISEFA has overseen the establishment of a cooperative in its efforts to offer immediate solutions to seaweed farmers. With C-Weed Corporation not able to buy seaweed from farmers on a weekly basis, and farmers requiring immediate market for their produce, the cooperative embarked on purchasing dried seaweed from farmers at 20KES/kg and later selling to the company at 25KES/kg with the difference of 5 KES being remitted as members' contribution to the cooperative. This way, farmers are able to realize immediate benefits from their activities and is thus a morale booster. There have been efforts to extend the functioning of this cooperative to other farming sites.

India

India has a rich biodiversity of seaweed beds. (Ganesan et al, 2019). The two Indian States which are the hotspots of seaweed biodiversity are Gujarat and Tamil Nadu. These two states constitute more than half of India's seaweed biodiversity. These two States together harbour around 366 species of the total 844 species found in the Indian subcontinent. India depends on seaweeds harvested from the wild for agar and alginates production, whereas the production of carrageenan resources is sourced from cultured species namely *Kappaphycus alvarezii*.

The history of seaweed cultivation in India can be traced back to the 1990s when the first biomass for cultivation was imported from Japan and its cultivation was initiated along the Okhai coast of Gujarat (Ganesan et al, 2019). However, seaweed cultivation in India gathered momentum in mid-1990s with a private company (Pepsico) ushering in contract farming of seaweed in the coastal district of Ramanathapuram of Tamil Nadu State India (Ganesan et al, 2019). The company started organizing the self-help groups of men and women in the farming and made tie up arrangements with financial institutions like NABARD (National Bank for Agriculture and Rural Development) so that a large number of men and women in the district started realizing the potential of seaweed farming as a high income, low investment and short duration farming and started organizing the groups on the basis of family enterprises. Fishing had been the mainstay of this coastal populace and when seaweed farming technology was introduced in these regions by CSMCRI (Central Salt and Marine Chemical Research institute) and CMFRI (Central Marine Fisheries

Research Institute), the fisher families decided to take it up as a family-based enterprise (Johnson and Gopakumar 2011). Infrastructural facilities in the form of bamboo poles and ropes were provided with financial assistance from nationalized bank subsidies. Each individual was allotted 45 rafts, so that an individual could easily plant as well as harvest a raft in a day. During this period, the average yield/rafts was 240 Kg/raft, out of which 200 kg of fresh biomass was processed to form the dry product and 40 kg was used as planting material for the next cycle. Pepsico established a buy back arrangement with the sea weed farmers. Under this arrangement 7 cycles/year was undertaken by the farmers with each crop cycle lasting 45 days. Within a very short time, seaweed farming could revolutionize the lives of thousands of women in this coastal district. The farming technology became a game changer and a money spinner. During the mid-1990s to two decades of the period following it, women were able to contribute to household income, food security, secure for themselves houses, property, quality education for their children, add on to their savings and above all build their self-esteem and march towards self-actualization.

The seaweed sector in Ramanathapuram has two domains of activities. One is the seaweed farming sector and the other being collection of seaweeds in the natural environment by diving underwater i.e. collection from the wild. In both the domains of activities the role of women is singular and

predominant. In the case of wild collection, 99.90 percent of the collection is done by women. It is considered as women's forte (Times of India, 2019). The central portion of the coastline of Tamil Nadu is occupied by the Palk bay. Palk bay harbours natural vegetation of Gracilaria that is commercially harvested in this region. The Gulf of Mannar region is located along the southern coast of Tamil Nadu and is rich in all three species of seaweeds namely Gracilaria, Sargassum, Ulva and Turbinaria. It has to be mentioned here that the Gulf of Mannar is a protected biosphere and harvesting of seaweed from the wild is strictly prohibited by law in the core area and such activities are permissible only in the buffer zone.

Community imposed self-regulations hold a sway over the coastal communities engaged in harvesting the resources from the wild. Harvesting is done only 12 days per month during spring tides. In the Gulf of Mannar, 1555 fisher folk from 14 coastal villages are known to harvest seaweeds, including 1270 women and 285 men. Along the Palk Bay coast, 670 fisher folks from 24 villages harvest seaweeds. Among them, 460 are women and 210 are men. (Ganesan, et.al, 2019). Harvesting is done by cutting the erect fronds with a knife. No metal scrapers are used by them lest they damage the corals on which the plants are found to grow. Farming of seaweeds in the Gulf of Mannar was put to a stop by a special government order in 2010 (Refs).



SITE DESCRIPTIONS

Kenya has approximately 600 km of coastline bordering the Western Indian Ocean. The coast of Kenya has a distinctive fringing reef system that runs parallel in a southwesterly direction from the Somali border in the north to the Tanzanian border in the South. The tidal fluctuation is semi-diurnal, i.e. there are two highs and two lows during each 24-hour period (State of the coast report, 2010). Administratively, the coastal region is divided into 6 counties: Lamu, Tana River, Kilifi, Mombasa, Kwale and Taita Taveta all of which border the Indian Ocean with the exception of Taita Taveta. The coastal area has a rapidly growing population currently estimated at 4.3 million, which is about 9.1 % of the national population (GOK, 2019). This project was implemented in Kwale county located in the south coast of Kenya. Creating motivation for dialogue called for holding small dialogues within three seaweed farming communities of Kibuyuni, Mkwiro and Nyumba Sita. The target village was Kibuyuni although starting there aroused the need to include two extra villages as informed by the site scoping visit which revealed difference in the socio-cultural set-up amongst these communities.

The project site in India was Ramanathapuram district of Tamil Nadu state in South east coast of India which is one of the two major hotspots for seaweed biodiversity in India. Ramanathapuram district has been selected as the study area for the project since it boasts of nearly three decades of seaweed farming with women emerging as key players contributing towards its growth and success. There have also been issues in the sector,

with prospects being good till 2013 after which fall in production was noticed due to reasons such as rise in sea surface temperature above 36°C and disease outbreaks (Johnson and Gopakumar, 2011). Farming has spread to adjacent districts such as Pudukottai, Thanjavur, Tuticorin and Kanyakumari too owing to simple technology and good incomes during the initial decades in Ramanathapuram.

DESK STUDY

A desk study was carried out in both the countries to review the status of seaweed farming. A review of available literature, technical reports and farmers' books of records on seaweed farming in Kenya was carried out. This included a preliminary analysis of the history of farming and current production status, market trends, stakeholder and institutional analysis as presented below. In India, the status of seaweed farming and connected issues were compiled and analyzed and a preliminary account of these has been presented in Section V. Most of the studies reported were undertaken to show the potential or actual benefits of introducing seaweed farming.

SAMPLING

Purposive sampling (de la Torre-Castro et al., 2007; Ochiewo et al., 2010) was adopted where the target population was individuals engaged in seaweed farming in both the project sites (the South Coast of Kenya and Ramanathapuram district of Tamil Nadu, India). Location specific approaches were adopted for grouping farmers/stakeholders for the dialogue process.



Plate 1: E-Literacy training to the seaweed farmers at the study sites

In Kenya for example, farmers were put in groups based on their having similar characteristics, for instance seaweed farmers who are women in one site/village and belonging to the same cooperative hence sharing the same experiences. The COVID –19 pandemic necessitated devising new strategies for conducting the dialogues and the teams evolved these as they progressed with the work. A combination of methods was adopted to conduct the dialogues with several small (Kenya) and virtual (India) being some of them.

DATA COLLECTION

Both primary and secondary data collection methods were used employing various techniques to include: desktop study, observation, transect walks across the farms while observing activities as they occurred and also engaged in various seaweed farming activities at the farms, seasonal mapping timelines, collection of anecdotes (PRA techniques), photography, videography and focus group discussions. The desk top study conducted involved acquisition of up-to-date published information on the seaweed value chain in the country and in the selected sites. A systematic review approach was used to identify, appraise and synthesize existing empirical evidence on the value chain with emphasis on the gender dimension. The desk top study provided the baseline information on the current production practices and the involvement

of women and men in it; the backward and forward linkages; the industry players; the market prices and trends; legal frameworks in which the producers and the other market functionaries operate; and issues at each level in the value chain. In the Indian site, a semi-structured interview schedule was also constructed to include the variables which were considered important and could contribute to certain degree of quantification of information.

Kenya

Collection of data occurred between January 2020 and December 2020 in Kenya that engaged the local leadership to aid in mobilizing the target population aided by field guides that worked closely with the project team. Small dialogues with different actors were conducted comprising of interviews with the leadership and the seaweed farmers. These included: the seaweed chairpersons, seaweed group cooperative officials, seaweed farmers (women, men and the youth), village heads Beach Management Unit (BMU) chairmen and the BMU officials. This culminated to 19 small dialogues (9 small dialogues held in Kibuyuni, 8 in Mkwiro, 2 in NyumbaSita) each constituted 6 to 10 members, 1 big dialogue (involving State and Non-State actors), one stakeholder validation and dissemination workshop. Due to occurrence of the COVID-19 pandemic, seaweed farmers requested for e-literacy training to enable them to use social

media to market their products (Plate 1). With this, the project team conducted ICT training where 50 farmers were trained and tasked with training at least 5 others. This projection would result in up to 250 farmers gaining skills in the use of smartphones as data collection tools and using social media for marketing and advocacy. The need to enhance e-literacy skills for farmers was raised during the small dialogues as they wanted their

activities to reach out to bigger audience. This was also necessitated by the Covid-19 pandemic which required collection of data remotely and equipping them with these skills would enhance swift coordination in future.

Keeping in view the objectives of the study where we looked into the 'impacts of globalized markets; small-scale fisheries guidelines implementations



Plate 2 : Small dialogues with different groups within the seaweed farmers group in the project sites.



and contextualized institutions (formal and informal) determine conditions for exclusion and struggles of women at local levels', were taken into consideration. Secondary sources of information like government plans and programmes were also reviewed to give insights on policies direction and impacts on the seaweed industry (production as well as processing). Aiming at small dialogues with the target groups within Kibuyuni, Mkwirowi and NyumbaSita villages where the discussion was centered on: Venn diagram analysis: who is working with whom, who has what relationships; Benefit and conflict analysis: who shares the benefit? who are in competition? Value chain analysis: What is the value chain of seaweed? Who is involved in

which part? Others were: group dynamics, societal enablers and hindrance to women involvement, effect of Covid-19 on seaweed farming, challenges and opportunities.

This was done separately for group leadership, men, women and youth to promote free expression amongst peers. Focus Group Discussions (FDGs) (de la Torre-Castro et al., 2007; Start & Hovland., 2004; Krueger & Casey.,2000) were used with open-ended questions to prompt participants (6-10) into free discussions revolving around: general outlook of seaweed farming sector, involved stakeholders, gender-related enablers and hindrance to involvement in seaweed farming,



BOX 1

STRENGTH OF A WOMAN

Majority of the farms you see along this stretch belong to women. They have been at the forefront since introduction of seaweed farming in the country. You might have come across men in some farms, but don't be deceived, they are just helping their wives", says MS Fatuma Mohamed, as she smiles under the scorching coastal heat. She is the chairman of Kibuyuni Seaweed Farmers Cooperative. Have you ever imagined how it feels to carry the hope of a village? How would you deal with cases of women approaching you for loans to pay school fee for their children?

You look at Ms Fatuma and see the eyes of Mekatilili Wa Menza, a woman freedom fighter who resisted the British rule at the coast of Kenya. Very determined to ensure the wellness of seaweed farmers. The seaweed champion that has literally carried the venture in her hands whenever challenges occur. Being amongst the pioneer farmers at inception, Mama Fatuma embraced seaweed farming. She has passed the knowledge and skills by training other farmers. And has single-handedly built her own permanent house, educated her siblings and continues to pay school fee for many children in the village. Her recognition as a woman of substance goes beyond the village as she has been invited to State events by The President of Kenya who values her contribution to the growth of the country's Blue Economy sector. Mama Fatuma remain to be a pillar as she always encourages other women to look at the bigger picture whenever they face challenges. She always refers them to the journey they have taken from storing dried seaweed in their houses for years due to lack of market, to attracting the attention of the Government which is now supporting them. She thus continues to rise against all odds to command respect in the whole village with the hope of influencing people's lives.

knowledge of existing laws and policies related to seaweed farming, sectoral needs, effect of Covid-19 on seaweed value-chain. The discussions were guided by two moderators where one recorded the proceedings on a note book while the other moderator facilitated the discussions using pre-designed discussion guides. During the discussions, each member was encouraged to speak openly during the dialogue from their individual experience and standpoint. This in return motivated active participation.

A separate workshop was held for other stakeholder as having them in the seaweed farmers' FGDs could have prevented open discussions. Combining State

and Non-state actors in one forum was meant to bring out any conflict of interests amongst them and agree on a win-win situation. They included representatives from KMFRI, County Government of Kwale Fisheries Department and Department of Trade and Cooperatives, The Nature Conservancy (TNC), Seacology, Coastal Marine Resource Development (COMRED), Coastal Oceans Research and Development-Indian Ocean (CORDIO) East Africa and a private entrepreneur (Plate 3). Presentations on institutional programs/projects related to seaweed farming and was followed by discussions on policy needs and redefining the business model to drive the seaweed sector forward.



Plate 3 : Stakeholder workshop with different state and non-state actors in Pride Inn Hotel Diani-Ukunda

Farmers, State and Non-state actors were lastly brought together in the big dialogue where each party was encouraged to openly articulate issues from a personal perspective. Aspects of gender considerations on institutional programs or future initiatives, emerging areas of gender and environment policy, small-scale fisheries guidelines and the influence on gender inclusivity, and market dynamics were discussed.

India

Dialogues were central to all the methods used either qualitative or quantitative, since they are powerful communication tools which are not restrictive, enable free flow of ideas, can be informal, capable of capturing hidden scenarios in a non-threatening friendly environment and effective pedagogical tools for interactive interlocutions. (Dale, 2004, Rodriguez, 2017). Given the COVID-19 pandemic and consequent restrictions imposed by the government, the only means of communication in the initial stages of the project was through mobile phones. Subsequently Information Communication

Technologies (ICTs) such as laptops, smart phones and cameras were made use of for conducting the dialogues. In-situ training workshops on the use of ICT tools were held at the project site for capacity building of the women and men seaweed farmers. When the lockdown restrictions were relaxed this permitted the project team to travel to the project site. Following this, the virtual dialogues were held from November 9th to December 4, 2020.

The women exhibited great enthusiasm and zeal in learning new tools of communication. In situ training was conducted in groups, each group presided over by the group leader. Women were trained to capture short videos featuring a narrative, and focusing on the issues in the farm and home front, from a gender centric angle, as well as the impact on their livelihoods wrought by the COVID-19 pandemic. Photo voice was also taught to the farmers. It is essentially a technique of making an individual to gain mastery over the use of a camera in taking pictures of a certain theme which are effective in conveying to the intended audience a story told

through a series of photos with a narrative attached to it. (Budig, 2018) This was the first step in making a woman realize her full potential, take control over her life and reveal her perceptions herself to the outside world about the subject matter in question e.g. the gender roles of women in seaweed farming, to show case pictures wherein the women's burden at farm and home front had increased manifold due to the impact caused by the pandemic and so forth. Equipping the women with ICT tools made women feel that they were indeed important people, sought after by the public, by government and policy makers and provided them with an opportunity to voice their feelings and opinions. During the virtual dialogues, women and men farmers prepared short videos of their lives indicating that gender wise division of labour was a very primordial layer of the gender analysis framework and that they were operating within the labyrinth of a closely knit framework, impacted by polices, industries, and the socio-cultural tapestry woven around them.

Field assistants in the team conducted on the spot interviews and also held discussions in the field as well as in the respondents' homes observing COVID protocols. The project team also visited the representatives of industries such as Aqua-Agri (a

private seaweed processing company), Officials of the State Fisheries Department, scientists of the Mandapam Regional center of ICAR-CMFRI (Tamil Nadu), scientists of CSMCRI, officials of the Forest Department and NGOs in the field such as Peoples Action for Development, Aquaculture Foundation of India (AFI) and M.S. Swaminathan Research Foundation (MSSRF).

Site Validation meetings were held (11th-14th December, 2020) at strategic locations of the district and a microcosm of the seaweed sector participated, consisting of all the players, farmers (men and women), seaweed collectors, Governmental and institutional representatives, NGOs, local leaders, members of the blue economy. The common platform was used to corroborate the evidence and facts gathered through virtual dialogues and field interviews. It also provided a venue for triangulation of data gathered earlier from the respondents.

The data collected was also subjected to simple statistical analysis to draw inferences. Additionally, the constraints encountered by the seaweed farmers were ranked using Garrett Ranking Method. (Garrett and Woodworth, 1969, Saei, 2019).

BOX 2

DIGITAL GROWTH

Achieving the Sustainable Development Goal of a 'world with zero hunger' by 2030 will require more productive, efficient, sustainable, inclusive, transparent and resilient food systems. This will require an urgent transformation of the current agri-food system. Digital innovations and technologies may be part of the solution as digitalization is capable of changing every part of the agri-food chain. Additionally, management of resources throughout the value chain can become highly optimized, individualized and anticipatory increasing traceability and coordination at the most detailed level. Digital agriculture creates systems that are highly productive, anticipatory and adaptable to changes such as those caused by climate change. This, in turn, could lead to greater food security, profitability and sustainability.

The so-called 'Fourth Industrial Revolution' is seeing several sectors rapidly transformed. In the agriculture and food sector, the spread of mobile technologies, remote-sensing services and distributed computing are already improving smallholders' access to information, inputs, market, finance and training. Thus, the digital technologies are creating new opportunities to integrate smallholders in a digitally-driven agri-food system. The next period of growth in mobile connections is expected to come mainly from rural communities. World Bank, 2016 estimated that already 70% of the poorest 20% in developing countries have access to mobile phones.

OUTCOMES OF THE SCOPING STUDY

KENYA

A reconnaissance visit to the seaweed farm sites was undertaken in March to understand the dynamics of the farming communities, introduce the project's goals and action plan to the target groups and assess their books of records.

The different stakeholders and their roles in the seaweed value chain at Kibuyuni was explained by the farmer's chairperson. The stakeholders included local NGOs, the County Government of Kwale, the National Government through Kenya Marine and Fisheries Research Institute, the State Department for Fisheries, Aquaculture and the Blue Economy, the Blue Economy Implementation Standing Committee, and the UN Food and Agricultural Organization. The support to farmers from various stakeholders has been through interventions in the form of provision of practical skills for establishment and monitoring of farms, provision of farm implements, post-harvest handling and processing, and value addition.

An account of the present status of seaweed farming in Kibuyuni was given. Farmers had sold 12 tonnes in November 2019 but there has been decline in production since December 2019 owing to freshwater input due to prolonged rainfall experienced in the region. Increasing sea surface temperatures was also identified as a challenge leading to stunted growth and low production. Technological change such as venturing into offshore systems such as floating rafts and longline was proposed as a solution to this although it comes

with its disadvantage of deeper waters where the chances for women farmers to participate are minimal.

The scoping exercise also revealed that women still dominate the seaweed farming value chain boasting almost 90% of the membership. Women are considered to have important roles in Kibuyuni and their full participation is reflected in the improvement of livelihoods in the village with better houses being built and children accessing formal education as a result of income from seaweed farming. This has encouraged men to join with some combining forces and taking it up as a household venture. Families with available labour have exhibited higher production. Any intervention, be it in the value chain or at policy level should work towards cementing the participation of women as this model has proved to be effective in this farming site.

Scoping was also done in other farming villages despite not being the main subject of the present project activities. This was deemed necessary as they are regarded as important stakeholders and they would be directly affected by the project output. The noticeable challenge that some of the women face is the fact that they are single mothers or unmarried and solely depend on seaweed farming as an income source. Therefore, they sometimes find it difficult to provide for their families when they don't immediately sell their produce and this demoralizes them.

Below is a detailed account of group profiles for the different farming sites.

i. Kibuyuni Seaweed Cooperative:

The group was formed in 2014 as a self-help group that recently (2019 July) evolved into a cooperative with 113 members, 101 women and 12 men. This move was in line with the current changes in the market that necessitates better positioning in setting and increasing bargaining power of the farmers. They are cohesive and well organized with farming being done individually.

- However poor record keeping was still evident with staggered records over some months (e.g. (i) membership records need to be updated, (ii) production records from June 2019 to 2020 where partial records were maintained). Much donor funding had been channelled through the group resulting in overreliance on funding from donors and lack of transparency. This should be addressed to ensure sustainability.

ii. NyumbaSita Seaweed Farmers: The group consists of 38 members of whom 28 are women and the rest are men. The group boasts a structured leadership that maintains the cohesiveness of the members with farming being done as a group venture with well-articulated formulae of sharing income from the farm's yields. However, like other groups, poor record keeping was still evident.

- Additionally, the group's farms lie within an area where fresh water intrusion is a major problem and hence they are calling for relocation of the farms; this is currently being done with support from C-Weed Corporation Limited-Kenya. The group is undertaking ongoing nursery establishment after most of their seedling was lost during the prolonged rainfall in December 2019.

iii. Mkwiro seaweed farmers: The group consists of 80 members of whom the majority (74) are women and the rest are men. The women have the zeal to work despite the many challenges they encounter in their day to day lives and low levels of education.

- The group's registration is currently expired. Elections have not been conducted for the past six years and hence it has no

recognizable office bearers.

- The area has proved to have the best site in terms of its location and viability in seaweed production and it has a great potential. However, there exists conflicts within the group and between the group and the main seaweed buyer (C-Weed Corporation). A new entrant in the market collects seaweed from the farmers even though he has hardly supplied any inputs. This breaches the farmers' contract with C-Weed Corporation Limited Kenya that had been supplying inputs in return for better production from the farmers.
- The group leadership is also volatile and hence this needs to be addressed to promote cohesion in the undertaking. Men are dominant and hence set all rules influencing women's engagement, and hence have an influence on the entire seaweed value-chain, dictating mobilization of farmers, farm establishment and negotiating prices with buyers.

iv. Mwazaro Seaweed Farmers: The group consists of 90 members; 60 old farmers and 30 new entrants.

- The group also boasts of a structured leadership that maintains the cohesiveness of the members with farming being undertaken as an individual venture. Women are supported and helped by their husbands; this gives a clear view of sustainability where families take up the initiative. There is also a lot of cohesion within the various groups that operate in the area with a strong backing from the village leadership.

v. Tumbe: The group has 55 members of whom 6 are men while the rest are women. They have an organized management structure that also has a committee to oversee various aspects of the group. They portrayed cohesion as a group.

OVERVIEW OF SEAWEED FARMING

Based on the desk study, a preliminary analysis of the history of farming and current production status, market trends, stakeholder and institutional analysis is presented below.



Plate 4 : Project team appreciating harvested *Kappaphycus alvarezii* (cottonii) from 1 rope in Kibuyuni village

Production status

Exploring the potential of seaweed mariculture along the Kenyan coast started in the early 1990s (Yarish and Wamukoya 1990). According to this study, there existed significant seed populations of *Gelidium*, *Gelidiella*, *Gelidiopsis*, *Pterocladia* that could produce high quality agar. *Gracilaria*, appeared to be widely distributed along the Kenyan coast and its culture would highly benefit the agar industry. Trials for cultivation of *Gracilaria salicornia* for commercial agar extraction are ongoing at the South coast of Kenya (Ollando et al. 2019). According to Yarish and Wamukoya, (1990), *Eucheuma*, *Kappaphycus*, *Halymenia* and *Hypnea* would be the major sources of carrageenan considering their abundance but their culture was suggested to increase their crop. Similar observation was made by (Bolton et al. 2007). This laid the basis for seaweed mariculture along the Kenyan coast which has mainly revolved two species: *Eucheuma denticulatum* and *Kappaphycus alvarezii* (Wakibia et al. 2011). The latter has however been abandoned due to its susceptibility to changing sea surface temperatures and grazing which leads to diseases such as ice-ice and crop loss.

Initial culture trials investigating growth rates of the two species (Wakibia et al., 2006a), and seasonal changes in carrageenan yield and gelling properties (Wakibia et al., 2006b) revealed their potential as mariculture species on the south coast of Kenya. Seaweed mariculture was further identified as an

alternative livelihood source for the marginalized coastal communities (Wakibia et al. 2011). Since the early 2010s, seaweed farming has been ongoing in coastal villages of Kibuyuni, Gazi, Mkwiro, and Funzi and this has now expanded into other villages such as NyumbaSita, and Tumbe with proposed expansion to other suitable areas.

The off-bottom method is the common culture technique, despite trials of other methods such as longlines and floating rafts having been documented. Adoption of longlines and floating rafts has been slow because they are deployed in the deeper waters and their maintenance requires diving and snorkelling skills. This makes it hard for more than 80% of farmers who are women and who are inclined to working in the shallow inter-tidal area. Farms are typically owned by households and they comprise of 6 blocks each having 50 ropes. Each farm measures 1,500m² with a total of 300 ropes onto which seedlings are tied. Average annual production in Kibuyuni is approximately 70 tonnes with a total income of \$17,500, but projections indicate that this will increase considering the Government's initiative to upscale production through the Blue Economy Implementation Standing Committee intervention.

Market trends and players

A stable market for dry seaweed has been a major challenge in Kenya. The sector has experienced change in market outlets with subsequent

changes in price. There has been a great influence from Zanzibar considering the close relationship between the two markets with farmers mostly selling to common buyers.

The market for dried seaweed produced in Kenya has undergone change since the introduction in the country. This has evolved from solely depending on sale of dried seaweeds to companies which later exported to Europe and Asia for processing, to, in recent years, the development of value-added products targeting the local market. In the early years, farmers sold to middlemen, mostly in Zanzibar, who later sold to exporting companies. The price at this point ranged between \$0.09-0.25. Despite being a reflective of the global prices, this amount was considered to be relatively low by the farming communities and was one of the challenges limiting full uptake of the initiative by the coastal people. Further analysis of the market dynamics revealed that the middlemen were also inconsistent in their purchasing and farmers had to store their seaweeds for long periods with the hope of selling, having implications for the quality of the produce.

Kenya Marine and Fisheries Research Institute (KMFRI) has been on the forefront of ensuring continuity and development of seaweed mariculture in the country. This ranges from offering technical knowledge in farm establishment to engaging different companies and investors and bringing

them on-board as a market outlet. Between 2014 and 2018, East Africa Seaweed Ltd. entered the seaweed market in Kenya and bought dried seaweeds at an improved price of \$0.3 for *spinosum* seaweed and \$0.4 for *cottonii* (KMFRI 2015). The company however exited the market shortly thereafter and this called for collaboration from different players to ensure continued production and improvement of livelihoods. As revealed in the stakeholder analysis, the intervention of KMFRI, the Government of Kenya through the Blue Economy Implementation Committee, Kenya Industrial Research Development Institute (KIRDI) and the UN Food and Agriculture Organization partnered to improve the post-harvest processing through design and fabrication of drying facility and soap making plants. The training of farmers on production of value-added products from seaweeds was facilitated initially by FAO and later by KIRDI who improved the quality of the original soap and developed other cosmetic products for the Kibuyuni group. These interventions were geared towards product diversification to minimize dependence on selling dried seaweeds as the sole farm product. The seaweed-based soap later was certified by the Kenya Bureau of Standards. Its production targets the local market. Soap production is a joint activity between men and women, with men handling machinery and women working on the initial stages of ingredient mixing.



Plate 5 : Community engagement during the scoping visit at Kibuyuni South coast, Kenya

Seaweed farmers are presently selling to C-weed Corporation Ltd-Kenya at \$0.25 apart from that product they use for making soaps and shampoos. With empowerment in entrepreneurship skills, Kibuyuni Seaweed Farmers (KISEFA) have established a co-operative which acts as the bridge between farmers and the purchasing company by buying seaweeds from farmers at a lower price and later selling it to the company, with the profits going to their welfare kitty. Farmers can therefore immediately sell to the co-operative and avoid the waiting time as experienced before with the exporting companies. Through this, women who are a majority, are able to provide food for their families and take care of other household needs such as healthcare.

Government policies & legal frameworks that support development of the seaweed Industry

Coastal and marine ecosystems are composed of multiple interacting systems – maritime, terrestrial and aquatic and include the islands and the 200 nautical miles exclusive economic zone (EEZ). The policy implication is that their future competitiveness and well-being depend heavily on improving the efficiency of natural resource use. This therefore demands the identification of development enablers which can help to define goals and means of implementation. Such “enablers” include set arrangements within existing system that provide opportune conditions for innovation and technology in sustainable use of resources.

Constitution of Kenya (2010):

Chapter 5, Article 69 recognizes utilization of the environment and natural resources for the benefit of the people of Kenya ; this is in support of Chapter 4, article 19 (2) that states that “the purpose of recognising and protecting human rights and fundamental freedoms is to preserve the dignity of individuals and communities and to promote social justice and the realisation of the potential of all human beings”. Hence seaweed farming is providing for incomes that aid in preserving dignity of communities through improved standard of living.

‘Big Four’ Agenda:

The Big Four Agenda is the country’s major transformation blueprint being implemented within

five years from 2017-2022. The Big Four Agenda items are: Food security, manufacturing, affordable universal health care and affordable housing.

In line with this, the Government is currently facilitating the ease of doing business as this will encourage companies to invest in Kenya, which will boost foreign investment and create employment. Additionally, the Government is also sourcing for new global markets for Kenyan exports to increase exports and hence improve the manufacturing sector. It is in light of this that the Blue Economy Implementation Standing Committee (BEISC) has embarked on facilitating investment in seaweed farming for its potential to contribute to the overall growth of the economy.

Vision 2030:

Kenya’s Vision 2030 envisages the transformation of the country into an industrialized economy by 2030. Industrial development is identified as a key driving force that puts pressure on the environment. Industrialization involves transformation of raw materials into value-added products using technology. Considering this fact, the second midterm plan aims at the adoption of the ecosystem approach in management plans to support sustainability in resource utilization. As highlighted in the Blue Economy initiative, Seaweeds will be utilized sustainably while enhancing biodiversity conservation and ecosystem integrity.

Fisheries Policy and legislation:

The Fisheries conservation and management Act 2016 provides for the conservation, management and development of fisheries and other aquatic resources to enhance the livelihood of communities dependent on fishing. The Kenya Fisheries Services has been established for this purpose. Part 50 (1c) of the Act empowers the cabinet secretary to gazette fish breeding sites and this includes macroalgal beds which also act as nursery habitats for juvenile fish (GoK, 2016c).

Environmental Management and Coordination Act, 2012:

Designed to alleviate pressure on the environment through good environmental management and safeguards against any type of pollution. It is therefore relevant to the protection of estuaries especially through activities that aid in safeguarding the environment.

Environmental and Development

Policy (Sessional Paper No. 6 of 1999):

Formulated to harmonize environmental and developmental goals to achieve sustainable development. It contains comprehensive strategies and appropriate guidelines for the Government to act, providing a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources.

Integrated Coastal Zone Management (ICZM) policy, 2013:

Aims at providing a framework for sound management of the coastal zone and associated resources through inter-sectoral coordination and integration of environmental consideration into socio-economic planning and implementation at all, levels. The Policy recognizes the inter-relationship and interconnectedness of the coastal environment. The seaweed farms fall within the coastal setback and safeguarding the industry will protect the seaweed farms from encroachment and damage through development projects.

Maritime Zones Act, 2012:

Provides for prescribing measures for the protection and preservation of the marine environment. The Act also promotes and enhances cooperation, collaboration, synergy, partnerships and participation in the protection, conservation, sustainable management of the environment and natural resources.

The Science Technology and Innovation Act 2013, Cap 250:

The Act provides for research in the coastal and marine environment. Additionally, it promotes and supports research and capacity development as well as use of innovative environmental management tools such as incentives, disincentives, total economic valuation, indicators of sustainable development, strategic environmental assessments (SEAs), environmental impact assessments (EIAs), Environmental Audit, and Payment for Environmental Services (PES). It is, therefore, under this Act that institutions like KMFRI were established to undertake research on the aquatic environment in order to provide scientific data and information for sustainable exploitation, management and conservation of Kenya's fisheries. Information remains a key foundation for sustainable

development and is fundamental to successful planning and decision making.

National policy on gender and development, 2000:

The policy sets legislative and administrative measures to address the existing gaps in the realization of gender equality and women's empowerment. Generally, gender plays an important role in the management of the environment since different social groups and demographics are impacted differently by environmental challenges. They also play unique roles in managing the environment given their unique capabilities, experiences and knowledge relating to the environment. The policy recognizes that achievement of gender equality and women's empowerment requires the concerted effort of all actors hence the need to mainstream gender and equity in all sustainable developments.

Land Act, 2012:

It recognizes three categories of land ownership as stipulated in Article 61 (1) and (2). These are public, community and private land. Further, Article 62 (1) of the constitution defines public land as including all government forests, rivers, lakes and all water bodies and land between high and low water marks (GoK, 2010). In terms of management and governance, community land is managed under unwritten customary laws. Private tenure is divided into freehold and leasehold where, under freehold tenure, land is owned by an individual or a group privately over an indefinite period of time. In leasehold tenure, land ownership has a time limit upon payment of the agreed charge. Land under public tenure is owned by the government on behalf of the citizens of Kenya (GoK, 2010).

Physical and Land Use Planning Act, 2019 Cap.303:

Sets out land planning regulations and gives the local authorities power to plan their own developments. According to the Constitution of Kenya (2010), the government holds public land in trust for the citizens and the National Land Commission (NLC) administers it on their behalf. Public land can only be disposed of through an Act of parliament as in GoK, 2010: 62 (4). However, the intertidal zone is exempted from disposal or any allocation as indicated in the Land Act, 2012: 12 2(b).

Further, community land is owned by communities, where the community must be registered with the government and is not limited to ethnicity (GoK, 2016:63 (1)). The Community land falls under different tenure categories, namely, customary, freehold, leasehold, and such other tenure system recognized under the Community Land Act (2016) or other written law (GoK, 2016a). Registered communities are expected to adhere to the laws and policies on sustainable conservation of natural resources within their land (GoK, 2016: 20 (1)). County government holds in trust any unregistered community land on behalf of the communities (GoK, 2016: 63 (3)).

Under Community Land Act (2016), men and women, without discrimination, can apply to a registered community for occupancy of registered community land. In Part III and Part VII of the Act, the management of community land is through a participatory process by a community assembly who can make rules and by-laws on management of land and other natural resources as long as they agree with county's national laws (GoK, 2016). As such this gives the groups involved in seaweed farming a window in utilizing community land for infrastructural development that support seaweed upscaling.

The Kenya Tourist Development Corporation Act, Chapter 382:

Gives powers to the Kenya Tourist Development Corporation to (a) investigate and formulate projects for the promotion or expansion of new or existing enterprises and to carry out such projects; (b) carry out activities which are needed for or in connection with the promotion or expansion of new or existing enterprises. As such engagement in Seaweed farming promotes eco-tourism within the villages while also aiding in creation of alternative livelihoods for the groups.

INDIA

Secondary data on the role of women and men in seaweed farming in Tamil Nadu and Gujarat states of India have been collected. The following have been reviewed: the existing literature on seaweed farmers (15 research papers), the industries involved in buying the seaweeds from farmers, the NGOs associated with the farmers and also the numerous schemes involving seaweed farmers implemented

by the National Fisheries Development Board, Hyderabad, India. Based on field visits undertaken during February 2019 at Ramanathapuram district, Tamil Nadu, different stakeholder groups who could be effectively involved in the ensuing dialogues under the Project were identified.

Seaweed farming is practiced in the districts of Ramanathapuram, Pudukottai, Thanjavur and Tuticorin in the State of Tamil Nadu, South India. The annual production of farmed seaweed from the state is 4,000 t. The species largely cultivated are *Kaphaphycusalverizi* and *Gracilariaedulis*. A pilot survey among seaweed growers of Tamil Nadu revealed that there are 600 families in Ramanathapuram district and 400 families in Tuticorin and Pudukottai district engaged in seaweed cultivation using rafts. These rafts are owned by individuals, by groups as well as by families.

A survey was undertaken during February-March 2019 among the seaweed growers of Ramanathapuram district, Tamil Nadu, India. The study was initiated among 650 seaweed farmers comprising both men and women engaged in the sector. Seaweed farming was observed in the locations of Munaicadu, Thangachimadam, Akkalmadam, and Rameswaram. Seaweed farming, being a family oriented enterprise, has the involvement of both men and women in various stages of the farming process. A raft is managed by 1 male member and 2 female members of the family. It could be observed during the course of the study that a single family could be in possession of as many as 25-45 rafts. Women in seaweed farming belong to the age group of 30-50 years. At present there are 5,000 rafts under seaweed culture in this district. The seaweed rafts are anchored at a depth of 1-1/2 meters in the water and at a distance of 500 meters-1 km from the shore, making it easily maneuverable for the women folk who are actively involved in seeding of ropes, maintenance of the rafts as well as harvesting and drying of the raw material. Menfolk are involved in the fabrication of rafts, installation of rafts at sea, maintenance of rafts as well as in harvesting of the produce. Seaweed rafts are square shaped and 12x 12 feet in size. A single raft harbours around 20 ropes and an average raft yields 300 Kg on harvest. The economic holding period is 45 days. Three such harvests are taken in a year. Out of 300 kg of harvested material, 230 kg is sold either as dry/fresh to processing companies

such as Aqua Agri, Aqua Foundation of India and SNAP and 70 kg is retained as seeding material. On an average, a woman laborer in seaweed farming earns Rs. 200 for 4 hours of labour/day, an average monthly income of Rs. 6,000 and a yearly income of Rs. 42,000/year, i.e. \$591. Both men and women command equal wages for the same hours of work. As a family owned enterprise, the earnings from seaweed farming are as high as Rs. 21,300/month, i.e. \$300.

An attempt was made to find out the extent to which seaweed farming contributed to/supplemented the main income from the main occupation of fishers (single day motorized gillnet fishing) in the regions where farming was predominant. Among the 650 seaweed farmers studied, the additional person days generated was 180, and the annual income generated from seaweed farming as a diversified livelihood option was Rs. 140,000 (\$1,971) registering a 93 per cent increase over and above the income from marine fishing. (CMFRI, 2019, Field Survey results, Unpublished).

OVERVIEW OF SEAWEED FARMING

The following is an analysis of the information sourced as part of the desk study. The discussion centres around the potential or actual benefits of introducing seaweed farming.

Human-seaweed interactions can be traced to the Neolithic period (Dillehay et al., 2008; Ainis et al., 2014; Erlandson et al., 2015). The earliest records

of the use of seaweeds for human consumption date back to China, 1,700 years ago (Yang et al, 2017). Seaweeds have been exploited for medicinal purposes for the treatment of goiter and for difficult child birth (Levine, 2016). Later, the focus was shifted from exploitation of seaweeds for industrial purposes such as manufacture of chemical fertilizers to extraction of hydrocolloids (Synytsya et al., 2015). At present, the countries which rank foremost in the farming of seaweeds are China, Indonesia and Philippines which also farm the greatest diversity in seaweed species. (FAO, 2014, 2016).

In India, natural seaweed resources are found in abundance along the TamilNadu and Gujarat coasts and around Lakshadweep, and Andaman and Nicobar Islands (Tandel, et al, 2016). Seaweed cultivation has been identified as a major livelihood focused intervention in the Southern State of Tamil Nadu, India. In India, they form the major raw materials for the production of agar, alginates, and for production of liquid seaweed fertilizer. In all, the Southern States of Tamil Nadu, Karnataka, Andhra Pradesh and the western state of Gujarat has 20 agar factories and 10 Alginate factories (Tandel, et al, 2016). Mantri et al (2019) reported that there are more than 1,000 fishermen along the coast of Tamil Nadu involved in seaweed cultivation, producing over 2,000 tons of seaweed. The entire farmed biomass today in India has emanated from a small piece of *K. alvarezii* (then known as *K. striatum*), of Philippines origin, acquired from Japan by CSIR-CSMCRI in 1984.



Plate 6: Women seaweed farmers seeding ropes for raft culture

Though India has only a 10 per cent share in global seaweed diversity, and 0.01 per cent in farming output, the country occupies strategic importance for its potential areas in seaweed farming such as the Union Territories of Andaman and Lakshadweep which form 20 per cent of its coast line (Mantri et al, 2019). Narayanakumar and Krishnan (2011) reported that large scale involvement of fisher folk in seaweed farming gathered momentum when they were organized into Self Help Groups (SHGs) by corporate bodies like Pepsico India Ltd., backed up by Institutional and financial support in Ramanathapuram district of Tamil Nadu in 2000. Later, the foundation of seaweed farming in Ramanathapuram led to the expansion of the cultivation in the adjoining districts of Tuticorin, Pudukottai and Thanjavur (Krishnan and Kumar, 2009). The SHGs consisted mostly of women members, though some groups had a mixed proportion of both women and men members. The government agencies involved in this venture were the Department of Biotechnology (DBT), Ramanathapuram Rural Development Agency (RDDA) and Tamil Nadu Department of Fisheries (Narayanakumar and Krishnan, 2011). Further, this study indicated that the district has an employment potential of 765,000 person days with current development projections promoting 5,000 families in the years to come.

The study by Vipinkumar et al (2013) reported that seaweed cultivation using the species *Kappaphycus alvarezii* had proved to be a promising venture for the women Self Help Groups of Ramanathapuram district. Of the 1,200 fisher families involved in this group venture, 60 percent were women beneficiaries. Vipinkumar et al (2017) studied the gender perspective in seaweed farming as well as the participation profile of fishermen and women in the enterprise. According to him, seeding, drying, packing, account and recordkeeping activities were being performed by both women and men. An assessment of gender needs revealed that the most important need expressed by both male and female counterparts included fabrication of floating rafts, seeding, raft maintenance and harvesting. Other needs considered important were drying, packing, institutional and non-institutional credit, account and record keeping. The decision making of the activities like seeding, drying and packing were equally shared by men and women. Overall, the study reported that the majority of activities in seaweed culture were carried out by men.

Johnson and Gopakumar (2011) studied the Self Help Group (SHG) model in *K. alvarezii* cultivation in Tamil Nadu, India. They have found that an average fisher family earned around INR 12,000/month, i.e., \$169. They further observed the avocation to be a family-oriented enterprise. The findings of the field survey of the seaweed cultivators of Ramanathapuram district showed that the majority of seaweed farmers earned around INR 50,000 to 100,000/- annually, i.e., \$704-1408. However, the majority of seaweed collectors in the wild were women.

Many SHG's of women engaged in seaweed cultivation and collection in Ramanathapuram district were formed by the corporate houses such as PepsiCo and AquAgri (Narayanakumar and Krishnan, 2011). Seth (2016) suggested that seaweed farming provided an ancillary source of income generation for the fisherwomen, who had limited or no livelihood opportunities in their local area.

The potential role of fisherwomen in seaweed farming was examined by the Centre for Ocean Research, Sathyabhama Institute of Science and Technology, Tamil Nadu, India. They conducted rigorous entrepreneurship training for fisherwomen Self-Help Groups formed at Muttom fishing harbor, Kanyakumari district, Tamil Nadu. They observed that, on an average per capita, a woman generates INR 8,000 (\$112) by selling fresh seaweed. Perisamy et al (2013) observed that a SHG of five members required working capital and total investment of Rs 225,000 (\$4,091). Best practices to get good income were implemented in 2010 in three districts, namely Ramanathapuram, Pudukottai and Tuticorin. The average approximate income Increased from INR 35,000 (\$636) to more than 50,000 (\$909) per SHG per month. The farming of *K. alvarezii* by using best practices had brought tremendous social impact to coastal fisher women.

Meenakshisundaram et al. (2019) investigated the average annual income of seaweed harvesters on the one hand and seaweed cultivators on the other in Tamil Nadu State, India. They reported that the average annual earnings from harvest of seaweed resources from the wild was \$1,000, whereas the cultivation yielded \$300 per month (\$3,600) and more than 1,500 families in the State of Tamil Nadu were engaged in seaweed farming as an alternate source of livelihood.



Plate 7: Seaweed farming as a family enterprise at Ramanathapuram, Tamil Nadu, India

Seaweed cultivation has emerged as a viable option for the economic improvement of low income coastal communities in India (Krishnan and Narayanakumar, 2010; Periasami et al., 2014; Periasami et al., 2015; Mantri et al., 2017).

Meenakshisundaram et al. (2019) in their study observed that, *Kappaphycus alvarezii* commercial cultivation was initiated in 2001 along the southeast coast of Tamil Nadu by Pepsico India Holdings (P) Ltd., Gurgaon, India after licensing cultivation technology from CSIR-CSMCRI, Bhavnagar. The company successfully adopted a contract farming model with buy-back arrangements for seaweed produced by the women's SHGs. Infrastructure was provided to the SHGs through national bank subsidies. Rajasree and Gayathri (2014) reported that women provided 50 per cent of the person power in seaweed mariculture in Muttom fishing village of Kanya Kumari district of Tamil Nadu. They further observed that the acceptance of this farming practice by the fishermen's widows of Muttom is indicative of the fact that a low cost simple technology which can provide substantial returns would find better adoption among the coastal fisher folk.

Mohammed (2015) suggested that seaweed farming was based primarily on the culture of *Kappaphycus* species which had grown significantly in the Philippines and Indonesia over the last two decades, with growth also taking place at a

smaller scale in India and a few other developing countries. With the establishment of many agar and algin extracting industries in different places in the maritime states of Tamil Nadu, Andhra Pradesh, Kerala, Karnataka and Gujarat, at the time the seaweed industry was poised towards establishing itself well in India.

Krishnan and Narayanakumar (2013) studied the social and economic dimensions of carrageenan seaweed farming in India. Their investigations revealed that seaweed farming had enabled households to raise their economic status significantly, with members of SHG families contributing substantially to total household income. In the last five years, the surveyed households had been able to acquire electronic appliances such as TVs, DVD players and mobile phones in addition to household appliances such as mixers and grinders. They further observed that the Income from seaweed farming had helped most respondents improve their clothing and enabled many of them to engage more frequently in social functions such as social and religious travelling. Income from seaweed cultivation had helped almost half of the respondents in Rameshwaram to conduct marriage celebrations in the family. Income from seaweed farming had also helped most respondents purchase household assets such as livestock and consumer durables. Most respondents have used seaweed farming income for home purchases or renovation of houses. About

4 percent of respondents in Rameshwaram have been able to purchase agricultural land with their income from seaweed farming.

Despite these studies on the potential benefits of seaweed farming and collection to women, men and their households, little has done on seaweed farming as a platform on which gender relations in the farming and collecting households perform, and people interact with the other local and more distant parties in the seaweed value chain. The gender dialogues intend to create a means for allowing

women and men to engage with private sector interests, policymakers, NGOs and researchers on questions of gender and policy in the likely face of seaweed farming further developing in Tamil Nadu. How do the participants see the development of markets, environment conditions (for farming and collecting), and the role of local institutions, including SHGs? How do the benefits affect women's social and economic advancement and what issues do women and men face as seaweed farmers and collectors?



Plate 8: Field data collection

DIALOGUE PROCESS & OUTCOMES

KENYA

About the dialogue process

A systematic approach of 'starting small' and building on each step was used. Each process was informed by a preceding activity. Creating motivation for dialogue called for holding small dialogues within three seaweed farming communities of Kibuyuni, Mkwiro and Nyumba Sita. The need to include extra villages was informed by the site scoping visit which revealed difference in the socio-cultural set-up amongst these communities. This was done separately for group leadership, men, women and youth to promote free expression amongst peers. Farmers, State and Non-state actors were lastly brought together in the big dialogue where each party was encouraged to openly articulate issues from a personal perspective. Aspects of gender considerations on institutional programs or future initiatives, emerging areas of gender and environment policy, small-scale fisheries guideline and the influence on gender inclusivity, and market dynamics were discussed. The need to enhance e-literacy skills for farmers was raised during the small dialogues as they wanted their activities to reach out to bigger audience. This was also necessitated by the Covid-19 pandemic which required collection of data remotely and equipping them with these skills would enhance swift coordination in future. Additionally, trade-offs that result in gendered inclusion or exclusion were discussed during the dialogues to highlight on the factors that have had an impact on their participation in seaweed farming (Table 1). The dialogue sites in Kenya are KMFRI's field stations and there is a longstanding relationship with the local community. Communities are always informed on any engagement once a project

proposal is approved for funding. We have in place a requirement for an elaborate process framework before any project involving communities is started. The community concerned has thus to give the implementation team consent before the project starts.

Dialogue outcomes

Dialogues brought out the importance of considering socio-economic aspects in efforts to improve farming in the country. Previous interventions on technical and material support could be complimented by promoting exchange of ideas in farmer forums as this brought out some underlying issues that required immediate attention. Creation of a friendly environment allowed farmers to speak out and existing conflicts were solved during the dialogues. One particular woman farmer lamented on attempts by the group leadership to allocate her farming space to a male counterpart. Such issues couldn't emerge by holding a general group meeting as other farmers fear being intimidated when they speak out. Dialogues also managed to fix longstanding issues such as registration with the relevant government ministry and agreeing on frequency of meetings.

Holding dialogue separately for men, women and youth was validated by the talking points of each group. Women, for instance, joined seaweed farming to increase household income as it is source of livelihood, to enhance their savings in village table-banking groups, and to support their families. Some women octopus fishers also joined seaweed farming to increase income. Men farmers on the other hand joined the activity after being sensitized by the Beach Management Unit who cited enhanced fish population (farms being



Plate 9: Dialogue moderation by Dr. Betty Nyonje

foraging grounds for fish) as one of the ecological benefits of seaweed farming. This clearly indicates that they are engaged in seaweed farming not only to sell the harvest but also to enhance fish catch as they are also fishermen. They also cited ready market, and quick returns over a short period as pull factors. Youth interestingly wanted to capitalize on the value-addition sector and others were influenced by their parents as they had benefited from seaweed farming, which paid school fee for some. Supportive society emerged as an enabler to women involvement in seaweed farmers as men are willing to offer support in terms of labor. Despite the freedom of expression in public for and absence of gender discrimination, some women still have to seek permission from husbands as head of household to engage in farming. For some, the husband determines the use of income earned from seaweed sales (Table 1). There is support from different stakeholders as revealed from the workshop output although the need to redesign the business model was highlighted. All developments are anchored on the Fisheries Management and Development Act and this will ensure protection of minority groups.

A total of 50 seaweed farmers were equipped with social media advocacy skills and proper packaging of content to reach the wider audience. Having employed a ToT approach, it is estimated that this knowledge will trickle down too many other farmers.

Other findings from the dialogues included:

- i. Low literacy levels among the seaweed farmers
- ii. Weak technological infrastructure

- iii. High costs of technology
- iv. Low levels of e-literacy and digital skills
- v. Limited access to services; poor connectivity
- vi. Cessation of group meetings due to the directives to prevent COVID-19.
- vii. C-Weed Corporation Limited Kenya has been supplying inputs in return for better production from the farmers.
- viii. C-Weed Corporation Limited Kenya has an agent in the village who buys the seaweed whenever available.
- ix. Active engagement of children in the seaweed farms. Some work for pay where they are paid \$ 0.10 for tying seaweed seedling on one rope making at least \$10 per day.
- x. The sea weed self-help group has transformed into a cooperative group with an aim of gaining a better market price for the seaweed products.
- xi. The noticeable challenge that some of the women face is the fact that they are single mothers or unmarried and solely depend on seaweed farming as an income source. Therefore, they sometimes find it difficult to provide for their families when they do not immediately sell their produce and this demoralizes.
- xii. Emerging issues: infrastructural development from the Huawei Food Processing Company and the upcoming steel processing plant that pose a threat to the sea weed farms.
- xiii. Majority of the seaweed farmers were unaware of the existing rules and regulations
- xiv. Frequent monitoring and follow up of the sea weed farming are necessary



BOX 3

THE POWER IN COMMUNAL FARMING

The Kenyan coast is beautiful and unique. Have you visited the award-winning sandy beaches of Diani? Have you interacted with the people and their culture? Hospitable. Welcoming. You just admire how they live amongst themselves. There are no huge electric fences separating homesteads in the villages. The play and pray together, they work and eat together. It will be hard for an enemy to dismantle them.

Visit Nyumba Sita Village in Msambweni and you will love what goes on at sea. A group of seaweed farmers have decided work together towards a common goal, improving livelihoods. Apparently, individual farming wasn't working for almost a decade. Maybe they had gone against their culture, and the ancestors were punishing them by rendering the ocean unproductive. They have embraced communal farming with women being the majority in the group. Division of labour between genders is evident. Some tasks such as sourcing pegs, seeding and drying are done by both men and women. Farm establishment and harvesting when water levels are high is left to the men who also take charge of transport using an engine boat. Income is distributed based on number of man-days put in by individual farmer from planting to drying.

Communal farming and gendered division of labour has changed the face of seaweed farming in the village. Production has increased and expansion of farms is ongoing. You can see the joy in eyes of women of all age groups working together. Maybe this also serves as a training session to the young ladies on societal virtues.

Table 1: Trade-offs that result in gendered inclusion or exclusion, KENYA

Category	Pull factors	Farmer-Farmer relationship	Hindrance/enablers to women involvement	NEEDS/GAPS
Men	<ul style="list-style-type: none"> • Sensitized by BMU-ecological roles associated with farming • Creates job opportunities • Ready market for dried seaweeds • Quick returns, short turn-over period • Alternative to fishing 	<ul style="list-style-type: none"> • Not good—there are divisions within the group • Self-centered farmers make it hard for rotational labor to be practiced 	<ul style="list-style-type: none"> • Support from men/ husbands (labor) • No gender discrimination • Societal norms and beliefs that prevent women from fully engaging in seaweed farming don't exist • Labor constraints • Religion—mode of dressing that is dictated by religion is hard for women to adhere to while at sea 	<ul style="list-style-type: none"> • Training on social media communication and marketing • Agribusiness skills to be self-reliant • Proper farm survey to replace inactive farmers for maximum utilization of space • Coastal development (port, Chinese fish processing company in Kibuyuni) • Monopoly from buyer • Low prices • Farmer-fisher conflicts
Women	<ul style="list-style-type: none"> • Source of livelihood • Opportunity to increase household income • To enhance their savings in the table banking groups • Need financial independence • To support family (school fees for children, build homes) • Alternative to octopus fishing 	<ul style="list-style-type: none"> • Rotational labor practiced amongst some farmers uplifts the weak that can't do hard tasks to enhance production • Not good-- they don't support each other if need arises. Support only based on family ties • Moderate-selectively support each other based on mutual understanding • Some farmers are selfish 	<ul style="list-style-type: none"> • Supportive spouses (provide labor), and society • Women free to speak and air their views, involved in decision making, • Men are head of the family and decide on women involvement • Limited family labor for the unmarried, separated • Ridiculed by a section of the society • Dress code while at sea • House chores 	<ul style="list-style-type: none"> • Sufficient technical follow-up on standard operations in the value addition sector • Improved seaweed milling machine • Diving training needed amongst the youth • Sensitization of farmers on the credit services issued by the cooperative • Theft of seaweed at drying facility • Destruction of farms by fishermen, theft of ropes by basket trap fishers • Lack of harvest boats • Long distance to drying area for some farmers • Low prices • Proposed port development---a threat • Herbivory by sea urchins • Rough seas • Freshwater input during SEM, high SST during NEM • Seaweed disease



Plate 10: Small dialogues with different groups within the seaweed farmers group in Kibuyuni village

Table 1: Trade-offs that result in gendered inclusion or exclusion, KENYA

Category	Pull factors	Farmer-Farmer relationship	Hindrance/enablers to women involvement	NEEDS/GAPS
Youth	<ul style="list-style-type: none"> Source of employment Earnings from seaweed farming paid school fee for some Attracted by the value addition venture which enhances industrial skills Opportunity to network with other sector players Need to exercise 	<ul style="list-style-type: none"> Good relationship as they have established support structures in cases of shortage of seed and provision of labor 	<ul style="list-style-type: none"> Women youth aren't involved in decision making (From a man--- It is because the ladies are not proactive) Women unable to farm in deeper areas- weak 	<ul style="list-style-type: none"> Training on Basic Sea Survival Some women farmers are weak and alone thus unable to utilize the model 6-block farm of 1500m2 They recommend 3 farmers per model farm to ensure the area is fully utilized Regular meeting by executive Mkwiro seaweed group to be formalized (renewal of certificate) The group to lay down structures (constitution, by- laws) C-Weed to have an agent in Mwiro



Plate 11: The project team at seaweed farming site

Table 2: Hindrances and challenges experienced, KENYA

Issues	Kibuyuni	Mkwiro	Nyumba Sita
Social hindrances to effective involvement of women included	<ul style="list-style-type: none"> The noticeable challenge that some of the women face is the fact that they are single mothers or unmarried and solely depend on seaweed farming as an income source. Therefore, they sometimes find it difficult to provide for their families when they don't immediately sell their produce and this demoralizes. 	<ul style="list-style-type: none"> Group wrangles Women engagement is dependent on whether one is granted permission by their husband Household chores Discouragement by non-farmers Mode of dressing as dictated by the Muslim faith is sometimes hard to adhere to while at sea Men still believe that seaweed farming is a women affair and have shied away from the activity Adhering to the daily prayer schedule hinders involvement of men considering that they have to work at sea Men determine the use of income earned from seaweed farming 	<ul style="list-style-type: none"> Leadership constating of majorly men who push for group farming while others still prefer individual farming Domineering leaders who negotiate price on behalf of the groups
Challenges	<ul style="list-style-type: none"> Emerging issues: Upcoming steel company, Huawei food processing company Unclear, uncoordinated agency actions for instance, KFS permit issued at national level not recognized at local level causing conflicts Competing community demands vis a vis investor needs Lack of sufficient equipment for value addition Impacts of COVID-19: reduced income from ecotourism, loss of market for seaweed products eg soaps, reduced savings Dormant farms and the need to reallocate them Lack credit facilities Lack of capacity building/training Climate change Theft of seaweed while drying Destruction of farms by the octopus fishers and other fishermen from neighboring villages who use beach seines Theft of ropes Mistrust among members in accounting for soaps sold Lack of group meetings Insufficient seedling 	<ul style="list-style-type: none"> Low prices that do not reflect the time and manpower invested Long distance from the village to farming area Dilapidated drying racks Unpredicted ecological conditions including high temperatures and influx of fresh water during rainy season Lack of harvesting boats 	<ul style="list-style-type: none"> Lack of transparency by the leaders especially when they sell the seaweed Lack of equipment for value addition Dilapidated drying racks Lack of harvesting boats

Table 3: Opportunities and challenges among various actors , KENYA

Actor	Opportunity	Challenge
Cooperatives	<ul style="list-style-type: none"> Utilization of economies of scale Set prices for produce Accumulate savings-higher amounts Training Cooperatives development policy is being developed and can consider some of the emerging issues within the sector 	<ul style="list-style-type: none"> Group dynamics Diverse perceptions within stakeholder eg cooperatives Vis a vis individual engagement
Seacology	<ul style="list-style-type: none"> Funding based on Islands approximately \$50,000 	<ul style="list-style-type: none"> Absence of structured guidelines for seaweed farming development Lack of spatial plans Lack structured ways of handling/processing seaweed Lack of guidelines to protect women from losing out in their engagement Lack policy that targets investors Lack frequent trainings from centres of excellence eg KMFRI
County Fisheries	<ul style="list-style-type: none"> Membership to BMU as a linkage forum for development in the sea Presence of BMUs that can aid in easing communication Encourage gender inclusivity in the BMU elections. Productive deeper areas Existing programs that target suppliers/ inputs to seaweed(since SWF is gender sensitive unlike fishing. 	<ul style="list-style-type: none"> Lack of gender sensitive actions; mostly not mandatory but require emphasis Developing regulations that are cascaded from national government; county extracting from the main law; need to develop county sensitive laws. Gender biased group names- seaweed was marketed as a women activity- this needs to change. Emerging issues: port and steel processing company development Lack of needs assessment when are implementing actions Conflict between resource users Safety at sea; women tend to their farms leaving their kids at the shores Minimal budget allocation; 1.3Mn for the year 2020 Attitude within farmers lead to loss of investors. Marketing and branding constrains
KMFRI	<ul style="list-style-type: none"> Policy is yet to be developed and hence a chance for SW farmers to be engaged Gender inclusivity Market availability 	<ul style="list-style-type: none"> Lack of policies that target seaweed farming Fatigue directly related to market Dependency syndrome
Trade	<ul style="list-style-type: none"> Networking/synergies among different actors Public participation in the budgeting process Different developments targeting various levels within the value chain Traders funds- Kwale County Development Fund; Kwale County Women, Youth and PLWD Fund Exchange programs and trade fairs 	<ul style="list-style-type: none"> Group dynamics Less in invested to promote seaweed farming
CORDIO	<ul style="list-style-type: none"> Training 	<ul style="list-style-type: none"> Lack of spatial planning in connection to the upcoming developments Swimming and survival techniques training Benefit sharing

Actor	Opportunity	Challenge
TNC	<ul style="list-style-type: none"> Emphasis are currently in seaweed farming Diverse production techniques depending with site of the farms Availability of experimental nurseries for seeds Clear target of production Micro-finance to farmers Market availability Exchange programmes initiated at County level 	<ul style="list-style-type: none"> Low production that discourages investors Multi taxation Lack of incentives to attract investors Meeting needs(quality/stds/quantity) of the investors Setting of farms Lack of local level spatial plans Unintended impacts eg men feeling excluded as women get more empowered. Handicap in information sharing between actors
COMRADE	<ul style="list-style-type: none"> Emphasis is on gender mainstreaming Establishment of a multi-stakeholder forum-being developed (Shimoni-Vanga multistakeholder forum); chaired by the County Commissioner and Sub-County administrator while the secretariat is the fisheries department 	<ul style="list-style-type: none"> Lack of a seaweed farming strategy for development

INDIA

About the dialogue process

During the initial phase of lockdown, the dialogues were mostly conducted through mobile phones. The telephonic calls were mostly attended by the men in the families. The project team members introduced themselves and gave a briefing about the project dwelling around the main premise of the work and the objectives served by the same. On hearing about the project objectives in detail, some of the male members in the family who were reluctant at first to let the female members to speak, allowed them to do so after a brief contemplation.

The COVID-19 pandemic and consequent restrictions imposed by the government, the only

means of communication in the initial stages of the project was through mobile phones. Subsequently Information Communication Technologies (ICTs) such as laptops, smart phones and cameras were made use of for conducting the dialogues. In-situ training workshops on the use of ICT tools were held at the project site, for capacity building of the women and men seaweed farmers, when the lockdown restrictions were relaxed, which permitted the project team to travel to the project site. Following this, the virtual dialogues were held from November 9th to December 4, 2020.

Prior to initiating the dialogues, discussions were held at length with the community leaders, women leaders and men leaders in sea weed farming. The project team had clearly outlined the objectives of



Plate 12: Seaweed farmers trained in the use of ICT tools

the project, and they were appraised of the benefits and merits of the participatory dialogue process through mobile phone (due to the Pandemic, other means of communication were limited). Following this, some of the leaders had triangulated the veracity of the project teams' discussions with the State Fisheries Department officials. Official communication and briefings regarding the project were sent by e mail to all line departments connected with seaweed farming, well in advance of the dialogues. This was a welcome initiative as they also helped in better co-ordination between the project team and seaweed farmers in smooth and effective implementation of the dialogues. The ICAR-CMFRI, Regional center located at Mandapam (study area) also assisted the project team in liaising with the farmers. The Dialogue Site leader was herself familiar with the community leaders, on account of the experiences and field level associations with the farmers of more than a decade.

The seaweed farming system and farmers

At present, in Ramanathapuram district there are 200 families doing seaweed farming, managing 5000 rafts in all. Each family has 25-45 rafts. The number of families doing seaweed farming in the

district has greatly dwindled after 2013 due to reasons such as high sea surface temperature (above 36 0 Celsius), poor quality of planting material, over-grazing by fishes and inclement climate. Women seaweed farmers involved themselves in all the onshore activities such as preparation of planting material, seeding of ropes, and tying of the rafts, cleaning of harvested seaweed, drying and packing of the produce. Women also helped the menfolk in launching the rafts in to the waters. Apart from these activities, women also help in mending of the nets which are tied at the base of rafts as well as at the surface to prevent grazing by fishes. The sea weed rafts are anchored at a depth of 1- 1.5 meters in water and at a distance of 500 meters-1 km from the shore making it easily maneuverable for the women folk, to attend to the rafts. The women are also involved in the aftercare of the rafts, once installation is done. Installing rafts in water is done by men. Menfolk are involved in the fabrication of rafts, installation of rafts at sea, maintenance of rafts as well as in harvesting of the produce.

Sea weed rafts are square shaped of size 12x 12 feet dimension. A single raft harbours around 20 ropes and an average raft yields 300 Kg on harvest. The economic holding period is 45 days. 3 such harvests are taken in a year. Out of 300 kg of harvested material, 230 kg is sold either as dry/fresh to the major processing company such as Aqua Agri, and 70 kg is retained as seeding material. Lesser known companies are SNAP, Seasix, and Prosmo. However, the procurement of seaweed from farmers is not on a sustained basis by other companies. Hence, Aqua-Agri continues to be the largest monopoly buyer of seaweeds in this district.

On an average, a woman laborer in sea weed farming earns Rs. 200 for 4 hours of labour/day, and an average monthly income of Rs. 6000 and a yearly income of Rs. 42,000/year (approximately. USD 591). Both men and women command equal amount of wages for the same hours of work. As a family owned enterprise, the earnings from sea weed farming are as high as Rs. 21,300/month (approximately USD 300).

Of the total seaweed farmer respondents contacted during the project period, the highest proportion of the seaweed farmers (36.79 %) were in the older age group (>45 years) followed by middle age group 35.85 % (36- 45 years) and young age group 26.42 % (up to 35 years) respectively. 33.01% of



Plate 13: Virtual dialogue in progress

the farmers were illiterate, followed by secondary (23.59%), primary (22.64%), higher secondary (8.49%), primary (7.55%), upper primary (3.78%) and graduation (0.94%) education levels. About 94.34 % of farmers had up to 5 members in the family and

the rest had families with more than 5 members. About 87.74 % of the families were male-headed and 7.55% women-headed. Of the rest some were widows and in some households the sons (in the absence of husbands) were heading the family.

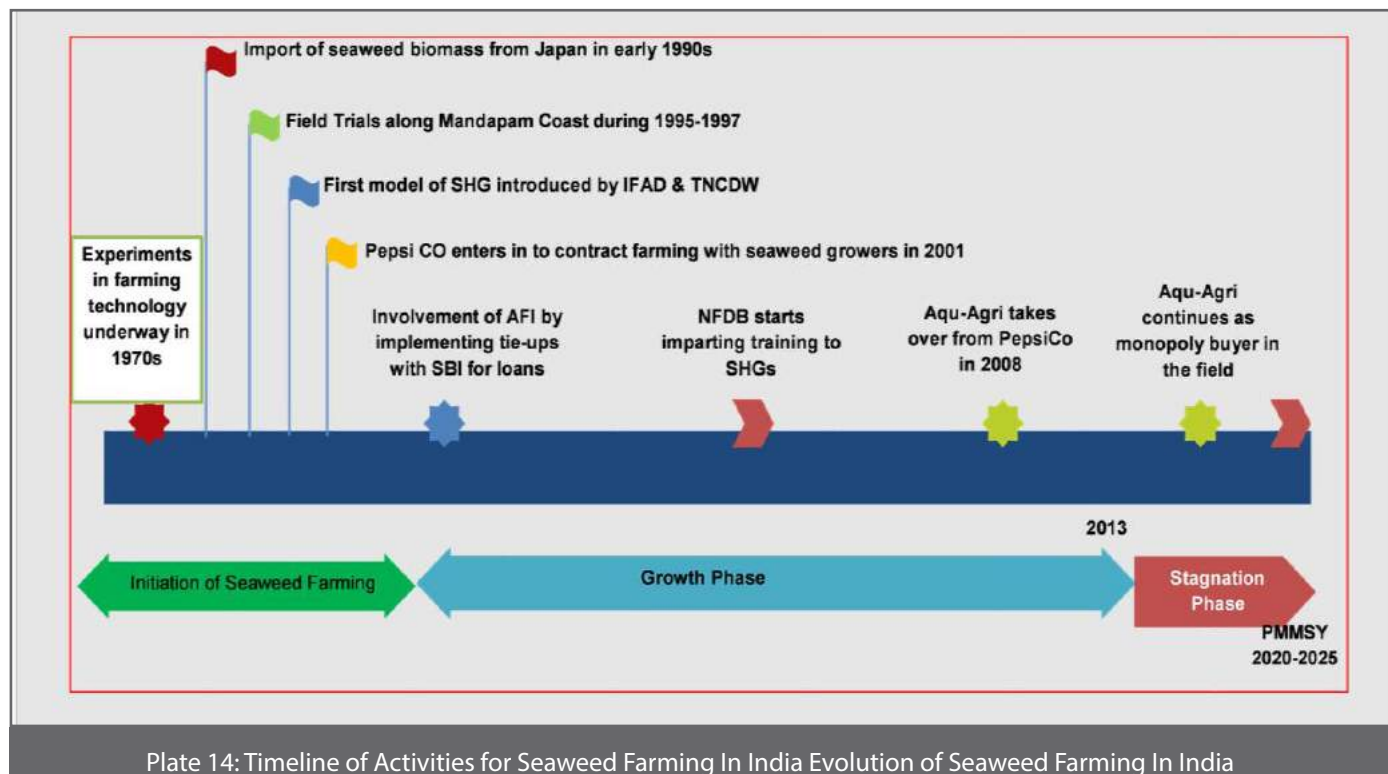


Plate 14: Timeline of Activities for Seaweed Farming In India Evolution of Seaweed Farming In India

About 81.13% had high seaweed farming experience (above 10 years) and 84.91% respondents were owner- farmers and only 15.09% were farm labour. The highest proportion of the seaweed farmers (37.74%) were located at Mandapam region, followed by Mancaud (24.53%), Rameshwaram (17.93%), Sambai (13.2%), Vedalai

(3.77%) and Munaikkadu (1.89%) respectively. All farmers adopted the raft method of seaweed culture and none of them used monoline as culture method which was practiced in the adjacent district of Pudukkottai. About 86.8% owned fishing nets, 84.9% had rafts, 11.32% had boats, 39.62% possessed vehicles and 27.36% had smart phones.



Plate 15 : Women segregating dried seaweed

About 43.4% of respondents were members of Societies (like Sambai Society, Mannar olaikuda society, Meenavar Society, Sreeminachi ladies SHG, Kadal nila, olalkuda society, Mahalir, RMW 16, Sambimeenavar Society, RMW mancaud makalin fishermen society, Meenavalthurai, Rameshwaram mancaud) but a majority of them (56.6%) had no such membership.

About 72.64% of the farmers had not availed any loans from formal credit sources, but a majority (66.99%) had received government subsidies through the National fisheries Development Board and other agencies like AquaAgri (industry), Fisheries Department (State government) and ICAR-CMFRI (Research organization, mainly for training). About 84.9% farmers had received training.

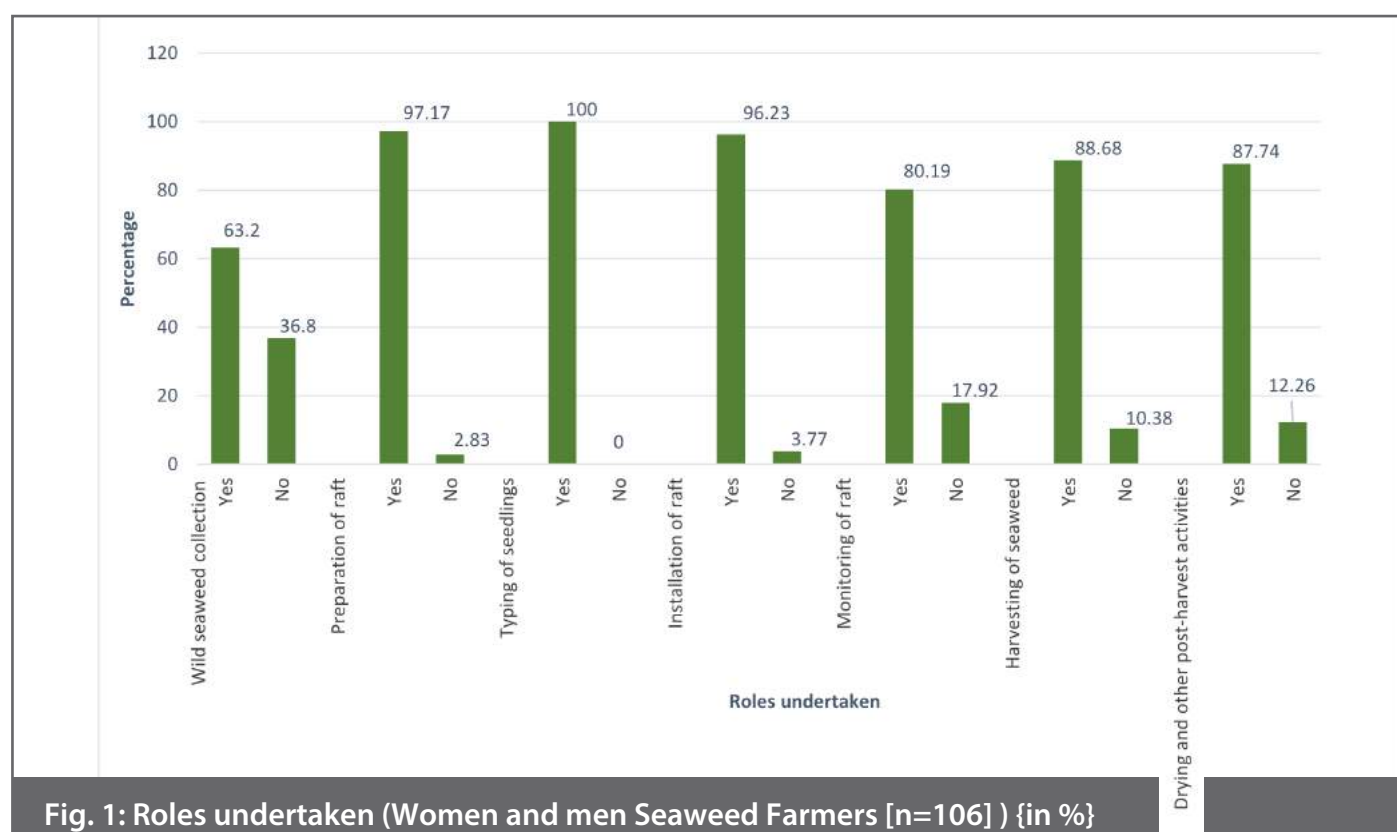


Fig. 1: Roles undertaken (Women and men Seaweed Farmers [n=106]) {in %}

The graph shows that out of the total seaweed farmers, the seaweed farmers take part in the roles such as preparation of raft (97.17%), typing of seedlings (100%), installation of raft (96.23%), monitoring of raft (80.19%), harvesting of seaweed (88.68%), drying and other post-harvest activities (87.74%) and wild seaweed collection (63.2%).

With respect to the seed procurement, out of the total seaweed farmers, the highest proportion of seed procurement by farmers was from AquaAgri (74.53%) followed by fellow farmers (7.55%), followed by farmers themselves from the harvested crop (1.89%) and none procured seed from fisheries department. Farmers sold their produce to AquaAgri (84.91%) and rest (0.94%) to Seasix respectively.

Out of the total seaweed farmers, the highest proportion of the seaweed farmers 74.53% were

interested in taking over seaweed farming as their occupation provided, they get higher yields and sustained higher income from this occupation. The highest proportion of the seaweed farmers (84.91%) were involved in joint decision making followed by decision making by women alone (8.49%) and men alone (6.6%). Both husband and wife (83.02%) determine the income usage, followed by women alone by (10.38%) and by men alone (5.66%).

Out of the total seaweed farmers, the highest percentage of the seaweed farmers spend their extra income as savings (96.23%) and a very few of them (0.94%) spend money on medical expense of the child, debt closure and education. All seaweed farmers knew about conservation aspects of seaweed.

Studies on Seaweed: Women farmers (N=87)

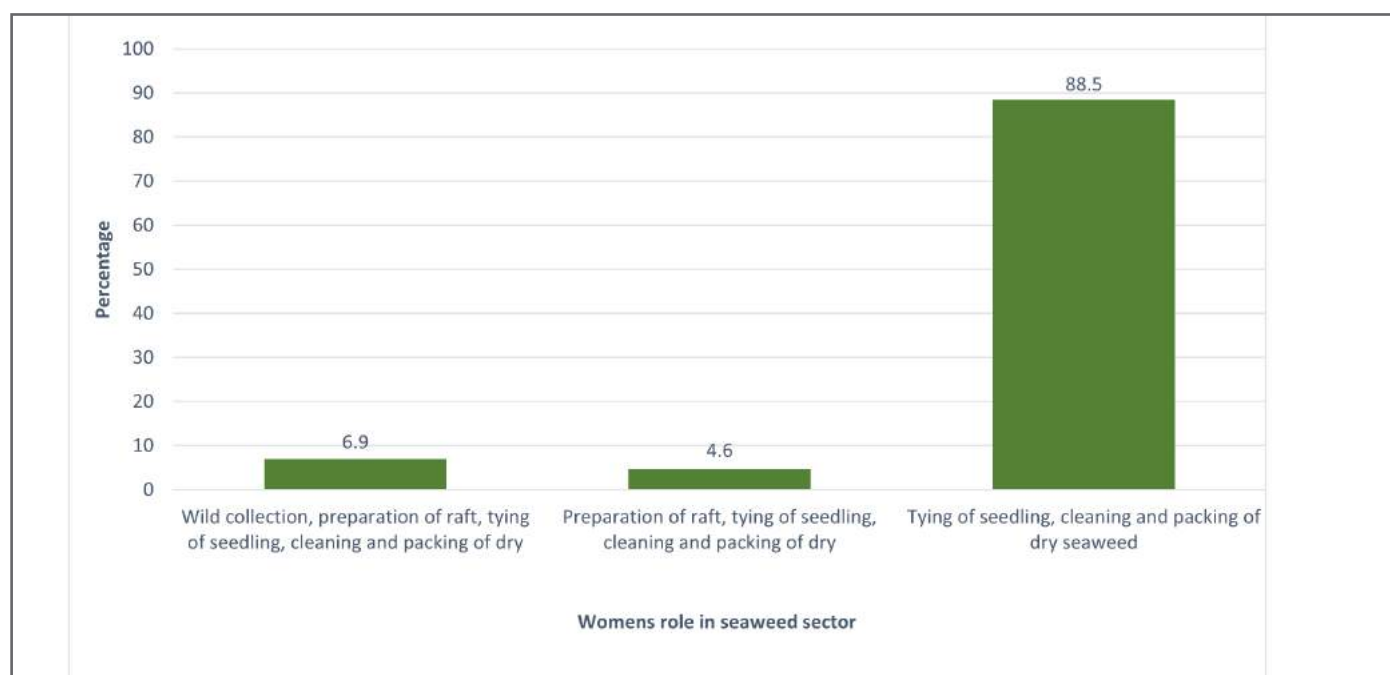


Fig. 2: Womens role in seaweed sector [in %]

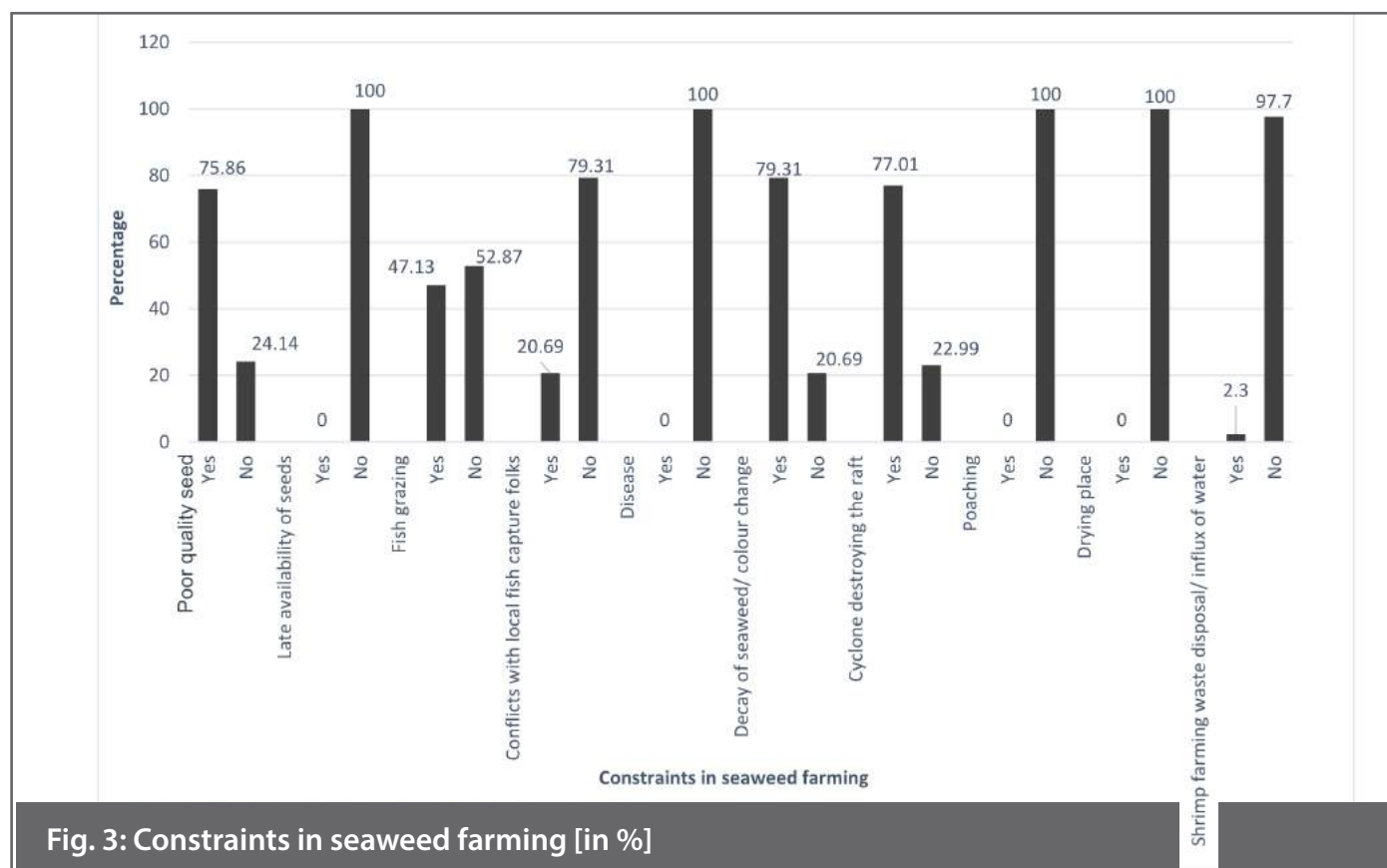


Fig. 3: Constraints in seaweed farming [in %]

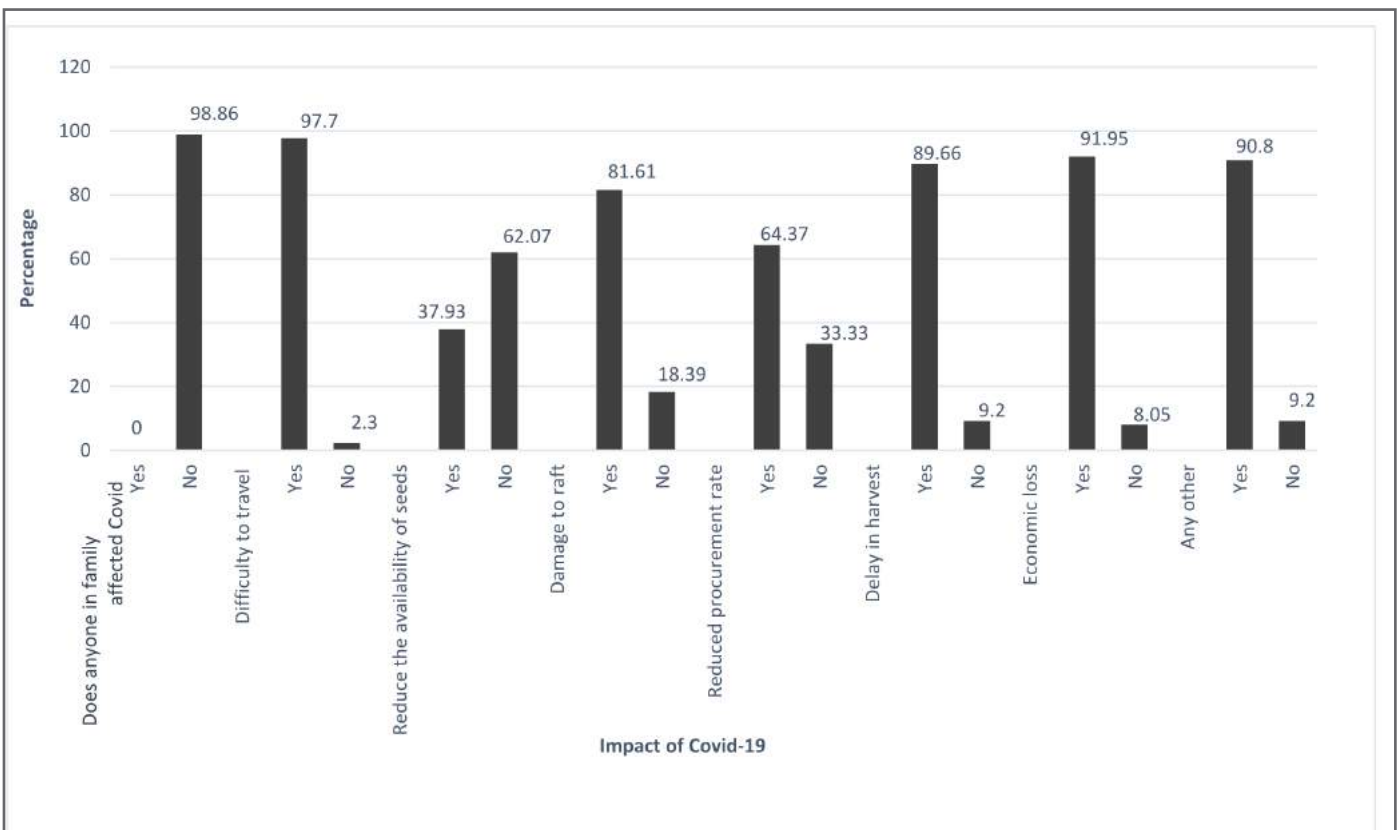


Fig. 4a: Impact of Covid-19 [in %]

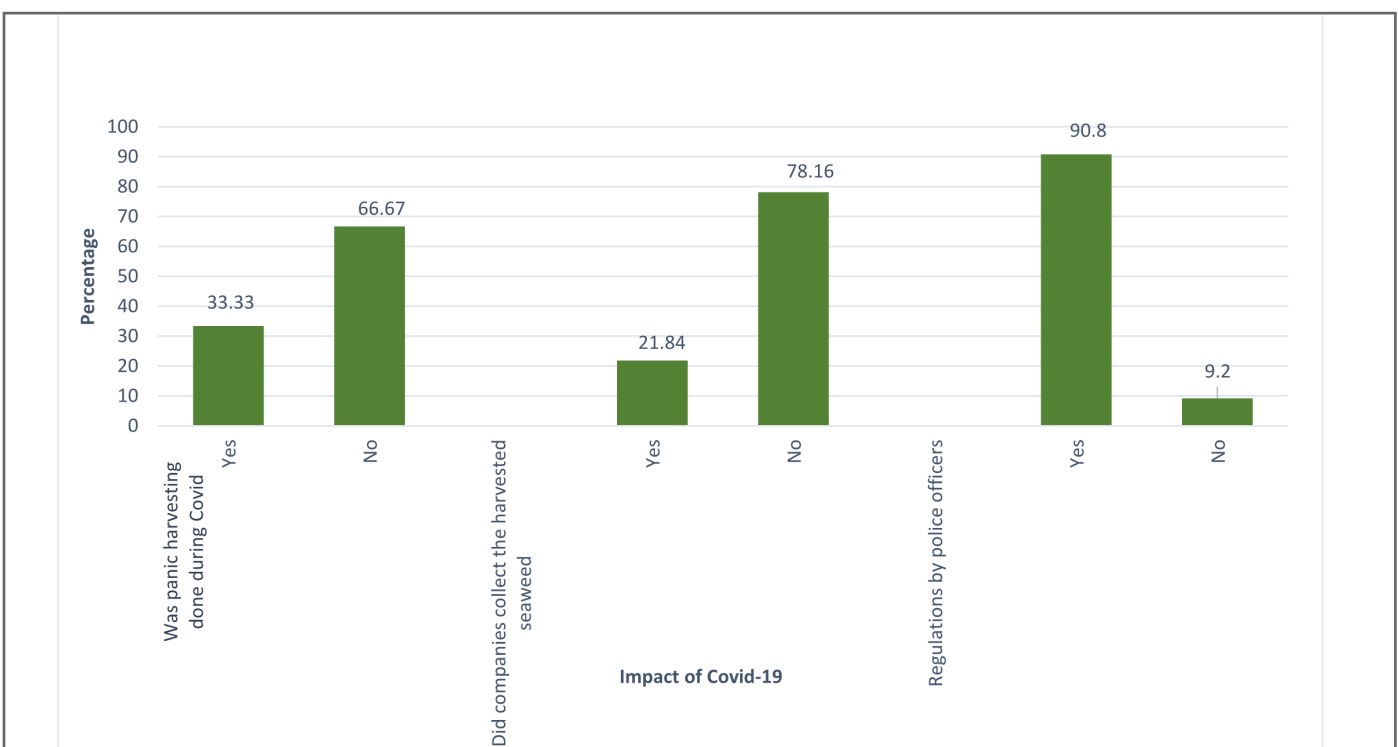


Fig. 4b: Impact of covid-19 (contd) [in %]



BOX 4

THE POWER IN COMMUNAL FARMING

Jayalakshmi, aged 52 is one of women seaweed farmers in the forefront of the seaweed farming scenario in Thonithurai, Mandapam, Ramanathapuram district. She is a seaweed farmer for the last 13 years. According to her, yields from farming were fluctuating over the years. In the beginning she used to get good crop yield and also earned handsome income from the farming. After the incidence of "Ice-Ice" disease, the crop yields started drastically reducing. She says that the high sea surface temperature has had an adverse effect on the crop yields. She says that if fresh bio mass of *Kappaphycus alvarezii* is imported in to the country, surely, crop yields would improve. The present seed material has lost its genetic vigour she, observed. Besides grazing by fishes is intense and has taken a toll on the yields. During 2020 the annual income earned from seaweed was less than Rs. 10,000. i.e, USD 136.76. In spite of these challenges, Jayalakshmi says, they have not compromised on the hard work that they undertake in the farming. They work with the same interest and zeal with the usual routine of 8 am- 4 pm. She attributes the never-ending enthusiasm and passion to continue in seaweed farming, on the hope that, better solutions would come in search of them, in the near future putting an end to all their woes. Jayalakshmi, says, she has sold the harvested seaweed only to Aquagri for Rs. 43/Kg (dry form). She has prepared liquid fertilizer out of raw seaweed (3 kg of raw seaweed required to make 1 liter of liquid fertilizer. She has sold to a Hyderabad based firm at Rs 85/liter, she has produced 240 liters from 720 kg of wet material. CSMCRI and State Fisheries Dept. have helped her in training and using their machine unit. She points out that marketing is the major problem here.

Studies on Seaweed: Men farmers

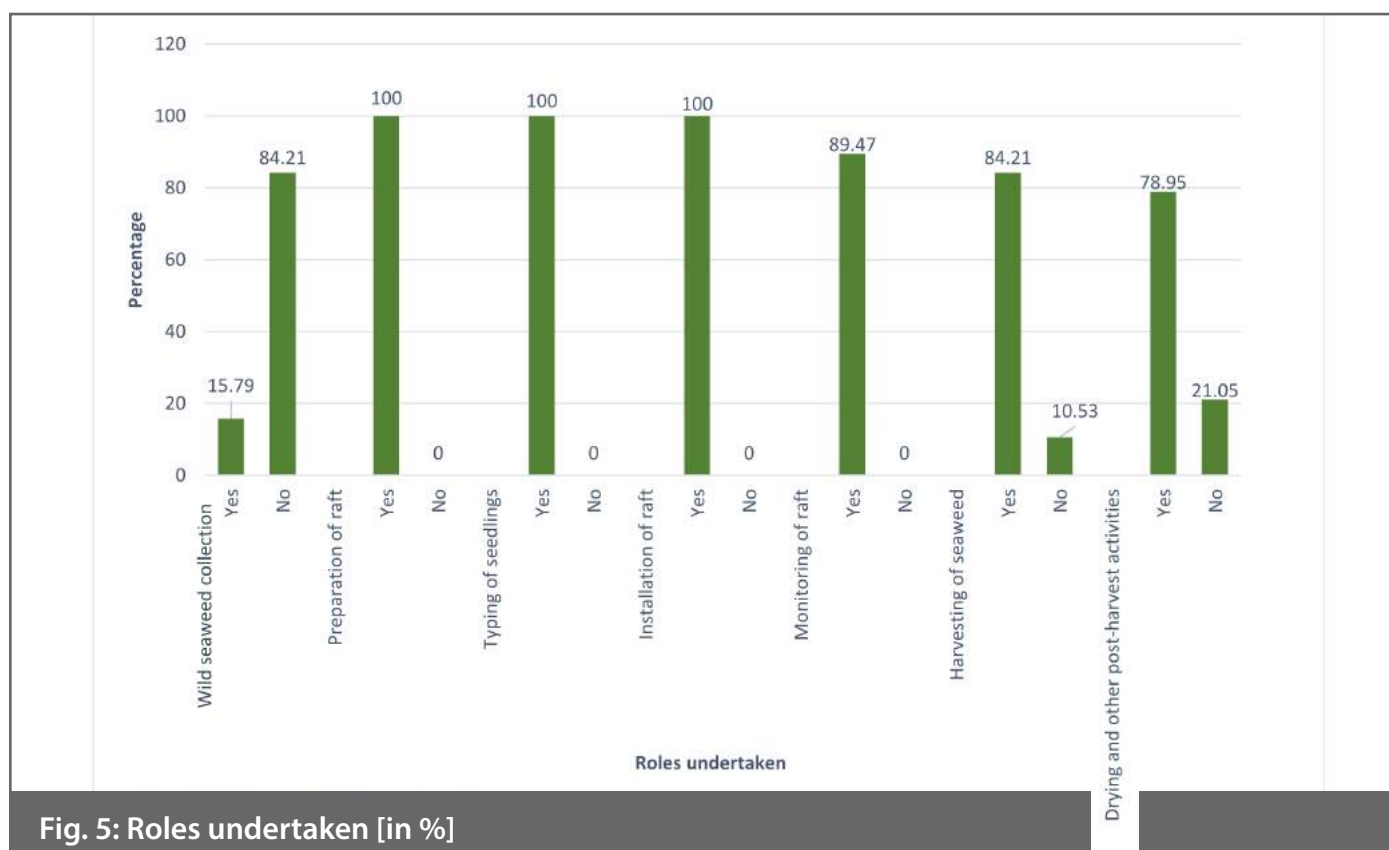


Fig. 5: Roles undertaken [in %]

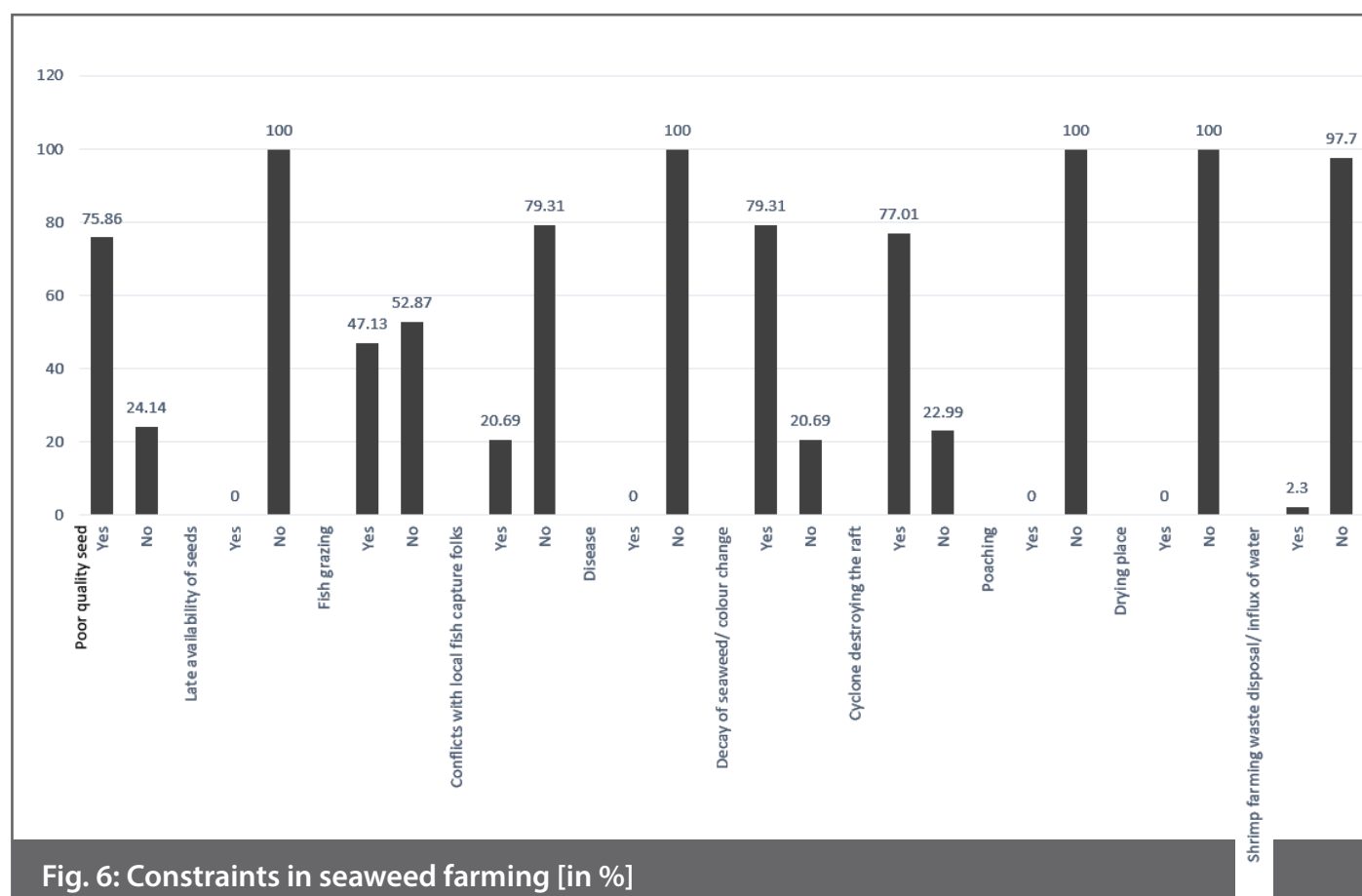


Fig. 6: Constraints in seaweed farming [in %]

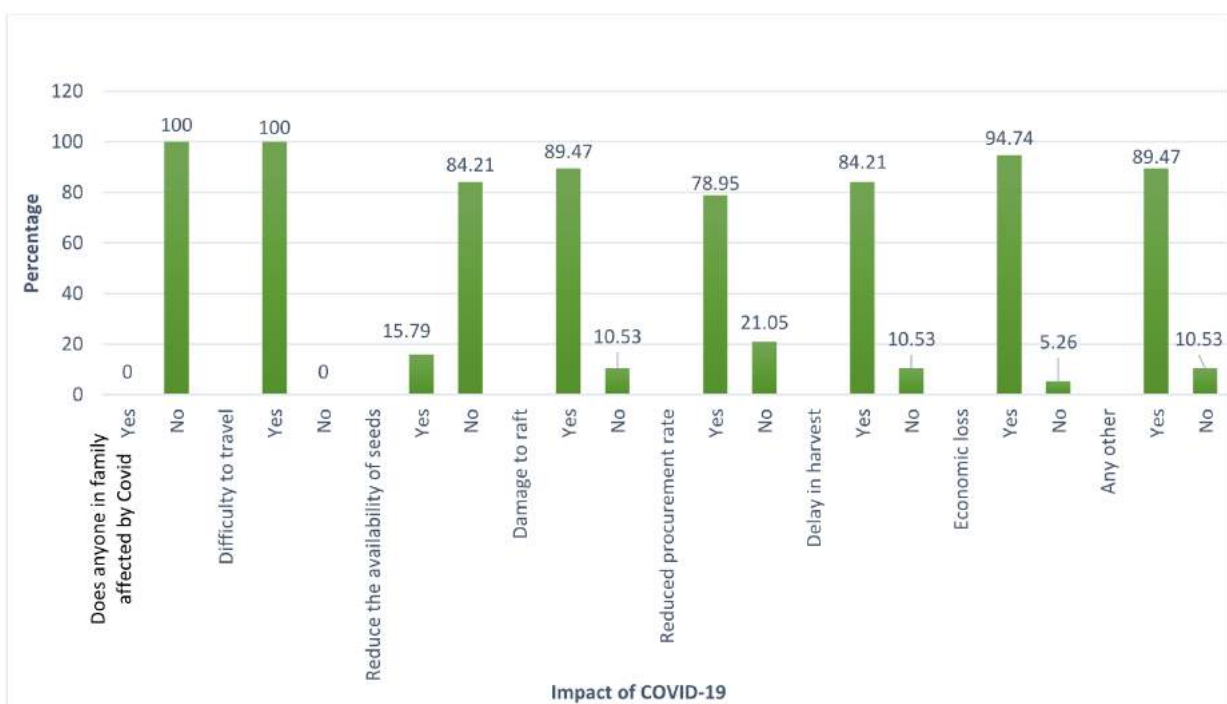


Fig. 7a: Impact of COVID-19 [in %]

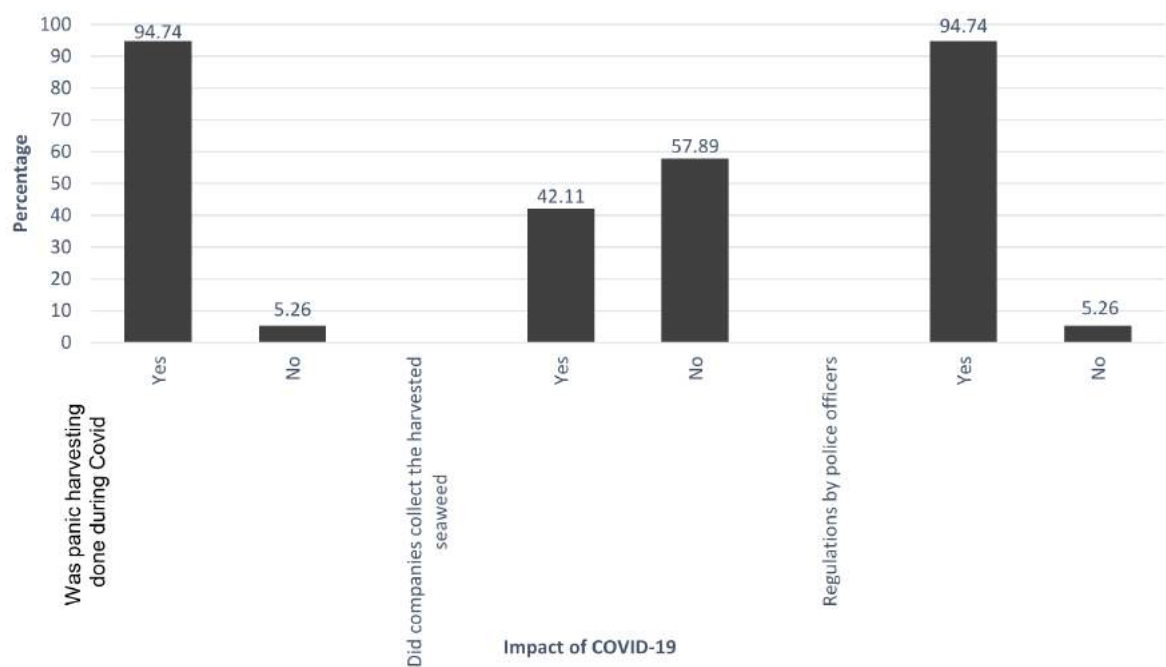


Fig. 7b: Impact of COVID-19 [in %]



BOX 5

THE LOCAL LEADER

Sivasakthiperumal aged 60 years is a local leader among seaweed farmers from Valayarvadi village of Vedalai. He has been farming seaweed for 20 years. He attributes the adoption of seaweed farming to the persistent motivational efforts undertaken by Aqua-Agri. Earlier when the farming started, he was a proud owner of 1500 rafts employing 15 laborers. According to him the price of dried seaweed/kg has been steadily rising from Rs 15/kg (USD 0.20) to the present Rs 45/Kg. (USD 0.61) He says the subsidy amount given for a raft was only Rs. 600 (USD 8.20) and only 15 rafts were allotted/individual. The initial investment/raft works out to be Rs. 2000. (USD 27.35). The current subsidy of Rs. 600/raft was not sufficient to meet the cost of production. According to him, seaweed farming would be profitable only if 50 rafts are allotted/individual which would help an individual to earn Rs. 15,000/month ie USD 205. The problems of crop decay caused by high sea surface temperature, "ice-ice" disease, grazing by fishes and low prices of the produce are not addressed either by research nor by the government. Though Aqua-Agri provided farmers with seeding material and infrastructure for rafts and were able to procure from farmers the crop on a sustained basis, their prices were not seen to register an increase. Other companies purchased at Rs.60/Kg (USD 0.82) of dried seaweed but did so intermittently.

Dialogue outcomes

Major Issues

Field data were collected from 106 respondents (seaweed farmers) consisting of 87 women and 19 men. Using a semi structured interview schedule, they were asked to rank the major issues encountered by them in the farming scenario. The responses were tabulated as ranks. The ranks were converted to score values by using the formula $\text{Percent position} = 100 (R_{ij} - 0.5) / N_j$, where R_{ij} = Rank given for the i th variable by j th respondents, N_j = Number of variables ranked by j th respondents with the help of Garrett's Table, the percent position estimated is converted into scores. Then for each factor, the scores of each individual are added and then total value of scores and mean values of score is calculated. The factors having highest mean value is considered to be the most important factor.

$$\text{Percent position} = [100 (R_{ij} - 0.5)] / N_j$$

Where R_{ij} = Rank given for the i th variable by j th respondents

N_j = Number of variables ranked by j th respondent

Table 4 : Garrett Ranking for major Issues affecting seaweed farming (n=106, INDIA)

Sl.No	Issues	Mean score	Rank
1.	Poor quality of planting material	71.32	I
2.	Indiscriminate grazing by fishes	55.99	II
3.	Incidence of Natural calamities	50.97	III
4.	Low price for seaweeds	48.33	IV
5.	Lack of proper Infrastructure	37.92	V
6.	Lack of government support for value addition and marketing	37.41	VI

Poor quality of planting material:

Seeding of planting material is a major role in which women are involved. Poor quality of seeds not only results in low yields but it also implies more time consumption for seeding them. Previously the labour which the women put in to complete 1 days' time has now been extended by 3 days to achieve the same outcomes because the quality of seeding/ planting material is poor. This results in women undergoing more ergonomic stress for a labour which is not going to pay them fair dividends.

Rafts which yielded up to 350 Kg of wet weight are at present yielding barely 200 Kg. Women argue for providing them with good quality plant biomass of *Kappaphycus alvarezii* imported from other countries. The farmers observe that the genetic material imported from Japan in the early 1980s is still the base genetic material. This has led to decreased genetic vigour and ultimately leading to reduced crop yield. This inefficient production that uses up too much of the women and men's time for such a poor return also is an inefficient use of coastal space and resources.

Researchers from CMFRI and Aqua-Agri officials said that efforts are being made to produce good quality seed by undertaking collaborative research with Madurai Kamraj University (MKU) as well as with Aqua-Agri. Possibilities of import of seed from countries in the forefront of seaweed farming would be explored. Besides, under the National Fisheries Policy 2020, the new Mariculture policy advocates for the setting up of seed villages in every village. Farmers' producer groups can easily take up this venture involving more women who will be solely involved in the seed production sector and supplying good quality seed for farmers who are in need of it. This will also provide viable livelihood avenues for women, he added.

Crop yields can be boosted due to such efforts which will attract more farmers to the sector. The ambitious "Pradhan Mantri Matsya Sampada" which is a flagship project launched by the Indian Prime Minister has allotted Rs. 640 crores (USD 87 million) for the expansion of seaweed farming in the country. This is further expected to motivate more farmers to take up seaweed farming in the district.

Indiscriminate grazing by fishes (Rabbit fishes) was ranked as the second most important issue faced by the farmers. Aqua-Agri officials were of the opinion



Plate 16: Women farmers seeding ropes under makeshift crude shelters

that double netting at the surface as well as bottom portion of the rafts has to be adopted. Women were of the opinion that fishes such as Rabbitfishes made their entry through meshes of nets, however small the mesh sizes were. The problem was intense during the cool season and often during harvest only empty ropes could be seen dangling from the rafts. It was observed that Rabbit fishes were absent in the nearby district of Pudukottai since there were no reefs in this district and farming was done with the monoline method. Better crop yield could be observed in Pudukottai when compared to Ramanathapuram.

Incidence of natural calamities was one issue which left the farmers in dire straits. The “Gaja” cyclone of 2018, and “Amphan” which occurred during May 2020, had left them with broken rafts and bamboo poles as all that remained after the onslaught of the tropical cyclone. The women farmers had approached companies and the State Department of fisheries for compensation. Added to their existing miseries, department officials inspected their farms and some women expressed their anguish that, in the natural calamity, certain rafts were totally swept off the coast by the cyclone. In such cases, it left them clueless regarding the rafts when the officials visited the site.

However, some men had taken photos of the damaged rafts and poles as they dismantled the broken pieces and pulled them ashore. Single women and widows had to fend on their own in attending to damaged rafts, having no one to help them, which compounded their troubles further.

However, the funds allotted for the damaged rafts is yet to reach the affected beneficiaries.

Low price for seaweeds was ranked as the fourth important issue by farmers. The price of dried seaweed has steadily increased from Rs. 20/Kg (USD 0.27) to the present price of Rs. 43/Kg (USD 0.59). At the same time, women who were the managers of the household economy, observed that the price of 1 kg of Rice was Rs 50 (USD 0.61) at the same time the price of 1 kg of dried seaweed was only Rs. 43/ Kg i.e., (USD 0.59). Since the women depended on seaweed farming as their sole livelihood option, they found themselves in a strange paradox of insecurity and poverty. Further, they said that when the price of dried seaweed was only Rs. 20/kg ie USD 0.27, their monthly income was as high as Rs.15,000. (USD 205) and presently when the dried seaweed was priced at Rs. 43/Kg ie USD 0.59, their monthly earnings were only Rs. 5,000. (USD 68.38).

Officials from Aqua-Agri (which were the monopoly buyers of seaweed) said that the production of seaweed at the farm level was very low. They were of the opinion that the raft which yielded as high as 400-500Kg now yielded only 100-150 Kg. But still they were procuring the seaweeds from farmers on a sustained basis, despite the low and uneven production levels. The high temperature of inshore waters led to crop decay and subsequently to yield loss. The officials were of the opinion that farming has to be shifted to deeper waters. The indiscriminate grazing by fishes further reduced crop yields. Scientists from CMFRI said that farming in deeper waters meant encroaching on the areas

meant for fishing. Unless a mariculture policy is in place specifying the areas suitable for seaweed farming in deeper waters, this problem could not be addressed immediately. Any fisheries related activity within territorial waters (12 nautical miles) was under the jurisdiction of the State and the decision of the State Government was binding in this regard, they observed. If production levels could be increased, Aqua-Agri would be able to hike the price of seaweeds, they observed.

Lack of proper infrastructure (Rank V) was a challenging problem for women seaweed farmers. Women from Munaicadu (one of the villages having the maximum number of seaweed rafts) had to undertake a long and arduous journey of 3 Kms on foot (taking almost 2 hours) to reach the farm sites. This path had no proper roads and bridges. During the monsoon, they had to wade chest depth in water often holding their sarees high above the water level, and are confronted in a discomfiting situation.

Besides, the paths were located along wooded areas which were lonely and desolate. Women who travelled with their husbands on motor bikes did not have this problem. However, they usually walked on foot, often in groups and single and widowed women had no other choice other than to walk by foot to reach their farming sites. Steeped amidst societal norms and the deep-rooted social

culture, they are prohibited from traveling on the motor bikes of other men as pillion riders.

At the farming sites women had to work in make shift thatched sheds (thatching only for the roof) exposing them to the hot sun, rain, storms and other vagaries of nature. At the work sites, the absence of toilets, water and hygiene facilities led to the incidence of infectious diseases and similar ailments.

Lack of government support for value addition and marketing was yet another problem faced by the farmers (Rank VI). Sea weeds are excellent sources of plant growth stimulants. If the wet seaweed could be extracted for making sap, this could be used as an excellent liquid manure for crops. Farmers said that sap had the vigour to promote growth of plants such as sugarcane, chillies and tomato. The State department of fisheries has set up a sap extraction unit in consultation with CSMCR and is all set to train the first batch of women seaweed farmers in sap extraction using sap extraction machines invented by CSMCRI. However, the marketing avenues for sap have yet to be explored. The State Fisheries Policy of the Government of Tamil Nadu has connoted in its policy that women seaweed farmers would be trained in extraction of sap using sap extraction units and that the sap would be sold to private entrepreneurs. (Policy Note, 2020-2021, Government of Tamil Nadu).



Plate 17: Women farmers participating in main farm activities in inshore activities

Mrs. Jayalakshmi, a woman seaweed farmer and leader from Thonithurai said that, she was the first person in the district to prepare the liquid manure out of raw seaweed (3 kg of raw seaweed required to make 1 liter of liquid fertilizer). She had then sold the sap to a Hyderabad based firm for Rs 85/liter. 240 liters of sap could be made from 720 kg of wet material, she added. However, she was unable to get orders from this firm later on. She has been trained in sap extraction by CSMCRI and State Fisheries Department.

During the validation workshop, farmers said that they wanted the sap to be sold to Government agencies at remunerative prices as they feared they would be exploited by private companies into selling the value-added produce at a lower price. Women farmers expressed their enthusiasm in adopting this new venture as they felt they could earn higher incomes. They were willing to participate in sea weed farming as well as in sap extraction as well as marketing the products. The men counterparts too expressed their solidarity in supporting the women farmers in this avocation.

Ganesan et al. (2019) observed that India was at present importing seaweed-based bio stimulants worth USD 25-30 million annually from Canada, Norway, Indonesia, Philippines and China. If India could be made self-sufficient in the production of sap by transforming the seaweed farming on the basis of a rural coastal women-based enterprise, it could cut the imports as well as reduce the expenditure of subsidies disbursed for chemical fertilizers and thus reduce the burden on the exchequer.

Alcohol abuse:

Alcohol consumption by men was observed, though women preferred not to be vocal about it. However, a few women said that the men attributed this practice of alcohol consumption to their hard work at sea. Exposure to the rough weather at sea and the monotony and drudgery of spending long hours of fishing at sea was the underlying reason stated by the menfolk for this habit. According to one woman seaweed farmer Kanakambal, aged 56 years, men spend $\frac{1}{4}$ of the income obtained from fishing towards drinking. Any sort of interference by their wives in the drinking habits of their husbands eventually leads to wife beating and domestic violence. The closely knit family values and societal norms induces the women to accept these vices as a part of their lives and makes them mute sufferers.



Plate 18: Women farmers cleaning harvested seaweed before sun drying

Some women, on the other hand were found to empathize with their men counterparts on account of the monotonous nature of their work at sea.

Problems faced by Women in their work:

Women do not have any proper resting place, where they could rest after work. A crude shelter, consisting of a thatched mat supported by bamboo poles are the only kind of shelter which could be seen along the seashore and in which the women work for seeding the ropes.

The plight of women is further aggravated by lack of toilets and water facilities. Long hours of standing in the water, tying seeded ropes to rafts exposes them to leg pain, back pain, infections and dermatological allergies. Women who hail from Sambai and Mangadu villages have to walk 3 Kms from their homes to reach the farm sites. The paths are devoid of proper roads and are often lonely, desolate pathways bordering woods, which makes their journey precarious and tiresome.



BOX 6

OLD BUT NOT WEAK

Parvathi aged 65 is a seaweed farmer, from Sambai village. She has 11 years of farming experience. Of late, the farming has become very challenging since during the hot summers, the crops decay fast and results in substantial yield loss. During the cool season, though a good crop yield is anticipated, due to indiscriminate grazing by fishes, the expected yields and income are not obtained. Seaweed farming has been their main source of income, though the menfolk in her family goes for fishing. The income from fishing too is low, and fishing is a risk prone occupation in which one family member had died, she adds. Due to lack of infrastructural facilities such as water, roads, educational facilities, in their native village of Narukuzhi, they have migrated to Sambai in search of a suitable livelihood. From Sambai, it is a long and lonely walk by foot for 3 kms taking 2 hours before they reach the farming site. The paths are devoid of roads and they have to cross the drainage canal and during rainy season, they have to wade through chest depth of water. Though illiterate, she says she has the courage and self-confidence to question the government authorities who have virtually not helped them through their difficulties, she emphasizes.

Table 5: Trade-offs that result in gendered inclusion or exclusion, INDIA

Category	Pull factors	Farmer-Farmer relationship	Hindrance/enablers to women involvement	NEEDS/GAPS
Men	<ul style="list-style-type: none"> Family enterprise Savings on labour cost Men play complementary roles in the farming sector 	<ul style="list-style-type: none"> Good 	<ul style="list-style-type: none"> Support from family especially from husbands. Constraints faced by women on seaweed farming. Tough work. Lack of infrastructural facilities like toilet, road etc. Difficulty to reach farm site. Body pain and allergies due to standing in salt water for long time and exposure to sunlight. Women's burden has increased in terms of domestic works and mobility, besides rendering them jobless and without any income 	<ul style="list-style-type: none"> No training on manufacturing of value added products such as manufacture of liquid fertiliser (sap) from wet seaweeds. Low prices and reduced profits from seaweed farming. Crop decay due to grazing of fish and sea temperature rise. Poor quality planting material. Lack of proper infrastructure. Lack of support from government.
Women	<ul style="list-style-type: none"> Primary source of livelihood income. Simple low-cost technology in farming. Get high returns in a short period of time. Spend their income for the socio-economic upliftment of their families. Practiced easily as a family-based enterprise. Enormous governmental and institutional support. Some farmers have fishery and non-fishery related secondary income sources. Extra income utilized as savings and children's education. 	<ul style="list-style-type: none"> Good 	<ul style="list-style-type: none"> Supportive family members especially husband. Most of the women involved in decision making. Exposed to domestic violence and alcohol abuse by men. No extra income due to alcohol abuse. Difficult to make their initial investment. High costs of inputs. Changing governmental norms. 	<ul style="list-style-type: none"> Low price, No training on manufacturing of value added by products. Low profit, difficult activities Lack of infrastructural facilities such as water, road, toilets, resting places etc. Difficulty in standing in water and it cause severe body pains and allergies. Non-availability of transportation. Exhaustion due to household and farm work. Yield loss due to hot climate, fish grazing and effluents from the shrimp farms. Difficulty to cross the river to reach sea for some farmers. Lack of boat availability. Lack of governmental support. Rough seas

RECOMMENDATIONS & LESSONS LEARNT

KENYA

- Capacity building for women to help them adapt to change. Training Basic Sea Survival skills such as swimming, as farming might evolve from intertidal to deeper waters.
- Blue economy policy/ coastal mariculture policy and a seaweed sector development strategy needed; participatory approach needed to include views of all stakeholders and protection of the interest of vulnerable groups are protected to guide the development of the sector. Political goodwill was brought out as a critical factor in the development of any policy.
- Redesign the business model; identify champion farmers and use them as a model. Provide technical and material support and monitor production to influence others into joining the sector.
- The need to build partnerships in seaweed farming while promoting synergy among various stakeholders to avoid duplication of efforts,
- Develop seaweed specific policies and seaweed development strategy at both county and national level,
- Marine spatial planning to consider seaweed farming advised by seaweed farming suitability maps,
- Formation of seaweed farmers loose forum, strengthening of cooperatives
- Have seaweed champions selected to work with other farmers in setting target tonnage per

farmer

- Protection of gender roles because much of the development is centered on individual farmers, majority being women.

INDIA

- After three decades of seaweed farming in India, women in the farming front have emerged as a major force to reckon with.
- The dialogues have brought out the quest for cognitive, affective and psychomotor skills in women which provide ample opportunities for honing and harnessing of the same.
- Though women have contributed immeasurably on the production sector, there exists a void in the research and development efforts, post-harvest technologies and value addition wherein a lot lies untapped.
- The avenues and hidden opportunities in the sea weed value chain, such as production of sap (seaweed bio stimulant) and the enormous potential for transforming the seaweed farming into a coastal rural enterprise warrant immediate policy attention.
- The morale of women seaweed farmers could be boosted through creation of remunerative price structure, strengthening of domestic markets and boosting production to export levels.
- Empowering women through imbibing of Information and communication Technology (ICT) skills is the need of the hour leading to all round and integrated development.

Lessons learnt

KENYA

- Seaweed farming was given importance in the economy from 2004, but at first only women were involved.
- Perceptions have changed in regard to seaweed farming since it is now highlighted in the Blue Economy agenda.
- C-Weed Corporation Limited Kenya has been supplying inputs in return for better production from the farmers.
- Seaweed farming was formerly targeting women however after the good returns accrued, men have also joined in the venture for income generation.
- Seaweed farmers are eager to utilize modern technology to reach out to a wider market for their seaweed products.
- Many donor funding had been channeled through the groups resulting to overreliance of funding from donors and lack of transparency, this should be addressed to ensure sustainability.
- Some individuals were still skeptical and cautious due to presidential directive that necessitated for social distancing and discouraging of any social gathering. The team therefore observed all the COVID19 pandemic health and safety measure protocols.
- Frequent monitoring and follow up of the seaweed farming is necessary

INDIA

- Seaweed farmers both men and women had fairly equal access to resources such as water space for cultivation as farming was primarily a family-based enterprise. However, poor quality of planting material makes it take longer for seeding of ropes which is done mainly by women, leading to ergonomic stress.
- Women in families wherein men folk participated in fishing, apart from seaweed farming, earned only a quarter of what the men earned and had no control over the income of their husbands. Women spent income earned providing quality education for their children and on household nutrition. They also invested in building of houses, purchase of jewelry and saving.

- In order to ensure equitable distribution of economic benefits by way of subsidies, the money was deposited by the State Fisheries Department in the joint account of both men and women in families. Ever since the Tsunami in 2004, the Government of India has undertaken serious measures to ensure that, the benefits of welfare Programmes reaches the women of the household. Eg. Ration cards are issued in women's name and this has been implemented in accordance with the National Food security's act, 2013.
- Women seaweed farmers opined that prices were very low (INR 45/Kg i.e. 0.61 USD for 1 kg of dry seaweed and INR 5/Kg i.e. 0.07 USD for 1 kg wet seaweed). A private firm held monopoly through a buy-back arrangement with the farmers. Problems included low production due to adverse conditions like high sea surface temperature, poor quality of seeds and intense grazing by fishes leading to economic losses, further compounded by COVID 19 pandemic.
- Bio stimulant sourced from raw seaweeds hold a great promise if production technology, production inputs like extraction machines, market access and adequate training are made available. The product fetches a premium price of INR 85/liter (1.16 USD), is also an import substitute as the country is at present importing 25-30 million USD worth bio stimulants annually. The women reiterated the need to diversify their production in to value added products and said that they were only too eager to produce both dry seaweed as well as the sap.
- An overwhelming majority (68.42%) of men seaweed farmers had access to smart phones as against only 16.09% of women. The dialogues under the project created a motivating stimulus for women to participate in the capacity building programmes for use of ICT (Information Communication Technology) tools and prepare the women for a learning ground on the use of smart phones for taking photos, short videos, and use of photo voice to communicate to the project team members. The dialogues which resulted following the capacity building saw stronger, confident, brave women speaking for the needs related to seaweed farming and livelihood.
- Prior to capacity building programme only the women leaders ventured to speak on behalf of their respective groups, but as the dialogues

progressed, and after the women were trained in ICT, every woman felt that she was important and her views were valuable and she had every right to be heard, loud and clear. Dialogues were thus catalysts for ushering in a social change among women seaweed farmers in the community. Repeated meetings in small groups in different farming locations provided a forum for women to voice their opinions and perceptions and thus promoted her self-esteem and restored her dignity and worth.

- Dialogues were perceived as powerful tools of communication. Face to face dialogues initiated among small groups, soon after the lockdown restrictions were relaxed, were instrumental in bringing out shy and introvert women to come to the forefront shed their inhibitions and feel free to talk fearlessly. This apparently set the stage for enhanced participation in virtual dialogues and validation workshops which followed thereafter.
- Every woman felt she was regarded as important in the dialogue process and felt that she had a right to be heard and her struggles would not be in vain and were confident that their concerns would receive a call, by the government in particular and other stakeholders in general. The virtual dialogues witnessed an outpouring of women's ecstasy, determination, mixed emotions of anger and happiness (anger due to their struggles cited above and happiness

Women argued for more infrastructural facilities, for eg. In Maangadu and Sambai villages for better roads as they had to walk for 3 hours to reach the farming site enduring hardships. The long walk through desolate and remote areas poses a security threat for women unless, they travel in groups or escorted by male family members. In rains reaching their farm sites was impossible. During COVID, women heading households and widows found it difficult to commute to farm sites. Single women did not want to ride with strangers on bikes due to societal and cultural restrictions and norms, like their married counterparts did.

The dialogues were able to create a small but significant change as within weeks after the dialogues concluded, the price of dried seaweed was hiked from Rs.43/Kg (0.61 USD) to Rs.50/Kg (0.68 USD).

Infrastructural works like laying of roads tread by women farmers en route the farm sites has been taken up by the municipal and civic authorities. The concept of establishing seed banks in each of the seaweed farming villages have been taken on a serious note for implementation.

Collaborative Research involving CMFRI, MDU and Aqua-Agri for the development of seaweed planting material with increased genetic vigour has been taken up.

since they have proved themselves as successful warriors in building their livelihoods and were in the forefront of seaweed farming in the country.

- The validation workshop was held in a face to face dialogue mode, wherein 40 stakeholders comprising of women and men seaweed farmers, seaweed collectors, government officials, researchers, NGOs, industries, officials representing the blue economy were called forth at a common platform. The issues raised by women were put across as discussion points and the concerned stakeholder group were called to address the same. Accordingly, low yield, poor quality of planting material, low prices, inclement climate, and lack of proper infrastructure, and weather, lack of training and infrastructure and markets for value added products such as sap were listed as the foremost problems flagging immediate attention.
- Creation of seed banks manned by farmers, import of new genetic material, collaborative research efforts in the offing by Madurai Kamaraj University (MDU) and ICAR-CMFRI, need for new Mariculture policy demarcating deeper waters for farming (in view of high sea surface temperature), government oriented funds being deposited in joint account of husband and wives in families practicing sea weed farming were some of the radical measures undertaken by the different sectors of the seaweed economy.

OTHER OBSERVATIONS

Filling the process gap of ensuring greater inclusivity in the dialogue process:

The dialogues have to be inclusive to achieve the fundamental objectives of any dialogue process/project. In this project a multiple evidence based approach was used as it was simultaneously implemented in two sites in two countries, having different seaweed farming approaches as well as unique socio-cultural settings. The cultural conditioning has had an impact on the participation of women as was witnessed in both the sites. This can also be the case in other socially vulnerable groups. Women tended to be timid in the beginning but strategizing to hold smaller dialogues and with people belonging to particular areas and for different age-groups (as in Kenya) eased the dialogue process for several women and they were able to speak up. Also as field work progressed, with training in ICTs being provided and virtual dialogues being organised, there was a definite improvement in the extent of participation of women. Women-only group dialogues also helped in making women more vocal. To make the dialogue space more inclusive, the strategy would be to start small, preferably category-wise (women, men, youth, age-groups etc). Increasing the number of dialogues will also make participants familiar with the process and expectations from it and this may lead to better interaction. Larger dialogues involving more stakeholders may intimidate women and other vulnerable groups and this can be resolved through the familiarization process mentioned above. Facilitators also have an important role in seeing that the dialogues are conducted smoothly with proper guidance and no interference from their part.

Managing conflicts and personal risks:

Conflict for space between seaweed farmers and fishermen exist in Kenya but they have their resolution mechanisms including proper farm demarcation. Seaweed farmers are now registered as Beach Management Unit members bound to the same by-laws as fishermen and thus enabling conflict resolution between them. There is however major conflict for space with big projects such as the steel recycling factory in one of the project sites (Kibuyuni) and likelihood of space being further squeezed with the development of a fish port in the vicinity of the seaweed farms. In the Indian site,

at present every village which is involved in sea weed farming has its own self imposed regulations as the number of rafts are the same for all families involved. At present each family owns 15 rafts. These are owned mostly by women in the family (as they are eligible for a 60% subsidy in comparison to men who are eligible only for a 40 % subsidy).

Holding dialogues separately for men and women minimized any risks of increasing gender-based violence in Kenya. Men didn't know the details from the women's dialogue and vice-versa. The ground-truthing of all the data and information collected from all the dialogue groups and villages was undertaken with the different gender groups from all villages, which then put even the vulnerable groups on a level playing ground. The increase in violence against women and alcohol abuse were voiced by certain sections of women farmers in India. Women were too shy or rather afraid to be too open about such domestic issues. Though a few women chose to speak out and own up that they, indeed, were victims of such abuse, the remaining women said that, it was too small or insignificant a claim, as such violence took place in a limited and too small number of families to merit substantial attention. Participation of women was ensured after due cultural aspects were considered so as to eliminate the aspect of personal risk to participants.

Documenting empowerment:

The ICT training empowered the women and youth tremendously both in terms of feeling comfortable with technology and having the confidence to stand up and talk during a large gathering with men and government officials in Kenya. The women from these groups today are participating in zoom meeting at both the national, regional and international levels to tell the world their story, market their products through social media and bargain for fair prices for their produce from the buyers. In earlier instances there was indeed resentment from men concerning the economic empowerment of their women in the majority of the villages, to the point of some men sabotaging the women's work. It took dialogues and training to allay the fears of the male members of the communities that their wives are not competitors, but rather supplementing the family income.

In India, the dialogues proved that the voices of women were heard. Through the dialogue process, women have been made aware of their rights and

privileges more, and they have gained more self-confidence. It was observed that both husband and wife jointly took part in decision making in the family. In early 2021 (after the project closure), the Central Minister of Animal Husbandry, Dairying and Fisheries, Government of India, Shri. Giriraj Singh visited the site and interacted with the farmers. Following the meetings held between the Minister and farmers groups, the price of dry sea weed was hiked to Rs. 50/Kg (0.67 USD) from the earlier Rs. 45/Kg ie (0.60) USD.

Dialogue outcomes in an Small Scale Fisheries Guidelines perspective:

What became apparent during this study is that formally structured markets and institutions do not pay enough attention to the small scale fishers and farmers. The intricacies of the challenges that constrain realization of their full potential, particularly for women within these socio-cultural set-up go unaddressed under both the formal and informal institutions. This, as the study unearthed, was due to lack of in-depth analysis of the issues on the one hand but even more importantly due to inability to create a conclusive environment for sincere dialogues. Women were open to product diversification with adequate technical and marketing support.

Future initiatives:

As continuation to this work in Kenya, a one year project on "Ruptures and Gendered Adaptation in Small Scale Fisheries" is now being implemented. We are looking at socio-political, economic and ecological challenges (calling them moments of shock) facing fisheries, coastal aquaculture and tourism as a result of mega development/infrastructural projects and how coastal communities are adapting to these. Social movements/actions against sudden and destructive economic development is one of the adaptation mechanisms being explored within these communities who are increasingly more confident to raise their voices to defend themselves against unfair practices.

In India, in January 2021, the state has inked MoUs with three companies for promoting processing, value addition and setting up of factories for effective and timely utilization of seaweeds, so that farmers can get the best price for their produce and post-harvest losses are reduced. The seaweed

would be procured from the farmers as well as those engaged in collection from the wild. The Government of India is also implementing various programs under the flagship scheme Pradhan Mantri Matsya Sampada Yojana (PMMSY). Research Institutions like ICAR-CMFRI will be working with seaweed farmers of Ramanathapuram, Tamil Nadu (project site) for imparting training. The program also has a subsidy component for women and weaker sections @60% of investment cost and for men @40 % of the investment cost. As per the Government of India's directives, the CSMCRI (Central Salt and Marine Chemical Research Institute), ICAR-CMFRI and NCSM (National Center for Sustainable Coastal Management) have been asked to conduct an in-depth study on the feasibility of sea weed farming and its impact on coral biodiversity, in the Gulf of Mannar islands, which is being taken up shortly. The farming in these islands have been prohibited since 2010.

Seaweed farming is one of the target sectors under the Blue economy initiative in both countries. In Kenya there is massive support from the government in terms of infrastructure and capacity building. The Government of India is targeting a cluster/area based approach for seaweed farming. Besides, the potential sites for seaweed farming in the country will be demarcated based on Marine Spatial Planning.

CHALLENGES IN OPERATIONALIZING THE PROJECT

The project was a multi-site, dialogue project aimed at creating motivation(s) at the seaweed farming project sites for holding dialogues and encourage diverse stakeholder groups to participate in the dialogue to share experiences. The particular focus was on the women involved in seaweed farming who would be encouraged to participate and be involved in the dialogue process.

While operationalizing the project in two locations, different administrative requirements needed responses from the side of the project coordination team (at GAFS, AFS and ICAR-CIFT) to enable that these needs were satisfied. Since electronic communication is now an accepted form of administrative communication, this facilitated the process, though follow up was needed and promptly provided. The queries raised centered around project plans and funding and were clarified through sharing of relevant documents.

The actual operationalization of the project happened during one of the most challenging times that the world was passing through. The COVID-19 pandemic seriously impacted the implementation at both the project sites, especially the field work. Several strategies were evolved by the project team to overcome issues during this time, while adhering to strict government regulations and maintaining the safety of dialogue participants and the project team. The meetings were all transferred to a virtual mode. While this did not have the human element of a physical meeting, migrating to a virtual platform made having more meetings possible with the team located in different parts of the world. Meetings could be planned and arranged at very short notices for smaller teams to discuss specific issues or for entire team for discussing larger questions. Both the inception and the final synthesis workshops were held virtually. In attendance during the second day of the final synthesis workshop were the Directors of KMFRI, ICAR-CIFT and ICAR-CMRI. There was all round appreciation for the successful conduct of the work that was carried out during very testing times.

The pandemic necessitated changes in methodology of conduct of the field work. The teams realized that virtual modes may need to be used to conduct the dialogues. The lack of knowledge of use of ICTs among the stakeholders, especially the women,

was identified as one of the gaps that may make this difficult. This was surmounted by deciding to incorporate training of the women in use of mobile phones, which then could aid in conduct of virtual dialogues, as was done in both the project sites, Kenya and India. It was also observed from other studies taking place during the pandemic that mobile phones were increasingly being used to collect information at field level as physical travel was not possible in several countries when the virus was spreading.

Another factor that aided the successful completion of the project was the flexibility offered by the funding agency in allowing the research teams to make necessary changes depending on the field situation, including allowing changes in budgets which were revised and finalized for which approvals were granted. This facilitated the project implementation.

There were challenges in the field as training in ICTs in both sites, small dialogues in Kenya and large dialogue in India were held on site. This could be conducted only after ensuring that governments allowed movement of people and also after taking care of the safety of the project staff as well as the participants. The teams, however, managed to conduct them successfully and no untoward events were reported during or after the field work.



REFERENCES

1. Bolton, J.J., Oyieke, H., and Gwada, P., 2007. The seaweeds of Kenya : Checklist , history of seaweed study , coastal environment , and analysis of seaweed diversity and biogeography. *South African Journal of Botany*, 73 (August 2014), 76–88.
2. Budig, K., Diez, J., Conde, P. et al. Photovoice and empowerment: evaluating the transformative potential of a participatory action research project. *BMC Public Health* 18, 432 (2018). <https://doi.org/10.1186/s12889-018-5335-7>
3. Dale, A. 2004. A perspective on the evolution of e-dialogue concerning interdisciplinary research on sustainable development in Canada. *Ecology and Society* 10(1): 37. [online] URL
4. De La Torre-Castro, M., Ochiewo, J., Mbagi, T.K., Pinault, M., 2007. A framework for addressing socioeconomic and management aspects of sea cucumber resources in the Western Indian Ocean. *SPC Beche-de-mer Information Bulletin* 25, 22–28.
5. Dhinakar, S., Inbakandan. (2019). Creating Opportunities for Women through Seaweed Farming. *IUCN CEM, South Asia*.
6. Dillehay, T.T.D., Ramirez, C., Pino, M., Collins, M.B., Rossen, J. & Pino-Navarro, J.D. (2008). Monte Verde: seaweed, food, medicine, and the peopling of South America. *Science*, 320: 784–786.
7. FAO (2014). *The State of World Fisheries and Aquaculture 2014 (SOFIA)*.
8. FAO (2016). *The State of World Fisheries and Aquaculture. 2016 (SOFIA)*.
9. FAO. 2020. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome. <https://doi.org/10.4060/ca9229en>
10. Food Agriculture Organization Fisheries and Aquaculture Information and Statistics Branch FAO-FIGIS (2019) FIGIS-Time series query on Aquaculture.
11. G.o.K, 1999. Environmental and Development Policy (Sessional Paper No. 6 of 1999)
12. G.o.K, 2000. National policy on gender and development, 2000
13. G.o.K, 2010. The Kenya Tourist Development Corporation Act, Chapter 382 14.
14. G.o.K, 2012. Land Act, 2012
15. G.o.K, 2012. Maritime Zones Act, 2012
16. G.o.K, 2012; Environmental Management and Coordination Act, 2012
17. G.o.K, 2013. Integrated Coastal Zone Management (ICZM) policy, 2013
18. G.o.K, 2013. The Science Technology and Innovation Act 2013, Cap 250
19. G.o.K, 2016. Constitution of Kenya
20. G.o.K, 2016. Fisheries Conservation and Management Act, 2016
21. G.o.K, 2019. Physical and Land Use Planning Act, 2019 Cap.303
22. Ganesan, M.; Trivedi, N.; Gupta, V.; Madhav, S.; Reddy, C. R. K.; Levine, I. Seaweed Resources in India – Current Status of Diversity and Cultivation: Prospects and Challenges. *Bot. Mar.* 2019, 62(5), 463–482. DOI: 10.1515/bot2018-0056.
23. Garrett EH, Woodworth RS (1969). *Statistics in*

- psychology and education. Vakils, Feffer and Simons Pvt. Ltd., Bombay, Pp. 329 (16) (PDF) Application of Henry Garrett Ranking Method to Determine Dominant Factors Influencing Smartphone Purchase Decisions of Customers. Available from: https://www.researchgate.net/publication/338175469_Application_of_Henry_Garrett_Ranking_Method_to_Determine_Dominant_Factors_Influencing_Smartphone_Purchase_Decisions_of_Customers [accessed Apr 05 2021].
24. <https://timesofindia.indiatimes.com/india/these-women-have-been-diving-deep-for-seaweed/articleshow/68547072.cms>.
 25. Jacob Ochiewo a, Maricela de la Torre-Castro, Charles Muthama, Fridah Munyi, J.M. Nthuta. 2010. Socio-economic features of sea cucumber fisheries in southern coast of Kenya. *Ocean & Coastal Management* 53. Pp 192–202
 26. Johnson, B, Narayanakumar, R, Abdul Nazar, A.K, Kaladharan, P and Gopakumar, G. 2017. Economic analysis of farming and wild collection of seaweeds in Ramanathapuram District, Tamil Nadu. *Indian Journal of Fisheries*. 64(4). Pp 94-99
 27. Johnson, B. and Gopakumar, G. (2011). Farming of the seaweed *Kappaphycus alvarezii* in Tamil Nadu coast-status and constraints. *Marine Fisheries Information Service*, (208), pp.1-5
 28. Kaladharan, P, Johnson, B and Bindu Sulochanan. 2019. Mariculture of *Kappaphycus alvarezii* in the coastal waters of Palk Bay: Crisis due to climatic change or carrying capacity?. *Journal of Marine Biological Association of India*. Vol 61 (2). Pp 105- 108.
 29. KMFRI, 2015. Aquaculture Research Division Annual Report.
 30. Krishnan, M and R. Narayanakumar. (2010). Socio-economics of seaweed farming in India. Central Marine Fisheries Research Institute, Kochi, India, Special Bulletin No. 104: 103.
 31. Krishnan, M. & Narayanakumar, R. (2013). Social and economic dimensions of carrageenan seaweed farming in India. In D. Valderrama, J. Cai, N. Hishamunda & N. Ridler, eds. *Social and economic dimensions of carrageenan seaweed farming*, pp. 163–184. Fisheries and Aquaculture Technical Paper No. 580. Rome, FAO. 204 p
 32. Krishnan, M. and Narayanakumar, R. (2009). Socio-economic dimensions of seaweed farming in India, Consultancy Report, Personal Services Agreement, FAO of UN, Rome, p. 103.
 33. Krueger, R.A., & Casey, M. A., (2000). (Third edition) Focus groups: A practical guide for applied research. Thousand Oaks, CA: Sage.
 34. Levine, I. (2016). *Algae: a way of life and health*. In *Seaweed in Health and Disease Prevention* (Fleurence, J. & Levine, I. A., editors), 1–5. Elsevier Academic Press, London. Li, L., Zhang
 35. M. De la Torre-Castro, J. Ochiewo, T. Kithakeni Mbagi and M. Pinault. 2007. A framework for addressing socioeconomic and management aspects of sea cucumber resources in the western Indian Ocean. *SPC Beche-de-mer Information Bulletin* #25. Pp 22-28.
 36. Mantri, A. Viabhav, Kavalan, Gajanan, Monica, Kasi Anisoddin, Mudassar. (2020). *Seaweed Biodiversity of India: Reviewing Current Knowledge to Identify Gaps, Challenges, and Opportunities*. Review, Diversity, MDPI Publication.
 37. Meenakshisundaram Ganesan, Nitin Trivedi, Vishal Gupta, S. Venu Madhav, Chennur Radhakrishna Reddy and Ira A. Levine. (2019). *Seaweed resources in India – Current Status of Diversity and Cultivation: Prospects and Challenges*. De Gruyter, Botanica Marina 2019; 62(5): 463–482
 38. Mohamed, Gulshad. (2015). Current trends and Prospects of Seaweed Farming in India. Winter School on Technological Advances in Mariculture for Production Enhancement and Sustainability. Teaching Resource in Course Manual. CMFRI.
 39. Narayana Kumar, R and Krishnan, M. (2011). Seaweed Mariculture: An Economically Viable Alternate livelihood option (ALO) for fishers. *Indian J. Fish.*, 58(1) : 79-84.
 40. Ollando, J.A., Mwakumanya, M.A., and Mindra, B., 2019. The viability of red alga (*Gracilaria salicornia*) seaweed farming for commercial extraction of agar at kibuyuni in kwale county South Coast Kenya. *International Journal of Fisheries and Aquatic Studies*, 7 (2), 175–180.
 41. Periasamy, Chelliah, Anantharaman, P, and Balasubramanian, T. (2013). Social Upliftment of coastal fisher women through seaweed (*Kappaphycus alvarezii* (Doty) Doty) farming in Tami Nadu, India. *Journal of Applied Phycology* 26(2):775-781.
 42. Periyasami, C., P. Anantharaman and P.V. Subba Rao. (2015). Experimental farming of *Kappaphycus alvarezii* (Doty) Doty with income estimates at different sites in the Mandapam region, Palk Bay, southeast coast of India. *J. Appl. Phycol.* 27: 935–944.
 43. Periyasami, C., P. Anantharaman and T. Balasubramanian. (2014). Social upliftment of coastal fisher women through seaweed

- (Kappaphycusalvarezii(Doty) Doty) farming in Tamil Nadu, India. *J. Appl. Phycol.* 26: 775–781.
44. Policy Note 2020-2021, Fisheries, Demand No 7, Government of Tamil Nadu. Pp 28.
 45. Radhika Rajasree SR and S Gayathri. (2014). Women Enterprising in Seaweed Farming With Special References Fisherwomen Widows in Kanyakumari District Tamilnadu. India. *J Coast Dev* 17: 383. doi:10.4172/1410-5217.1000383.
 46. Rodriguez, I. 2017. Linking well-being with cultural revitalization for greater cognitive justice in conservation: lessons from Venezuela in Canaima National Park. *Ecology and Society* 22(4):24. <https://doi.org/10.5751/ES-09758-220424>
 47. Saei, M. (2019). 'Examining Barriers and Problems of Greenhouse Vegetables Production in the South of Kerman Province', *Journal of Vegetables Sciences*, 3(1), pp. 67-81. doi: 10.22034/iuvs.2019.36549
 48. Seth, Abraham. (2016). Sultan of Sea: How Abhiram Seth made seaweed farming acceptable with AquAgri- https://economictimes.indiatimes.com/sultan-of-sea-how-abhiram-seth-made-seaweed-farming-acceptable-with-aquagri/articleshow/55851736.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
 49. Start, D., & Hovland, I., (2004). *Tools for Policy Impact: A Handbook for Researchers*. Overseas Development Institute, London, UK.
 50. Synytsya, A., Čopíková, J., Kim, W.J. & Park, Y. I. (2015). Cell wall polysaccharides of marine algae. In *Handbook of Marine Biotechnology* (Kim, S.-K., editor), 543–590. Springer, Berlin.
 51. Tandel, Kirtankumar, Joshi, Nilesh, Tandel, Gauravkumar, Patel, Mihir, and Tandel, Jitendrakumar. (2016). Seaweed Cultivation in India, A New Opportunity of Revenue Generation. *Advances in Life Sciences* (ISSN 2278-3849). 2487-2491.
 52. Vipinkumar, V. P Narayanakumar, R Johnson, B. SwathiLekshmi, P.S. Ramachandran, C, Shyam, S Salim, Jayasankar, Reet, Shinoj, PandAswathy, N. (2017). Gender Mainstreaming and Impact of Self Help Groups in Marine Fisheries Sector. Project Report. ICAR- Central Marine Fisheries Research Institute, Kochi.
 53. Vipinkumar, V.P. (2013). Dynamics of Self Help Groups in Indian Marine Fisheries Sector. In: ICAR funded Short Course on "ICT-oriented Strategic Extension for Responsible Fisheries Management, 05-25 November, 2013, Kochi.
 54. Vipinkumar, V.P. (2020). Mainstreaming Gender in the Context of Seaweed Farming SHGs in Ramanathapuram: A Pragmatic Evaluation. *Indian Journal of Pure and Applied Biosciences*. 8 (4). Pp 294-305.
 55. Wakibia, J., John, J., Keats, D., and Raitt, L.M., 2006. Seasonal changes in carrageenan yield and gel properties in three commercial eucheumoids grown in southern Kenya. *Botanica marina*, 49, 208–214.
 56. Wakibia, J.G., Bolton, J.J., Keats, D.W., and Raitt, L.M., 2006. Factors influencing the growth rates of three commercial eucheumoids at coastal sites in southern Kenya. *Journal of Applied Phycology*, 18, 565–573.
 57. Wakibia, J.G., Ochiewo, J., and Bolton, J.J., 2011. Economic Analysis of Eucheumoid Algae Farming in Kenya. *Western Indian Ocean Journal of Marine Science*, 10 (1), 13–24.
 58. Yang, L.-E., Lu, Q.-Q. & Brodie, J. (2017). A review of the bladed Bangiales (Rhodophyta) in China: history, culture and taxonomy. *European Journal of Phycology*, 52: 1–13.
 59. Yarish, C. and Wamukoya, G., 1990. Seaweeds of potential economic importance in Kenya :field survey and future prospects. *Hydrobiologica*, 204/205 (November), 339–346.



9

APPENDIX

Synthesis Presentations Kenya & India





DIALOGUES IN GENDER AND COASTAL AQUACULTURE Gender and the Seaweed Farming Value Chain

By:
Dr. Betty Nyonje

PROJECT SYNTHESIS (5th March 2021)



Methodology

- The project brought together farmers, fisher folk, researchers, industry, government and NGOs into dialogues
- Focus Group Discussions (FDGs) were organized separately for men, women, youth and group leadership to get gender segregated data on the seaweed mariculture value chain
- Dialogues revolved around
 - Group dynamics,
 - Opportunities brought by seaweed farming,
 - Value chain actors,
 - Societal enablers and hindrance to women involvement,
 - Effect of Covid-19 on seaweed farming



Methodology Cont....

- Three sites were selected
 - Kibuyuni
 - Mkwiro
 - Nyumba Sita
- 9 small dialogues held in Kibuyuni, 8 in Mkwiro, 2 in Nyumba Sita
- Project implementation is divided into;
 - Desk study (institutional and legal framework)
 - Small dialogues,
 - Stakeholder workshop (State and Non State actors),
 - ICT training,
 - Big dialogue meeting,
 - Stakeholder validation workshop and dissemination.



Institutional and legal framework

- State Department of Fisheries, Aquaculture and Blue Economy
- Kenya Marine and Fisheries Research Institute- spearheaded seaweed farming research, establishment of trial farms, and upscaling
- County Government of Kwale- Department of Fisheries



Institutional and legal framework Cont....

- 'Big Four' agenda- **Food security**, manufacturing, affordable universal healthcare and affordable housing by 2022(Blue economy initiative anchored in this blueprint)
- Vision 2030-turning Kenya into an industrialized economy by 2030
- The Science and Technology Act, Cap 250 (under which KMFRI is established)
- Fisheries Conservation and Mgt Act, 2016
- Environmental Mgt and Coordination Act, 2012
- Integrated Coastal Zone Management policy, 2013



The dialogue process-some highlights

- Participants motivated to speak up on any issue (made possible by separating, leadership, men, women and youth)
- Initiated a group meeting and renewal of registration with the relevant Ministry in one of the sites (Mkwiro)
- Solved a farm dispute in Kibuyuni---farming space was being taken away from one female farmer (she raised this during the small dialogues)
- Misunderstanding amongst members (for a sight that farms as a group- Nyumba Sita) had pushed some farmers away
 - Some want to farm individually
 - Hard for new farmers to join the existing group, unless they form a second group and source their own implements.

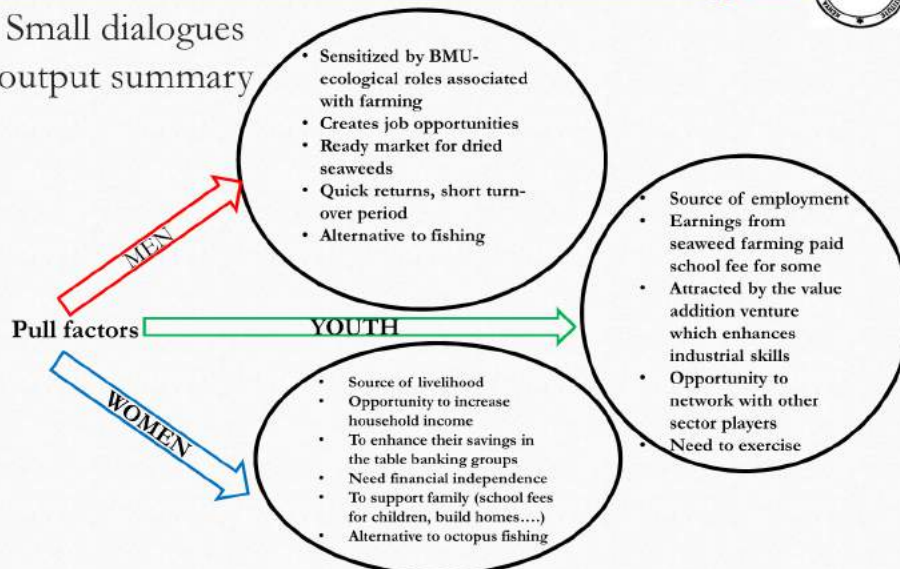


The dialogue process-some highlights

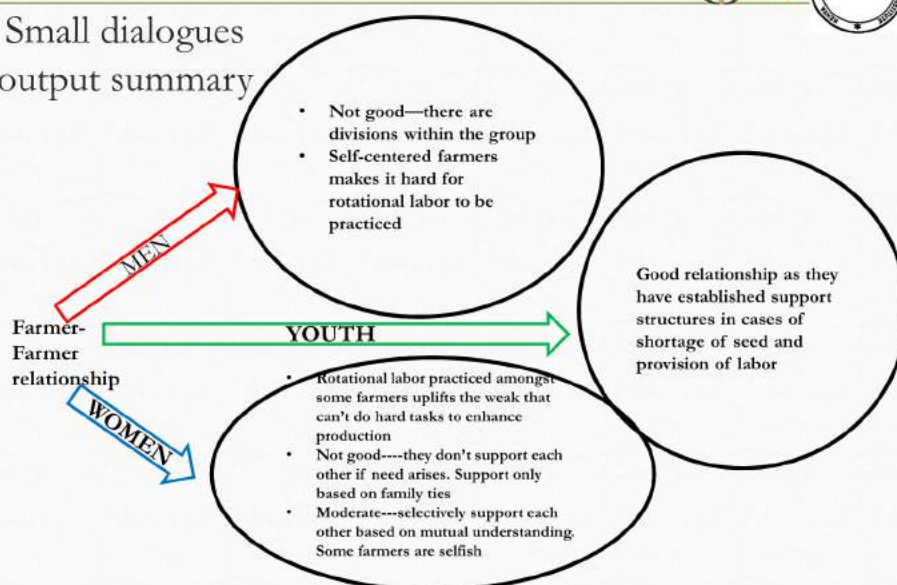
- Holding dialogues separately for farmers and other actors also made it easy for each stakeholders to articulate their issues before the big dialogue
- Market turned out to be a major challenge—from the big dialogue process
- Political goodwill was highlighted as a key towards the success of any initiative in the counties

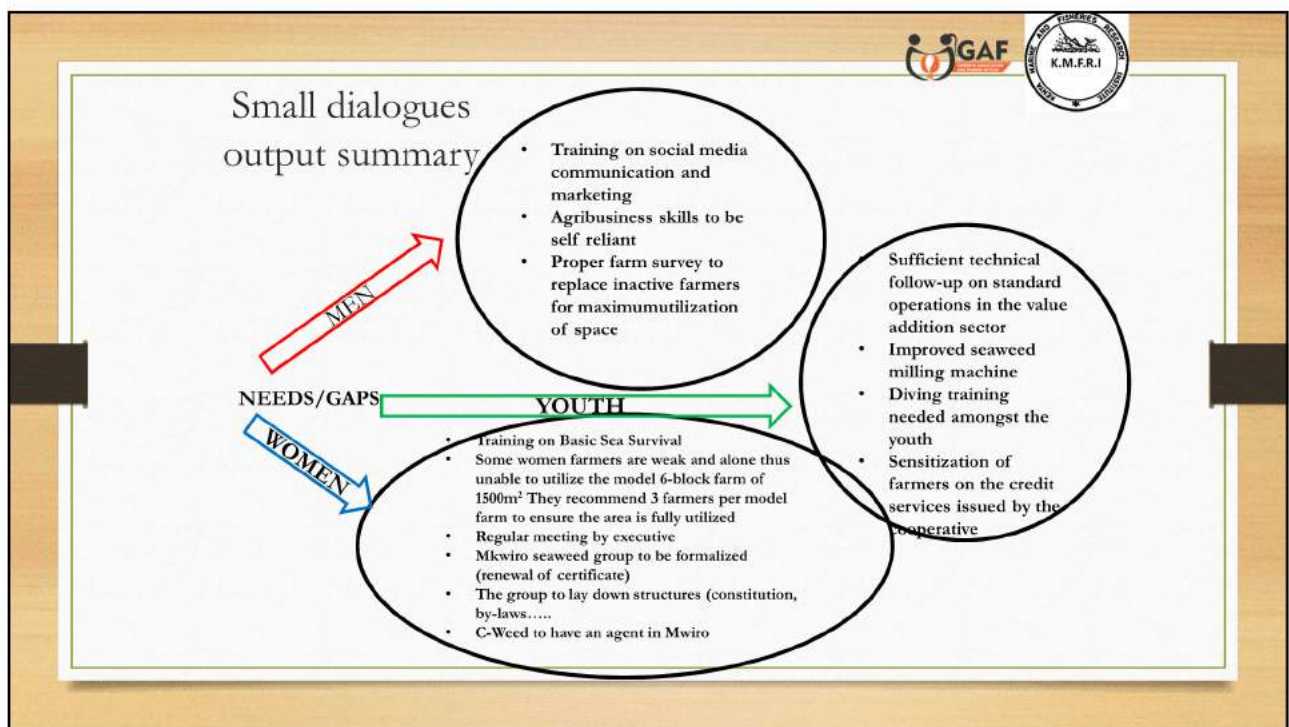
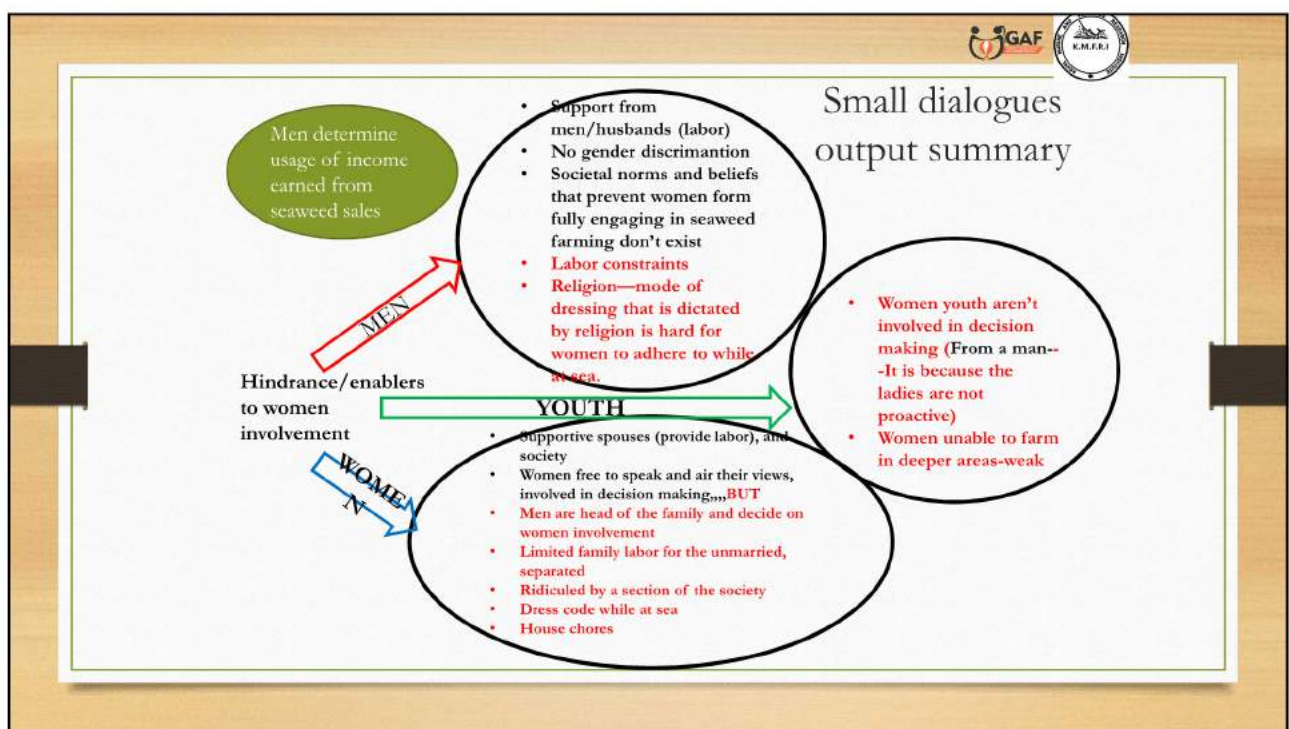


Small dialogues output summary

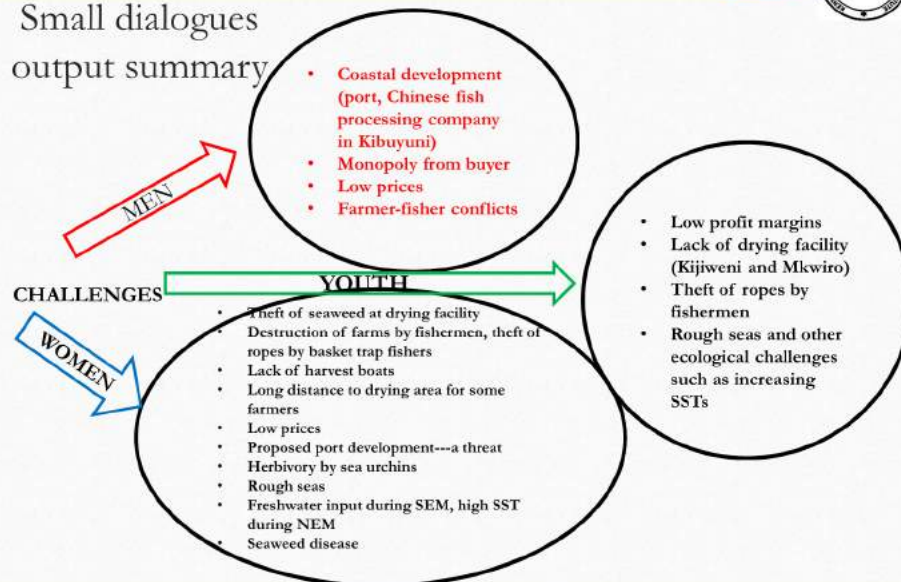


Small dialogues output summary





Small dialogues output summary



Stakeholder workshop-methodology

- Representatives from state and non-state entities engaged in an open dialogue during a 2-day workshop
- Representatives from the following on their programme and future opportunities for the seaweed farming sector
 - County Government of Kwale-Fisheries department, cooperatives department
 - Kenya Marine and Fisheries Research Institute
 - The Nature Conservancy (TNC)
 - Seacology
 - Coastal and Marine Resource Development (COMRED)
 - Coastal Oceans Research and Development in the Indian Ocean (CORDIO)



Stakeholder workshop-methodology Cont...

- Discussion revolved around;
 - Institutional role in the seaweed value-chain
 - striking partnerships amongst stakeholders to improve farming
 - Developing a working business model
 - Safeguarding the role of vulnerable groups as the industry expands
 - Sectoral needs



Stakeholder workshop-outcome

- Roles
 - The county government support farming through the issuing of implements and offering extension services
 - Seacology is open to funding seaweed farming, although restricted to island communities
 - TNC is implementing a restorative aquaculture programme in Zanzibar in partnership with Government of Zanzibar, Cargill Ltd. and C-Weed corporation (PPP model). Plans to replicate in Kenya
- Safeguarding role of vulnerable groups (women, youth.....)
 - Gender representation is anchored in the Fisheries Act (1/3 representation for Beach Management Unit executive committee, where seaweed farming is embedded)
 - Development is centered on individual farmers, a majority being women, their role is safeguarded
 - Training women on Basic Sea Survival as mechanization and deep water farming is seen as the next

Stakeholder workshop-outcome Cont...

- Developing a working business model and promoting partnerships
 - Adopting the public-private partnership model. This could be done between the farmers, government and private companies (seaweed exporters)
 - Select champion farmers and work with target tonnage per farmer. Will eventually pull in others
 - Value-addition to be a separate business entity
 - A seaweed working group was suggested to build synergy amongst stakeholders and avoid duplication or roles



Mr. George Maina (Africa Fisheries Strategy Manager) presenting on TNC's programme and plans to role out a restorative aquaculture project in Kenya



E-literacy training- methodology



Ms Jane Kiguta, KMFRI's personal relations and communication officer taking women through the training

- This emerged as a need amongst seaweed farmers during the small dialogues
- A personal relations and communications specialist was involved in training seaweed farmers on the use of social media as marketing and advocacy tools
- Smartphones were used during the training
- Farmers introduced to different social media platforms (Facebook, Instagram, WhatsApp)
- Trained on taking short videos and photographs on seaweed farming
- Aspects of proper packaging of information, and intended audience were also covered
- A Training-of-Trainer (ToT) approach adopted where vibrant farmers were selected after which they were tasked with training others



E-literacy training-outcome

- 50 farmers trained and tasked with training at least 5 others
- This will see upto 250 farmers gaining skills in the use of smartphones as data collection tools and using social media for marketing and advocacy
- On-site sample videos taken by respective farmers

Sectoral needs

- Capacity building for women—to help them adapt to change. Training Basic Sea Survival, As farming might evolve from intertidal to deeper waters
- Blue economy policy/ coastal mariculture policy/ seaweed policy-----this would guide the development of the sector
- Seaweed development strategy can be developed together with the policy to ensure the interest of vulnerable groups are protected
- An inclusive policy to be developed with participation of farmers
- Political goodwill was brought out as a critical factor in the development of any policy

Acknowledgement

- Gender in Aquaculture and Fisheries Section of the Asian Fisheries Society
- SwedBio of the Stockholm Resilience Institute, via the Swedish Government development
- ICAR-Central Institute of Fisheries Research,
- ICAR-Central Marine Fisheries Research Institute
- KMFRI
- All state and non state actors
- Farmers
- Community

THANK YOU



1 rope of harvested *Kappaphycus alvarezii* (cottonii)

Photo credit: **Joseph Kighamba**



PROJECT SYNTHESIS MEETING



SWEDBIO PROJECT

Dialogues In Gender and Coastal Aquaculture

Gender and the Seaweed Farming Value Chain : Asian and African Partners

By

P. S. Swathi lekshmi, Site Project Leader & Principal Scientist, ICAR-CMFRI, India



OBJECTIVES

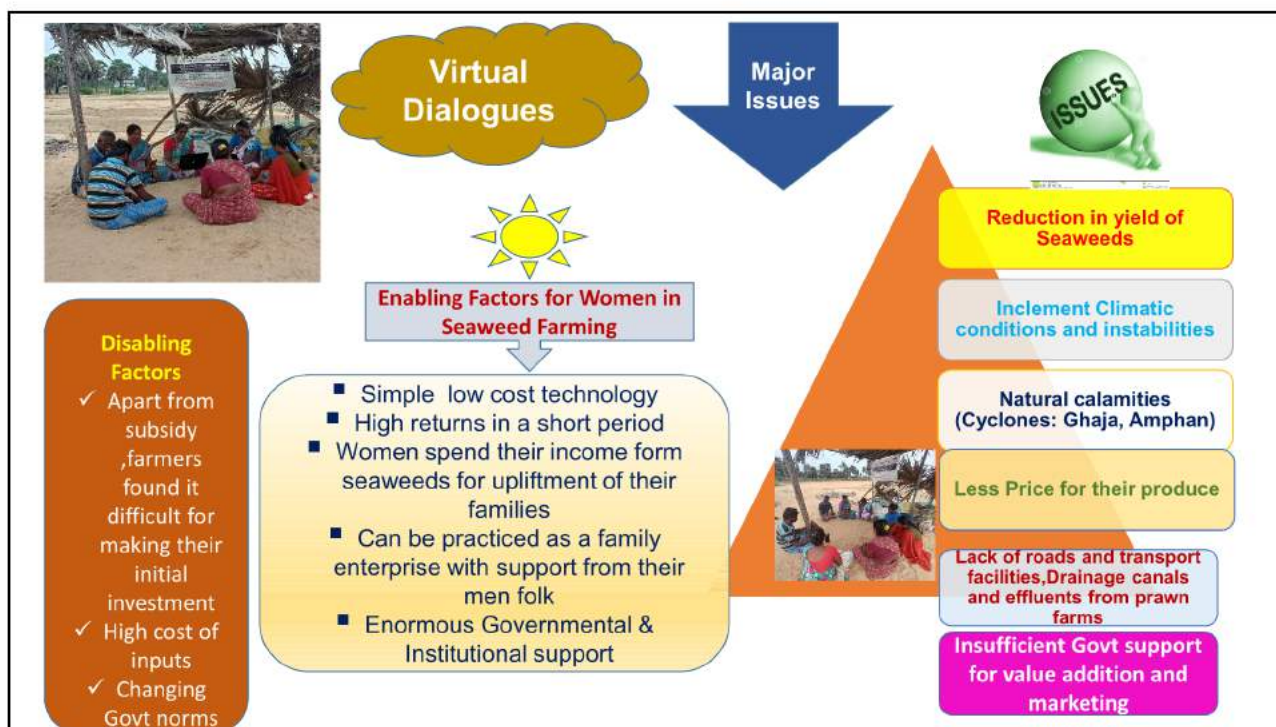
Creation of Motivation for dialogues

Engage all stakeholders in interactions on Gender and Policy Implications

To indicate emerging areas of Gender and Environment Policy Enquiry

Impacts of Globalized markets determine conditions for exclusion of Women and Womens Struggles at local levels

How distribution of benefits affects social and economic advancements



Validation Workshop



Reduced Yield – Higher temperature,
Grazing by fishes, reduced genetic vigour

- **Solutions:** To do farming in deeper waters, (Policy issues, conflict with fishing activities)
- To start setting up of seed banks, import of new genetic planting material varieties, train farmers to open seed banks in every village
- Collaborative research involving CSMCR, CMFRI & MKU
 - Pmmsy schemes of Govt



- Willing to maintain prices at same rate/increased rate in case of higher production
- Granular formulations would be accepted for same price as dry seaweed
- Liquid fertilizer ventures are not remunerative for them

Low price for seaweed
Aqu-Agri –buy back arrangement Dry Seaweed :Rs 43/Kg and wet Rs 5-6/Kg

Solutions: Increased Production,
Liquid fertiliser units to be set up in villages manned by women
Liquid fertilizer (SAP) to be procured by Govt directly
Presently 1 sap extraction unit set up by State Dept of Fisheries & CSMCRI involving a group of women seaweed farmers

- Jayalakshmi from Thonithurai village Woman seaweed farmer & leader ,in farming since 2004. Says Seaweed farming was successful in uplifting their livelihood status and earning higher incomes.
- After 2013,less yield income, Poor quality seed, ice ice disease, high SST, Grazing by fish all has lead to less yield.
- But determined to pursue the same avocation, and hoping new genetic material will be imported and new fresh strains will be provided for enhancing yields and income.



- Jayalakshmi, says,she has sold the harvested seaweed only to Aquagri for Rs. 43/Kg(dry form)
- She has prepared liquid fertilizer out of raw seaweed (3 kg of raw seaweed required to make 1 litre of liquid fertilizer. She has sold to a Hyderabad based firm at Rs 85/litre, she has produced 240 litres from 720 kg of wet material.
- CSMCRI and State Fisheries Dept have helped her in training and using their machine unit.

Marketing is the major problem here

State Dept of Fisheries



Funds deposited in joint account

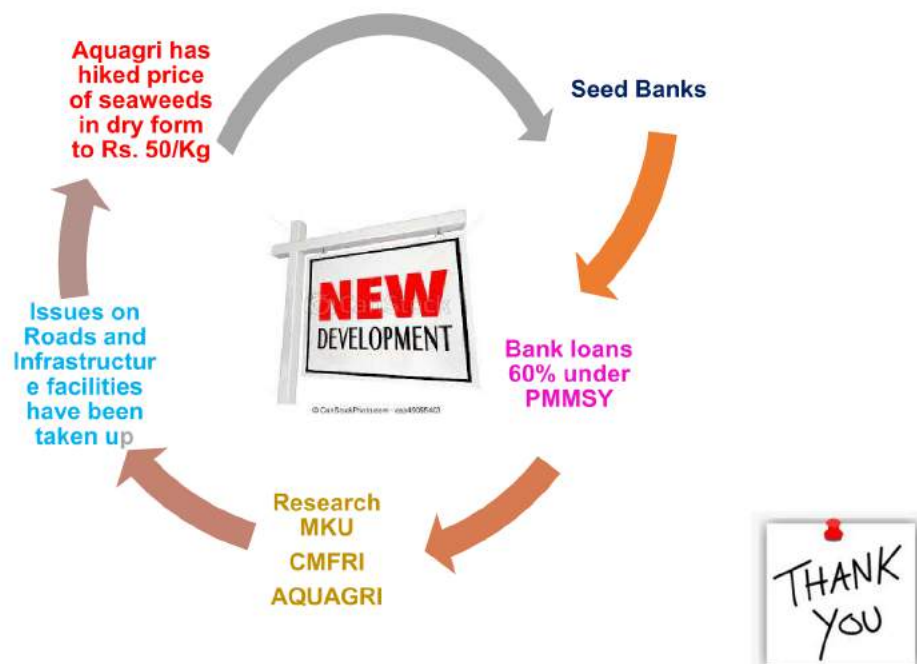


Sharing of benefits and Gender equivalent distribution of benefits

Kanakambal, aged 56, farming for 14 yrs,says initially there were good yields and income. Too many rafts at sea,high SST has dwindled returns. Self imposed management measures -25rafts/family. Alcholism among men and domestic violence main issues.



Parvati aged 60, says that the last 4 years have been very worrisome with less yield and income from farming. Setting up of prawn farm near seashore and effluent discharge canals have made it difficult for women to commute. Covid 19 has compounded the impacts with loss of income, hungry children and families and poor quality distribution of rice and pulses from government.



Disclaimer:

Views expressed in the report are of the Project Team and do not necessarily represent those of the ICAR-CIFT, ICAR-CMFRI and KMFRI

DIALOGUES IN GENDER & COASTAL AQUACULTURE

Gender and the Seaweed Farming Value Chain

