Advanced Aquaculture Technology
Professor Gourav Dhar Bhowmick
Department of Agriculture and Food Engineering
Indian Institute of Technology, Kharagpur
Lecture 41
Organic Aquaculture Standards

Hello everyone, welcome to the first lecture of module 9, the technology of organic farming. My name is Professor Gourav Dhar Bhowmick; I am from the agriculture and food engineering department of IIT Kharagpur.

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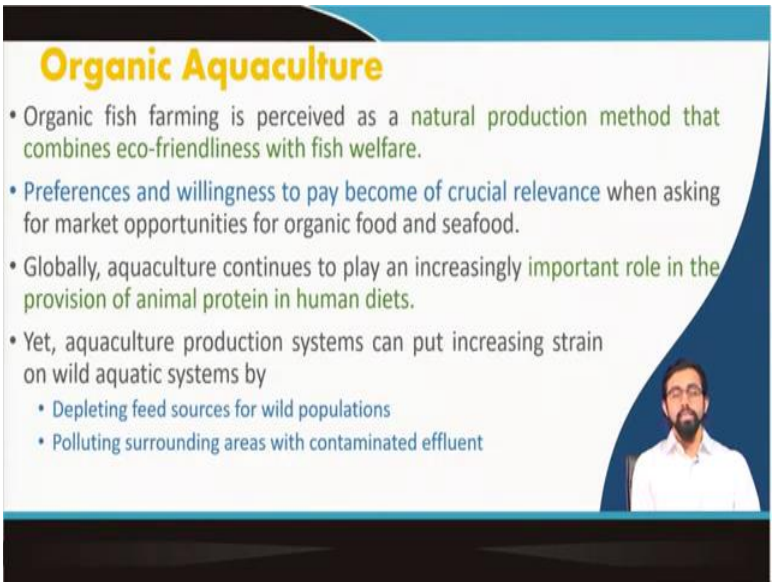

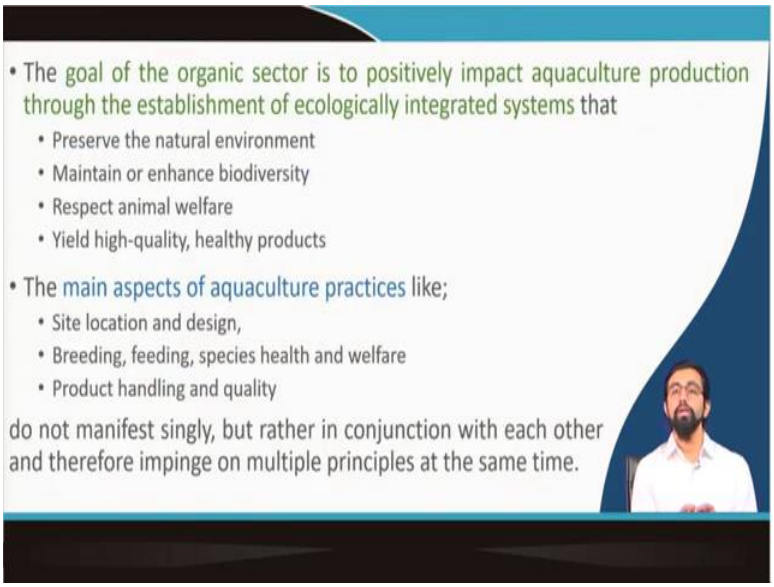

So in this lecture material what we will be focusing on majorly the organic agriculture and this aquaculture in general. So based on these organic aquaculture concepts and all we will be focusing on some basic principles of organic aquaculture, what are those principles; principle of health, principle of ecology, principle of fairness and principle of care. So just try to remember these are the, this is all the principles that I am talking about is based is actually tells us that whether the culture system that we have used it is a organic culture systems or the normal, the standard ones or not.

So if we consider it such a as a organic aquaculture it should rely on, it should definitely follow some basic principles, so in this lecture we will follow, we will try to understand those basic principles that we need to follow in order to claim that what we are doing it is a organic aquaculture. So in general, this organic fish farming is considered as a natural production method that combines the eco-friendliness with fish welfare, try to remember whenever we talk about organic things and all we always talk about the welfare of the culture species or the culture crop, whenever we discuss about organic agriculture it is culture crop, we have to take care of the welfare of the culture crop or the related living beings.

Same way organic aquaculture also it shows us the basic necessity of fish welfare or the aquatic species welfare. Preference and willingness to pay become a crucial relevance when asking for market opportunities for organic food and seafood, because sometimes people prefer it however they cannot afford it because if you want to go for complete organic it may cost you a little bit more even sometimes little bit less also.

It all depends on the target area and target species, however this willingness to pay and preferences are crucial relevance when or we talk about the organic aquaculture. Globally

aquaculture is actually increasingly having important role in the provision of animal protein in human diet and however, aquaculture still increases the strain on wild aquatic systems by depleting the feed sources for a wild populations plus polluting the surrounding areas with contaminated effluent.

So these are the reason why we should go ahead with the organic aquaculture systems and why people are started, why researchers have started developing ideas and also the aquaculture is mostly they started pruning towards the organic aquaculture. The goal of the organic sector is to positively impact the aquaculture production through the establishment of ecologically integrated systems that preserve the natural environment as it is, it will maintain and enhance the biodiversity if possible, it will respect all the related animal welfare and also it will yield high quality healthy product, so that is our motto when we talk about the organic sector.

The main aspects of aquaculture practices like first site selection and design, breeding, feeding, species health and welfare, and product handling, and quality. Do not manifest singly but rather in conjunction with each other and therefore impinge on multiple principles at the same time, therefore we should rely on; it is not that something your cultural in tilapia just you are worrying about tilapia that is it, somehow you want to culture it, somehow you want to make it as much precious as possible so to get higher market benefit, no.

Organic culture it only shows that it is not only the tilapia but all the related species in that ecosystem has to be well taken care of. So it is not a single phenomena, it is a not a single target, it is a multiple species target, multiple principles impringed in a same Venn diagram, so that is what we need to do.

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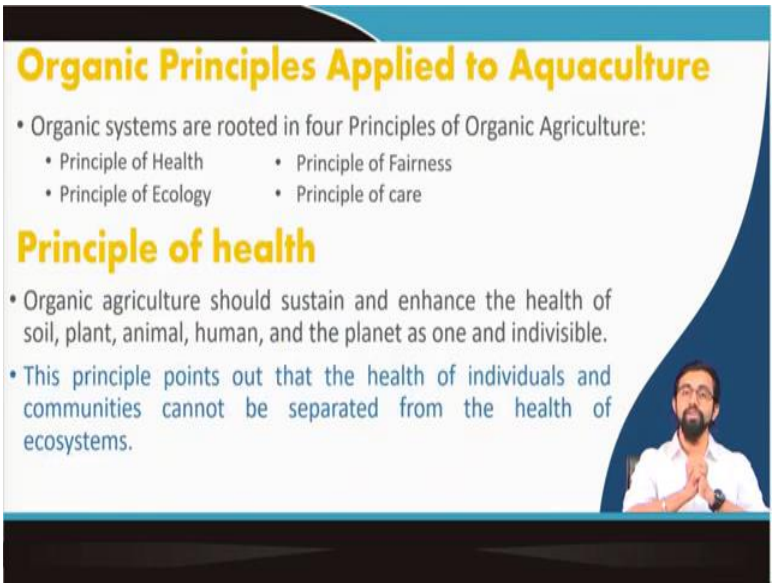

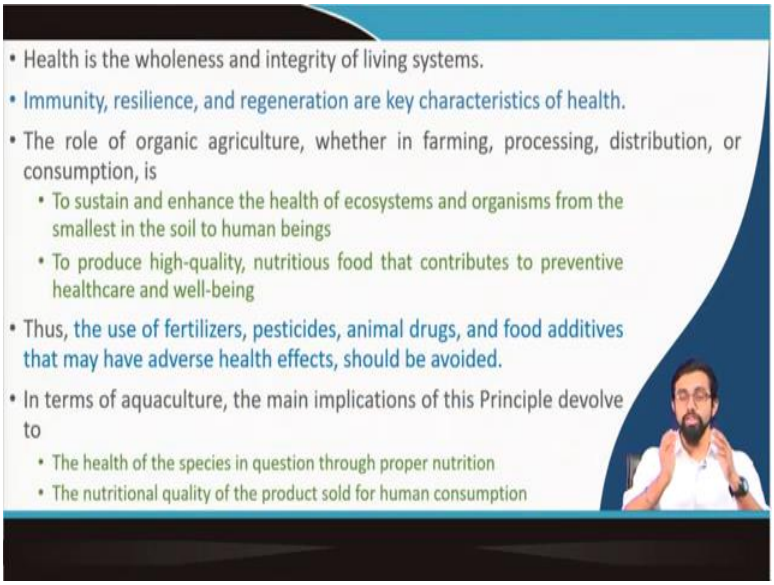

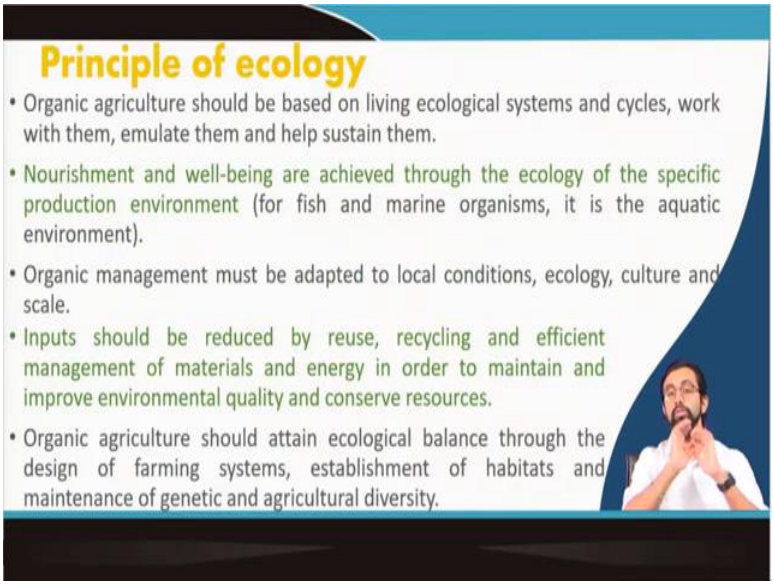

Organic systems in general it rooted in four principles, in terms of any organic agriculture it may be an organic aquaculture, it may be organic agriculture for crop yield. What are the fours, what are these four principles; principle of health, fairness, ecology and care. We will discuss about all these things, what does that mean, what is principle of health means, what is principle of fairness, ecology or care means.

Principle of health, any organic agriculture it should sustain and enhance the health of soil, plant, cultured animal, in our case it is fishes, human and the planet as one and indivisible. The principle points out that the health of individual and the communities cannot be separated from the health of ecosystem. So our main motto is to take care of the health of the whole ecosystem.

Health is a wholeness and integrity of a living system that we should take care of; immunity resilience and the regeneration are the key characteristics of health and the role of organic agriculture when we talk about whether in farming, processing, distribution and consumption, is to sustain and enhance the health of ecosystems and the organisms from the smallest in the soil to the human beings, so whole ecosystem has to be benefited out of it.

The second goal is to produce the high quality nutritious food that contributes to preventive health care and the well-being in general. Thus the use of fertilizers, pesticides, animal drug, food additives that may have adverse health effects should be avoided at the best. In terms of aquaculture the main implication of the principle devolve into the health of the species in quotient through proper nutrition, second the nutrition quality of the product sold for human consumption has also to be taken care of whether it implies with the certain standard or not, so that is what the principle of health shows us.

What is the principle of ecology, organic agriculture or say organic aquaculture it should be based on living ecosystem, its cycle, its work with them and the emulate them and help sustain them. Nourishment and well-being are achieved through the ecology of the specific production environment for fish and marine organism, it is aquatic environment. Organic management must be adapted to local conditions, ecology, culture and scale.

Inputs should be reduced by reuse, recycling and efficient management of the materials and energy in order to maintain and improve the environmental quality and to conserve the resources. Organic agriculture it should also attain the ecological balance through the design of farming systems, establishment of their habitat, and maintenance of their genetical and the aquaculture or agricultural diversity.

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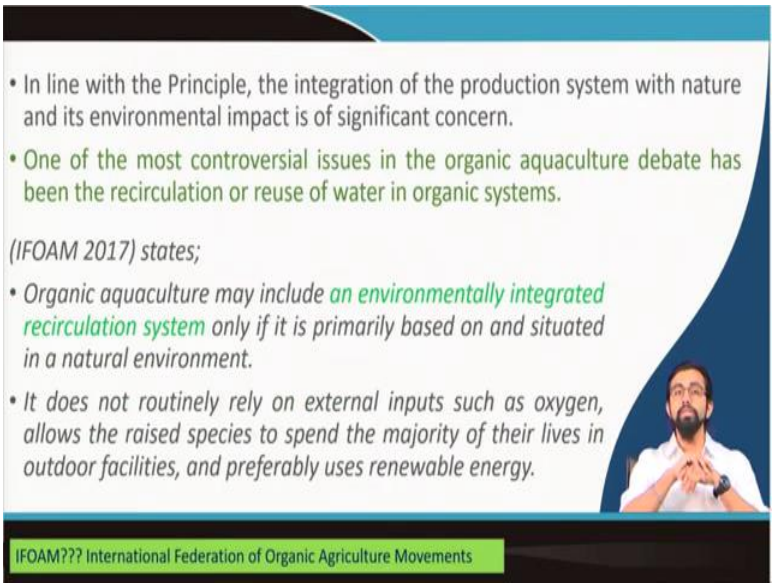

In line with the principles, the integration of the production system with nature and its environmental impact is to be the major concern for us. One of the most controversial issues in this organic aquaculture debate has been the recirculation and the reuse of water in organic systems whether it is a well led practice of organic way or it is not that is a very standard debate.

Based on that if you see the international federation of organic agriculture movements in 2017, they state that organic aquaculture may include an environmentally integrated recirculation system only if the primary, primarily based on and situated in a natural environment. They said you cannot do it in a artificial environment, you can only do it, you can only go for this environmental integrated recirculation systems if it is based on and situated in a or situated in a natural environment. It does not routinely rely on external inputs such as oxygen, allows the rays of species to spend the majority of their life in outdoor facilities and preferably uses renewable energy.

So once and unless somehow they go for all these criteria, they maintain all these criterias then only it will be considered as organic aquaculture systems, so it should not rely on the external inputs like oxygen, so they mostly talk about the semi intensive ones or extensive ones. If you want to go for intensive one definitely you cannot follow this rule, so it is very hard to follow organic aquaculture practices in intensive aquaculture system.

It is doable in semi intensive and extensive and with proper precaution intensive also it is doable, nowadays scientists are trying their best to make it as organic as possible but it comes

with because basically you are providing it with the aeration and other artificial means you cannot just have it in proper organic way.

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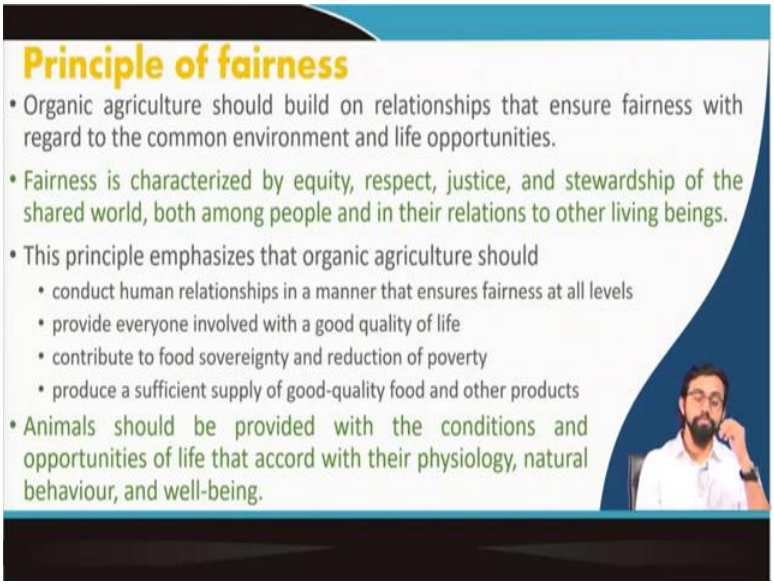

So now we discuss about the principles of health and wellness, let us discuss about the principles of fairness. Organic agriculture should build on relationships that ensure the fairness with regard to the common environment and the life opportunities, it is characterized by equity, respect, justice and stewardship of the shared world both among the people and in relation of the living being that you are culturing or rearing.

This principle further emphasizes that organic agriculture or organic aquaculture should conduct human relationships in a manner that ensures fairness at each level whether it be the microbiota that is present in your system, whether it be the human being that is consuming that rearing species, it should provide everyone involved with it a good quality of life, it will contribute to the food sovereignty and reduction of poverty, it should produce sufficient supply of good quality food and other food by products.

Animals which are, so what does that mean whatever the animals that you are culturing or rearing it should be provided with the conditions and opportunity of life that accord with their physiology, natural behavior and well-being. So this is being practiced all over the world right now, especially the persons with animal concerns they really worried about it, we should really think about how we can maintain a proper condition and proper opportunity that can be provided for them to live the way they live naturally, all our rearing species or culture species.

We are consuming it that does not mean we can be as cruel as we want. So this is a very important thing to be when we discuss about the organic culture, the principle of fairness should be maintained.

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Fourth one is the principle of care, what do I mean by principle of care? Organic agriculture it should be managed in a precautionary and the responsible manner to protect the health and well-being of current and future generation and the environment.

So here we are not only talking about the current generations and current animals in the different tropic level, but also the future generations and the future impact on the environment. The practitioners of organic agriculture can enhance the efficiency and increase the productivity, but it should not jeopardize the health and well-being of all the animals or all the species that involves in the system.

Consequently, if you are adding any new technology it has to be properly assessed and properly reviewed that whether it can be replaced and for this kind of organic aquaculture practices or not. Given the complete understanding of the ecosystem or agriculture then only the care should be taken and this care should be taken when we are introducing in a new technology, any retrofitting of any existing technology, whenever we do that we have to put a proper care on the species that is available what will happen to any future implications that we need to really worry about.

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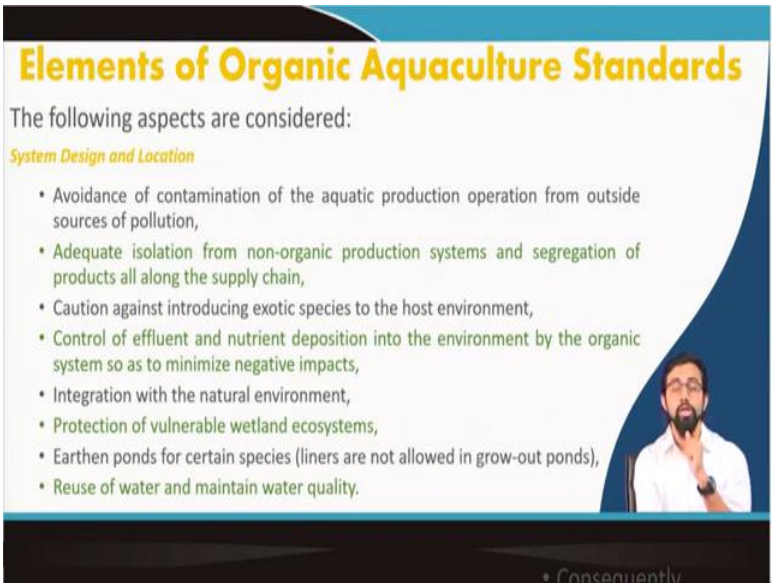

So in general when we discuss about the elements of organic aquaculture, how we go ahead with that, what are the aspects that should be considered when we discuss about the organic aquaculture? First thing is the system design and location, we have to avoid the contamination of aquatic production operation from the outside sources of pollution, first thing, we have to provide adequate isolation from non-organic production systems and segregation of products from all through the supply chain.

We have to have a proper caution against introducing any exotic species in the host environment; it can drastically change the whole ecosystem. So any time when you are culturing any species and all of a sudden your culturing started thinking now let us produce some exotic species it will give us much more yield and much more economic benefit, but it will completely disrupt the whole ecosystem.

So you have to worry about it before bringing any exotic system to your to any new environment or new ecosystem. Control of effluent and nutrient deposition into the environment by the organic system so as to minimize the in negative impact, integration with the natural environment should be practiced, protection of vulnerable wetland ecosystem has to be provided; this wetland ecosystems are very standard and very natural, so it would be better to protect all the available wetlands anywhere you found just protect it, its very important. It is like a lungs of of our earth, so more the wetland the more it will provide us all the healthy benefits possible.

Earthen ponds for certain species like liners are not allowed in grow out ponds, so you have to provide this earthen ponds like when you go for this organic culture. Reuse of water and the maintaining the water quality is very important.

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When you talk about the conversion of organic aquaculture, we have to have a adequate cleaning of existing systems prior to use for the organic production typically ranges from 3 to 12 months, so you cannot just all of a sudden retrofit any existing non-organic aquaculture systems with the organic agricultural systems, because there has to be some practice that you need to go ahead before you are claiming it to be organic aquaculture.

What are the practices, first you have to clean the existing systems typically for 3 to 12 hours, you have to provide adequate time to establish and verify the organic practices that is in

place, typically a full life cycle of a target species or sometimes a smaller fraction but generally not less than two third of the species life that has to be maintained. Adequate conversion of the existing non organic stocks before they can be used for the organic breeding and sold as an organic products typically at least 3 months before allowing for building and at least two third of there the life cycle of the rearing species or a correspondingly high percentage of the weight gain for the sole product to be maintained.

So the sources and the the next thing is the sources of stock, breeds and the breeding, how are you going to do that in organic aquaculture, preferably choose the locally adapted species do not go for the exotic species, breeding should be done using the organic stock, seed and juvenile in preference to non-organic stocks.

Prohibition of polyploidy or artificial hybridization or non-manual means of creating any monosex populations, prohibition on the use of hormones, and also restrcition on the artificially lengthening the daylight period. All these practices have to be stopped when you talk about the organic agriculture systems. Any manipulation, any physical behavioral manipulation is prohibited in organic aquaculture. In case of algae and microalgae production or restriction on the nutritional input to the production system has to be maintained and the control of harvesting methods to ensure the long term system productivity.

In case of production of molluscs, restriction on the nutritional input to the production system as same as the algae and others, and careful integration of molluscs with the rest of the production environment like appropriate polyculture can be introduced, cultivation locations example like the bottom cultivation versus the other scenario has to be properly taken care of before you are producing molluscs in organic aquaculture systems.

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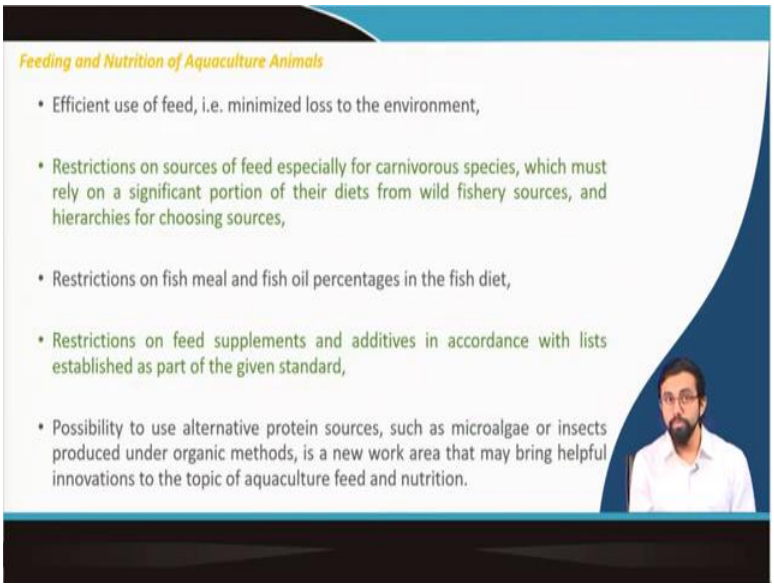

What about the feeding and nutrition? Efficient use of feed that is minimized loss to the environment definitely you do not lose in terms of economically, in terms of chemical loss, in terms of like nutrient loss. Restriction on the sources of feed especially for carnivorous species which must rely on significant portion of their diet on the wild fish resources and hierarchy for choosing different other sources of food.

Restriction on the fish meal and fish oil percentage in the fish diet, you try to get rid of, you cannot get rid of it but you try to minimize the percentage of fish oil and fish meal percentage in your fish diet and restriction of the feed supplements and additives in accordance with the least established given by the standard regulatory bodies, you have to follow those rules. Possibility to use alternative protein source like microalgae or insects produced under organic methods can be introduced, so that it will be used as a feed and nutritional source for your aquatic rearing animal and also it will help you reducing the requirement of fish meal and fish oil based nutrition for your fish diet.

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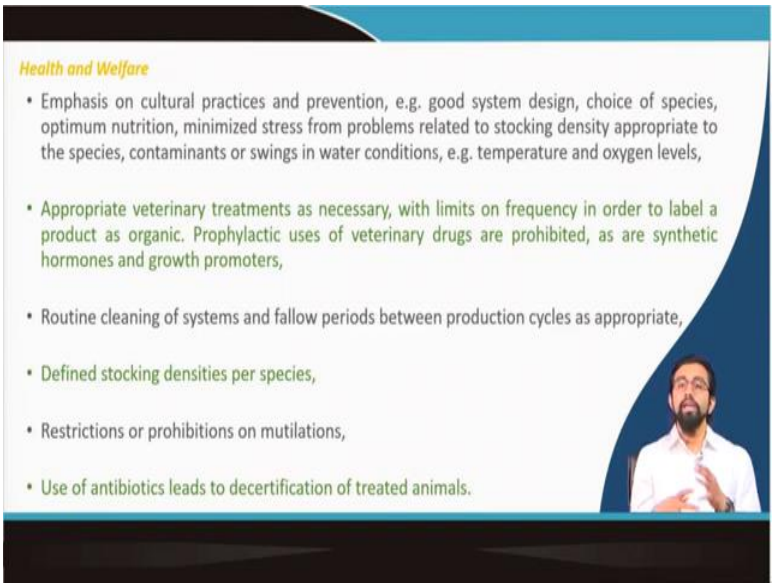

In terms of health and welfare, how you control the health and welfare? We have to emphasize on the cultural practices and the prevention, good system design, proper choice of species, optimum nutrition supply, minimize the stress from problems related to like stocking density, it has to be appropriate to the species that you are culturing, contaminants or swings in water conditions has to be reduced, and temperature and oxygen level has to be controlled.

So all this like this optimum level for your culture species has to be maintained for different parameters, so appropriate veterinary treatment is necessary also in case of when you talk about the welfare definitely and with limits on frequency in order to label a product as organic, this is very important like this appropriate veterinary treatment that you are providing.

Also this prophylactic uses of veterinary drugs has to be prohibited as there are like synthetic hormones and the growth promoters are there, so that has to be completely stopped when you talk about the aquaculture like organic aquaculture, routine cleaning on the systems and the fallow periods between the production cycles as appropriate, define proper stocking density per species, restriction on prohibitions on the mutilations, use of antibiotics which leads to decertification of the treated animal you have to be cautious about it.

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How to harvest, how to transport and how to slaughter your animal or your target species, you have to minimize the stress at pre slaughter level, how we can do that? You can control the environment and the transport medium as easy as possible for your aquatic species, you have to minimize the suffering during the slaughter by normally using different incense sets like you can put them in the freezer slowly reduce the temperature and give them some thermal shock and they will be in a or I am just giving you an example.

You can use a some means like the natural means by which they will be less suffered during the slaughter, you have to maintain a product quality post slaughter via proper hygiene and the temperature control, when you do the processing and the labeling, adequate segregation from non organic product to the organic product has to be maintained, transparent traceability system in place and the restriction on additives and the processing aids and the minor non organic ingredients based on the leads established as a part of the given standard has to be maintained. The label indications in compliance with the standard and other regulatory relevant statutes have to be provided.

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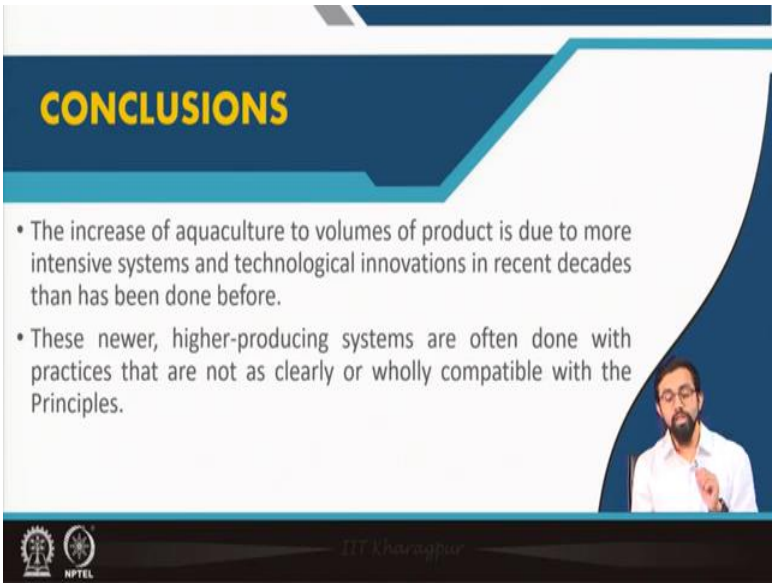

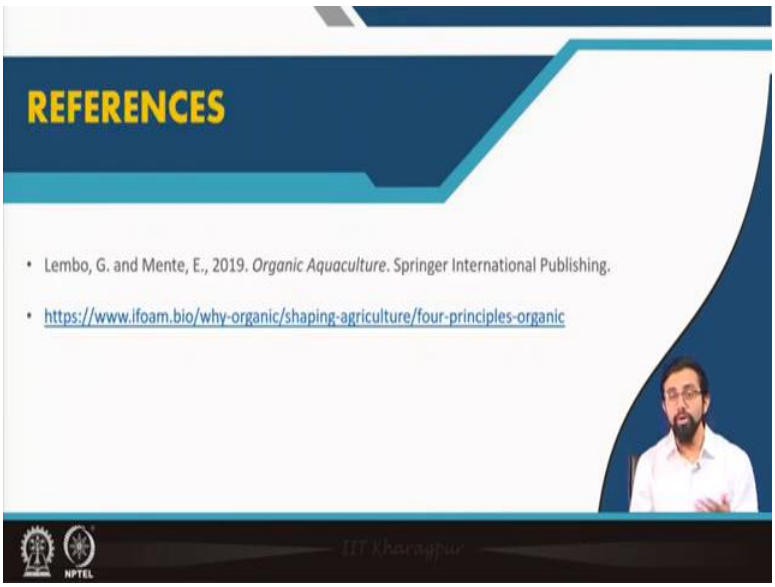

So these are all the means that actually there in organic when we talk about the organic aquaculture systems and have to maintain all this criterias and then only you to be called as a practice which is organic enough or like standard enough and organic enough so that people who are worried about it, people like us who are working on it and they will be more satisfied with the practice that is done and when we will be consuming it we will feel less guilty about it.

So in general this is coming from the the psychological point of view also, so I am sure like most of them would not be much triggered about this going for organic aquaculture even there is a chance most of them are, however, this is a very standard, very good practice and in future this is actually a very futuristic model I would say, like people should follow so to do any agriculture or aquaculture practices in a very as minimum as harmed to the ecosystem like in in a way so that it will cause as minimal as harm to the ecosystem.

In so in conclusion increase of aquaculture to volumes of product is due to more intensive systems and technological innovations in recent decades that have been done before. These newer and high producing systems are often done with practices that are not as clearly and wholly compatible with the principles of organic aquaculture systems. So we have to follow those organic aquaculture systems and thus the aquaculture stakeholders have to weigh positive and negative consideration and make compromise in this period of meeting the needs, desires and expectation of producers and consumers alike.

So this has to be maintained and all this discussion I hope you have benefited with the some knowledge about what is organic aquaculture, what is organic in general, so these are the references that you can follow. Thank you so much I hope you really enjoy this lecture matter, because it will give you a very brief though it is not detail enough, but still it be good enough information about the organic aquaculture and organic agriculture in general and how you can practice organic aquaculture in your farm, so that it will not cause any detrimental effect to the surrounding ecosystem and the nearby vicinity. So that is to be taken care of and I hope you learned a good lesson in this lecture, so hope to continue with this, thank you.