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**Aatmanirbhar Bharat
critical to tame soaring
edible oil price**

**Biofortification of staples
to address micronutrient
deficiency**

**Industrial development
and market linkages
in Seaweed sector
key priorities of Govt:
Fisheries Secy**

**Non-bovine milk: Health
drink for children**

**Backyard poultry
farming for raising
income of small farmers**



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Independence Day Speech –
15th August 2021
- Shri Narendra Modi
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From the Editor

Seaweed farming potential in India

India with more than 8000 km long coastline and vibrant fishing industry has insurmountable potential in seaweed farming. To put it in perspective, a mere one per cent of the coastline is sufficient to achieve India's projected production target of 11.5 lakh tonnes in the next five years.

The growth trajectory, however, at best, has been tenuous so far. Neighbouring China has made immense strides, meeting almost 50 per cent of the global demand. South-East Asian nations have also sustained an impressive production volume. In comparison, India's contribution is somewhere around 0.8 per cent, which is an insignificant 2500 tonnes.

To correct this oddity, the Pradhan Mantri Matsya Sampada Yojana (PMMSY) has made seaweed farming one of the aspirational goals that seek to unlock the latent potential of India's rich bio-diverse coastline.

Seaweeds and their by-products have economic, social and environmental benefits. They are rich in nutritional properties and medicinal values. They have been a major disruptive factor not only in the food industry but across sectors including the pharmaceutical industry. They have amended dietary requirements of health-conscious citizens worldwide and assumed a high level of

acceptability among medicos in treating respiratory disease and terminal illness. Seaweed cultivation tames carbon-dioxide (CO2) and reduce global warming.

The advantages, therefore stretches beyond socio-economic integration to protecting the climate.

The global seaweed market size is projected to reach USD 25 billion by the turn of this decade and the genuine concern for India should remain focussed on sustainability. As with the agriculture sector, seaweed farming needs enhanced support in way of strategic interventions and technology upgradation.

We need to reverse the uncomfortable trend witnessed in the recent past when seaweed production (comprising both wild-collected and produced through aquaculture) decreased from 34922 tons in 2009 to 27937 tons in 2018, in terms of wet weight.

Value-addition is the demand of the market and the industry, and it can be achieved through technology upgradation of traditional seaweed processing units, capital infusion and skill development.

Technologies, introduced on pilot scale, should be incorporated at a large scale measuring their success and benefits. The other areas of attention should be on the development of processing technologies in mission mode by adopting a consortium approach.

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IFFCO & IIT Delhi join hands for collaborative research in Agri sector



Two of the premier research organizations of the country have joined hands to work on new technologies and workable solutions in the agriculture sector to enhance the quality of farm produce and farmers income.

The research and development unit of IFFCO known as the Nano Biotechnology Research Centre (NBRC) has signed an MoU with IIT Delhi for joint collaboration in research activities and sharing laboratories in pursuit of developing sustainable solutions for agriculture and the environment, said an IIT Delhi statement.

“The MoU will facilitate advanced research in the area of nanotechnology for futuristic applications. IFFCO scientists and engineers will work with academic research faculty and scholars of IIT-Delhi in addressing challenging agricultural

and environmental problems to find an innovative solution,” the institute said.

IFFCO Managing Director U S Awasthi said his organisation has supported new technologies that help a farmer with his produce and enhances his income.

“We also believe in creating sustainable innovative solutions to reduce the input cost of agriculture and farming and hence increase the income of farmers and that is the reason we were able to create the world’s first nano urea liquid at IFFCO. We are also committed to sustainable agriculture and look for opportunities to create new solutions for sustainable farming to reduce environmental pollution,” he said.

In his statement, IIT-D Director V Ramgopal Rao said the “impetus to research and innovations will help in achieving the modern agriculture system.”

Oil palm developers association hail ‘national edible oil mission’ announced by PM



The Oil Palm Developers and Processors Association on Monday lauded Prime Minister Narendra Modi’s announcement of the National Edible Oil Mission-Oil Palm scheme, saying it will help in incentivising the production of palm oil, reduce dependence on imports and help farmers exploit the huge market demand.

In a statement, the association said it had been demanding significant change to push for local oil palm cultivation and hoped the announcement will help fulfil the Atmanirbhar Bharat agenda in the vegetable oil sector.

In his address to the farmers, while releasing the ninth instalment of the funds under PM-KISAN, the PM had said the new scheme will see a fund infusion of Rs 11,000 crore for expanding palm oil cultivation in the country and expanding all faculties to the farmers.

“The expanse of Oil Palm cultivation in the country is very negligible today

as compared to the potential the crop possesses. We have seen the transformation this crop has brought about in the lives of the farmer community in Andhra Pradesh and we hope to emulate the same in the other potential states as well. A robust, long-term policy mechanism will give this crop the required push across India,” association president Sanjay Goenka said in his statement.

With the new scheme, India can truly achieve its goal of self-sufficiency in edible oils by pushing for development in the Oil Palm plantation sector.

“While we await the detailed policy guidelines on this front, we appreciate the move by the Government of India and simultaneously assure our Honourable Prime Minister that all of us Processors at the Oil Palm Developers and Processors Association of India will strive hard to make his dream of self-reliance in Edible Oil come true,” Goenka underlined.



India is heavily dependent on imported edible oils, with nearly 15 million tonnes (or nearly 68%) of edible oils getting imported to meet the country’s annual requirement of about 22 million tonnes. Of the total 15 million tonnes of import, about 9 million tonnes (or nearly 60 per cent) is palm oil and its derivatives.

The Centre plans to raise the domestic production of palm oil by three times to

11 lakh MT by 2025-26. This will involve raising the area under oil palm cultivation to 10 lakh hectares by 2025-26 and 16.7 lakh hectares by 2029-30.

The special emphasis of the scheme will be on India’s north-eastern states and the Andaman and Nicobar Islands due to the conducive weather conditions in the regions.

Farmers in Odisha earning higher than national average, says State’s Agri Minister

Farmers income in Odisha has continued to rise over the years and has surpassed the national average despite recurrent exposure to natural calamities, State’s Agriculture Minister Arun Sahoo underlining the progress achieved in the sector.

He said that with the increase in agriculture production, the existing network of procurement centres are being strengthened with an eye on the small and marginal farmers, who constitute 90 per cent of the state’s overall agriculture workforce. They are also being provided training on the use of technology for increasing yield.

Sahoo was addressing a webinar on ‘Odisha Agri Sector: Logistics Challenges and Solutions’ organized by industry body ASSOCHAM. He said Odisha today is a surplus state in paddy production.

Chief General Manager of NABARD C Udayabhaskar advised the State Government to work on the production level issues if it seeks to win over the farmers from Rabi to other potential crops.

In his virtual address attended by experts from the agriculture sector, the Agriculture Minister highlighted the achievements in the sector.

“Agriculture production in Odisha over the years has increased and as a sector, it is growing. We have witnessed that farmers’ income has grown and it is much-

much better than compared to some other states and is even better than the national average,” he said, inviting young entrepreneurs to invest in the State’s agri-logistics space.

The state is increasingly focussing on supply chain management as it is the backbone of agriculture commodity transportation to increase farm income, reduce losses and improve production.

Sahoo drew attention to the recurrent cyclones visiting the state, about 135 natural calamities in the last two decades, as he sought to highlight the increased agriculture production despite challenges because of the government’s continued support for the sector. Support is also being extended in way of financial assistance and the adoption of innovative practices.

“Our department is promoting farmers-producers organisations (FPOs) and agriculture production clusters for holistic development in production, value addition and organic market,” he underscored.

Referring to the new agriculture policy of the state, he said the policy seeks to exploit the untapped potential of the agriculture sector, developing warehouses and logistics and supply chain management to help market farm produce more effectively.

Managing Director of APICOL Prabhat Kumar Roul alluded to the participants

about the initiatives from their organization to strengthen the agri-logistics in the state. Regional Manager of Central Warehouse Corporation Abhishek Anand said they have a presence in all the districts of the state, with a total warehousing capacity of 11.82 lakh metric tonne.

Udayabhaskar, on his part, emphasised the urgent need for developing backward linkages to help nurture horticulture, dairy, fisheries, oilseeds and pulses production in the state.

Highlighting various production level issues that are needed to be resolved to win away farmers from paddy and focus

on other potential crops like banana, oilseeds, coconut, mango and others, he said, “unless these production level issues are taken up, it will be very difficult to create a logical, viable agri logistics system. So that said, we need to build up the agri infrastructure.”

“For Odisha to become self-sufficient to produce in a particular scale, the state also needs to solve issues like lack of cold storage system which is a key part of agri logistics,” he said.

Vice-chancellor of OUAT Dr P K Agarwal, Executive Director of Rashmi Dash, among others, participated in the webinar.

Animal feed prices eases after Centre allows import of soya de-oiled cake

In a big relief to the poultry industry reeling from sky-high input costs, the Centre has allowed the import of soya de-oiled cake for livestock feed. The development could bring down the prices of chicken meat that is trading between Rs 200-240 in the open market.

The decision was conveyed by the Department of Animal Husbandry and Dairying to the All India Poultry Breeders Association. Chairman of the association Bahadur Ali had requested the Department in a letter on August 6 for the import of the de-oiled soya meal for the manufacture of the animal feed. High input costs are also reflected in the rice in egg prices.

He hailed the Centre’s move, saying it will safeguard the interest of more than 10 crore livestock farmers and another five-crore people who are engaged in livestock employment directly or indirectly. It will also ensure that the nation’s livestock is fed and citizens can purchase milk, chicken, fish and shrimp regularly and at an affordable price.

Ali lauded the support extended by the Narendra Modi government for the poultry sector, which has been significantly impacted over the last two years since the Covid-19 outbreak.

It began in March 2020 when the country went for a general lockdown following the covid outbreak. Unfounded apprehensions about chicken meat consumption and linking it with the spread of the virus exacerbated the crisis for the industry.

Avian influenza in January once again hit sales. But as things looked up, the rising feed prices pushed back the industry to the corner once again.

In its letter, the Animal Husbandry and Dairying department also referred to the communications from the Ministry of Environment and Forest which had expressed its no objection to the import of soya de-oiled cake since it “does not contain any living modified organism”.

The item can be imported subject to the payment of the existing duty tariff and other applicable taxes.



Agri sector registers highest new business registrations in 2020-21

The agriculture sector eclipsed other legacy sectors with the highest number of new business registration in India during 2020-21 notwithstanding the Covid-19 pandemic as consumers restricted their expenses on the necessities, a white paper released by US-based Dun & Bradstreet said.

The sector saw 12,368 new birth companies as compared to 6107 during the previous fiscal, a growth of 103 per cent.

Agriculture sub sectors such as agriculture production, food and kindred products manufacturing, wholesale of non-durable goods, chemicals manufacturing etc took the lions share in new registration.

The paper said 96 per cent of the newly registered business had a paid-up capital of up to Rs 10 lakh.

“Higher registrations in agriculture and food manufacturing seems reasonable given that consumers restrict their expenditure to necessities and cut down on non-discretionary spending during economic downturns. Good monsoon season could have provided the further impetus,” the paper said in its assessment.

The new registrations, notably, were witnessed in non-metros, away from traditional business hubs of New Delhi, Mumbai or Bengaluru. The top 10 business cities accounted for only 42 per cent of the new registration, while the rest went to other places.

Agri sector saw robust job generation in 2019-20 as manufacturing industry tanked; Govt survey

The agriculture sector remained the best hope for the labour force for sustenance and livelihood during the last two financial years as a staggering 45.6 per cent of the workers took to cultivation during the period owing to the contraction in the manufacturing sector and the Covid pandemic.

According to the Centre’s latest Periodic Labour Force Survey (PLFS) and analysed by the Centre for Monitoring Indian Economy (CMIE), the reverse migration manifested in the labour force joining in large numbers in agricultural activities.

CMIE termed the trend as “involuntary” because low wage jobs in the agriculture sector in the order of Rs 250-300 per day would have remained unattractive for casual labourers in good times.

The PLFS survey showed 45.6 per cent of the total workforce joining the agriculture sector in 2019-20, up from 42.5 per cent in 2018-19.

This period coincided with the first phase of the Covid pandemic, the outbreak of which pushed the country towards a general lockdown. The closure of almost all sectors triggered a reverse migration. Not only that,

it exacerbated the state of welfare of the labour force who, so far, were reeling from contraction in the economy. During 2019-20, the GDP growth rate had dived south to four per cent.

The sectors which saw massive job losses were transportation, logistics, manufacturing and communications.

CMIE estimate suggests that 60 per cent of the employment in the manufacturing sector are in the unorganised sector. With no social security cover or protection from exigencies, workers, particularly from this space are believed to have left in large numbers to native places and the agriculture fields.

The crisis spilled over. Between July 2020 to June 2021, the reverse migration did not slow down as the second wave of the covid pandemic hammered manufacturing and other industries.

While the share of agriculture in total employment jumped to 39.4 per cent from 38 per cent in 2019-20, the share of manufacturing dropped sharply from 9.4 per cent to 7.3 per cent, PFLS data said.





Aatmanirbhar Bharat critical to tame soaring edible oil price

Soaring prices of edible oil have created a palpable sobering feeling across households in the country. Rationing of delicacies is the last thing one would expect at the dinner table. Sadly, it is an infallible reality today.

Somesh Jha, who manages a five-member family, has cut down on his sundry expenses to maintain that wholesome meal. "Sky-high price could send your budget for essentials haywire, more so in a family with high intake of edible oil. But I did not allow the price rise to rob away the gratification of foodies like us," the father of three kids told SMART AGRIPOST.

Not many, however, are positioned

to manage expenses prudently. The ongoing Covid pandemic has pushed middle-class India to a corner. Falling income and the rising cost of essentials have created a state of economic asymmetry in the family. And rising prices of vegetable oil, which has shot up by more than 60 per cent over the last year, has only exacerbated the crisis.

Retail prices, however, could cool down by the beginning of 2022, said Executive Director of the Solvent Extractors' Association of India B V Mehta, the apex body of vegetable oil in the country, words which could bring comfort to the consumers. But the country should start

The domestic demand for palm oil traditionally remains the highest at about 32 per cent, followed by soya oil at 22 per cent and sunflower oil at 16 per cent.

thinking about the long-term solution from now on to ensure price stability, possibly through self-reliant measures and higher and assured remunerations to farmers, he emphasized. He was talking to Smart Agri Post.

So, what has fueled the record spike in edible oil prices?

The reasons are manifold but primarily ascribed to India's vulnerability to developments in external markets. Currently, India spends a whopping USD 10 billion to import edible oil as 60 per cent of our requirements are met by other countries. They include Argentina, the USA, Brazil, the European Union, Russia, Ukraine, Malaysia and Indonesia as major source markets.

As such, labour unrest in Malaysia, poor harvest in the USA or Russia could upstage the fragile domestic vegetable oil market, as has happened this time around. India, as per market estimates, consumed around 24 million tonnes of edible oil during the last fiscal while its production level remained at about 11 million tonnes.

Making the scenario worse during this year was the unfolding threats from emerging challenges. Excessive purchase from China, resulting in a supply crisis and diversion of the harvest for biofuel triggered a yawning demand-supply mismatch, fueling the price rise.

Soybean oil at the futures market, for example, traded at more than 70 per cent in the US while futures in Malaysia touched a record USD 1,007.30. Reports suggested that low yield also hit the European markets.

For India, 54% of its palm oil requirement is met by Indonesia and Malaysia, while Argentina and Brazil provide 25 per cent of Soybean oil needs. Ukraine, on the other hand, exports 19 per cent of the sunflower requirement.

Except for rapeseed, India does not figure alongside the top three producing nations in palm oil, soybean oil, sunflower oil and mustard oil.

When it comes to palm oil, Indonesia

produces 44,500 million tons, followed by Malaysia at 19,700 million tons and Thailand at 3100 million tons. Likewise, the top three Soybean oil-producing countries are Brazil (34 million hectares), the USA (31 million hectares) and Argentina (18 million hectares). When it comes to Sunflower oil production, Ukraine tops the chart with 4,400 metric tons, Russia at 4,063 metric tons and Argentina which produces 931,700 metric tons.

In the case of mustard oil, Canada produces 141,600 metric tons, Ukraine generates 26,977 metric tons and Germany produces 15,224 metric tons.

In rapeseed production, India comes next after Canada with the cultivation of 7.3 million hectares. Canada's production remains highest at 8.4 million hectares and China comes third with 5.6 million hectares.

The way out?

On August 18, the Narendra Modi Government announced the National Palm Oil mission with an outlay of Rs 11,040 crore to make India a palm oil self-sufficient country and reduce the import bill.

The domestic demand for palm oil traditionally remains the highest at about 32 per cent, followed by soya oil at 22 per cent and sunflower oil at 16 per cent. The Government, through this ambitious mission, has sought to push the production level to about 11.20 lakh tonnes by 2025-26 and up to 28 lakh tonnes by 2029-30. But policy initiatives should be even rounded, one that helps the sector grow uniformly, as market observers would infer.

Mehta, while lauding the palm oil mission, proposed that a national mission on edible oil should be considered on a similar scale as India has to set a target of doubling production level in the next ten years to attain a level of security in edible oil.

"We have to think of reaching a production level of 25 million tonnes by 2025. We cannot reduce the import bill overnight but we have to set our targets from now

Data analysis reveals that, overall Madhya Pradesh occupies the top position in oilseed production at 6244 metric tons.

on to walk towards the path of making India an edible oil secure nation in the next 10-15 years," he said.

"One of the key aspects of this is also ensuring better remuneration for oil seed-producing farmers and incentivising them," he underscored, adding that a package for increased oilseed production should also be announced.

To encourage oilseed producers and increase the level of production, the Centre on September announced a Rs 400 per quintal hike in the minimum support price of mustard and rapeseed, from Rs 4650 per quintal in 2021-22 to Rs 5050 per quintal for 2022-23. With this the return on the coast incurred is projected to jump 100 per cent, considering Rs 2523 as the production cost. In the case of safflower, the hike announced in MSP is Rs 114 per quintal, which translates to a gain of 50 per cent during the 2022-23 rabi crop season.

The objective is to woo more farmers into oilseed cultivation and increase the total cultivated land. Unlike rice and wheat, oilseed production is confined to a few states such as Rajasthan, Gujarat, Madhya Pradesh and Maharashtra.

While Gujarat, Andhra Pradesh and Karnataka remain top groundnut cultivators, Rajasthan, Haryana, Uttar Pradesh and West Bengal are key mustard producing states. Rajasthan, along with Maharashtra and Madhya Pradesh are the major producers of soybean. Almost 48.12 per cent of rapeseed and mustard is produced in Rajasthan alone.

Data analysis reveals that, overall Madhya Pradesh occupies the top position in oilseed production at 6244 metric tons. Rajasthan comes next with a production figure of 5711 metric tons and Gujarat follows next with 4102 metric tons. The total production in the case of Maharashtra is 2375 metric tons. States



whose production level is less than 1000 metric tons are West Bengal, Tamil Nadu, Andhra Pradesh, Karnataka, Uttar Pradesh, Haryana and Telangana.

In all, the cultivation is spread across 25 million hectares. However, the national palm oil mission has proposed to expand oilseed cultivation areas with a focus on the entire Northeast region and the Andaman Islands. Kerala also remains upbeat about the new policy and has expressed its desire to adopt palm oil cultivation in a big way.

As a way of increasing production, Mehta suggested that non-conventional sources should also be explored. Rice bran oil has seen a steady rise in consumption over the year among health-conscious citizens. According to agriculture experts, cotton seeds can also be explored big time as an alternative source for producing vegetable oil.

Regeneration of fallow land for oilseed cultivation is also being looked into by the states. Some estimate suggests India has around 27 thousand hectares of fallow land. These can be used for cultivating low water consuming mustard crops. The Tamil Nadu government, in its first agriculture budget, has earmarked funds for converting fallow land into harvest areas.



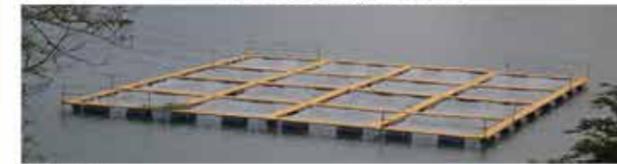
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Industrial development and market linkages in Seaweed sector key priorities of Govt: Fisheries Secy



The seaweed sector has the potential to generate income and employment, and stimulate the growth of new entrepreneurs and startups all over the coastal States/UTs, says Shri Jatindra Nath Swain, IAS, Secretary-Fisheries, Government of India, in a special interview to Pravash Pradhan, Chief Editor, AQUA POST

Q. India aims to increase seaweed production to 11.5 lakh tons in the next 5 years. Could you please briefly talk about government policies and programs to achieve the target?

Ans: Hon'ble Prime Minister in his address to the Nation from the ramparts of the

Red Fort on Independence Day 2021, announced several major developments initiatives in the coming years. Exploring the full potential of Seaweed cultivation was one among them.

India has enormous scope for seaweed cultivation as it is bestowed with a coastline of more than 8000 km, embracing 821

The Department of Fisheries, under the 'Blue Revolution' Scheme, has started promoting this activity since 2015-16.

species of seaweeds. Considering their use as a renewable source of food, fertilizer, energy, chemicals and medicines, the seaweeds have great demands in the international markets also.

The Department of Fisheries, under the 'Blue Revolution' Scheme, has started promoting this activity since 2015-16. As a result, several Self-Help Groups and coastal Fishermen Associations have come forward to take up seaweed cultivation as an additional livelihood option and proven its potential in empowerment for coastal women.

The Government of India has recognized that the seaweed production potential of the country has not been explored in the way it deserves, despite the techno-economic ease for its intensification compared to other aquaculture sectors.

It is therefore under the Pradhan Mantri Matsya Sampada Yojana (PMMSY), an amount of about Rs. 600 crores have been earmarked for the development of Seaweed farming, wherein Seaweed seed banks, nurseries, tissue culture units, processing and marketing units, etc. will be established over the coastal states and Union territories.

The support from the government will be extended to ensure the seaweed cultivation takes root in all the potential

areas spread all over the country's coastal waters apart from the conventional farming areas where seaweed is being cultivated on a limited scale.

The Government has already laid down tentative targets for seaweed production with weightage in funding assistance as per the production potential for all the coastal states and UTs.

With these efforts, the Govt envisages boosting the seaweed cultivation to reach about 11.2 Lakh tones wet weight in 5 years.

Q. What are the major challenges in this sector and how do you plan to address the issue?

Ans: The major constraints on the seaweed cultivation and value chain at present are identified as:

- Ready availability of good quality seaweed seed materials
- Species diversification in Seaweed farming
- Creation of processing facilities and marketing infrastructure for processed seaweeds/products.
- Leasing policies for seaweed farming in coastal areas.
- Need for enhancing awareness about the vast potential of the seaweed-based by-product industry, other than phycocolloids among the public.



Govt of India is supported by the R & D institutions for the development of seed production technologies for the cultivable species in Indian waters.

Industrial development and market linkages in the Seaweed sector has been considered as one of the top priorities for the Government and efforts are progressing in that direction through interactions with appropriate stakeholders to form the industries and cooperatives on an urgent basis.

Q. What incentives are there for entrepreneurs? Several international companies are also interested in investing in the seaweed sector in India. What are the facilities available for them?

Ans: Government of India recognizes that the seaweed sector has the potential as a powerful income and employment generator, and stimulates the growth of new entrepreneurs and startups all over the coastal States/UTs.

Apart from farming, the input-delivery-systems, marketing and exports,

processing and product development also needs entrepreneurs as many of the modern technologies are complex from the traditional fishers' point of view, and professionals in the government sector cannot take up all the responsibilities to bring quantum change in the system.

Therefore, it has become the need of the hour to develop entrepreneurship in various sectors of fisheries, including seaweed cultivation and value chain with strategies for training and capacity building among the traditional fishers, as well as mobilizing new entrepreneurs in the fisheries sector.

Under PMMSY financial assistance will be provided for taking up large scale cultivation in cluster area approaches for fisher groups, SHGs and Cooperatives. In addition, Govt. of India is encouraging investment in processing and value addition of seaweed for which the Govt is taking consultation with industrial players and state governments to engage entrepreneurs to establish seaweed value addition industries.

One of the important initiatives in this regard is the budget announcement made by the Hon'ble Finance Minister this year (2021-22) was the establishment of a multipurpose seaweed park in Tamil Nadu.

Further Govt. of India recognizes that the industry requires the scale of production. In this regard, the Fisheries Department is working for ensuring the minimum crucial biomass of seaweed. One of the important aspects is to create adequate raw materials for industries.

One of the important initiatives in this regard is the budget announcement made by the Hon'ble Finance Minister this year (2021-22) was the establishment of a multipurpose seaweed park in Tamil Nadu. The Park will have several activities catering to fishers, farmers, entrepreneurs and R&D institutions.

The Park would also support the establishment of seaweed value-added units, under one roof, and ensure easy access to raw material to the industry on a continuous basis, thus ensuring higher returns to the seaweed cultivators.

The establishment of Fisheries Incubation Centers (FICs) would also be supported under PMMSY both through

the government and private sector. Fisheries Incubation Centers would provide opportunities to the incubatees like young professionals/entrepreneurs' fisheries institutes, fisheries researchers, cooperatives/federations to showcase their innovations and innovative ideas, technologies and commercialize them for the benefit of fishers/fish farmers. This would also help in creating new businesses, entrepreneurs' development (aquapreneurs) and employment opportunities in the sector.

Q. What is the status of the Seaweed Park in Tamil Nadu?

Ans: Hon'ble Finance Minister in her budget speech FY 2021-22 announced to establish a Multipurpose Seaweed Park in Tamil Nadu to promote seaweed cultivation.

The Seaweed Park in Tamil Nadu will be developed as a hub to serve as a one-stop park for the entire seaweed value chain linking all the activities from

Under PMMSY financial assistance will be provided for taking up large scale cultivation in cluster area approaches for fisher groups, SHGs and Cooperatives.



The Dept of Fisheries and Govt. of Tamil Nadu had series of consultations for farming up the contours of the proposals during the meetings held on 15th May and 04th August 2021.

pre-and post-harvest infrastructure, logistics, marketing, export promotion, innovation, technology incubation and knowledge dissemination for arriving at optimum outputs and thereby maximizing value addition, minimizing wastage and increasing the income of all stakeholders and creating employment opportunities.

Department of Fisheries (DoF), Govt. of Tamil Nadu has submitted a preliminary project proposal on the establishment of multipurpose seaweed park in Tamil Nadu during four years (2021-22 to 2024-25) at seven Coastal Districts (Thoothukudi, Ramanathapuram, Pudukkottai, Thanjavur, Nagapattinam, Thiruvarur and Mayiladuthurai).

The Dept of Fisheries and Govt. of Tamil Nadu had series of consultations for farming up the contours of the proposals during the meetings held on 15th May and 04th August 2021.

Govt. of Tamil Nadu is preparing a detailed project report. The project is likely to be approved by end of October-November, 2021). Based on that, more seaweed parks will be set up.

Q. Please tell us about the status of seaweed farming in the States and its potential.

Ans: Although the pioneer attempts in seaweed farming in particular commercial farming of Kappaphycusalvarezilhas gained wide popularity from the Mandapam coast, the seaweed production potential in India has been reported from all the coastal states and Union territories, with varying levels of productivity according to the geo-climatic conditions.

Presently the cultivation is picking up in certain coastal districts of Tamil Nadu, Gujarat and some other parts of the

country.

I am happy to inform that during the COVID-19 first national lockdown, there was a fishing ban and seaweed farming was the only source of income for some fisherwomen owned family in the State of Tamil Nadu, by which her family and she could earn an income of Rs. 65,000. Seaweed farming activity has enhanced her self-confidence and empowered her to manage her family activities.

Considering its huge potential, the government has been actively working for bringing on board, research and development institutions such as CSIR-CSMCRI, CMFRI and concerned state departments in developing viable culture technologies as well as mapping new potential areas for seaweed farming in various states and UTs.

Till September 2021 a total of 31000 Seaweed culture rafts including inputs, with a total cost of Rs. 465 Lakh and 23,531 Seaweed culture monoline with a total cost of Rs. 1882.42 Lakh have been sanctioned under PMMSY for augmentation of seaweed cultivation to the states of Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu.

In addition, one Seaweed bank has also sanctioned to U.T. Administration of Dadra and Nagar Haveli and Daman & Diu with a total cost of Rs. 120 Lakhs. Apart from that, a proposal on Seed plant production of seaweeds worth Rs. 53.18 Lakhs have been sanctioned to CSIR-Central Salt & Marine Chemicals Research Institute (CSMCRI) and another proposal on establishment of pilot-scale farming of commercially valuable seaweeds in Andaman Coast worth Rs. 82.74 lakhs has been sanctioned to the U.T. Administration of Andaman and Nicobar Islands during the FY 2020-21.



Biofortification of staples to address micronutrient deficiency



Dr. Trilochan Mohapatra

The global poverty is rising in the present scenario due to Covid pandemic and, therefore, it is required that the sustainable food systems are designed to fight hunger and malnutrition.

Food insecurity

It is required to bring science, investment and political commitment to transform the food system for better nutrition and health. It is our shared responsibility to reduce hunger and address micronutrient deficiencies in South-Asia subcontinent. The latest edition of the state of Food

Security and Nutrition in the World (SOFI) report, released jointly by five UN organizations, revealed that there is a significant increase in the prevalence of hunger and food insecurity in the south-Asian region due to pandemic. South Asia alone accounts for 36 per cent of global food insecurity. The globally

CRISPR technology has emerged as the powerful tool for genetic modification and should be utilized effectively for target genes specific to nutritional quality.

accepted indicators of food insecurity are the Prevalence of Undernourishment (PoU) and the Prevalence of Moderate and Severe Food Insecurity (PMSFI). Prevalence of Undernourishment (PoU) estimates the proportion of people suffering from chronic deficiency of calories based on per-capita supply of food and distributional parameters. On the other hand, the Prevalence of Moderate and Severe Food Insecurity (PMSFI) estimates are based on the data collected through surveys that attempt to capture people's experiences of food insecurity such as eating less, skipping meals and modifying diets.

My group initiated the molecular breeding programme and built the capacity in this area through teaching and training, formulated and implemented the first genome sequencing project on rice and partnered for the development of several crop varieties including the first rice variety named improved Pusa Basmati produced through marker assisted breeding. Another significant outcome of this partnership was development of the first high protein variety of rice. After my joining in the current position, we focused on biofortification of crop varieties to provide nutritional food through natural food system and address the problem of malnutrition in India.



Bio-fortified crops

During past five years, ICAR developed and released 71 biofortified varieties in different crops. Seventeen of these varieties were dedicated to the nation by Honourable Prime Minister on October. 16, 2020. These crops are naturally biofortified with vitamins, minerals and amino acids and have reduced level of anti-nutritional factors. The major varieties include 7 of rice (high in protein, zinc, iron, beta carotenes), 22 of wheat with (Fe & Zn rich), 11 of maize enriched with essential amino acids lysine and tryptophan, 8 of pearl millet (Fe & Zn rich), 2 of lentil (Fe rich), 3 of mustard (low erucic acid and low glucosinolate), 3 of soybean (KTI free), 1 of cauliflower (high beta carotene), 2 of sweet potato and 1 of pomegranate.

The biofortified varieties delivers required energy as well as essential nutrients for human growth and development. These varieties have been brought under seed chain to make the biofortified food grain available to public distribution system. It is estimated that the biofortified crop varieties are grown in more than 4 million ha in India. We need to enhance the production of biofortified varieties to address hidden hunger and protein-energy malnutrition in the country. Production of adequate



The different concepts such as homestead garden, vertical garden and rooftop garden have been popularised so that production and consumption of diverse food including bio-fortified crops are mainstreamed.

quantity of breeder seed and its conversion to foundation and certified seed would be essential to increase area under biofortified crops. Differential procurement and supply of biofortified grains through public distribution system and mid-day meal scheme in a targeted manner would go long way in addressing malnutrition.

Currently the natural system develops about 300 varieties in different crops annually and only 5% of these are biofortified for specific traits. We are now targeting to increase this proportion so that all the varieties in major staple food crops which are released in a year are biofortified for the important micronutrients in high yielding backgrounds. This would help increase in area and adequate availability to meet the demands. Global climate changes and its possible impacts on agricultural production are known. The crop yield and quality are projected to be affected negatively due to increased atmospheric temperature. This calls for integrated approach for the development

of biofortified crop cultivars.

All future biofortified varieties are to be climate resilient with adequate level of tolerance to multiple biotic and abiotic stresses. Genomics-assisted breeding coupled with doubled haploid (DH) and speed breeding technology would further accelerate the development of multi-stressor biofortified cultivars. Transgenic rice lines with high phytase (low phytic acid), lysine and ferritin (for high iron) are in progress. CRISPR technology has emerged as the powerful tool for genetic modification and should be utilized effectively for target genes specific to nutritional quality. The RNA demethylation route to increase productivity has been shown to be successful recently and can be tested for other traits related to stress tolerance and nutritional quality.

Enhancement of production and consumption of biofortified crops as well as diverse crops demands massive efforts to create awareness among producer, traders and consumers and policy

makers. ICAR has started awareness programme on home-stead nutrition to fulfill the nutritional requirement of children and women from their backyard garden. Similarly, the nutri-garden models have been conceptualized to overcome the micro-nutrient deficiency. ICAR is promoting Nutri-Garden and Nutri-Thali through KVKs and Anganwadi workers. Nutri-SMART village (NSV) are being established to fulfill the nutrient requirement of citizens in the specific region. The different concepts such as homestead garden, vertical garden and rooftop garden have been popularised so that production and consumption of diverse food including bio-fortified crops are mainstreamed.

Nutritional diversity

The micro-nutrient deficiency is due to monotonous food habits and consuming similar diet over the period. It is also being advocated to bring different colours to plate. To maintain nutritional diversity in food system, there is a need to promote consumption of milk and aquatic foods. Milk and milk-based products are important source of nutrition as it serves as wholesome food. ICAR is also working in non-bovine milk and goat milk is the front runner in non-bovine milk production sector. South-Asian region produce highest amount of goat milk. Goat milk fulfills the nutrient requirement of growing children and pregnant mothers in all disadvantaged regions. There is a scope to enhance goat milk as part of daily consumption. Food diversity is required to maintain better gut health and traditional fermented produce maintain gut microbiome to fulfill various micronutrient deficiency.

The diversified food production systems would require high levels of public and private sector investment in transportation, storage, and market development. Diversifying diets to include protein and micronutrient-rich food could provide new opportunities for agriculture-led growth for small holder farmers. Dietary diversity and economic



growth will bring diverse socio-economic group of farmers (including smallholders) to participate in relevant markets to increase their income. Youth particularly young women as entrepreneurs to build start-ups and farm value chains would find enough opportunity to create wealth and enhance farmers income. The design of such programs and the effectiveness of delivery system holds the key to achieving better nutrition through social support programs.

Solutions

One of the sustainable development goals targets to end hunger by 2030. . The latest report on food insecurity by the Food and Agriculture Organization (FAO) in 2021(<http://www.fao.org/3/cb4474en>) shows that the Asian continent is still rife with hunger and malnutrition. Therefore .it is essential to focus on small holder production system and smallholders need to adopt new approaches for better output. Moreover, the regions of the world with wide spread hunger and malnutrition have predominance of small-holder farming. The pathway to increase the food production in this region needs to be revisited in the light of shrinking natural resources, accesses to modern agricultural technologies and declining number of rural workers. At a time when food security worldwide is being threatened by disruptive forces like climate change and pandemics, technology coupled with appropriate government agri-food policy and adequate improvement in infrastructure has an important role to play in bringing innovative solutions.

Goat milk fulfills the nutrient requirement of growing children and pregnant mothers in all disadvantaged regions.



Challenges and opportunities in seaweed value addition in India

Niladri Sekhar Chatterjee, Lekshmi RG Kumar, C N Ravishankar, Suseela Mathew

Seaweed, which is rich in protein, micronutrients and vitamins, is a premium commodity today in the food industry and an in-demand product used as raw material across medicines, pharmaceuticals, textiles, fertilizers, animal feed, etc. The global seaweeds market is valued at almost US \$6 billion. India, with its 8100 km long coastline, is

poised to leverage its potential to become a major seaweeds production hub.

Introduction

The use of seaweed as food dates back thousands of years. Today, seaweeds are perceived as a superfood, rich in protein, micronutrients, vitamins, and health-

promoting phytochemicals, backed by recent research.

Globally, seaweeds are traded as ready to eat food and functional food products with a premium price tag. Seaweed hydrocolloids such as Agar, Alginate, and Carrageenan are other major drivers of global seaweed trade. Markets for seaweed-based cosmetics, animal feed ingredients, fertilizers, soil conditioners are relatively small but rapidly growing. Dried seaweeds as raw materials in various industries are also traded but fetches a comparatively lower price. Hence, besides ramping up seaweed production, judicious and focused investment for establishing post-harvest infrastructure and value chain is essential.

The Indian coastline of 8100 km and EEZ of 2.17 million km² support luxuriant growth of diverse seaweed resources belonging to 700 species. Of these, nearly 60 species are economically important. Approximately 20,000 t (wet weight) of these resources are harvested annually compared to a potential of 870,000 t.

The major species harvested are Gracilaria edulis, Gelidiella acerosa, and Kappaphycus alvarezii among red algae; Sargassum wightii, Turbinaria conoides, and Cystoseira spp. among brown algae and Ulva lactuca, Enteromorpha sp., Caulerpa spp. among green algae.

The state-wise distribution of the number of seaweed species in the country are, Gujarat 202; Maharashtra 152; Goa 75; Karnataka 39; Kerala 20; Lakshadweep 89; Tamil Nadu 302; Andhra Pradesh 78; Orissa 1; West Bengal 6 and Andaman &

Nicobar Islands 34. Seaweeds provide a valuable source of raw materials for industries like health food, medicines, pharmaceuticals, textiles, fertilizers, animal feed, etc.

Market potential

The global seaweed industry is valued at approximately US\$ 5.5–6 billion. Food products for human consumption contribute about US\$ 5 billion to this (FAO2018). China, the European Union, Japan, and the USA are the major importers of seaweed products. In 2016, the top 35 seaweed importing countries imported seaweed products worth USD 2 billion. Carrageenan and edible seaweed

1. The Indian coastline of 8100 km and EEZ of 2.17 million km² support luxuriant growth of diverse seaweed resources belonging to 700 species.
2. Nearly 60 species are economically important. Approximately 20,000 t (wet weight) of these resources are harvested annually compared to a potential of 870,000 t.
3. Gazette notification should be amended to include Indian edible seaweed species to legally market seaweed-based supplements and nutraceuticals in India.
4. A conducive policy environment needs to be formulated for achieving the true potential of seaweed value addition and processing in India.



Globally, seaweeds are traded as ready to eat food and functional food products with a premium price tag.

Recent market research suggests that the value of the global "Fucoidan Market" in 2020 is 30 million USD and growing at a CAGR of 3.8%.

Opportunities and Challenges:

Opportunities	Challenges
<ul style="list-style-type: none"> • Increase in the yield of carragenophytes might solve the supply constraint of the domestic carrageenan producers. • Development of innovative high-value edible seaweed products and nutraceuticals for higher value realization from the increased production. • Emergence of food businesses and farmer producers' organizations producing high value-added processed products from seaweeds for both domestic and international markets. • Popularization of seaweed-based products in the domestic market, promotion through Chef's associations, increased use in restaurants, promotion as healthy food through FSSAI 	<ul style="list-style-type: none"> • Competition with established players in carrageenan supply chain will be intense • Domestic industries that manufacture edible seaweed products are almost non-existent. • Ecosystem for rapid technology upscaling and demonstration is lacking. • Regulatory challenges in promoting seaweed as a novel food.

products were the major imported items with a share of 37% and 30% respectively.

The market analysis indicates that besides seaweed hydrocolloids, the market for edible seaweed products is equally lucrative. The market for high-value seaweed nutraceuticals such as fucoidan and fucoxanthin is rapidly growing. Fucoidan is a bioactive sulphated polysaccharide found in brown seaweed. Many research reports noted the anti-inflammatory, anti-viral, and anti-cancer activities of fucoidan. Fucoxanthin is a carotenoid found in brown seaweed. The carotenoid has proven anti-diabetic and anti-obesogenic properties.

Recent market research suggests that the value of the global "Fucoidan Market" in 2020 is 30 million USD and growing at a CAGR of 3.8%. While, the global "Fucoxanthin market" is valued at 95 million USD in 2020, growing at a CAGR of 2.6%.

Convergence of activities: The research institutes, regulatory bodies and concerned ministries need to converge the activities towards the goal of

establishing a thriving value chain for seaweeds. The identified activities are:

- Research and development on value-added functional food products from seaweed.
- Research and development on Nutraceuticals and dietary supplements from seaweed.
- Research and development on biomaterials and composites from seaweed for food packaging, veterinary medicine and personal care applications.
- Research and development on immune stimulants and feed ingredients for aquaculture and animal husbandry.
- Nutritional labelling of seaweed and seaweed products for marketing and label claim
- Quality control of seaweed and seaweed products
- Process engineering for seaweed handling, drying and processing.
- Pilot-scale process demonstration
- Handholding, incubation of

entrepreneurs from production to marketing

- Providing production and test marketing facilities to entrepreneurs
- Technology transfer to KVKs, FPOs and SHGs for value-added products from seaweeds.

Seaweed raw material for food and feed purposes

The seaweed raw materials used for food and feed purposes need to be tested for Iodine and Mercury. In 2006, the European Union (EU) for Scientific Committee on Food (SCF) established an upper limit of 600 µg/day for iodine intake for adults and 200 µg/day for children of 1-3 years of age. For mercury in algae and prokaryotic organisms, a maximum residue level of 0.01 mg/kg is established according to Regulation (EC) No 396/2005. For arsenic, lead, cadmium, and mercury, the maximum levels in the feed are established under EU Directive 2002/32/EC of the European Parliament and the Council.

As certain seaweed species are used as feed, the metal content of these species should also be investigated, both for animal health reasons and given the transfer of these metals to food products of animal origin. As per this EU directive 2002/32/EC Aldrin, Dieldrin, Toxaphene, Chlordane, DDT, Endosulfan, Endrin, Heptachlor, Hexachlorobenzene, and Hexachlorocyclohexane needs to be tested. The regulatory limits for feed material/ ingredients are presented in the following table.

For polycyclic aromatic hydrocarbons and polychlorinated biphenyls such regulatory limits are not available. However, the presence of these organic pollutants is a possibility in seaweeds and should be monitored. In this case, a default regulatory limit of 0.01 ppm can be considered.

In India, as of now, there is no regulatory limit for heavy metals and persistent organic pollutants in seaweed for food supplement and feed purposes. The Food Safety and Standards (Contaminants, Toxins, and Residues) Regulations, 2011

mentions a regulatory limit for Mercury in non-specified food as 1 mg/kg and Methyl mercury in all food staff at 0.25 mg/kg. The same should be applied to seaweed-based food and supplements. More importantly, the Gazette of India Notification No. 465 on Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, Functional Food and Novel Food) Regulations, 2016 mentions only “Kelp” as an approved nutraceutical or supplement ingredient in India. No other edible Indian seaweeds are listed. This Gazette notification should be amended to include Indian edible seaweed species to legally market seaweed-based supplements and nutraceuticals in India. The probable enforcing agency for seaweed-based food and supplements may be the FSSAI. Whereas for seaweed-based feed the Ministry of Agriculture and Farmers Welfare may be the enforcing agency.

Regulatory limits for feed material/ ingredients

Parameter	Tolerance limit (mg/kg at the moisture of 12%)
Arsenic	2.0
Lead	10.0
Mercury	0.1
Cadmium	1.0
Aldrin and Dieldrin (Single or combined)	0.01
Toxaphene	0.1
Chlordane	0.02
DDT	0.05
Endosulfan	0.1
Endrin	0.01
Heptachlor	0.01
Hexachlorobenzene	0.01
Alpha HCH	0.02
Beta HCH	0.01
Gamma HCH	0.20



High-value food additives

Regulatory limits for heavy metals have been mentioned in European Commission Regulation (EU) No 231/2012 of 9 March 2012 for high-value food additives from seaweed. Formaldehyde (50 mg/kg), Arsenic (3 mg/kg), Lead (2 mg/kg), Mercury (1 mg/kg), and Cadmium (1 mg/kg) should be monitored. E. Coli should be absent in 5 g, and Salmonella sp. Should be absent in 10 g. In India, the Food Safety and Standards (Food Products Standards and Food Additives) Regulation, 2011 mentions regulatory limits for Agar, Alginates, and Carrageenan. For Agar and Alginate, the Lead and Arsenic content should be no more than 5 and 3 mg/Kg respectively. For Carrageenan, regulatory limits of Cadmium (1.5 mg/Kg), Mercury (1 mg/Kg), Arsenic (3 mg/Kg), and Lead (5 mg/Kg) have been specified. E. Coli and Salmonella sp. should be absent. The probable enforcing agency may be the FSSAI for high-value food additives from seaweed.

Seaweed fertilizer and plant growth regulators

Levels of heavy metals and pesticides in seaweed-based bio-stimulants should be monitored as per the Gazette of India Notification No.812 (CG-DL-E-24022021-225410) of the Ministry of Agriculture and farmers welfare. Levels of Cadmium (5 mg/kg), Chromium VI (50 mg/kg), Copper (300 mg/kg), Zinc (1000 mg/kg), Lead (100 mg/kg), and Arsenic (10 mg/kg) needs to be monitored. For pesticides and other organic pollutants, the permissible limit is 0.01 ppm. Seaweed-based plant growth regulators

contain micronutrients, amino acids, and plant growth regulators (auxins, cytokinins, polyamines, gibberellins, abscisic acid, and brassinosteroids), phloroglucinol and eckol, etc. Label claims for these constituents should be there and the products should be analyzed to verify the label claim. The probable enforcing agency may be under the Fertilizer Control Order. State Governments are responsible for enforcing the fertilizer control order. Central Fertilizer Quality Control & Training Institute and its three Regional Laboratories, State fertilizer testing laboratories should be responsible. ICAR institutes may extend support for quality analysis of seaweed bio-stimulants.

Conclusion

ICAR-CIFT has developed several technologies for value-added products and nutraceuticals from seaweed. Five of the technologies have been transferred to industries and commercial production has started for four of them. ICAR-CIFT is the national reference laboratory of FSSAI for fish and fisheries products and will have an important role to play in the quality control of seaweed and seaweed products. The institute has a pilot plant facility for process demonstration and has transferred the technology for solar dryers for hygienic drying of fish and fish products. However, a conducive policy environment needs to be formulated for achieving the true potential of seaweed value addition and processing in India.

(The authors represent the ICAR-CIFT. Views expressed are their personal.)

State Governments are responsible for enforcing the fertilizer control order.



Non-bovine milk: Health drink for children

In higher reaches with fewer cows, non-bovine milk is key for a child's growth



Families living in higher reaches with limited access to cow milk need not worry about fulfilling the nutritional requirements of their newborns. Non-bovine species milk, as this article suggests, has nutritional and therapeutic values that are critical for the growth of a child. It can help the country fight zero hunger.

Non-bovine milk for kids

Nutrition for the young one for the first 1000 days of their lives is an essential requirement as it contributes towards life-long health, growth and cognitive benefits. As mental development occurs during the first 1000 days, the diet of the mother-to-be and after birth plays a major role in a kid's development. Therefore, it is necessary to ensure the supply of better nutrients to fight against malnutrition

and hunger. Non-bovine species milk serves as an important source of nutrition and sustenance in difficult climatic and geographical conditions. Non-bovine milk from different species has several nutritional and therapeutic values.

Moreover, the presence of different bioactive peptides in non-bovine milk provides a new horizon for the development of different nutraceuticals, health care/bio-care products to meet

Goats are the front runner as a source of milk production as it is profitable for poor households and productive in the low-quality forage, less water and distributed over diversified rangeland.

various human requirements. Similarly, the gut microbiome has also evolved over the years concerning ecosystem and food habits.

The biological potential of milk is manifold as it is transformed into various products with specific nutritive and health-promoting values. Milk of non-bovine species is important for human nutrition and traditionally used in disadvantaged geographical areas where cow milk was not available. The products from non-bovine species milk are gaining consumer attention and market demand. The milk is being used for the development of various nutraceuticals and functional foods. The traditional dairy products, microbial load and post-translational modifications maintain gut balance for better nutrient utilization.

The domestic non-bovine milk producing species are goats, sheep, mare, camel, yak donkey, reindeer, Mithun and even llamas. Non-bovine milk is the major source of nutrition for people in high mountainous regions, arctic regions and other places with adverse climatic conditions. It also contributes significantly to the economy of some countries and is also a source of nutrition for the people thriving in the region. It is also a good source for calcium, magnesium,

selenium, the vitamins B complex (thiamin, riboflavin, niacin, vitamin B6, and folate), vitamin A, vitamin C, magnesium, zinc and other minerals and vitamins. The traditional produce developed from raw milk of non-bovine species had immense nutraceutical and therapeutic value for the people in the region.

Goats are the front runner as a source of milk production as it is profitable for poor households and productive in the low-quality forage, less water and distributed over diversified rangeland. Some non-bovine species produce milk that is close to human milk. The milk from some species is best for babies and produces fewer allergies and products do not cause lactose intolerance symptoms and have better digestibility. As there is a large scope for developing other dairy species, it is necessary to produce better nutritious products for the people of the adverse region of the world including arctic regions.

Nutritional significance

Non-bovine milk can be classified as:

- i. Milk of well-known domesticated species: goat, sheep and buffalo.
- ii. Milk of less known domesticated species: donkey, mare, camel, yak, Mithun, reindeer.



- iii. Milk of other domesticated and wild species: Elk, muskox, alpaca, llama elephant, pinnipods and polar bear.

Non-bovine milk from well-known domesticated species, less known domesticated species and other minor species has nutritional and therapeutic value. The milk and milk products are used by nomads and the regional population. The milk of minor species such as polar bears, moose and pinnipods contains the highest protein. Moose and polar bears have the lowest lactose concentration. Pinniped milk has the highest fat concentration. Reindeer milk is popular in the Eurasia region, yak milk in the high altitude of Ladakh region, Mongolia, Tibet and camel milk is popular in the desert region. The milk is being used for the development of various nutraceuticals and functional foods. The non-bovine milk products include cheese, fermented beverages (kefir), yoghurts, frozen desserts, dried milk powder, butter, whey powder concentrates and other traditional products are also popular among consumers.

This complex flavour associated with goat milk is due to diverse compound and their reaction to lipids, protein and carbohydrates. The free short/medium-chain fatty acids found in goat milk contributes to its distinctive characteristic flavour and aroma. Similarly, the flavour of the cheese is due to the complex reaction to proteolysis of proteins, lipolysis of fats and fermentation of carbohydrates. Cheese holds the greatest economic value among all manufactured goat and sheep milk products. Sheep milk is mainly available in Europe and some parts of Asia. The flavour of sheep milk products is due to lipolysis, proteolysis and amino acid catabolism. Sheep milk fermented products have the highest viscosity followed by goat, cow and camel milk products. Asiatic populations of Steppes reflect fermented mare milk as a traditional dietary ingredient and it is used in ethno-medicine.

The market potential of reindeer milk products lies in an exclusive niche within tourist, gourmet and cosmetic markets. The dairy products from other minor

species and wild and domesticated mammals largely depend on milk availability, processing properties and suitability for human consumption. Milk and Cheese from moose are commercialized in Russia and Sweden. Products such as kefir and yoghurt from milk of minor species would contain whey proteins high in cysteine and tryptophan.

The cheeses and fermented milk products are produced from non-bovine milk and are widely distributed worldwide across a large variety of climatic and geographical areas. Diverse microbial profiles have been observed in raw milk microbiota between samples collected at the different pastures altitudes and weather conditions. It has been shown that milk protein diversity across different geographical locations was associated significantly with latitude. The presence of specific peptides and microbial composition in different altitudes protects from specific weather conditions such as rain, cold and hypoxia conditions. Therefore, it is necessary to analyze the specific association with the environmental condition for further value addition to provide a geographical indicator tag to produce and better economic gain for farmers.

Post-translational modification (PTM)

These milk proteins and peptides could potentially be used for multiple human health benefits. We have identified 1,307 proteins from diverse goat breeds from different geographical locations that are associated with 144 pathways in metabolism, genetic information processing, environmental information processing and cellular processes. These proteins are also involved in signalling pathways, including ones related to the immune and nervous systems. We have also found 1,051 peptides with biological activities such as mineral-binding, antioxidant, antihypertensive, anti-microbial and anti-inflammatory.

PTMs of proteins represent a central mechanism regulating their structure, localization, and function in response to a variety of signals. Proteins undergo chemical modifications after the process

of synthesis. Such post translational modifications (PTMs) often enhance their functions. The proteins are modified through phosphorylation – one of the common and most important PTMs which add phosphate groups to amino acid residues of proteins. We have identified modifications on the proteins' amino acids such as serine, threonine, tyrosine and aspartic acid. Serine showed the highest affinity for phosphate groups. Protein phosphorylation is vital for the regulation of metabolism, proliferation, inflammation, programmed cell death, signalling and other important physiological processes. We have identified PTM sites and bioactive peptides in goat milk that show antimicrobial, anti-inflammatory, antioxidant and blood-pressure-lowering effects. These peptides could potentially be used to develop therapies for various chronic disorders and microbial infections in humans.

Bioactive peptides

It has been recognized that dietary proteins provide a rich source of biologically active peptides. Biopeptides have been defined as specific protein fragments that have a positive effect on body functions or conditions and might ultimately influence health. Biopeptides are inactive within the sequence of the parent protein and can be released by enzymatic proteolysis during gastrointestinal digestion or food processing. Bioactive peptides represent an important element in determining the nutritional and health properties of food proteins. Goat, sheep and other non-bovine milk proteins have been reported as sources for bioactive peptides. Bioactive peptides derived from milk proteins of buffalo, camel, yak, and mare milk have not been analyzed. Milk is a

source of various proteins and hormones such as lactoferrin, lactotransferrin, lactoperoxidase, lysozyme, plasmin, Igs, insulin, thyroid-stimulating hormone, somatostatin and growth factors.

Conclusion

Non-bovine milk is very important for its nutritive values in difficult places for people of all strata. It provides a strong ground for the development of functional foods, one health mission and also to establish sustainable development goals towards zero hunger. The biological potential of milk is manifold as it is transformed into various products with specific nutritive and health-promoting values. Therefore, it is necessary to optimize milk proteome and milk microbiota from different regions for diverse applications and better economic impact.

There is a need for comprehensive investigations of milk protein variability and different genetic variants of non-bovine milk. The characterization of casein and whey protein of all the species should be carried out for different climatic regions. Non-bovine milk proteomics will enhance our knowledge of milk protein components, protein interactions, and their functional role, and identify peptides in metabolism, immune regulation and disease pathways for application in nutraceutical and drug development. The non-bovine dairy products contain several ingredients with prebiotic properties such as oligosaccharides that could positively interact with probiotics to alter their functional properties.

(The author is the Principal Scientist, CIRG, Mathura. Currently he is working as Scientific Advisor to Secretary, DARE & DG, ICAR. Views expressed are personal.)

Backyard poultry farming for raising income of small farmers

Dr. Vivek Kumar Nayak

Introduction

India is the world's second-largest developing economy and desires to become a 5 trillion economy by 2025. However, India still has many growing concerns. As the Indian economy has diversified and grown, agriculture's contribution to GDP has steadily declined from 1951 to 2021. Agriculture, with its allied sectors, is the largest source of livelihoods in India and feeds the entire population which has exponentially grown over the years. The rural population living in India constitutes 72.22 per cent of the total population, which is predominantly occupied by the poor, marginal farmers and landless labourers. Seventy per cent of its rural households still depend primarily on agriculture for their livelihood, with 82 per cent of farmers being small and marginal. The livestock and poultry sector provides the baseline of employment and earning to these people to raise their standard of living and thereby has a major contribution to India's economy.

India now has a large and rapidly expanding poultry sector. Expansion in India is being driven by rising incomes and a shift in industry structure toward integrated ownership and coordination of the input, production, and marketing operations. Poultry as an important supplementary source of cash income is reared by about 89 per cent of rural livestock households. Poultry farming is widely accepted and possible in different agro-climatic environments. It requires small space, less capital investment, with higher chances of a quick return and well-distributed turn-over throughout the year, which makes it remunerative among all classes of rural as well as urban population.

Poultry farming can either be commercial or traditional. While commercial layer or broiler farming on large scale is restricted to limited geographical pockets and affluent entrepreneurs, traditional backyard poultry production in India is practiced among a majority of the rural population since time immemorial. It



Global trades have continuously been challenged by diseases like avian influenza and other government policies like changing standards in import markets as well as local supply issues in exporting countries.

The global trade is hampered as many ports are subjected to delays and lockdowns being practiced by different countries have forced traders to move to other ports, to reshipe or to delay shipments.

is the primary source of animal protein and supplementary income for the downtrodden rural poor and was the only source of poultry egg and meat for city dwellers before poultry industrialization. The importance of backyard poultry production has been globally recognized to overcome the worsening problems of poverty, hunger and malnutrition in developing countries. It has come to the added rescue to those segments of the population with health consciousness having a preference towards organic meat or egg, free from antibiotics and pesticides.

Backyard poultry production forms the basis for transforming the lives of small and marginal farmers from subsistence to a more economically productive enterprise culminated with crop production. Also, increased backyard poultry production would result in a positive impact on household food security both in terms of increased dietary intake as well as income generation. Thus, for promoting the backyard poultry, it is necessary to give the much needed infrastructural support (in form of improved poultry birds/ day-old chicks at a subsidized rate, hatchery units, training etc.) to the targeted beneficiaries to get optimum production from this sector.

Importance of Backyard Poultry for doubling income & Rural Empowerment

Livestock production and agriculture are intrinsically linked, each being dependent on the other. According to a report on Situational Assessment of Agricultural Households by the NSSO, to double the income of farmers by 2022 compounded income growth rate of 15% would be required. However, the real income of farmers had been calculated based on GDP deflator, showing a real growth rate of 5.24 per cent. If the more appropriate index, the Consumer Price Index for Agricultural Labourers, is used the annual growth rate of real income for farmers falls to a lowly 3.5 per cent. With this growth rate, farmers' income will double in 20 years. Therefore, to achieve the target of doubling farmers' income in upcoming years there is a need for much greater effort and focused attention.

The production of agricultural crops has been rising at a rate of 1.5–2 per cent per annum, whereas eggs and broilers have been shown to rise at a rate of 8-10 per cent per annum but the growth has been mainly restricted to commercial poultry. But the scale, technology, management and capital requirement for commercial poultry is beyond the reach of small

and marginal/ BPL farmers. At the same time, there is a niche market for Desi or indigenous birds reared in the natural environment. The activity can be taken up by beneficiaries from BPL families, SHGs, landless, small and marginal farmers for supplementary income and nutritional support.

Traditionally, native chickens were the mainstay of poultry production in rural and tribal areas in the country. Mostly free-range and backyard systems of production with little or no proper housing are followed for production across the country. Free-range and backyard systems are of low input and low output systems. Backyard poultry production over the years is gaining attention due to higher demand for their meat and eggs. This can be attributed to their desirable flavour and perceived health benefits due to their slow growth devoid of antibiotic treatment, low-fat content and lack of antimicrobial usage as growth promoters. The increasing demand is particularly higher in urban areas due to the increasing purchasing power and growing population in cities.

Therefore, there is a huge scope for increasing backyard poultry production in the country as they can play a vital role in bridging the gap in the requirement and supply of poultry meat and eggs as well as provide sustainability in the income of small and marginal farmers.

Advantages of backyard poultry farming & characteristics of indigenous poultry

- Provides additional income and employment to the rural households mostly rural women. Due to low maintenance, acceptability among the landless labourers or marginal farmers and women members of Self Help Groups is higher. Source of supplementary income and better utilization of family labours who are not able to perform other agricultural works.
- It integrates well with other agricultural operations, additional land or infrastructure support is not

required. It also aids in enhancing soil fertility in backyards. Waste material (insects, ants, fallen grains, green grass, kitchen waste, vegetable waste etc.) can be efficiently converted into the egg and chicken meat for human consumption.

- A unit can be started with a very small size with low initial capital investment, which fetches high prices compared to those produce from intensive poultry farming.
- Eggs and meat from birds reared under free range conditions have low cholesterol concentration compared to those produced under intensive poultry farming. Alleviates protein malnutrition in vulnerable groups viz. expectant women, feeding mothers and children.
- Poultry Birds can thrive well under adverse environments like poor housing, poor management and poor feeding. They are comparatively disease resistant, have better adaptability to extreme climatic conditions prevailing in the country.
- The meat from native fowl has significantly higher amino acid contents (arginine and lysine) than meat from exotic birds and is widely preferred especially because of their pigmentation, taste, leanness and suitability for special dishes and often fetches higher prices.
- The brown-shelled eggs of native fowl are rich in threonine and valine than farm eggs, have good flavour and fetch premium price.

Challenges in rural Backyard poultry farming

- Lack of technical knowledge.
- Lack of suitable germplasm.
- Decrease in availability of natural resources of feed.
- Inadequate Veterinary support

The native chicken varieties adopted in the free-range backyard conditions have low productivity. Increasing the genetic potential of the local chicken varieties will

greatly help in increasing the productivity. Predator menace, diversified climatic conditions, consumer preferences, lack of commercial feed etc. are some of the major issues, which need attention while popularizing birds suitable for free range backyard farming.

Popularization of Backyard Poultry Farming in Rural India

- **Trainings:** Poultry farmers must approach to Krishi Vigyan Kendra's to obtain the basic training on backyard poultry farming. This is very useful for rearing of chicks, feeding, housing and disease management.
- **Exhibitions:** Through regular exhibition of local poultry breeds in Kisan Melas, Animal Camps, Livestock Championship and other poultry exhibitions. This helps in the selection of good quality birds.
- **Breeding of local poultry breeds:** Since most of the small holder poultry farmers are poor, Government should extend assistance to improve the poultry farming system by providing good quality chicks to the backyard poultry and suggest for multiplication of birds at their own level from these good quality hens. Within a time frame the skills are to be transferred to farmers at village level. Attempt, however, should be made to retain broodiness in the local stocks since it makes the system auto generating. These hens are used for producing the chicks at home level.
- **Record keeping:** In order to improve egg production there is a need to record the performance of individual hens for egg production. It is not a problem to obtain this information since each hen lays her egg in a separate nest regularly. This will provide information on laying capacity and hatching performance for each hen. Those hens with higher egg production and hatchability should be selected to reproduce next generation.
- **Extension services:** Extension

support for health care, input supply, market linkages and other aspects should be readily available at village level. The people should participate in the health care and breed development programme.

Backyard poultry farming plays an important role in providing income and protein to local rural people with minimal resource input. Although several organizations such as NGO's, KVK's, SAU's has initiated to popularize the traditional Backyard poultry farming, it needs a lot more to be done to overcome its constraints so that backyard farming can be undertaken by each and every family of villages for their upliftment as far as possible.

Government initiatives

National Livestock Mission- Backyard Poultry Development

Government of India is encouraging conservation of indigenous poultry breeds for producing poultry birds suitable for backyard poultry. More focus is being given to provide appropriate support to indigenous poultry farming in the form of financial assistance, genetic stocks and improved technologies, subsidy, scientific advice, extension/ awareness.

Dept. of Animal husbandry and Dairying, Gol vide its order dt. 08.10.2020 has amended the various components under Poultry Venture Capital Fund (PVCF) component of NLM. The PVCF component now stands deleted and in place of it Backyard poultry Development has been brought forward which clearly shows Gol outlook and aim to develop the backyard poultry sector. Subsidy to the tune of Rs. 12.00 lakhs (25% of the Total project cost) would be available for composite backyard poultry units having parent farm, hatchery unit and mother Unit.

Central Poultry Development Organisations (CPDOs) located at four regions viz. Chandigarh, Bhubaneswar, Mumbai and Bengaluru are working on improved breeds of birds for backyard poultry which can survive at the farmer's



doorstep, provide training to backyard poultry farmers and conduct feed analysis. Kalinga Brown, Kaveri, Chhabro and Chann are the varieties / strain of Low Input Technology birds (Chicken) developed by these CPDOs. Several state governments have also come forward to promote improved desi poultry through backyard poultry low input technology birds. Under state schemes chicks/ birds suitable for rearing in the backyard are reared in the mother units upto 4 weeks and are further distributed to the BPL beneficiaries in at least two batches under, Rural Backyard Poultry Development (RBPD).

KCC for working capital needs under Poultry Activities

Working capital needs for poultry and related animal husbandry activities are now eligible under KCC and further the loans will be eligible for Interest subvention. Beneficiaries can avail loan up to Rs 2 lakh under the KCC scheme under Animal Husbandry and Poultry activities with an interest of 7 per cent year and on timely repayment, an Interest subvention of 3% will be provided resulting in ultimate rate of interest on loan availed to 4%.

Conclusion

Poultry development in the country has taken a quantum leap in the last three

decades. The development owes to various factors which include growth in income and urbanization, progresses in processing technology and improvements along the marketing chain.

Backyard farming will certainly improve the economic status of a majority of rural/tribal families from lower socio-economic groups in the rural/tribal areas. The majority of the farmers expressed their willingness to increase their poultry activities, although the highest proportions of the farmers were medium producers. To increase poultry production at the farmers' level, a systemic training program should be organized specifically for rural communities. Additionally, extension and motivational work along with technical support should also be provided in the villages to encourage farmers to rear and consume more backyard system of poultry production, since this is a means of sustainable livelihood of poorer sections of the society and will help in food production, food security and providing employment to rural peoples.

(Disclaimer: The author is the Assistant Manager, NABARD, West Bengal Regional Office. Views expressed are personal.)



Former PepsiCo executive's tryst with seaweed cultivation



Mr Abhiram Seth, an ex-PepsiCo executive, had a difficult choice to make in 2008-- switching over to the farm sector, seaweed farming at that, leaving behind a successful career in the corporate world. The odds were stacked against him, but not his confidence.

A decade later, Mr Seth presents a picture of a content man, a feeling of vindication. Mr Seth has not only cultivated his way through the seaweed farming sector adroitly, but has come out with healthy yields and helped generate employment for 1000+ people in coastal Tamil Nadu. Even though the business model of his company Aquagri Processing Private Ltd. (APPL) is proven, the desire to create at least 100,000 jobs in seaweed cultivation remains a dream. Though now there

is light at the end of the tunnel as the production target set by the Ministry of Fisheries is pegged at 11.2 lakh tonnes by 2025 from the current level of 25,000 tonnes.

Entrepreneurial journey

This successful entrepreneurs tryst with seaweed farming started during his days with PepsiCo when he was introduced to it by an international customer. The idea looked fascinating and the potential

immense and to achieve it an enduring partnership with the Central Salt and Marine Chemical Research Institute, PepsiCo carried out an exhaustive seaweed cultivation trials in the coastal Tamil Nadu. Trials were conducted in over 10 hectares of land.

“It was in early 2000 when we carried out successful trials and in the next four years, we demonstrated the farmers that it was a workable model that would add to the level of income,” he said.

Mr. Seth decided to retire from corporate life after spending 33 years in the industry. At the time of departure realised that PepsiCo did not have any interest in persisting with the seaweed initiative as it was not part of its core portfolio. So he decided to create Aquagri to continue the work and Pepsi Co. graciously facilitated the business transfer.

Aquagri continued with commercial cultivation of Kappaphycus having achieved 20,000MT wet seaweed production as the highest ever in 2013. Since then due to climate change

and abnormal sea water temperature conditions, the seaweed cultivation faced a set back and is still struggling to recover from it in absence of high growth planting material availability and having no defined process for bringing fresh planting material and cultivars from the international sources.

Tamil Nadu State model of private sector participation in seaweed collection directly from collectors can be rolled out at other promising locations. Such a model has had no adverse impact as seaweeds are self-generating resources and go waste if not exploited seasonally.

The fact that seaweed cultivation has remained in the mind of the country’s leadership and on the top of government’s agenda despite stiff opposition from the Ministry of Environment and Forest. ‘There was a time when I was challenged with the prospect of the business folding up. I had to then dig into my saving to keep the venture alive. During those days, no banks were also willing to invest in this business,’ recalls Mr Seth.

“Mr Seth observes the following factors have slowed the pace of development of the seaweed sector.

1. **Currently own species, which the farmers are cultivating since 2005, is Kappaphycus. Even after, over 30 years of its introduction to Indian waters, Ministry of Environment and Forests terms it as exotic and invasive and prohibits the cultivation in the gulf areas. Need to open up the gulf areas for cultivation of Kappaphycus**
2. **Our planting material has lost vigor and we need to get fresh cultivars of Kappaphycus and other successful species being cultivated in Indonesia and Philippines if we want to catch up with them.**
3. **We need to set up commercial micro-propagation and tissue culture based nurseries and seed banks in PPP model to ensure uninterrupted supply of the planting material to the farmers.**
4. **Infrastructure and training should be imparted to the farmers only after validating the cultivation site and ensuring adequate planting material supply.”**

In India seaweed is a sunrise industry with scope for production and fulfilment of commercial requirements of food, feed, chemicals, pharmaceuticals, cosmetics, biofuels, biofertilisers, biostimulants etc for various industries. It provides additional income to cultivators and fishermen families.



The major turnaround for Seth’s company came in 2017 when the world’s biggest farmers’ cooperative, Indian Farmers Fertilizer Cooperative Limited (IFFCO), one of the largest manufacturer and marketer of chemical fertiliser globally having revenues of 3.90 billion USD on the fertilizer, took 50% equity stake through its wholly owned subsidiary IFFCO Bazar Ltd. in Aquagri.

IFFCO in line with the stated government strategy of reducing chemical fertilizer usage, diversified its offering by expanding its portfolio to include organic products, amongst which the most successful has been “Sagarika” Marine Algae based bio-stimulant. Since IFFCO partnership, Aquagri business has grown exponentially and starting out from being an exporter of seaweeds from India the company now has to rely on imports to sustain its commitments to its customers in the Indian market.

In the last year or so, seaweed sectors potential has duly been recognised by the government and the decision to make it a part of Ministry of Fisheries mandate, could now lead to a turn around. The

Ministry has come out with encouraging policies both from the Centre and the Tamil Nadu State Government

Some issues, however, need attention for giving a boost to the sector. They include addressing the shortage of planting materials and working out with the Ministry of Environment and Forest which has put restrictions on cultivation of Kappaphycus in the gulf areas, he suggested. Besides, Mr Seth called for clear demarcation of the areas of cultivation.

Challenges

The greatest challenge is to align the Ministry of Environment and Forest and to educate them to understand that seaweed cultivation and harvesting is being done globally to combat climate change and to protect eco sensitive coral regions.

Seaweed cultivation not only acts as a carbon sink but also helps in scavenging the fertiliser run offs from land agriculture to the sea by absorbing phosphates and nitrites from the near shore areas.

It must be recognised that India’s successes in agriculture have been

Lawmakers perturbed over states withdrawal from PMFBY



Farmers happy with the application of Sagraika

triggered by adopting the exotic species in a controlled manner, the introduction of rice varieties from Philippines and Wheat from Mexico. Similarly, India became the largest exporter of prawns after introduction of Vannamei shrimp. There denial and opposition for adopting Kappaphycus for cultivation in gulf areas just on the grounds that it is exotic and may be invasive is without any scientific basis. No invasion is reported from Indonesia or Philippines, the largest growing centres or from Palk Bay area where it has been cultivated for the last 20 years.

The greatest opportunity seaweed cultivation offers is of providing sustainable livelihood to the coastal communities. These communities do not have thriving agriculture due to soil salinity

and lack of fresh water availability, further their traditional livelihood occupation of fishing is under strain due to depletion in fish catch.

The other big opportunity is in the space of marine algae based bio-stimulants which are globally being used for providing relief against abiotic stress and boost crop production, while reducing chemical fertiliser usage by 25-30%. This fact itself has huge implication both for the farmers and for relieving the government subsidy burden on chemical fertilisers.

The role seaweed additives as part of animal feed can play in reducing methane emission from cattle and improving health of animals is a matter of global focus, where India has the potential to emerge as a major supplier.



New Delhi: The withdrawal of the states from the Pradhan Mantri Fasal Bima Yojana (PMFBY) has caused considerable consternation among lawmakers, who have asked the Centre to initiate suitable steps to reverse this chasm in the larger interest of the farmers.

The Parliamentary Panel on Agriculture has also nudged the Narendra Modi Government to amend PMFBY's operational guidelines and make them more participatory and favourable to the states instead of penalising them.

In its report tabled in the Monsoon Session of the Parliament, the standing committee of Lok Sabha headed by Parvatagouda Chandanagouda Gaddigoudar has suggested revamping a provision that prohibits a state from participating in the scheme if it fails to release its portion of premium subsidy beyond the stipulated timeline. The other provision for which changes have been sought is linking the subsidy burden with the irrigated areas.

The flagship scheme was launched in April 2016 to include more schemes under crop insurance and make it more affordable to the farmers. While Punjab has sought to remain out of the scheme, Bihar and West Bengal have withdrawn from PMFBY in 2018 and 2019 respectively.

Andhra Pradesh, Gujarat, Telangana and Jharkhand have not implemented the scheme in 2020.

The report, quoted the government saying "financial constraints of the state governments and low claim ratio during

the normal season are major reasons for non-implementation of the Scheme by these States".

Though most of the states have rolled out their programmes to provide insurance coverage, the committee felt that the withdrawal of the states will defeat the intent of the scheme in the coming years.

"The Committee, therefore, recommend the Department to properly look into the reasons and factors leading to withdrawal or non-implementation of the PMFBY by Punjab, Bihar, West Bengal, Andhra Pradesh, Gujarat, Telangana and Jharkhand and to initiate suitable steps so that States continue to implement the Scheme and farmers reap the benefit of the Scheme," the report said.

Concerning the opening of the functional office at the tahsil level by the insurance companies implementing PMBY and instances where such companies were unrepresented in several tahsils, the committee recommended uploading details and addresses of functional offices on the National Crop Insurance Portal. Such measures will instil a sense of responsibility and help mitigate farmers' hardships.

Besides, it has asked the government to initiate action against insurance companies defaulting on payment of claims and ensuring that the process of penalising them is done within a fixed timeframe.

According to the government, insurance companies owe Rs 22, 17, 38, 725 for the crop season up to Rabi 2017-18.



'Special liquidity facility' for farmers to meet post-harvest requirement in Covid time

New Delhi: The Centre informed the Parliament that the moratorium on agriculture term loan announced last year given the Covid pandemic has not been extended beyond August 2020 but an additional special liquid facility has been extended for post-harvest and Kharif sowing requirements.

Minister of State for Finance Bhagwat Kisanrao Karad, in a written reply in Lok Sabha, said that as per RBI's advice the moratorium beyond August 31, 2020, was not extended taking into account the impact on the banking sector, credit culture and financial stability.

The moratorium was announced for a period of six months last year, up to August 31, to provide reprieve to the

farming community because of the Covid pandemic. During the six months, the farmers were provided with the benefit of 2 per cent interest subvention and 3 per cent prompt repayment incentive was also extended to them.

However, the Minister said a front-loaded Special Liquidity Facility (SLF) of Rs 55000 crore has been extended by NABARD for post-harvest requirement during the Covid pandemic for regional rural banks, cooperative banks and non-banking financial companies as an additional facility.

"This additional special liquidity facility to the rural financial institutions at concessional rate of interest will ensure enhanced credit flow to the agriculture and the allied sector," the Minister added.



More than 19 lakh employed in the food processing sector in 2017-18

New Delhi: The Centre informed the Parliament that there is no proposal at present to set up more national food technology institutes in the country.

Minister of State for Food Processing Industries Prahlad Singh Patel, in a written reply in the Lok Sabha, said the existing two institutes have been able to achieve the objectives for which they were set up. The two institutes are the National Institute of Food Technology Entrepreneurship and Management

(NIFTEM), Kundli, Haryana and the Indian Institute of Food Processing Technology (IIFPT) at Thanjavur, Tamil Nadu.

While the former is offering 12 programmes, the latter is offering six courses in the field of food technology and allied services.

As per the annual survey of Industries, the Minister said, number of employees registered in the food processing sector in 2017-18 was 19,33,429. In the previous financial year, the number was 18,53,816 and 17,64,995 a year before that.



Zero fund allocation to protect livestock from disease, chides Parliamentary panel

New Delhi: Veterinary care has hit alarming lows in India which boasts a livestock population of over 54 crores. This is reflected by the fact that some of the disease control programmes received "zero allocations" during the 2020-21 financial year.

Visibly dismayed, a Parliamentary panel has hauled the government, demanding "necessary explanation" as it expressed its concern over the nil financial progress and zero physical achievement.

It pointed out the three programmes under the overarching Livestock Health and Disease Control (LH&DC) initiative of the government who received zero fund allocation during the last financial year. They are Professional Efficiency Development (PED), National Animal Disease Reporting System (NADRS) and Classical Swine Fever Control Programme (CSF-CP).

Under the CSF-CP scheme, for example, zero achievements were recorded in the vaccination of the pigs in the northeastern states during the 2020-21 and zero training was conducted under PED during the last three financial years.

What intrigued the committee was that despite no financial and physical progress, fund utilisation remained 100 per cent.

"Taking a negative view of such a misleading approach of the Department, the Committee strongly desire that necessary explanation be furnished about non-achievement of physical and financial targets..." the Standing Committee on Agriculture in its report tabled in Parliament this week.

The committee's recommendation followed its examination of the 'status of veterinary services and availability of animal vaccine in the country'.

The report quoting the Centre's reply that there are a total of 65,894 veterinary institutes in the country which include veterinary hospitals and dispensaries.

The National Commission on Agriculture (NCA), 1976 had recommended that there should be one veterinary doctor/Institution for 5000 cattle units by 2000.

According to the report, the states with deficient veterinary infrastructure are Uttar Pradesh, Gujarat, Rajasthan, Bihar, Madhya Pradesh, West Bengal, Maharashtra, Assam, Jharkhand and Chhattisgarh, with the deficient rate in Gujarat standing at 82.7 per cent as of January 2019.

No specific provisions for mobile veterinary diagnostic labs under Livestock Health and Disease Control Scheme.



India could soon export IFFCO-produced 'nano urea'

New Delhi: The Indian Farmers Fertilizers Cooperative Ltd. (IFFCO) could soon be exporting 'nano urea' manufactured at its plant in Gujarat. The company has sought permission from the Department of Fertilizer for the export of nano urea (liquid) manufactured from its nano fertilizer plant at Kalok, Gujarat, Minister of Chemicals & Fertilizers, Mansukh Mandaviya informed the Parliament in a written reply.

The development comes against the backdrop of the National Fertilizers Limited (NFL) and Rashtriya Chemicals and Fertilizers Ltd signing an MoU with IFFCO for the technology transfer for the production of Nano Urea.

Earlier, Chemical and Fertilizer Minister Mansukh Mandaviya had informed the Parliament that nano (urea) liquid fertilizer has been developed by IFFCO to bring

uniformity in urea usage which was not possible with conventional urea.

Nano urea is increasingly being seen for its useful properties in plant nourishment with higher nutrient use efficacy.

“Experimental trials of nano nitrogen undertaken on different crops like paddy,

wheat, mustard, maize, tomato, cabbage, cucumber, capsicum, onion etc. were found agronomically suitable indicating that nano nitrogen (nano urea) can enhance farmer’s crop yields besides nitrogen saving to the extent of 50 per cent,” said a government statement.



Coconut Development Board (Amendment) Bill, 2021 gets Parliament’s approval

New Delhi: The Parliament passed a legislation to reorganize the composition of the Coconut Development Board whose mandate is to develop the coconut industry in the country and enhance product marketability outside India.

The Coconut Development Board (Amendment) Bill, 2021 was passed by Lok Sabha, four days after Rajya Sabha gave its consent to the legislation.

The amended legislation seeks to make the post of the chairman a non-executive one and creates a separate CEO post to be appointed of the rank of a joint secretary-level officer from the Central government.

The bill also seeks to introduce a member representing the Department of Consumer Affairs by substituting the member representing the Department of Civil Supplies and Cooperation.

Seeking to enhance the efficiency of the management, the bill proposes to increase the state representation in the board from three to four with the inclusion of Andhra Pradesh. Similarly, apart from the representations of the coconut growers from Kerala, Tamil Nadu and Karnataka, the bill has sought to include representations from Andhra Pradesh and Gujarat.



More than 2 cr farmers in 2020-21 benefitted from MSP; Centre informs Parliament

New Delhi: More than two crore farmers in 2020-21 benefitted from the minimum support price (MSP), the Centre informed the Parliament.

In a written reply in Lok Sabha, Agriculture Minister Narendra Singh Tomar said 2,10,07,563 farmers benefitted from the government’s MSP in comparison to 2,04,63,590 in the previous financial year. During 2018-19, 1,71,50,873 farmers benefitted from MSP.

The Minister’s statement comes against the backdrop of the ongoing farmers’ agitation against the enactment of three contentious farm laws, a move farmers’

maintain will put an end to MSP and the mandi system.

The government announces MSP for 22 agricultural commodities of fair average quality each year in both the crop season based on the recommendations of the Commission for Agricultural Costs and Prices. Remunerative prices are also extended to the farmers through intervention schemes, the Minister said in his reply.

The Minister also said that if the farmer gets favourable terms to sell his produce better than MSP, he is free to sell anywhere other than the government agencies.



Challenges and opportunities in seaweed value addition in India

ICAR-Directorate of Coldwater Fisheries Research (DCFR) has an interesting history of origin and a vision to be a global knowledge center in coldwater fisheries research and innovation.

Origin & Growth

Cold water fisheries in Indian sub-continent was initiated by British administrator turned naturalist by introducing two main types of trouts viz. brown trout (*Salmo trutta fario*) and rainbow trout (*Oncorhynchus mykiss*) around the beginning of the last century primarily to meet their needs for sport fishing or recreational angling. These introductions in India could be considered as the formal beginning of coldwater fisheries development in the country. For many decades, the mere intention remained to

develop recreational fisheries to satisfy the needs of anglers for sports. Later on, these species introduced in culture system for food and therefore, hatcheries were setup for seed production.

The development of hill fisheries thus started in the selected locations particularly in the Kashmir valley and some parts of the peninsular India. The research on coldwater fisheries commenced with the establishment of Coldwater Fisheries Research Centre of CIFRI in the year 1963 at Harwan, Jammu & Kashmir as a scheme

under 3rd Five year Plan. Initially the centre assisted in providing the research inputs related with departmental trout hatcheries and other trout related problems to the State of Himachal Pradesh and Jammu & Kashmir. The activities of the centre increased rapidly and it carried out significant amount of investigation on coldwater fishery resources of the country. Thus, it was realized that coldwater fisheries as an important sector have potential in generating rural income and providing food security to the economically underprivileged population residing in Indian uplands.

To utilize the available resources and opportunities in the coldwater fisheries, the involvement of Indian Council of Agricultural Research in this sector started during late sixties and subsequently culminated in the creation of National Research Center on Coldwater Fisheries (NRCCWF) as an independent Research Center on 24th September 1987 during the 7th Five Year Plan. This is the only national facility in the country to take up the research investigation on capture and culture aspects on coldwater with a focus on exotic and indigenous fish species.

Since its inception, the NRCCWF in spite of constraints in terms of manpower and infrastructure has made significant contribution for proper appraisal of coldwater fishery resources and developed suitable technologies to propagate important coldwater fish species in hills. Thus, keeping in view the ever-expanding activities of NRCCWF,

and the greater potential of coldwater fisheries in different Himalayan states, in a significant decision during the 11th Five Year plan it was upgraded to Directorate of Coldwater Fisheries Research (DCFR). The basic objective was to develop location, situation and system specific technologies by utilizing and augmenting resources in all the Himalayan states from Jammu and Kashmir to Arunachal Pradesh.

The directorate is a national facility to strengthen fishery research in coldwater sector encompassing the Himalayan and peninsular parts of the country. The research programmes undertaken by the Directorate designed with major thrust on conservation and management of open water fisheries and development of hill aquaculture. The directorate has well equipped state of art laboratory facilities for research in diverse areas such as aquatic resource management, aquaculture, fish health management & disease diagnosis, fish nutrition & feed development and molecular genetics & biotechnology.

Achievements

During the last three decades, the ICAR-DCFR has achieved commendable success in the area of coldwater fisheries research and disseminated need based technologies to different stakeholders. It has significantly contributed towards the enhancement of fish production, species and system diversification, health management of fishes, genetic



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characterization of important species, conservation of endangered fish species as well as human resource development through training and skill development. The directorate has strong national and international linkages with SAUs, universities, NGOs, Government departments, farmers and other stakeholders. The ICAR-DCFR is on its glorious path of virtually actualizing its vision by imparting boon of quality research in sustainable coldwater fisheries production, management and conservation.

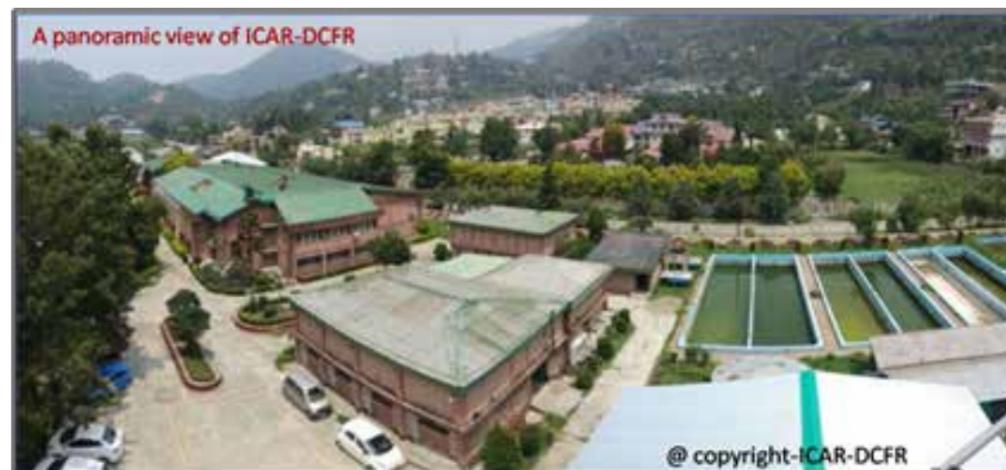
Mandate, Mission & Linkages

The ICAR-DCFR is a constituent research organization under the aegis of Indian Council of Agricultural Research (ICAR) and fully devoted to the development of technologies for coldwater fisheries and aquaculture. During its journey of last three decades, it has tirelessly worked for the development of coldwater fisheries sector in the country. It has played pivotal role in the socioeconomic development and livelihood security of the hill farmers. It has well defined objectives, which are stated as (i) to conduct basic, strategic and applied research in coldwater fisheries and aquaculture (ii) to act as a repository of information on the hill fisheries resources and (iii) human

resource development through training, education and extension. The directorate has a mission “to become a national facility of excellence for assessing and managing coldwater fishery resources, develop technologies and models of hill aquaculture and provide critical inputs in formulating strategies for sustainable growth and development of the sector”. For achieving greater success in extending and disseminating its ideas and technologies it has linkages with different stakeholders in government and non-government organization spread all over the country and thus works in close cohesion with them. It has direct reach to the farmers and remains committed to the mantra of “Lab to Land” and “Land to Lab”. During the years, the directorate has addressed problems of farmers and other stakeholders through research and responded by giving feasible technologies benefitting not only farmers but also different line departments of the hill states. Through its work and committed manpower the ICAR-DCFR has been working to achieve the dreams of Atam Nirbhar Bharat to make the sector self-sufficient.

Infrastructure & Research facilities

The ICAR-DCFR is located at Bhimtal in the district Nainital of the state of Uttarakhand at an altitude of 1470m asl. The Uttarakhand is located at the foothills of the Himalayan mountain ranges, rich in natural resources especially water, and forests with many glaciers, rivers, dense forests and snow-clad mountain peaks. The state is proud to have Char-dhams, the four most sacred and revered Hindu temples of Badrinath, Kedarnath, Gangotri and Yamunotri are nestled in the mighty mountains. It's truly God's Land (Dev Bhoomi). The directorate is surrounded by beautiful and famous serene Himalayan lakes like Nainital, Bhimtal, Sattal, Naukuchiyatal and Shymlatal. The headquarter of the ICAR-DCFR is at Bhimtal and the present establishment occupies an area of 1.3 ha comprising essential infrastructure facilities which includes well equipped research laboratories, library, auditorium,



A panoramic view of ICAR-DCFR

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Globally, seaweeds are traded as ready to eat food and functional food products with a premium price tag.

feed mill, wet lab facility, aquarium, coldwater fish museum, fish hatchery and seed rearing units. In recent years, the directorate has established country's first re-circulatory aquaculture system (RAS) for intensive farming of table size rainbow trout. The directorate has a field center and Experimental Fish Farm (Cheerapani) at Champawat district (Uttarakhand) to carry out farm activities. The farm has trout hatchery, raceways for nursery and brood stock rearing of rainbow trout and tanks for conducting field trials on various culture aspects of indigenous and exotic fish species.

Glimpse of coldwater fisheries resources of India

India's coldwater region extends from north western to north-eastern Himalayan region and some parts of Western Ghats, encompassing about ten states. Coldwater natural resources includes around 8,243 km long streams and rivers, 20,500 ha natural lakes, 50,000 ha of reservoirs both natural and manmade and 2,500 ha brackish water lakes at high altitude. The Himalayan region is drained by 19 major rivers. The main river systems draining the Himalayan region are the Indus, the Ganges, and the Brahmaputra. The Indus and the Brahmaputra are the longest, each having a mountain catchment of about 160,000 km². There are numbers of lakes situated in the mid and high altitudes of Himalayan regions. These lakes have diverse origin such as

retreat of glaciers, landslides and tectonic movements. The sizes of these lakes also vary as some are of large area while others have small.

The water bodies of the Himalayan region inhabit diverse kind of fish fauna. Out of total fish fauna available in India 17% fishes were documented from the mountain ecosystem establishing the status of the area as a center of origin and evolution of biotic forms. Around 218 fish species have been listed to be found in the Himalayas while 36 species of freshwater fishes (out of 1,300) are endemic to the Himalayan region. Among important ichthyofauna, snow trout (*Schizothorax* sp.), mahseer (*Tor* sp.), minor carps, barils, minnows, catfishes, loaches and exotic trout are important. The Himalayan region is ecologically fragile, and further due to different developmental activities made it vulnerable for aquatic flora and fauna. Consequently a number of species have become endangered or threatened and therefore need immediate attention for their conservation. However, after the introduction of exotic trout, commercial aquaculture in Himalayan states has significantly contributed towards high value fish production. The three-pronged fish farming, that covers high and mid altitudinal regions as well as foothills have been a successful model for aquaculture production based on exotic trout and indigenous fish species. It has provided an opportunity for sustainable utilization of aquatic resources for enhancement of production, livelihood security as well as conservation of fish species.

Role of ICAR-DCFR in coldwater fisheries development

ICAR-DCFR is a nodal agency for the development of coldwater fisheries sector of the country and played pivotal role in the development of the sector through its research and developmental activities. In last three decades, the directorate has developed models and technologies for both open water fisheries as well as aquaculture development. Aquatic resource assessment is the basic requirement for conservation and sustainable utilization

of fishery resources. The directorate has developed GIS based maps of aquatic resources of Himalayan states for aquaculture suitability and fishery development. The habitat and health assessment of rivers are being carried out to develop ecological models to formulate strategies for sustainable utilization as well as conservation. There is considerable scope for the development of aquaculture in the hill areas.

The directorate has successfully demonstrated and popularized polytank based multi-tier integrated fish farming model in mid-hill regions. The new farming model has significant improvement in fish productivity per unit area (from 0.3 kg/m³ to 0.5 kg/m³) in mid altitudinal regions. Species diversification in coldwater aquaculture remained a challenging task. In recent past, the directorate has developed breeding and seed production protocols for six new species

having food and ornamental values. Golden mahseer (*Tor putitora*) is the most important and popular freshwater game fish of the Indian subcontinent and called as 'Pride of Himalaya'. However, due to its overexploitation, its natural population has significantly declined leading to the status of 'endangered' species in the IUCN red list. The directorate has put historic efforts not only in conservation but also in the breeding and propagation of this species. The scientists at ICAR-DCFR has successfully developed captive breeding of golden mahseer for seed production through temperature and photoperiod manipulation.

Rainbow trout (*Oncorhynchus mykiss*) is the main commercial high value species for coldwater aquaculture and most of its production is contributed by northwestern regions (Jammu & Kashmir and Himachal Pradesh). However, recently production from northeastern Himalayan region



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(e.g. Sikkim) has shown considerable increase, due to addition of new ventures of trout farming. The total rainbow trout production in India has increased from a mere 147.0 tonnes (2004-05) to 1200 tonnes (2019-20). The directorate has developed efficient and cost-effective protein based starter feeds for initial feeding of rainbow trout fry providing higher survival and better FCR values (0.9-1.1 vis-a-vis 1.4-1.5). The developed feed is commercially available and now contributing in reduction in mortality at early stage thus making available more stocking materials for grow-out culture. The predominant trout production system in the country is flow-through system consisting of concrete raceways, which are designed in series or parallel arrangements and utilize gravity to move snow or spring-fed stream water through production system. The stocking density is low (15-20 kg/m³) and thus these traditional system has trout production from 800-100kg/raceway (area around 45 m³), depending upon stocking density and management measures applied during cultivation. The directorate has designed and established an indigenous re-circulatory aquaculture system (RAS) for intensive farming of table size rainbow trout where the stocking density can be increased up to 50 kg/m³. Moreover, RAS can reduce water requirement to

less than 1m³ per kg of trout produced and culture duration to 5-6 months compared to flow through system where it requires 200 m³ of water per kg fish of produced and growth period is nearly 14-16 months. The RAS has been installed at Bhimtal and many of the entrepreneurs and state departments have shown their interest in replication of the model for commercial trout production.

Apart from this, the directorate is intensively involved in the areas of disease diagnosis and health management of the coldwater fish species. Active disease surveillance is one of the core programme of the directorate which helped in early disease diagnosis and remedial measures for the containment of the fish diseases. It has developed different probes for the identification of the pathogens as well as working on the drugs development for the major diseases of the coldwater cultivable species. Advanced molecular tools are quite essential for the genetic characterization as well as species development. The directorate is continuously doing molecular marker based species and population characterization of important coldwater species which provides essential information for conservation, prioritization as well as selection of population for broodstock development. Global climate change poses many threats to biodiversity and altering the physical, chemical, and biological characteristics of freshwater habitats, with concomitant effects on freshwater fishes particularly in coldwater regions. The directorate has initiated research programmes to address these challenges through formulating strategies.

The ICAR-DCFR is ever growing with enthusiasm to realize its dreams of becoming a national leader in the area of coldwater fisheries research and development with an aim to be a global knowledge centre for innovative and simple solutions to the challenging and difficult problems.



Coldwater aquaculture- a sustainable livelihood option for hill people



In an interaction with AQUA POST, Dr. Pramod Kumar Pandey, Director ICAR-Directorate of Coldwater Fisheries Research shares the current status of cold-water fisheries in India and its impact on the livelihood and nutritional security of people living in the hilly terrain.

Q. What is the current status of coldwater aquaculture in India?

Ans: The country is bestowed with vast and varied hill fishery resources, which are spread over the Himalayan and peninsular regions as upland rivers, streams, high and low altitude natural lakes and reservoirs. There are around 8,243 km long streams and rivers, 20,500 ha natural lakes, 50,000 ha of reservoirs, both natural and manmade, and 2500 ha brackish water lakes in the high altitude. These water resources harbour 272 fish species, belonging to 21 families and

76 genera in the country, of which 203 are recorded from the Himalaya, while 91 from the Deccan Plateau. The large population of indigenous and exotic coldwater fish species in mountain water bodies has immense potential for aquaculture and capture fisheries as well. In the Indian Himalaya, the cultivation of fish contributes little to the overall freshwater fish production. At present, the total fish production (approx. 55000 tonnes) from upland areas constitute about 3% of inland fish production of the

Jobs, Admissions & Events

country. Commercial farming of high value rainbow trout (*Oncorhynchus mykiss*) is in vogue in higher mountainous ranges whereas other exotic carp are being cultured in low and mid altitudinal areas. Presently, coldwater fishery sector in India is undergoing a transformation and has the potential to contribute for the livelihood development of large section of economically underprivileged population of the country. The emerging production technologies, higher economic growth, population explosion and shifts in dietary pattern are leading to rapid growth in production as well as demand for food of animal origin.

Q. What are the short and long term goals of ICAR-DCFR?

Ans: Coldwater Fisheries Research started as a unit of Central Inland Fisheries Research Institute (CIFRI) in 1963 keeping in view the necessity to assess and utilize the fisheries resources available in the Himalayan region. In 1987, recognition of the hill aquatic resources paved the way for the establishment of the National Research Centre on Coldwater Fisheries (NRCCWF). In 2008, this institution was elevated as ICAR-Directorate of Coldwater Fisheries Research (DCFR). The dawn of ICAR-DCFR developed location, situation and system-specific technologies for facilitating the expansion of research and developmental activities in Himalayan states. The directorate is working in a mission mode with long term goals of the overall development of

coldwater fisheries and aquaculture, in order to make the sector a sustainable livelihood option with a view to provide nutritional security to the people inhabiting the hilly terrain.

Q. What is the scope of entrepreneurship development in cold-water aquaculture?

Ans: There are immense scope for entrepreneurship development through trout farming to provide a source of employment and income to the resource poor hill people. Suitable sites are available in different parts of the hill states, which could be utilized for trout production through aquaculture. Being a low volume high value commodity, the rainbow trout has good potential for domestic consumptions as well as foreign export. In spite of having excellent positive traits, the development and expansion of trout farming is yet to be done on commercial scale. Trout farming has progressed steadily in last 20 years in India amid different constraints. The total trout production in the country was about 147 tones during 2004-05 which has increased about ten-fold in last fifteen years and has reached up to 1500 tones during 2020-21. Presently, the bulk of trout production is contributed by the Jammu & Kashmir and Himachal Pradesh, while the other hill states like Uttarakhand, Sikkim and Arunachal Pradesh also have potential for rainbow trout farming. Apart from that, there are ample scope for the development of ornamental fisheries.



Jobs:

ICAR-CIFE has invited applications to fill up Chief Engineer Grade I vacancies in MFV Saraswati division.

Important Dates:

Notification date: 6th September 2021

Last date of submission: 21 September 2021 by 4:00 pm

Date of examination: 22nd September 2021 (11:30 am)

Eligibility:

The candidate must have secured at least

- Matriculation or equivalent qualification
- Certificate of Competency as Fishing Vessel Engineer or Equivalent as per D.G Shipping / MMD Norms.
- Five years' experience onboard fishing vessel and not less than 25 GRT

How to apply:

Interested candidates can apply to the posts by sending the application through email to vmc@cife.edu.in in before the 21-09-2021 (4:00pm). Candidates can log on to URL www.cife.edu.in for details or can click here (<https://www.cife.edu.in/pdf/Careers/Chief%20Engineer%20Gr.I%20Notice%20&%20Service%20Details-7-9-2021%20.pdf>) and read the notification carefully before applying.

Training:

ICAR-CIFA has invited application for a short-duration programme on Bioinformatic Analysis of Next Generation Sequence Data (Physical Mode) (5 days)

Dates to remember:

Start Date: 11th January 2022

End Date: 15th January 2022

Last date to apply: 7th January 2022

Entrance Fee: 8000 INR

Coordinators: Dr P.Das, & Team

Maximum Intake: 30

Eligibility:

Researchers & Students

How to apply:

Candidates can apply online by clicking here (<https://www.cifatraining.com/program-details.php?pid=16>) . For further information, the candidate may visit the official website:



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