Advanced Aquaculture Technology

Professor Gourav Dhar Bhowmick
Department of Agriculture and food Engineering
Indian Institute of Technology Kharagpur

Lecture 61

Opportunities in Aquaculture Sectors for the Entrepreneurs from the Coastal Regions of India

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Hello everyone, welcome to the 6th lecture of the module 12, though this particular lecture is not actually connected to the module 12. It is actually a standalone and self-explanatory. In this particular lecture video, I want to discuss about the all opportunities that is lies with the entrepreneurs from the coastal region of India.

Whoever wants to work on the aquacultural sector and what are the opportunities what are the possibilities of working in different variants of aquaculture sectors and I will discuss about some very specific ideas, which people really should start working on it at the beginning and this at this particular date.

The moment you are seeing this video, because it has a drastic opportunity a lot of opportunities in Indian context, I will tell you why I am saying this opportunity, these ideas are very much important and at this period of time and specifically in this in a government of India is promoting this blue revolution and they are promoting this what is it called a the different grants, different like Pradhan Mantri Matsya Sampada Yojna So, there are a lot of things are coming up and comment is also putting a lot of effort on it.

So, I can see this aquaculture sector will be blooming in the next 3 to 4 years like anything. And this is your time to what from your side and come up and start working on this in this aquaculture sector. In my name is Professor Gourav Dhar Bhowmick I am from the Agriculture and Food Indian department of IIT Kharagpur.

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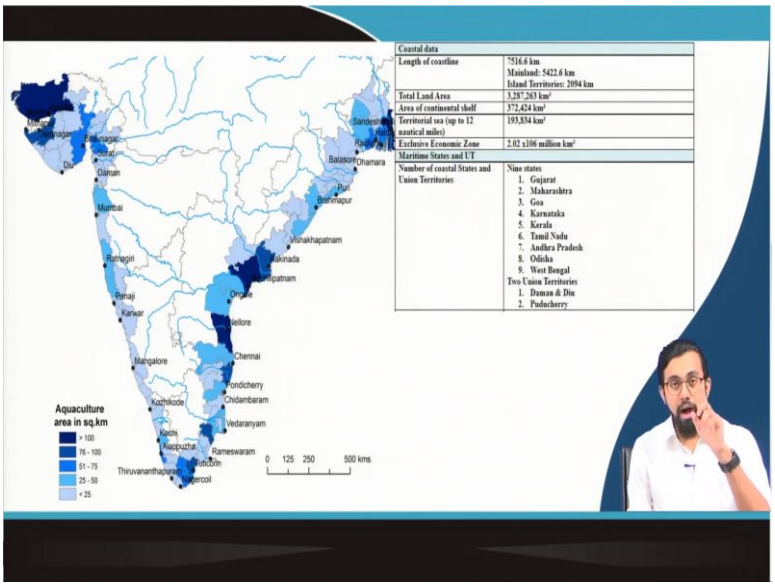

To start with if you see this Indian peninsula specifically. You see this blue region with blue deep, blue light blue and the super light blue this all this region this is the coastal region of India, which has which extends up to 7500 kilometer of land including the exclusive economic zone we have almost 2 million square kilometers of area 2 million square kilometer.

Can you imagine the data here it should be like 2 into 2 into 2.02 million square kilometers forget about the 10 to power 6 it is 2 million square kilometer the actual data the actual value. So, you can see the amount of area, amount of opportunities that we have as an aquaculture enthusiast or say like agricultural farmer or say aquaculture expert.

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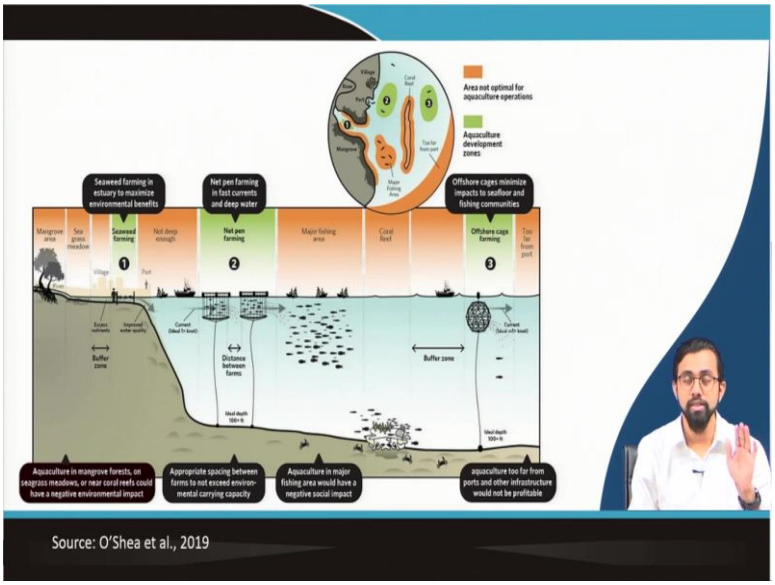

Out of all these things, we are hardly utilizing any space just forget about the space that we cannot use see in this particular picture. These green ones are the places where we can work on it and we can utilize this area in the near coastal region and even in the or even in the high seas for different aquaculture practices.

To start with, if you see a coastal region to see where to start with say like there is like mangrove area mangrove area mangrove forest. That is that acts as a new energy dissipating such a waste dumping area that place should be as it is you should not touch it is very it is very much environmentally poor situation if you are working, if you are destroying this in mangrove areas.

Then, there comes this seagrass mediated, seagrass areas and this seagrass meadows if you work that is also working as reducing the energy from the waves which will help to reducing the soil erosion these things that also should be left unattended. Village area definitely not then there comes the seaweed farming there is the opportunity that I will talk about more in details in coming slides. The opportunity in the seaweed sector, the production of seaweed in Indian context,

Then, this area word this the dogs will normally present and then we do not have to go for shipping go for aquaculture. Then, there come this net this pen farming, in the pen farming we can go for this pen culture and we can go ahead with the even cage culture as well. There we the water is not as deep and the current is still there.

Then there comes a major fishing area. You do not want to interrupt and make any problem to the situation because aquaculture is not expected to be there. Because it is already its heigh fishing area. Heigh fish so, there are a lot of schools of fishes are there. So, people can go there and you can catch it for the benefit.

Then, there comes a coral reef you should avoid that. Then, some buffer zone and then you can start going for this heigh sea offshore cage forming. In this cage forming you can utilize it properly you have proper float and system proper guidance systems. And then, there comes the area which is too far from the port which we do not want to use. This 1, 2, and 3 this area as you can see in this circle also this 1, 2 and 3 this is also bifurcated in very fine way. These are the places where we should focus on.

An Indian contest, there are a lot of opportunities there are a lot of a possible areas on in this green zone is still there in India and which is not yet attended by even any single fisherman anything single fishermen.

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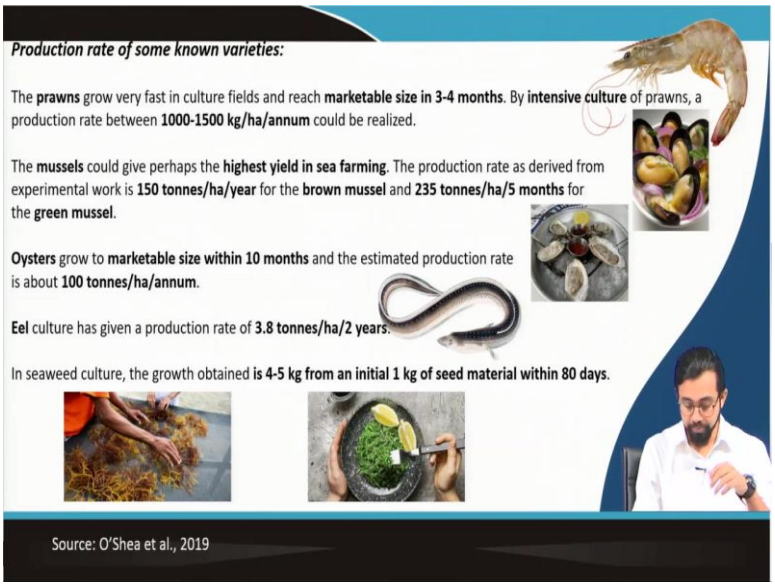

Let me give you some idea about the production rate of some of the varieties. So, that you will get some idea about like what are the varieties that you can work on in Indian context prawns, which has which is it is very fast in the which can grow very fast in the culture condition. It can reach a marketable size in 3 to 4 months. By intensity cultural prawns' production rate can be between 1000 to 1500 kg per hectare per annum.

Same way Mussels can be it is it has a very high yield in the sea farming condition, it can go in go up to 150 tonnes per hectare per year and is brown mussels and for green mussels it can walk up to 235 tonnes per hectare in 5 months.

Oysters which is also another costly very profitable business, it has a marketable size within 10 months and estimated production rate of about 100 tonnes per hectare per annum. Eel culture, which is not yet attended in India at all it is doable, it is possible just you have to meaning the situation for its favorable condition and then you can culture it. It can it has a production rate of around 3.8 tonnes per hectare per 2 years.

Seaweed culture you can get 4 to 5 kg of the growth is 4 to 5 kg from initial 1 kg of seed material within 80 days. Can you imagine almost in 80 days you will get 4 to 5 times higher production rate and this production this 4 to 5 kg of the seaweed it has a various application its various application whether from pharmaceutical, agriculture, aquaculture feed.

Is it for personal care product, where like you human consumption, lot of application is possible from the seaweed, but in India, surprisingly, only very few people in a very on decentralized way people are working here. It has to be well centralized; it has to be people should come forward and work on it and do the research and how we can make it centralized, do it in a centralized manner.

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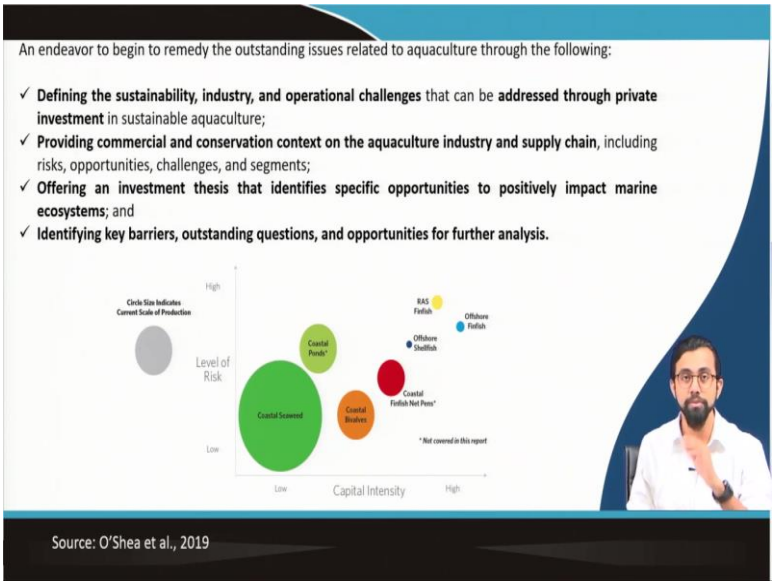

So, the problems that we are facing right now and what we can do to endeavor this journey is like the first of all to define the sustainability, industry and the operational challenges that can be addressed to private investment. Second, you have to provide the commercial and the

conservation context on the aquaculture industry and the supply chain, including all the possible risk opportunities, challenges and the segments.

You have to offer this investment thesis that identifies the 6 specific opportunities to positively impact our marine ecosystem. That investment thesis has to be very precisely made; it is more like your business strategy your profit-making idea. You have to identify the key barriers, outstanding questions and opportunities for further analysis. Here sees this capital intensity versus the level operate.

Coastal seaweed it has a very low level of risk and also the capital intensity of that not that much, but it can range it has a huge range, if you go for offshore fin fisher at the research wood aquaculture system is fin fish. It has a high level of risk, but the capital intensity also very high. So, this graph will give you an idea about the current scale of production all these, the size of the circle is giving you the idea about the current scale of production.

And these excesses give you an idea about that capital intensity and why access give you the level of risk involved with this system. However, if you just simply go for coastal bivalve in the coastal seaweed collection, seaweed, farming. Finfish farming it will give you a huge benefit in the near future for sure.

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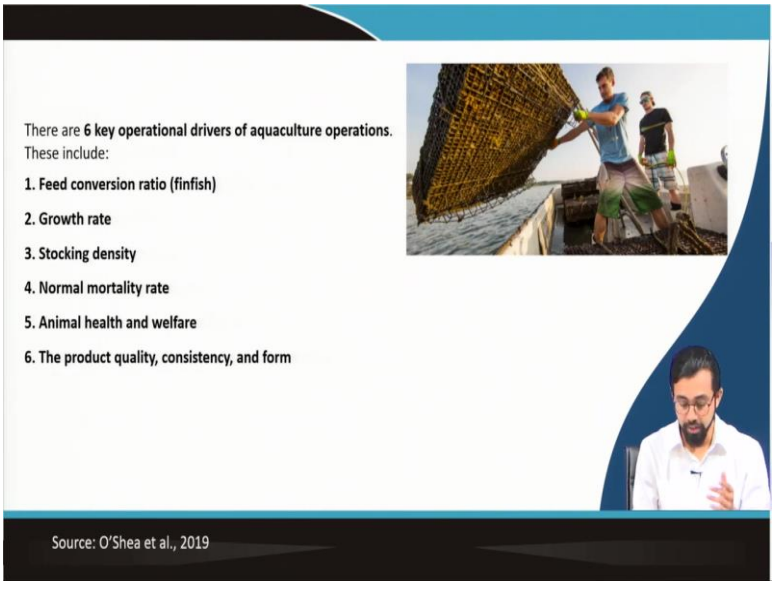

There are 6 different operational drivers in the aquaculture operation. First the feed conversion ratio. In case of fin fish specifically you have to worry about the growth rate, the stocking density, normal mortality rate, animal health and welfare and the product quality, consistency and the form. These 6 terminologies just put it in your mind these 6

terminologies if you work on it in a precise way, if you do proper research, you can definitely come up with the operational idea of the of your farm and how you will go ahead how will go for the revenue generation model these things. Think about these 6 things and how it can be introduced to your system to your farm.

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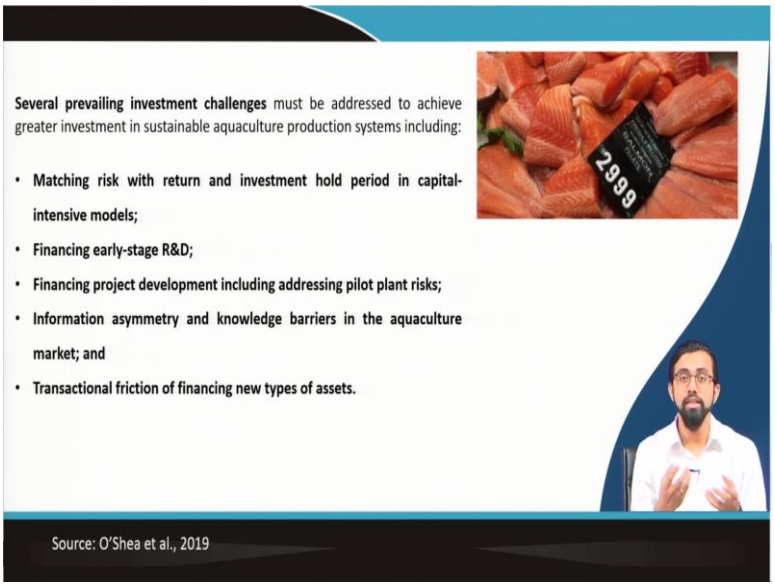

Several investment challenges are there which has to be addressed and how we can address it. First, we have to go for the matching risk with the return and investment hold period. In capital intensive models, we can go for financing the early-stage research and development programs like all the suppose the all the research and r&d institutions they are central r&d Institute, they are in India.

You go there finance them, and ask them to like even in IIT Kharagpur, also, we have a aquacultural Engineering Section. Go here try to get an idea about what is going on here, how to go ahead with the further research on this particular field. Financing the project development, including addressing the pilot plant risk, you have to identify those risks that is there involved with it. And think about the troubleshooting phenomena.

Information asymmetry in the knowledge barriers in the aquaculture market has to be removed. Then you got to know more about the details when you keep in touch with the experts. Then only you will get to know more about its functionality. Transactional friction of financing new types of assets that is also important.

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And based on all the discussion and all, we come up with 3 different ideas that I will be sharing with you that has a very high impact on the aquaculture sector in the very near future. First one is online finfish is circulating aquaculture systems. I think already you got an enough idea about what is recirculating aquaculture system. We have our treatment, we have our fish tank, the fisheries are having feed, most of them are being uneaten, this uneaten fish and the fish excreta, it converts into obnoxious like this unwanted pollutant, this pollutant are treated in different sets of treatment unit then it goes to goes back to the tank again.

This way we are having a we are reducing the water footprint; we are reducing the land footprint and also, we are utilizing the water again and again in the same unit. And what are the helpful benefit of it we have we can control the whole environment for our tank we based on it completely in our hand how we are treating the water, wastewater and converting it into the water which is good enough for your culture-to-culture rearing species.

You have a greater control over the production outcome you can reduce the mortality rate you can have a very high production capacity per unit area because in this kind of treatment, you can be utilized for very highly intensive aquaculture units. So, they are though the production rate of wastewater is very high, but just because you were already introducing some treatment unit. So, you can afford that you can afford to have more and more stocking rate, high amount of stocking rate in your aquaculture system.

You can reduce the impact to the wild stock habitat the water pollution disease transfers all these phenomena. However, everything is not good about it. It has it may come with the

increment in the energy usage, water usage and the land usage compared to the normal CNPs like coastal net pen structures. However, people are working on it and it is I am saying you again and again this is the future this is the futuristic model that people want even already it is there in the market people are working on it at different stratum.

And so I think this is something that we should go ahead and whenever we think about the aquaculture. This is our research should be focused on our entrepreneurship tendency to be focused on these 3 different ideas that I will be sharing.

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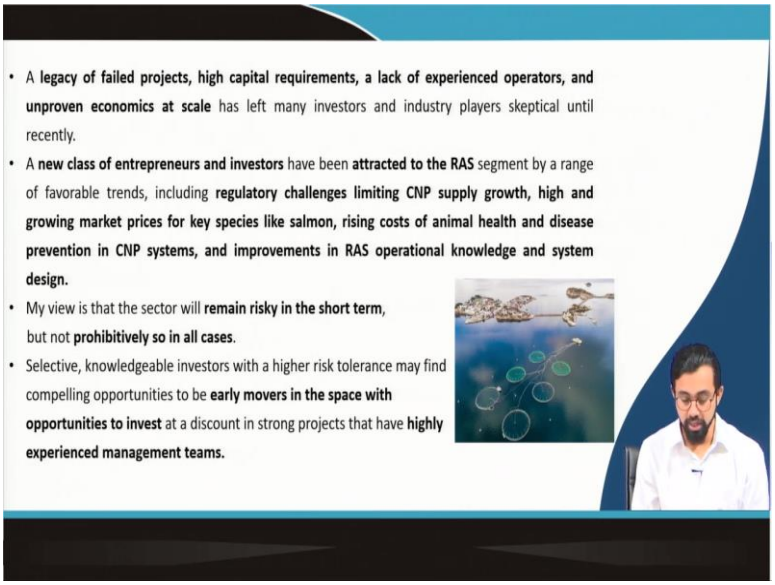

The first one I have already discussed like about this only in details if I talk about it. In general, this RAS systems has a legacy of failed projects, high capital requirement and lack of experienced operator and also in unproven economics at scale.

However, a very new class of entrepreneurs are coming out and they are actually working on it and they are working and they have been they are attracted to recycled aquaculture systems. Because they know that there will be a change in the regulatory in system in policy and key supply growth, especially in the coastal net pen supply to see this kind of coastal net pen areas. The supply growth and high and growing market prices like for species like salmon. We have to think about some alternative system to the CNPs this net pen instruction.

We can improve the RAS operational knowledge and system design and based on that my view this sector will remain risky in short term, but not prohibited for repetitively so in all cases. And also, knowledgeable investors with a very high-risk tolerance may find compelling opportunities to be early mover in this space with opportunity to invest at a

discount in strong projects that have highly experienced management team. So, that is what I am like requesting to be the early mover you be the change, be the first person in this kind of system and do something in a pilot skill bases.

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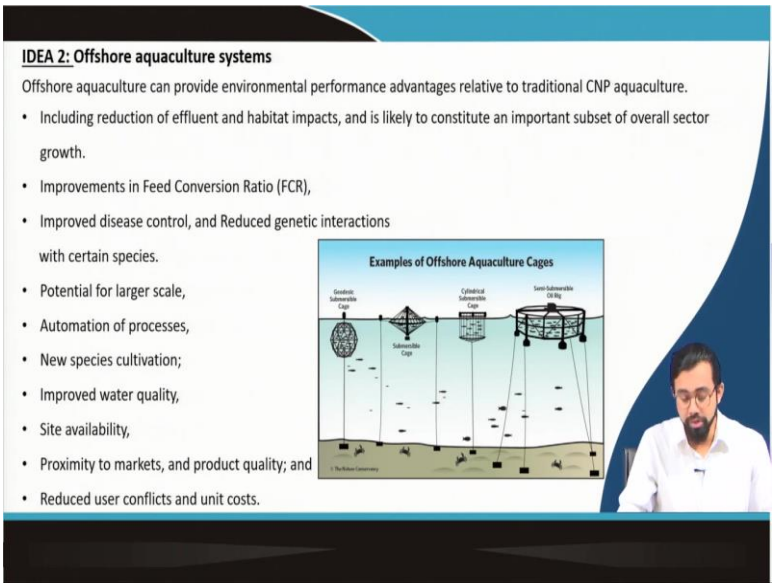

Second, it is the offshore aquaculture system, definitely, it is a future in Indian context, we have a huge coastal line, you just go there, talk to the government and develop some project idea and get the money out of it. And also, good go ahead with the research institution, fund them, work with them, discuss about the possible research project and think about how we can utilize them.

See here in the offshore aquaculture system it is in it includes the reduction in the effluent and the habitat impact. It improved the feed conversion ratio, it has a potential for large scale applications, if you go to the Norway will be surprised to see how in a very large scale, they are working on this kind of offshore aquaculture in this cage and this cage culture center. They have it like in a huge scale.

New species cultivation is possible, automation is completely possible. And despite availability, you do not have to worry about sight and the size of your land area because it is like the whole vast ocean is at your service. The proximity of market and product quality is in your hand, the reduced user conflict and the unit cost definitely.

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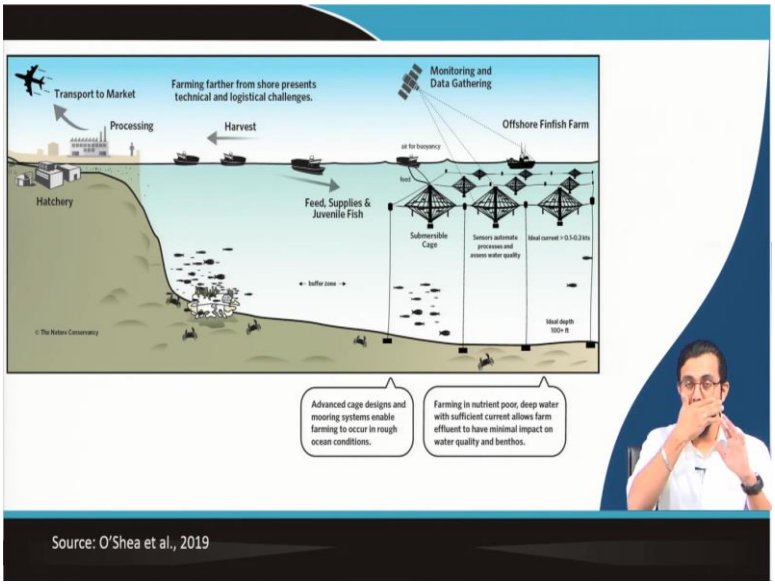

So, in general, you can have this advanced case designs and systems which can have a proper monitoring and the data gathering unit. It will be having underwater cameras and underwater sensors which will keep on giving you the real time data from your processing unit is from your system office itself.

So, from your office we can get an idea about each and every cage, how it is working, what are the problems, what are the all the sensors will be there, which are very low energy optic in device in general. So, you do not have to worry about much that data will be collected. You can collect the data and that big data if you do analyze, you can come up with some very innovative further ideas as well.

And also this the harvest is also possible it is very easy. And the speed and supply in the juvenile fishes is also very easy from the hatchery. So, in general, this is like an the recurring cost is almost nothing other than the transportation cost you do not have recurring costs because you are not worried about the food much, you are not worried about. Because everything is you are actually kind a having a culture you need in a natural environment. So, nature is actually taking care of all the things you do not have to worry about this.

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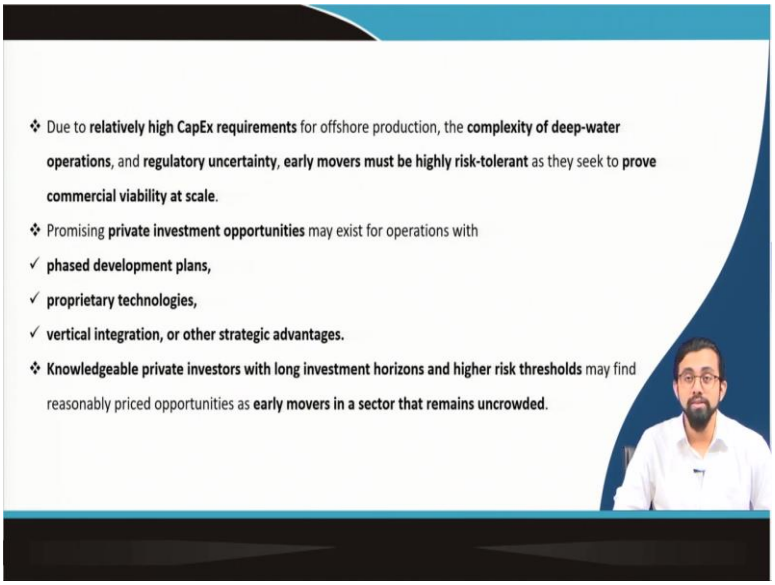

So, this is what I would suggest like though it comes with some disadvantages very like but I would say like definitely we should go ahead with this and then the government is also you will get a lot of grants, a lot of opportunities from that government if you design a proper pilot plan. Though it has a high capex requirement, capex capital expenditure in the initial stage and the complexity in the deep-water operation regulatory uncertainty and that is why early movers must find it must be very high-risk tolerance in order to make it prove as a in a commercially successful project.

Promising a private investment opportunity may exist for operation with the phased development plan you can have a proprietary technology. You can vertical integration or other strategic advantages you can incorporate from the cage. You can do this long lining of rope culture of scallops or like rock culture of or like we can make a proper design of seaweed culture. So, you can do the multiple culture propositions also can be given in these kinds of projects to get more benefit out of it.

In general, knowledgeable private investors with long investment horizons and higher risk threshold may find this reasonably priced opportunity as early movers in a sector is that remain uncrowded till now. So, that is one of the reasons that I am saying that this has a very high opportunity in the near future.

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In general, if you see the structure of this different cages which is installed in northern sea of the near to the Norwegian coastal region. Say they have this huge salmon industry and they have they are utilizing very accelerated technology and they have validated that offshore aquaculture is possible and it is very much clear. And it is very much not only possible it is highly beneficial and highly high amount of return is possible. Profit is possible from this kind of system.

Such producers are big by this the backed by experienced operators and who have dedicated substantial r&d resources to invest into new and mega scale technologies. Most Norwegian producers have a salmonid focus in general. They received design input from offshore oil and gas sector and are incentivized by a government program granting the free development concessions. So, that is the requirement from the policymaker's point of view in Indian context, but it is doable.

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Third idea is like the bivalve when the seaweed production, it has a lot of benefits that if you go for seaweeds in the bivalve, it will clean your environment, because it will consume the all the waste products and pollutants from your system from your water. It will give you a high amount of monetary return you do not have there is hardly any recurring cost because you do not have to there is no you do not have to go ahead with the culturing it by yourself it will be just planted there give it to continue in a proper environment it will do it will grow by yours by himself by itself.

So, you do not have to go for any further continuous recurring in recurring cost involved with it. It has any if environmental benefits and so all the way it is like good like the bivalve is in general, they are majorly produced in the temperate geographies with the production dominated by China.

And the growth potential for developed in the tropical waters are also being introduced and investigated recently. And it is possible that in the southeastern Asia also it has a very it is a huge market, especially in Indian context it has a huge possibility for India to be the lead runner in bivalve and the for seaweed production.

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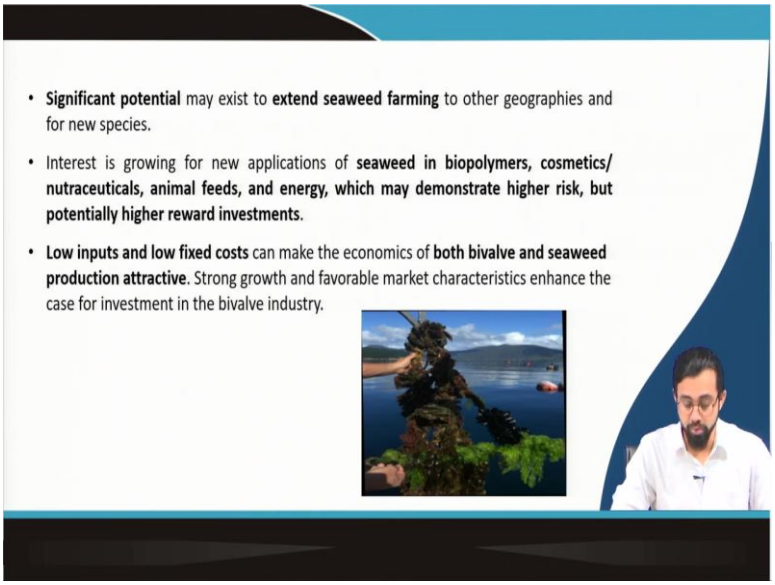

The seaweed farming which can have enough which can be used as a use for biopolymer, cosmetics or nutraceuticals, animal feed and energy sector which may demonstrate higher risk but potentially high reward investment.

However, it has a very low input and low fixed costs, it can make the economics of both bivalve and seaweed production much more effective much more attractive, higher and also strong growth and the favorable market characteristics definitely enhance this particular in the investment scenario of this bivalve industry specifically seaweed industries to be presented, if you asked me to.

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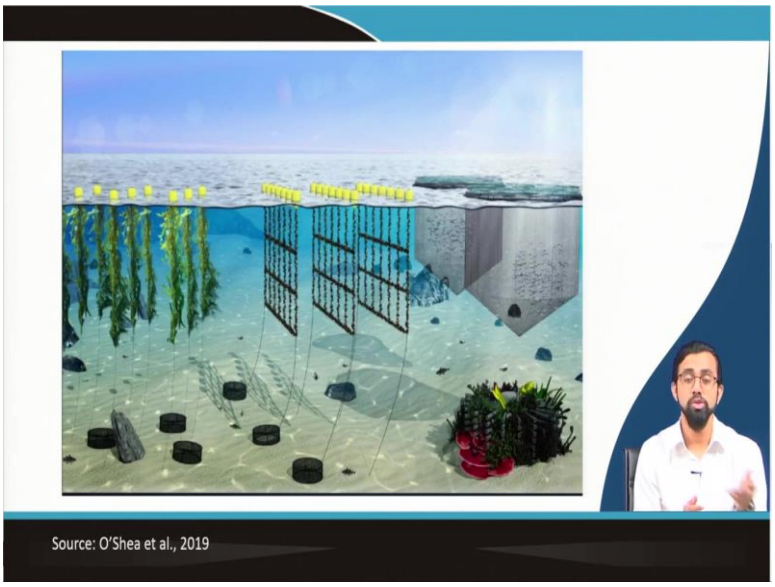

So, it can be how to say reproduced with a like I mean it can be done with a polyculture method also like you have your sea culture, you can have your seaweed culture, you can have your Pearl culture, you can have your bivalve culture at the end you can have the artificial coral reefs and all.

So, all these things will give you a very sustainable approach to reduce the greenhouse gases from the atmosphere to enhance the environmental the ecosystem of the nearby vicinity to improve, to give you a helping economic return. It will help you grow something and give you the opportunity for employability and on your union nearby areas.

So, in all way, this is doable and this is very much useful and that is why I am keep on saying it that these ideas are actually very much useful and people should go and think about it and work on it very precisely. So that like, especially the you have to very strengthen the r&d sector. In this how could be a the design, how it had to be designed properly scientific way. Then, only we will get a proper return. So, talk to the expert go ahead and think about the possible project establishment.

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For the philanthropist, policymakers and NGOs like nongovernmental organizations, I have we have something to discuss. First of all, it is your responsibility like we have to design properly in a proper protective transparent and effective permitting process and regulation to promote this kind of aquaculture practices in Indian context.

You should establish clear property rights and the resource tenure. You should promote the development of enabling infrastructure to support the industry development especially for

poor areas, then the rural areas where people are enthusiastic about it, they are interested in it, but they do not have the proper infrastructure to go ahead and start their business.

Providing the program to promote a sustainable innovation in this aquaculture sector different ideas that have discussed, developing public financing mechanism so that they will not think about like okay so the capital investment is very high. So, I cannot just go ahead and start doing it.

Forget about it, the system has changed, there are a lot of you can get a lot of grants from the government, you can forget about grant, you can get very a lot of different soft loans from government and organization from the banking sectors. And they will promote the people who wants to work in this kind of sector, this kind of opportunities, and they will definitely help government to promote more amount of employability and definitely people will you will be supported. If you have a good idea, definitely you will be supported in the long run.

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So, in general, this is the reference that you should follow, you should really go ahead and look this, go ahead and study this book. It is very important towards the blue Revolution by Nature Conservancy and an Encourage Capital Arlington.

So, in general, I hope in this lecture, I have given you the brief about all the discussions that we have that what are the understanding that we develop, and at the end, you get to know about all the opportunities and possibilities in this sector for you to work on. And so that in future, you will also be an aquaculture expert, or an r&d specialist or say, like entrepreneurs

in this field, and help not only help yourself to get some additional economic benefit, but also to help the government to give the boost the economy of your country as well.

I hope this whole lecture series are helpful to you. And if you have any issues, I always pay to discuss and you can come and contact me my mail id and its official mail id. And definitely I will be very happy to help you with any issues, any development or any plan that you want to. Thank you so much. It is, it is a very good opportunity for me as well. I hope I will come up with some more lecture videos in coming sessions and which you can find helpful as well. Thank you so much.