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From the Director's Desk...

Dissemination of information on various issues related to environment of the State is the main objective of establishment of our ENVIS Centre. We have discussed on various issues in our earlier publications. In this issue we have focused on one of the important topic "**Seaweed Farming For Livelihood Generation in Coastal Areas of Odisha State**".

I hope this issue of Newsletter will be useful for various planners, decision makers, scientists, environmentalists, researchers, academicians and other stake holders.

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Seaweed Farming For Livelihood Generation in Coastal Areas of Odisha State

Abstract

The most important seaweed products to-day are the phycocolloids agar extracted from red algae and algin extracted from brown algae. The various other uses of seaweeds could be as fertilizer, food, feed, fuel and pharmaceuticals. Prior to 1965 the seaweeds used to be exported and now with the development of indigenous technologies for the manufacture of agar and alginate, the prospect of seaweed cultivation in coastal region of Odisha state appears to be bright. Initially the work was stared with an aim for Gracilaria farming operation in southern parts of Chilika Lake to produce raw seaweed crops. Wnen sufficient large quantities of seaweeds will be produced from the farm efforts attempts will be taken for the utilization of the raw materials hence seaweed farming will be an alternative method for maintaining the socio-economic condition of the fishery village communities. The Fishery village women folk can go for the seaweed farming along with the fish farming which will uplift their standard of living.

Introduction

Odisha with a coast line of 482 KM is rich in natural resources. Long period of neglect, mismanagement, lack of proper vision and long term plan based on resource endowments have given the state the dubious distinction of the poorest state. The dead lock needs to be broken with an urge based on the spirit of adventure and determination so that the state emerges as a vibrant state with an equally vibrant economy without of course compromising the environmental norms. The development then becomes sustainable. Odisha's poverty is far higher then the national average of 26.1 percent. The poverty scenario of Odisha is more concentrated in rural areas. As far as the social and economic backwardness is concerned the marine fishers who exclusively depend on

marine fishing are economically poor, geographically isolated, physically segregated, socially despised. The community is facing the problems of poverty, vulnerability and marginahzation.

Many people consider the seaweed as the weed of the sea but let us not forget that seaweed has a real great economical value. Seaweed, since ancient time a staple in food, feed, fertilized and delicacies is to a high extent composed of hydrocolloids which through isolation reveal unique properties. From old home industries to modern processing techniques today's highly specialized factories cater to a wide spectrum of sophisticated needs by varying processing parameters with the proper combination of seaweed species. Seaweeds are important renewable resources found in sea, estuaries and backwaters. They are the only source for the production of phytochemicals namely agar, agarose, carrageenan and algin. In India, seaweeds are mainly used for the commercial production of agar, alginates and also liquid seaweed fertilizer. Thus the seaweeds industries offer employment to hundreds of people living in the coastal areas.

The commercial exploitation of seaweeds is going on in India since 1966 (Silas and Kalimuthu, 1987). Detailed account on the distribution, potential areas for commercial exploitation of seaweeds, their standing crop in different maritime states of India and the seaweed resources in esturies and backwaters of Tamilnadu and Ponicheherry was given by Kaliaperumal et al (1987).

Seaweeds are the marine macro algae growing abundantly in marine ecosystems of sea, estuaries, salt pans and backwaters. They represent the key component in the coastal ecosystems. Ninety per cent of the marine plants are algae and contribute to about 50% of global photosynthesis(Manilal et al, 2009 and Dhargalkar and Neelam, 2003). Seaweeds function as primary producers in the food chain (Lee, 2009) and they are mainly used as a source of phycocolloids (agar, carrageenan and alginate). These phycocollcids are the thickening, gelling and stabilizing agents(Ruperez et al, 2001 and Mabeau and Fleurence, 1993) used in various industries such as food, tentiles, pharmaceuticals, dairy and paper industry (Caliceti et al, 2002).

India ($08^{0}04'$ - 37^{0} 06'N and 68^{0} 07' - 97^{0} 25'E), a tropical country has a 7000 km coastline and 2 million km^2 Exclusive Economic Zone(EEZ). Till now there are about 770 species of seaweeds reported from different parts of Indian coast. It includes 184 specia of chlorophycal, 166 species of phacophycede and 420 specia of Rhodephycene (Sahoo et al 2001). Seaweeds have emerged as a valuable commercial resource. Utilization of seaweeds has increased considerably over the past fifty years.

Seaweed Cultivation

The two most popular methods for cultivation of seaweeds are the fixed, off bottom line method and the floating raft method. Selection of suitable sites for cultivation of desired seaweeds depend upon many factors. The places where the seaweeds grow naturally, are

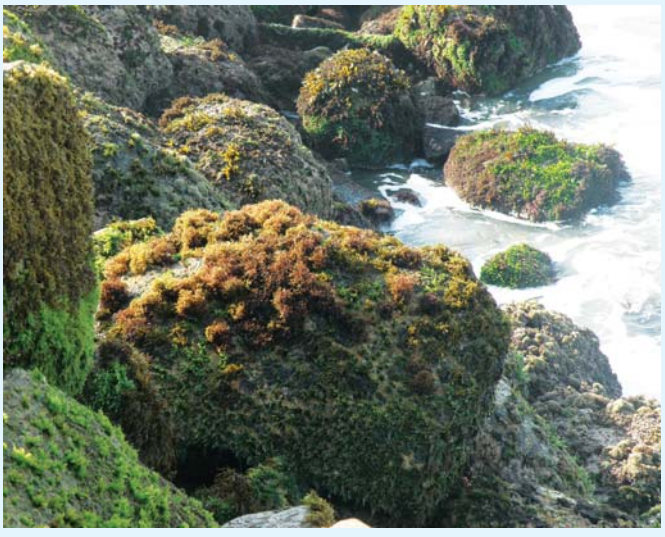
usually the suitable sites for cultivation. Water temperature should be 25-30^{0}C in shallow water usually at a depth of 0.5 to 1m depth. The sites should be away from fresh water source. If the seawater salinity falls below 30ppt, the seaweed does not grow well. The seaweeds obtain its nutrient for growth from the water. So water movement through the seaweed is important. Moderate water movement is preferable. This also helps to stabilize water temperature and salinity. If the current is too strong it can cause piece of the on growing plant to break off and be lost. Wave action must be avoided for the same reason. The sea bottom type is important, a white firm bottom with a limited amount of natural seaweed is good. Too much seaweed or sea grass will compete for nutrients with the cultivated seaweed. Silt or mud on the bottom indicates possible poor water flow and if the silt is disturbed it may settle on the plants. Muddy water will also reduce the light available to the seaweed. The site should be free of pollution.

Plenty of sunlight is necessary for good growth; seaweed planted in shallow water (0.30-50cm) grows well in deeper water(more than 1 m) the light is reduced and growth is poor. Water depth is also important for farming 0.5 - 1.0m depth at low tide is good for the seaweed and allow the seaweed water to carry out maintenance more easily. Regular maintenance is essential. It consists of removing other seaweeds growing either on the liner or the crop itself remaining poorly growing plants, replacing lost plants and making any necessary repairs to the liners, staker etc.

Floating raft Method of cultivation

This method is suitable in protected areas, where water current is weak or where the water is too deep for fixed bottom line method of cultivation. A floating construction is used to

suspend the seaweed raft 50 cm below the surface. Often a 3+3m square bamboo or mangrove timber is made with 3 mm nylon or polypropylene ropes stretched parallel in one direction between the timbers at 10-15cm intervals. The seedlings are tied to the ropes and the raft is anchored to the bottom. The seedlings can be tied to the raft on land and the raft towed into position. Regular maintenance during growth is required. At harvest time the entire raft can be removed and used on a drying rack by sun pending it between four corner support. To maintain the value of the crop, careful harvest system is necessary. It must be kept away from sand and dirt, so drying mats are used. Sun drying for about 2-3 days is sufficient to reduce the moisture content to the required level.



Fixed, off bottom line method of cultivation

After selection of the suitable site, two wooden stales, about 5-10m apart are placed into the bottom. Between the Stake are stretched either a monofilament nylon line or a poly propylene rope and the line should be 20-30cm above the sea bottom and the water must be deep enough to ensure that the seaweed is not exposed at low tide. Small piece of seaweed (50-100g) are tied to the line. Many of these liner are, constructed usually I m a part. It the site is suitable and farming maintenance is carried out regularly the seaweed can reach 10 times to its original size in 6-8 weeks. When it can be harvested it is sun-dried away from sand and dirt, then packed properly.

The off-bottom farming method allows earlier access since the worker can walk around the lines at low tide but the floating raft have the advantage in it they can be early moved to another position. If necessary, and removed from the water altogether in bad weather, thus avoiding destruction by heavy rain and strong wind.

Seaweed Farming an excellent rehabilitation programme for coastal poor

Seaweed farming is profitable if it is taken up as an agri-minded family business. In Phillipines, more than 10,000 families are earning daily bread through seaweed farming. A master plan in selected pockets of south Chilika coast can be taken up for sewaweed cultivation. Opportunities for the participation of the local SHG (Self Help Group) ps women, local communities should be available through cooperation of Govt., NGO's and private sector. Langaleswar site should start with demonstrations to prove the techno-economic viability in seaweed cultivation. Since the project is found to be viable at langaleswar site, it should aim at the rehabilitation of coastal rural poor in seaweed cultivation with proper training etc. The prospect of seaweed farming is a promising alternative for maintaining the socio-economic condition of the coastal women. The attempt of cultivation of Gracilaria verrucosa and some other important seaweed will help in their conservation in a sustainable way. The major issues of the fishery women community are as follows:

1. Fish resources are depleting and erratic species flow.
2. Non-recognition of fisher women engaged in post-harvest fishing activity as active fisher and not covering them under various social security schemes.
3. Fishing is not economically viable thereby force fisher men and women to migrate for employment.

Cultivation of the seaweed can be an alternative livelihood income generation for the poor rural women and there is no doubt that the cultivation of this seaweed by growing into a

major economic activity can diversify the state's economy, can meet the requirement of state and on the top of it, it can well fit into the statergy of the integrated rural development.

The red alga Kappaphycus alverzii (Doty) ex P.Silva is one of the best sources of kappa Carrageenan and it is extensively used in the colloid industries like food, pharmaceutical and aquaculture feed (Bautista et al, 1990). K.alverzii cultivation is the first report of cultivation in the Ganjam coastal waters(Padhi, S.B, et al, 2008). There is very good scope for further experiment on large-scale cultivation of seaweeds in our coastal water of Odisha state.

Conclusion

Seaweed farming should be taken up as a community based activity coordinated through village committees in such manner that they are within the financial capabilities of the mostly small holder farmers. A further strengthening of the village communities through enhance networking as well as farming clusters amongst village could lead not only to improvements in farming processes but also enable market opportunities and improved track of the farmed commodities. In the longer term the livelihood of these coastal communities involved in the seaweed farming will benefit greatly if sustainable industrial development can be achieved. No serious attention has been paid in the lucrative market of seaweed chemicals and algal biomass applications. It is the turn of the Biotechnology industries, Govt, organizations, proper entrepreneurship organizers, scientists and researchers to work in a coordinated way for harnessing the seaweed biomass through seaweed farming methods for value added products.

Various Workshops and Training Programmes Organised by the CES during February -March 2012

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References

Bautista, M.N., O.M.Millamena and A. Kanazawa (1990): Use of Kappa Carrageenan microbound diet (C-MBD). As feed for peraeus monodon larva. Mar. Biol.93:169-173.

Kaliaperumal, N.; V.S.K. Chennubhotla and S. Kalimuthu(1987): Seaweed resources of India. CMFRI, Bull. 41:51-54.

Padhi, S.B, P.K.Swain, S.KBehera, L.Nayak, H.P.Panigrahi and S.M.Samantray(2008): Feasibility study for the cultivation of Kappaphycus alverzii (Doty) Ex. P.Silva in the coastal areas of Ganjam District (Odisha). Indian Hydrobiology 11(2):297-307.

Manilal, IA., Sudithi, S, Kiran, G.S./ Selvin, J. Shakir, C. Gandhimath, R. and panikkar, M.V.N. 2009. Biopotentials of seaweeds collected from saltwater come of India. J. Man. SCI. Technol- 17: (1) 67.73 Dhargalkar, V.K. d Weelam, P. 2005. Seaweed promising plan of the millennium Sci. Cult 71:60 Lee, R.E. 2009. Phycolosy. Cambridge University Prem, USA-pp 89-475. Ruperez, P.I and Saura-Calixto, F. 2001. Dietary fibre and physiochemical properties of ediblp Spanish seaweeds. Eur. Food. Ra. Technol. 212:349-354.

Mabeauis and Fleurence, J. 1993. Seaweeds in food products: biochemical nutrition aspects. Trends food Sci. Technol. 4: 103-107. Caliceti, M., Argese, E., Sfriso, A. cd Pavoni, B. 2002 Heavy metal contamination in this seaweeds of venice lagoon. Chemosphere 47:443-454.

Sahoo, Dinabandhu,Sahu, N. Sahoo, D. 2001. Seaweeds of Indian Court, A.P. It publication New Delhi. PP-1-296.

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