A BOOK ON

Farmer Friendly Innovations in Fisheries: Rural Poverty to Prosperity

Innovative Ideas of
Young Fisheries Minds of India
presented on the occasion
of National Conference
"Transforming Rural Poverty
to Prosperity Through
Sustainable Fisheries"
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A Book

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PREFACE

In a world where millions of people continue to face the hardships of rural poverty, it becomes imperative to explore innovative approaches that can transform their lives and provide a pathway to prosperity. Fisheries industry stands out as a promising avenue for economic empowerment and sustainable livelihoods. "Farmer Friendly Innovations in Fisheries: Rural Poverty to Prosperity" is a book that delves into the remarkable innovative ideas in the realm of fisheries, particularly with a focus on empowering farmers and communities. The ideas featured in this book go beyond traditional approaches and demonstrate a deep understanding of the needs and aspirations of the fisher folk. From low-cost aquaculture techniques that leverage sustainable practices to enhance productivity, to value-addition strategies that open doors to lucrative markets. Each innovation showcased here has shown its potential to uplift communities out of poverty. It offers a holistic perspective by exploring the critical role of technology, policy interventions, capacity building, and social empowerment. It underscores the importance of collaboration between various stakeholders, including governments, non-governmental organizations, research institutions, and local communities. It recognizes the need for continued research, investment, and knowledge sharing to ensure the scalability and sustainability of these innovative ideas. It is our hope that this book will ignite a wave of transformation, ultimately empowering farmer communities, and paving the way for a prosperous future where no one is left behind.

Editors

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SMART, SUSTAINABLE AND SELF- SUFFICIENT VILLAGE

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Details of Innovation/project

Genesis of the Idea

In one of our RFWEP module, we visited many fishing villages for a socioeconomic survey. In most villages, we found that fisherman were not aware of any modern techniques, and there was also very less awareness about alternative income generation options, though the government has already taken many initiatives in this regard, but the "transfer of technology" was insufficient, so adoption of modern technologies among fishermen was limited and they strictly followed their traditional practises. Our idea here is to fill this void, make this type of village self-sufficient, and turn their poverty into prosperity by applying modern technologies and generating more income from their own natural resources. There are many alternative income generation options, like different types of farming that include shellfish aquaculture (pearl culture, lobster and crab fattening, clam and mussel cultures, etc.), and also some recent modern rising techniques like biofloc, aquaponics, backyard ornamental hatcheries, collections of marine ornamental fishes in sustainable manners, collections of ornamental gastropods, and harvesting wild seaweeds. Through educating young fishermen through, by extension, activities and training, we can make trained manpower and also improve their socio-economic status. In fisherman's families, women are usually engaged in post-harvest activities such as marketing, processing, net mending, etc., but as the technology is getting advanced, some activities such as net mending are also getting mechanised as it consumes less time and manpower. Here women can utilise their extra free time in different activities such as freshwater pearl culture, aquaponics, etc. In this way, we can also empower women. So, by observing fisherman's lives closely and understanding their styles of living, we are here trying to make smart village infrastructures that are sustainable for nature and also climate-resistant. In this smart village concept, we can engage local colleges, NGOs, fisheries institutes, rural banks, and SHGs.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

i) Lack of infrastructure: Rural areas lack roads for transportation and also lack processing facilities like cold storages, modern markets etc.

ii) Limited access to markets: Rural areas face limited access to markets, so fisherman get lower price of their commodities.

iii) Climate change and natural disasters: Rural areas can be particularly vulnerable to the impacts of climate change and natural disasters, which can affect the availability of stocks and quality of water resources, disrupt supply chains, and damage infrastructure.

iv) Overfishing and resource depletion: Overfishing and resource depletion are ongoing problems in many rural areas, leading to reduced catches and declining fish stocks.

v) Lack of technical knowledge and training: Many rural fishers and fish farmers may lack the technical knowledge and training needed to adopt sustainable and profitable practices. This can limit their ability to increase productivity, reduce costs, and access new markets.

vi) Limited access to credit: Access to credit can be a major constraint for rural fishers and fish farmers who need to invest in equipment, infrastructure, and other inputs. This can limit their ability to grow their businesses and improve their livelihoods.

vii) Lack of institutional support: Rural areas may lack the institutional support needed to develop and implement policies and regulations that support sustainable fisheries and aquaculture practices.

Objectives of the project

i) To trigger processes which lead to holistic development

ii) To substantially improve the standard of living and quality of life of all sections of the population through

iii) It Improves basic amenities and enhances human development.

iv) Productivity can be increased and better livelihood opportunities will be there.

Project component and functioning

A) Adoption of various aquafarming techniques: Pearl culture, mussel/ clam culture and lobster and crab fattening – during off season when fishing activities are not encouraged, during that period they can adopt such culture to generate some extra income.

B) Developing Eco tourism: Sports fishing, marine museum, eco parks, boating etc. - Barren or dried old ponds and canal which is not been used can be modified and used for sport fishing ground.

Area with high diversity in coastal areas can be preserved and be made as eco park. Boating and other water activities should be initiated in coastal waters.

C) Potential use of Renewable energy for power generation: Adopt solar power equipment's – solar panels should be set up in suitable village area, this will ultimately decrease the cost of all the electricity and power.Solar power generation can be a very effective solution for rural fishing communities that lack access to reliable electricity. This can provide a sustainable source of energy for fishing boats, fish processing facilities, and other essential infrastructure. Here are some potential benefits of using solar power in rural fishing development.

D) Developing modern post harvesting technologies: Product handling area, hygienic markets, cold storages at landing centers should be developed so that quality of fish is maintained and there is less chances of spoilage and product demand is increased which will results in high income generation.

E) Awareness and education through extension activities: Providing training for various modern culture, aware about fishing of endangered species like marine mammals, whale shark and cetaceans, turtles etc, sea ranching of selected species.

F) Climate resistant aquaculture

- ✓ **Seaweed farming** – Seaweed farming can help to address environmental challenges such as water pollution and coastal erosion by providing a means of filtering water and stabilizing shorelines.
- ✓ **Aquaponics** – Aquaponics can be used to grow a wide range of crops, from leafy greens to fruiting plants like tomatoes and cucumbers, providing a diverse range of produce for local markets.
- ✓ **IMTA** – IMTA has great potential for promoting rural fishing development by providing a diverse source of income and food security. Established wild harvest seaweed processing facilities also engaged in seaweed farming and IMTA). To promote successful IMTA systems for rural fishing development, it is important to provide training and education to farmers, access to markets and financing, and support for sustainable farming practices. Governments, NGOs, and other organizations can play a role in promoting and supporting IMTA initiatives, and in developing policies that encourage sustainable and responsible farming practices.

Is the project in use?

Yes, many fishing villages are developed but all components are not included. For example, let's say about fishing village of Gujarat, they not completely well developed.

Target areas of its operation

i) Implementing new fishing technologies
ii) Ecotourism
iii) Value addition (food security)
iv) Cold chain management (post-harvest sector)
v) Women empowerment
vi) Climate mitigation and reduction
vii) Solar power generation

Cost for Implementation and operation of this project

Cost is not fixed as it fluctuates according to village areas and conditions. Most of components of our projects are included in PMMSY, so fisherman get benefited by this scheme.

Monetary benefits to be obtained by farmers through the project

i) Income from selling fish: By adopting various farming options and value addition of products fisherman can generation income by selling it to direct markets and also export it.

ii) e-Marketing and direct selling: e-Marketing and direct selling of fish to exporters can offer several benefits for sellers and buyers alike, including increased reach, cost-effectiveness, real-time tracking and analytics, efficient supply chain, and increased profitability.

iii) Tourism activities: By developing tourism in terms of marine museum, eco parks, sports fishing, boating etc., fisherman generate income and improve their life styles.

iv) Collaborative arrangements: Fisherman can collaborate with various extension institutes and colleges and also government agencies that engaged with fisherman welfare and various start-ups and

industries, incubation centers and improve their source of income and also get knowledge that useful for development another income generations options.

v) Government subsidies and support: Fisherman also get subsides from state/central government that may include financial assistance for purchasing equipment, fuel, and other inputs.

vi) Pradhan Mantri Matsya Sampada Yojana: A scheme to bring about Blue Revolution through sustainable and responsible development of fisheries sector in India. PMMSY is designed to address critical gaps in the fisheries value chain from fish production, productivity and quality to technology, post-harvest infrastructure and marketing. It aims to modernize and strengthen the value chain, enhance traceability, and establish a robust fisheries management framework while simultaneously ensuring the socio-economic welfare of fishers and fish farmers.

vii) Saansad Adarsh Gram Yojana (SAGY): Inspired by the principles and values of Mahatma Gandhi, the Scheme places equal stress on nurturing values of national pride, patriotism, community spirit, self-confidence and on developing infrastructure. SAGY will keep the soul of rural India alive while providing its people with quality access to basic amenities and opportunities to enable them to shape their own destiny.

SWOT analysis of the project

A. Strengths

- ✓ Knowledge and expertise in traditional fishing practices
- ✓ Experience in fishing in local water bodies
- ✓ Ability to adapt to changing weather conditions and water currents
- ✓ Access to local fishing grounds and markets
- ✓ Strong social and cultural ties within the community

B. Weaknesses

- ✓ Limited access to modern fishing technologies and equipment
- ✓ Lack of formal training and education in fisheries management
- ✓ Low bargaining power in the market due to small-scale operations
- ✓ Dependence on one or few species of fish for livelihood
- ✓ Vulnerability to natural disasters and climate change impacts

C. Opportunities

- ✓ Access to government subsidies and support for fisheries development
- ✓ Growing demand for sustainably caught seafood
- ✓ Potential for diversification into aquaculture or value-added products
- ✓ Collaboration with other fishermen or with larger companies to increase bargaining power
- ✓ Development of tourism activities related to fishing

D. Threats

- ✓ Competition from larger fishing operations and illegal fishing activities
- ✓ Decline in fish stocks due to overfishing or environmental factors
- ✓ Impacts of climate change on fish populations and fishing activities
- ✓ Changes in consumer preferences or market demands
- ✓ Lack of access to credit or financial resources for investments

Contribution of the project in transforming rural poverty to prosperity

When combining the entire component together in a single unit, it can contribute to large income generation and will also ultimately improve the socioeconomic condition of village and its peoples.

SUSTAINABLE AND ENVIRONMENTALLY FRIENDLY FISH FARMING PRACTICES

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Details of Innovation/project

Genesis of the Idea

The idea of transforming rural poverty to prosperity through sustainable fisheries emerged to us by the RFWEP programme done by us in B.F.Sc 4th year. During our visit in various villages, we saw many ponds and resources were there unutilized. By doing cage farming in such ponds and resources it can provide a source of income for local residents and a source of food, also promoting sustainable and environmentally friendly fish farming practices. Also integrated fish farming like poultry cum fish farming, goat cum fish farming is possible in such ponds which will provide a sustainable and environmentally fish farming practices yielding a better source of income. With proper management, the fish produced can be sold in local markets or processed for export, providing a steady source of income for the community. In addition to this the low value fish cultured in cage farming can be used for value added products which will generate income to the local women of villages. Therefore, small cage culture farming in villages has the potential to transform rural poverty to prosperity by providing a sustainable source of income and food for local communities, while also promoting sustainable and environmentally friendly fish farming practices.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

The rural areas in fisheries and aquaculture face several challenges, including limited access to resources such as land, water, and capital; inadequate infrastructure and technology; and low levels of productivity and income. These challenges can be addressed through integrated fish farming, cage culture, and value-added products from fish. Integrated fish farming involves the simultaneous cultivation of fish, crops, and/or livestock in a single system, which can increase efficiency and productivity while reducing waste and environmental impacts. This approach can help rural farmers make better use of available resources and improve their income and food security. Cage culture, on the other hand, involves the cultivation of fish in cages placed in natural bodies of water such as ponds. This approach can provide rural farmers with an alternative source of income and help them to better utilize natural resources such as water bodies. Finally, value-added products from fish, such as fish cutlets, fish burgers and fish steaks, can help rural farmers to increase their income and access higher-value markets. By processing fish into value-added products, farmers can capture a larger share of the value chain and reduce their dependence on middlemen and traders. Overall, these approaches can help address the challenges facing rural areas in fisheries and aquaculture and improve the livelihoods of rural farmers.

Objectives of the project

i) Increase the income of rural communities: By developing integrated farming and cage culture systems, rural communities can generate additional income from fish farming. Furthermore, by creating value-added products such as smoked fish, fish sauce, and fish crisps, communities can further increase their income.

ii) Improve food security: By producing fish locally, rural communities can improve their access to nutritious and affordable food. Fish is a good source of protein and essential nutrients and can be an important part of a balanced diet.

iii) Increase employment opportunities: Developing an integrated farming and cage culture system can create job opportunities for rural communities, particularly for women and youth. Additionally, value-added products can create employment opportunities in processing, packaging, and marketing.

iv) Enhance environmental sustainability: Integrated farming systems can help to conserve natural resources and reduce environmental degradation. By using the waste from fish farming to fertilize crops, farmers can reduce their dependence on synthetic fertilizers and reduce nutrient pollution in water bodies.

v) Promote entrepreneurship and innovation: Developing value-added products requires creativity and innovation. By promoting entrepreneurship and innovation, rural communities can develop new and unique products that can create a niche in the market and increase their income.

Project component and functioning

A) Integrated fish farming: Integrated fish farming, also known as aquaculture, is a sustainable method of raising fish alongside other livestock or crops. It involves using the waste produced by one organism as food for another, thereby creating a closed loop system that minimizes waste and maximizes efficiency.

B) Poultry cum fish farming: In this system, chickens or ducks are raised in a coop or free-range setting above a fish pond. The chickens or ducks provide a source of protein-rich food for the fish, while the fish provide nutrient-rich water for the chickens or ducks. The waste produced by the chickens or ducks also acts as a natural fertilizer for the fish pond, which helps to promote the growth of algae and other microorganisms that the fish can feed on.

C) Goat cum fish farming: In this system, goats are raised on pasture or in a barn above a fish pond. The goats provide a source of manure for the fish, which helps to fertilize the pond and promote the growth of algae and other microorganisms. The fish, in turn, provide a source of protein-rich food for the goats, which can help to supplement their diet.

D) Horti-cum-fish: Fish are raised alongside crops such as vegetables or fruits. The fish pond provides a source of nutrient-rich water for the plants, while the plants provide shade and oxygen for the fish. The waste produced by the fish acts as a natural fertilizer for the crops, which can help to improve their growth and yield.

E) Small cage culture fish farming: To set up small cage culture in a village pond, you will need to first select an appropriate location within the pond. This area should have adequate water depth and flow to support the growth and health of the fish. Next, you will need to construct the cages or pens. These can be made from a variety of materials, such as bamboo, wood, or metal, and should be designed to allow water to flow freely through the cage or pen. Once the cages or pens are in place, you can stock them with fish. Common species used in small cage culture include tilapia, catfish, and carp. Feeding and care of the fish will depend on the specific species being raised, as well as the local climate and water conditions. It is important to note that small cage culture can have both positive and negative impacts on the local environment. Careful management and monitoring of the fish and the surrounding ecosystem is essential to minimize any negative effects and ensure sustainable fish farming practices.

F) Value-added products from low-value fish: Value-added products from low-value fish can help to increase the economic value of these fish species, while also reducing waste and promoting sustainability in the fishing industry. Low-value fish are typically those that are smaller in size, have lower market demand, or are considered less desirable for human consumption due to their taste or texture. However, these fish species can still be a valuable source of protein and other nutrients, and can be used to create a variety of value-added products.

Is the project in use?

Yes, many fishing villages are developed but all components are not included.

Target areas of its operation

Use of unutilized resources, job opportunities for unemployed people of villages especially farmers, women empowerment, and value addition of products prepared from low value fishes.

Cost for Implementation and operation of this project

Cost depends according to village areas and conditions. Most of components of our projects are included in PMMSY, so fishermen get benefited by this scheme.

Monetary benefits to be obtained by farmers through the project

i) Reduced Costs: By using sustainable practices, farmers can reduce their costs of production. For example, using natural feeds, such as algae or insects, can be cheaper than using commercial feeds. Using recycled water or adopting efficient water management practices can also reduce the costs associated with water usage.

ii) Premium Prices: Consumers are increasingly willing to pay a premium for sustainably produced fish. Farmers who adopt sustainable practices can therefore command higher prices for their products, increasing their profits.

iii) Access to New Markets: Many large retailers and distributors now require sustainable certifications for the fish they purchase. Farmers who adopt sustainable practices can therefore gain access to new markets that were previously unavailable to them.

iv) Improved Productivity: Sustainable fish farming practices can lead to improved productivity and higher yields. This can translate into increased revenues and profits for farmers.

v) Reduced Risk: Sustainable fish farming practices can help to reduce the risk of disease outbreaks and other production challenges. By minimizing the use of antibiotics and other chemicals, farmers can produce healthier fish and reduce the risk of product recalls or other reputational damage.

SWOT analysis of the project

A. Strengths

- ✓ **Reduced impact on the environment:** Sustainable and environmentally friendly fish farming practices typically use methods that minimize the impact on the environment, such as reducing the use of antibiotics and chemicals, using recycled water, and controlling waste and pollution.
- ✓ **Healthier fish:** These practices tend to result in healthier fish, as they are raised in conditions that more closely resemble their natural habitat and are less prone to disease.
- ✓ **Positive reputation:** Businesses that adopt sustainable and environmentally friendly fish farming practices may benefit from a positive reputation, as consumers increasingly prioritize sustainability and ethical considerations when making purchasing decisions.

B. Weaknesses

- ✓ **Higher costs:** Implementing sustainable and environmentally friendly practices can be more expensive than traditional methods, as it may require investments in infrastructure, technology, and training.
- ✓ **Limited scalability:** These practices may be more challenging to scale up due to their focus on environmental sustainability, which could limit their profitability and growth potential.
- ✓ **Limited adoption:** Despite growing consumer demand for sustainable and environmentally friendly products, not all businesses in the fish farming industry have adopted these practices, which could limit their impact.

C. Opportunities

- ✓ **Growing demand for sustainable products:** As consumers become more aware of the environmental and social impact of their choices, the demand for sustainably and ethically produced fish is likely to increase.
- ✓ **Potential partnerships:** Businesses that adopt sustainable and environmentally friendly fish farming practices may have the opportunity to collaborate with retailers, restaurants, and other partners that prioritize sustainability.
- ✓ **Innovation:** There is significant potential for innovation in sustainable and environmentally friendly fish farming practices, as new technologies and methods are developed that further reduce the industry's impact on the environment.

D. Threats

- ✓ **Competition:** Businesses that do not adopt sustainable and environmentally friendly practices may continue to compete with those that do, potentially limiting the market share of the latter.
- ✓ **Regulatory changes:** Changes in regulations, such as stricter environmental and animal welfare standards, could increase the costs and complexity of sustainable and environmentally friendly fish farming practices.
- ✓ **External factors:** External factors, such as climate change, natural disasters, or disease outbreaks, could impact the success and viability of sustainable and environmentally friendly fish farming practices.

Contribution of the project in transforming rural poverty to prosperity

The socioeconomic situation of the town and its inhabitants will ultimately improve when all the components are combined into a single entity, which can help to generate significant income.

SMART FISHING VILLAGES: THE INTERSECTION OF TRADITION, INNOVATION, AND SUSTAINABLE INLAND TOURISM

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Details of Innovation/project

Genesis of the Idea

As a fisheries background, we go to the fishing village to visit and observe the lifestyle of a fishing village. In those days we are observing that many water bodies are underutilized and because of a lack of knowledge about sustainable utilization and leasing policies about lake, reservoirs, and other water bodies. As we know, ecotourism and sport fishing can have a positive impact on uplifting an inland fishing village by creating new business opportunities, providing employment, promoting conservation efforts, developing infrastructure, and preserving local culture and traditions. Ecotourism and sport fishing can also help to promote conservation, management, and development efforts in the area. The increase in tourism can also create job opportunities for locals, such as tour guides, fishing guides, and hospitality staff. It uplifts the standard of living of the people residing there. The influx of tourists can also lead to the development of new infrastructure in the area, such as roads, transportation systems, and communication networks. Ecotourism and sport fishing can attract visitors to the fishing village, which can create new business opportunities for locals. So, we developed new opportunity to utilize water bodies and also restored degraded water bodies and use them in ecotourism. That will benefit inland fishermen and improve their socioeconomic lifestyles.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

i) Lack of access to modern technology
ii) Limited knowledge and skills among rural fishers and farmer
iii) Unable to adapt latest technologies and knowledge
iv) Poor infrastructure and inadequate transportation facilities
v) Limited access to credit and financial services
vi) Limited institutional support and weak governance

Objectives of the project

i) To understand how digital technologies can be used to support the development of sustainable tourism practices while benefits both the local communities and the environment. New technologies, ideas, and practices that can improve the tourism experience while minimizing negative impacts on the environment.
ii) Sustainable inland tourism aims to balance economic development with environmental protection and social well-being.
iii) To preserving and promoting local cultural and natural resources. Ultimately, the goal is to create a model for sustainable inland tourism that can be replicated in other inland communities around the world.

Project component and functioning

A) Fish Gallery

- ✓ **Digital fish museum:** Creating a 4D/8D digital fish museum in a smart village can be a unique and innovative way to showcase freshwater fish species and promote education, tourism, and economic development.
- ✓ **Virtual reality exhibits:** Use virtual reality technology to create immersive exhibits that allow visitors to explore underwater environments and interact with fish species in their natural habitats.
- ✓ **Aqua-tourism:** Marine and Freshwater fish species with aqua-forest. The aquarium can also be used to attract tourists who are interested in learning about freshwater fish and aquariums. The community can organize guided tours, workshops, and events related to the aquarium, providing a source of income through ticket sales and related activities.
- ✓ **Selling fish:** The aquarium can be used to breed and sell freshwater fish to the local market, providing a sustainable source of income for the community.

B) Sport fishing

- ✓ **Create a fishing museum:** Creating a fishing museum in the village can help to showcase the history, culture, and ecology of sports fishing in the area. The museum can display

fishing gear, photographs, and videos related to sports fishing, and can also provide information on the different fish species found in the area.

- ✓ **Utilization of natural resources:** Many rural farmers have access to natural resources such as rivers, lakes, and ponds. By promoting sports fishing, farmers can utilize these resources to generate income, without having to invest in additional land or infrastructure.
- ✓ **The attraction of tourists:** Sports fishing can attract tourists to the area, which can create additional opportunities for farmers to generate income through the sale of agricultural products, handicrafts, and other services. Tourists may also be interested in learning about the local culture and cuisine, which can further promote economic development in the area.
- ✓ **Conservation of the environment:** Promoting sports fishing can also contribute to the conservation of freshwater and marine habitats and the species that depend on them. By promoting sustainable fishing practices and educating visitors about the importance of conservation, farmers can help to preserve the natural environment and ensure its long-term sustainability.

C) Boost domestic fish consumption and value addition of fish products

Processing and selling value-added fish products: Farmers can add value to their fish products by processing them into value-added products such as fillets, smoked fish, fish cakes, and fish jerky. These products can be sold at a higher price than live fish, and they have a longer shelf life. Value addition can help fish farmers earn more income from their products. By selling value-added products such as fish fillets, fish cakes, or fish jerky, farmers can command a higher price per kilogram of fish compared to selling the whole fish.

Is the project in use?

Yes, although numerous fishing communities have been built, not all elements have been used. Take Gujarat's fishing villages, for instance, which still need development.

Target areas of its operation

i) Ecotourism (Sports fishing, Fish Museum, Aquarium)
ii) Use of unutilized inland resources
iii) Value addition products from low-value fish
iv) Ornamental Fish selling

Cost for Implementation and operation of this project

The price varies depending on the conditions and sections of the village and is not fixed. The majority of the parts for our projects are in PMMSY, hence this plan benefits fishermen.

Monetary benefits to be obtained by farmers through the project

i) Diversification of Income: In addition to selling fish, farmers can also generate income by offering tourism-related services such as fishing tours, fish tastings, and cultural experiences. This can provide a new revenue stream for farmers and help them diversify their income.

ii) Access to Funding: The Digital Village can also provide fish farmers with access to funding opportunities such as grants, loans, and investments. These funds can be used to expand operations, purchase new equipment, or improve infrastructure.

iii) Value Addition: By adopting innovative and sustainable practices such as organic farming, farmers can increase the value of their products and command higher prices in the market

iv) Access to Funding: The promotion of sustainable tourism in the area can provide fish farmers with access to funding opportunities such as grants, loans, and investments. These funds can be used to expand operations, purchase new equipment, or improve infrastructure

v) Preservation of Tradition: By preserving their traditional farming methods and cultural heritage, fish farmers can attract tourists who are interested in authentic cultural experiences. This can generate revenue for the farmers and also help to preserve their way of life.

SWOT analysis of the project

A. Strengths

- ✓ Strong cultural heritage and traditions associated with fishing villages can attract tourists.
- ✓ Integration of digital technology in fishing villages can enhance the tourism experience and create new opportunities for economic growth.
- ✓ The presence of sustainable tourism initiatives can help to protect the natural environment and preserve the traditional way of life.

- ✓ Strong community ties and local support can provide a sense of authenticity and connection for tourists.

B. Weaknesses

- ✓ Limited infrastructure and resources may hinder the implementation of digital technology and sustainable tourism initiatives.
- ✓ Lack of awareness and understanding about the potential benefits of digital technology and sustainable tourism among local communities.
- ✓ Overreliance on tourism may result in a loss of authenticity and cultural identity.
- ✓ Dependence on fishing as the primary economic activity can be vulnerable to external factors such as climate change and overfishing.

C. Opportunities

- ✓ The development of innovative digital technologies such as augmented reality and virtual reality can enhance the tourism experience and attract more visitors.
- ✓ Collaboration with local businesses and organizations can create new economic opportunities and improve the overall tourism experience.
- ✓ The expansion of sustainable tourism initiatives can help to protect the natural environment and preserve traditional fishing practices.
- ✓ Marketing campaigns that emphasize the unique cultural heritage of fishing villages can attract new visitors.

D. Threats

- ✓ Competition from other tourist destinations can limit the growth of digital fishing villages.
- ✓ Natural disasters and climate change can significantly risk the tourism industry and the local environment.
- ✓ Increasing regulation and bureaucratic hurdles can limit the development of digital technology and sustainable tourism initiatives.
- ✓ Socioeconomic challenges such as poverty and inequality can negatively impact the growth and development of digital fishing villages.

Contribution of the project in transforming rural poverty to prosperity

When combining all three-component fish gallery, sports fishing, and value addition of fish products together in a single unit, it will ultimately increase income generation and socioeconomic condition of village and its peoples.

INNOVATIVE ENGINEERING FOR SUSTAINABLE AQUACULTURE PRODUCTION IN RURAL HIMALAYAS

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Details of Innovation/project

Genesis of the Idea

The idea originated in regards to the hills of Uttarakhand where the rural people, who are unaware and unexposed to the profession, reside and struggle with the common problems like unemployment, losses, etc. We aim to make this venture a new start in their lives which gives them the solution to all their problems. This model demonstrates a typical running water system supporting the cold-water fisheries in the hilly areas situated near rivers of UTTARAKHAND and other parts of India. The major attraction of our project is a "WETLAND SYSTEM". This concept promotes sustainability, eco-conservation & bioremediation adding to productivity with minimum wastage of water. Our contour setup focuses on commercial cold-water aquaculture. The artificial wetland system (Constructed Wetland) combines phytoremediation with integrated aquaculture. Another one of the major issues for both the government sector and rural farmers while risking into these enterprises is feed cost. This is compensated by the concept of 'PANCHAKKI' and 'PLANT-ANIMAL BASED' feeds. Naturally occurring plants and animals grown in wetland will serve as feed source for cultured fish along with a hydro-powered PANCHAKKI (grinder) to reduce the cost of a mechanized grinder. The electric supply is maintained by the turbine powered by fast running water. Yet, sustainability halts at the scenario of endangering bioresource for production i.e., fish species cultured. Introduction of *Cyprinion semiplotum* (Assamese Kingfish) into our running water system seems to be a promising venture. The whole fish farm originates from the idea of sustainability and cost-effectiveness as we discuss the drawbacks in rural fisheries sector all over India. Our model settles for both government & the rural fish farmers leading their hand towards prosperity. Aquaculture is one of the major sectors providing food security to the continuously expanding population of India. It contributes around 1.23% to the Indian GVA and 6.72% to the Agricultural GVA. It is a complex field that needs attention to grow. In India, there are many problems in its way. Each one needs effective solutions that are both sustainable as well as economically beneficial. Be it marine sector or the inland fisheries, the major drawbacks remain the same. However, they require different solutions at different levels.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

India is a diverse nation with many rural and urban areas existing together in peace. These areas are developing at an alarming rate. But as the time is passing by, the people of the rural areas are seeking new opportunities and business fields to stand out of the rising competition and live above poverty. The economic state of the rural India is very predictable. Therefore, the people seek to indulge in activities that give them security of all sorts (food, employment, life, etc.) and make them economically stable without much primary investment. They seek a greater profit than the initial capital. We intend to address the general issues of the rural people involved in aquaculture. As an isolated community, the rural society as well as the rural aquaculture faces the following problems:

i) Environmental degradation: Whenever any natural resource is exploited for economic gains, there is always a negative impact to it. The water used in aquaculture contains a high load of organic matter and peaked up BOD. This water is drained untreated into the natural water bodies. This is one of the reasons for the biological aquatic pollution.

ii) High feed cost: The fish feed prices are rising day by day at a very high rate. Due to this reason, the fish farmers who cannot afford the costly feed either get smashed under a heavy debt or attain low production and profit. This is discouraging the rural people to take up the profession.

iii) Technical challenges: Whenever we talk about aquaculture, it is always 'large ponds, no or difficult water exchange, no draining, and no bottom sediment removal' etc. These problems are carved into the minds of the fish farmers and cause them to back off as they choose not to invest in an expensive solution to these setbacks.

iv) Reliance on a very few species: The Indian aquaculture is reliant on a very few species in the field of culture.

v) Unemployment: Rural areas are getting abandoned due to residents migrating to urban cities for jobs and livelihood.

vi) Low income: Any venture took up in the hilly areas results in comparatively high investment and low income at the end. This is due to additional costs of transportation and storage. While we intend not to dive into these issues right now, we might have sought an alternative.

vii) Electricity shortage: Hilly areas, being remote, experience a shortage of electric supply even for their daily use, let alone use it for their farm.

Objectives of the project

The main aim of our idea is to create a sustainable aquaculture model with increased employment and profit opportunities for the rural people residing in the hills of Uttarakhand and India, prioritizing the nature and its welfare in our minds. The innovation brings together the solutions to aquatic pollution due to drainage of used water full of organic matter from the running water systems into the streams or rivers, high feed cost due to the purchase of artificial feed, low income and profit due to focused attention on highly semi-intensive/intensive monoculture of the common cold water fish species, increased investment due to excess electricity requirements, unemployment due to labor extensive nature of advanced aquaculture practices, and exploitation of Assamese Kingfish due to unregulated fishing for monetary benefits from the wild.

Project component and functioning

A) Running Water System/Running water system: A running water system is a rectangular, square, or circular tank constructed out of earth or concrete with a continuous water flow system. It is equipped with an inlet and an outlet that facilitate a constant and continuous flow of water. It is one of the easiest ways to culture fishes and increase production by keeping a high stocking density. The continuous flowing water maintains a desired water quality and aeration to allow less stress in relatively compact enclosure. Running water systems are typically used in hilly areas due to their less space utilization and easy handling. The water flow is maintained at a regulated speed in accordance to species if fish cultured and need. The depth of the running water system is kept shallow (1 to 1.5 m) to allow good transparency as well as ease in visibility of fish. The flowing water allows less waste accumulation in the enclosure along with regular water exchange. The rate of disease infection is relatively high due to a high stocking rate but easy to manage. Running water systems operate in two different circuits, some in series and some in parallel. Parallel arrangement of running water systems is advantageous over the series as it reduces disease transmission between the running water systems and also each tank receives clean water unlike in series where water from the upper running water system is used in the lower ones carrying the entire organic load from the former running water system.

Fig. 1. Running water system constructed in a hilly region for cold water fisheries

B) Wetland System and Phytoremediation: A wetland is an area of land dominated by water which governs the biota and abiotic systems of the ecosystem. It is usually crowded by a large diversity of aquatic macrophytes and animals. It is a whole different ecosystem on its own. Studies have been conducted on the use of

Fig. 2. Wetland (Source: Google.com)

these water bodies for the purpose of phytoremediation and water treatment using various categories of macro- and microphytes. All these plants utilize the organic matter and heavy metals suspended in the polluted water and effectively reduce the load, thus, decreasing the BOD. Plants restrict pollutants by creating a zone around the roots where the pollutant is precipitated and stabilized (Nedjimi 2020). The use of plants to conduct the treatment of water or to bioremediate the used water or effluents is called phytoremediation. Chaney (1983) suggested this idea of phytoremediation. Phytoremediation is a low cost system of remediation of soil and water, which allows some uprooted essence to be reclaimed for profitable use (Ghosh et al, 2023). The plants accumulate all the suspended solids to use them for their metabolic gain which in turn reduces the load in the water. Excessive use of insecticides and pesticides in modern agricultural techniques also contributes to the pollution of water resources. Phytostabilization, phytoextraction, phytovolatilization, and rhizoremediation are some of the phytoremediation strategies for polluted areas (Saleem et al, 2020). This technology is used in many places where a cost effective and eco-friendly solution is needed against rising water pollution and environmental degradation. *Chrysopogon zizanioides*, *Spirodela polyrhiza*, *Pistia stratiotes*, *Eichhornia crassipes*, and *Pennisetum purpureum* are employed in routine for their phytoextraction potential (Yang et al. 2020), while Rhizofiltration-friendly plants include *Datura innoxia*, *Lemna minor*, *Azolla pinnata*, and *Eichhornia crassipes* (Manucci and Franchini 2017).

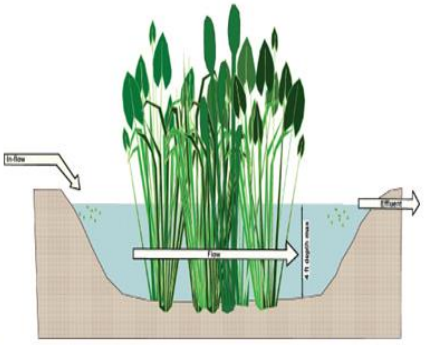

Fig.3. Artificially constructed wetland for phytoremediation purpose (Source: Google.com)

Artificial wetland systems are constructed to stimulate the process of phytoremediation in these enclosures using selected plants as per need and reducing the cost of treating water in such scenarios. The organic material is either directly or indirectly (with the help of microorganisms) accumulated in the plants. The nitrogenous wastes and organic decomposing matter (excess feed, etc.) are the main concerns for our system. These are successfully accumulated by the wetland's remedial plants. This method works against polluted water and effluents from industries and factories which are dumped into water bodies untreated. It does not treat water as effectively as an artificial water treatment plant but it is surely a sustainable way to go which promotes nature and biodiversity.

C. *Cyprinion semiplotum:* *Cyprinion semiplotum* is a persistent minor cold-water carp belonging to the family Cyprinidae. It has been a delicacy, an aquarium fish as well as a medically important species in the Himalayan cold waters of Southern Asia [India (in Assam and neighboring states), Bangladesh, Malaysia, Nepal, Bhutan, etc.]. Vernacularly, it is designated by various names among different tribal regions viz. emperor fish, kissing Prochilodus, Khurpi, Cheptiputhi, Bedangi, Perballey, Sundari, Orche, Ngogir, and Pech (Menon 2004, Mogalekar 2017). This species grows to a maximum recorded length of 60cm and lives upto 7+ years in the wild. It breeds in the peak monsoon season at the age of 1-1.5 years when the female (146.22 to 154.51 mm) and male (151 to 160 mm) reach maturity (Bagra 2012). The fish is a voracious feeder, identified as an herbivore but also as an opportunistic feeder. Found to be bentho pelagic, it is mainly habitant between rocky bed and boulders, feeding on plankton and algae at night at the bottom as well as using these as hiding places too. It is a highly nutritious fish having a comparatively good percentage of macro and micro nutrients.

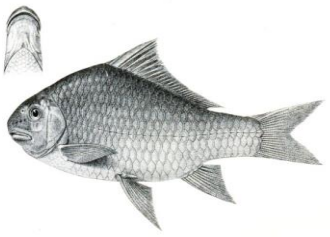

Fig.4. *Cyprinion semiplotum*

Sl. No.	Nutrients	Proximate Composition (g)
1.	Crude Protein	23.13 ± 0.09
2.	Crude Fat	29.85 ± 0.010
3.	Carbohydrate	38.55 ± 0.21
4.	Ash	1.54 ± 0.033
5.	Nutritive value	521.38 ± 9.23

Apart from being an ornamental and food fish, Assamese kingfish is also attributed as a great pharmaceutical agent by the

traditional visions of the South Asian inhabitants. It is known to cure smallpox, stomachaches and urinary as well as digestive distress. These may be due to its very high nutritional values. Because of its therapeutic qualities, it has been a fish of great importance to the region. But no conservational measures were taken care of till recently due to which it has made its place as a vulnerable species in the IUCN Red List, 2009.

D) Aquaculture-Agriculture Integration: Integration of Agriculture with Aquaculture simply implies to culture of fish and edible crops together to form a cost effective, sustainable, and profitable alliance. Many such integrations have been studied and witnessed like paddy and carp culture in different parts of India (especially Kerala's Pokkali fields). Many fishes can survive in the waters along with the crops grown into it. The water with a high nitrogenous as well as organic load is used up by the crop in its metabolism as it acts as a good source of minerals for the plant. In exchange, the water quality and dissolved oxygen content along with the BOD in the water is maintained for the fish to survive. It is a very inspired innovation that combines all the culture methods for human consumption and minimizes wastage of resources. It uses the knowledge of different trophic levels and integrates it into a useful model. Many other integrated systems inspired and are inspired from the idea like Agriculture-Piggery-Aquaculture, Agriculture-Duck Culture-Aquaculture, etc. It later gave birth to a new and advanced system of Aquaponics, where aquaculture and hydroponics are complexed to form a versatile technology for integrated culture systems. Our model proposes the idea of the culture of *Cyprinus carpio* (Common carp), *Trapa natans* (Water chestnut/Singhada nut), and Tadpoles in the wetland ecosystem along with the aquatic macrophytes to aid phytoremediation, increase production and profit as well as to highly reduce the cost of feed by obtaining Plant-based and Tadpole feed for the cultured species. Common carp, being a very versatile species, grows well in 6 months, and as a bottom feeder would survive well with Water chestnut/Singhada nuts which can be either sold directly or dried or as Singhada flour. The Tadpoles cultured are one of the excellent sources of protein, though considered an unconventional feed for fishes. These are cultured, harvested, dried and further grinded to obtain a paste to be integrated into the plant-based feed prepared for the fish. It not only nourishes the fish and increases its protein consumption, but also reduces the cost of feed to a large extent.

a. b. c.

Fig. 5. a. *Trapa natans, b. Cyprinus carpio, c.* Tadpoles (Source: Google.com)

Our model is built on the idea of sustainability, commercial profit and the most important of all, eco-conservation. Below are a schematic representation and a brief description of our innovation.

i) Water source: The system receives water from a nearby coldwater spring or stream. The water is usually pure and best for fish culture as it provides homely environment to the fish.

ii) Water Feeder channel: A water feeder channel (20m × 0.35m × 0.35m) is dug from the water source to aid in the swift flow of water. The dimensions are formulated keeping in mind the regulated and fast flow of incoming water into the system. The water channel is further diverted into two –

- ✓ **Panchakki:** One end meets a Panchakki in the way. It is basically an equipment used to grind wheat to get flour yet it is working as a grinder for feed production in our system. The panchakki is well seated in a regulatory compartment to manage the water flow and working of the device. This device is used to grind the raw materials which are mainly plant- based and grown by the farmer nearby it. The feed is made in the premise itself to significantly reduce the cost. The natural feed is highly nutritious for the fish growth and is easy to obtain. The panchakki operates when the sluice opens and water is allowed to fall over the grinder to make it revolve fast.

- ✓ **Turbine:** The other diversion passes via a turbine. The continuous water flows at a fast speed over the turbine and revolves it at a high-rate of 1800 rpm. The miniature hydropower plant generates about 2kW energy. An alternator is connected to the turbine which generates electricity which can be used for any purpose like pumps, etc. if needed. The water sub channels meet at a junction where they emerge as the main channel again and head towards the running water systems.

iii) Raceways and connected pipes: The 3 raceways are constructed in a parallel arrangement to obtain an efficient system. The water flows through the channel into the running water systems through the inlet. The inlets contain a sluice gate to regulate the water flow. The water is continuously flowing through the running water systems and flows out through the outlet pipes. There are 2 outlet pipes per tank- one at 30 cm from the bottom and the other at the height of 1.2 m.

iv) Wetland: The water leaving the running water systems is now loaded with organic matter and nitrogenous waste. This flows directly into the wetland constructed further. The outlet pipes merge and open into the enclosure. The wetland constitutes a huge diversity of flora including *Spirodela polyrhiza* (Duckweed), *Pistia stratiotes* (Water Lettuce), *Myriophyllum elatinoides*, *Typha orientalis* (Bulrush), *Nymphaea spp.* (Water Lily), and others suited to the region. This system helps in phytoremediation of the water received from the culture tanks. Along with this, *Cyprinus carpio* (Common Carp) is cultured along with *Trapa natans* (Water chestnut/Singhada) in the wetland for commercial purposes. Tadpoles are also cultured as a part of animal- based feed. The water is then sent back to the nearby water body or used for domestic purposes. This facilitates the eco-conservation of natural resources as we do not support the discharge of water with high organic load into natural water bodies. In cases of unintentional ranching, the species we culture pose no harm to the natural ecosystem if introduced instead it shall contribute to its conservation.

Target areas of its operation

The model is intended for hilly rural areas of Uttarakhand and other parts of India where only cold-water fishery is/can be practiced. No special demands are kept except for a stream or any other water body near the project, less large vegetation around the constructed ponds and an active neighbourhood ready to take up the occupation. The fish species chosen for culture are to be studied carefully beforehand. Eurythermal species (having high thermal tolerance range) can be cultured in a wide variety of temperature fluctuations and thus pose less threat to the production. On the other hand, stenothermal species (having narrow thermal tolerance range) need extra attention and precautions when their culture is taken up. The area where we intend to establish the project is a general rural community with good native floral vegetation which can be used as natural food when incorporated into the fish feed. Studies are being conducted in large numbers proving many commonly occurring plants and herbs beneficial for the fish culture.

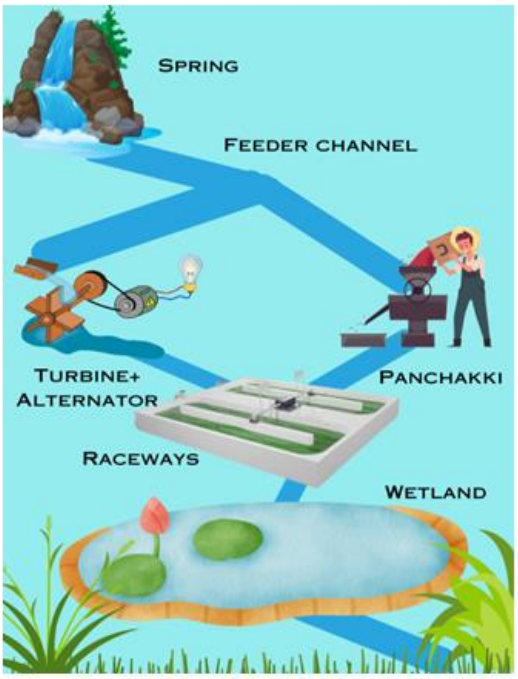

Fig. 6 Running water system innovated to include a turbine and panchakki receiving water directly from the water source and an artificially constructed wetland at the exit of the model to discharge water with comparatively less organic load

Cost for Implementation and operation of this project

Model technical specifications for Assamese Kingfish in running water system

S.No.	Title	Description
1.	Name of Species	*Cyprinionsemiplotum*
2.	Running water system Size	20m × 3m × 1.5m
3.	Effective water volume	60 m^3/running water system
4.	No. of running water systems	3
5.	Effective water depth	1m
6.	Stocking size	10 gm
7.	Stocking density	100/m^3
8.	Stocking no.	6000/Running water system
9.	Survival rate	70%
10.	Culture period/crop duration	10-12 months
11.	Cost of seed	₹6/pc
12.	Cost of feed (crude protein ≥40%) (plant-based and tadpole feed)	₹ 50/kg
13.	Total feed required	6 MT (expected)
14.	Average size at the time of Harvest	250 gm (expected)
15.	Expected Total Biomass	4 MT (expected)
16.	Sale price	₹350 /kg (average)

*Note: This price is an approximate value in reference to the fish markets in Assam

Model technical specifications for Common Carp in wetland

S.No.	Title	Description
1.	Name of Species	*Cyprinus carpio*
2.	Wetland Size	10m × 10m × 3m
3.	Effective water volume	250 m^3/wetland
4.	No. of units	1
5.	Effective water depth	2.5m
6.	Stocking size	15 gm
7.	Stocking density	2/m^3
8.	Stocking no.	200/wetland
9.	Survival rate	80%
10.	Culture period/crop duration	10 months
11.	Cost of seed	₹ 5/pc
12.	Average size at the time of Harvest	800 gm
13.	Expected Total Biomass	150kg
14.	Sale price	₹180/kg (average)

Model technical specifications for Water Chestnut/Singhada nut in wetland

S.No.	Title	Description
1.	Name of Species	*Trapa natans*
2.	Wetland Size	10m × 10m × 3m
3.	Effective water volume	250 m^3/wetland
4.	No. of units	1
5.	Effective water depth	2.5m
6.	Seed rate	0.5/m^3
7.	Spacing between 2 crops	1 m
8.	Stocking no.	50/wetland
9.	Culture period/crop duration	8 months/crop

10.	Cost of seed	₹1/seed
11.	Expected Total Biomass	80 kg
12.	Sale price	₹ 50 - 100/kg (average)

Cost Estimation

Capital cost				
S.No.	**Particulars**	**Qty.**	**Unit cost (lakhs)**	**Total (lakhs)**
1.	Construction of Running water systems (20 x 3 x 1.5m): 60m^3	3	1.50	4.50
2.	Construction of Wetland (10 × 10 × 3m): 250 m^3	1	0.50	0.50
3.	Water head work and channel construction from water source up the running water system (20m x0.35mx0.35m): 2.25m^3	1	1.50	1.50
4.	Generator/Alternator, Turbine, Panchakki	4 (1,2,1)	0.20 (0.12,0.04,0.04)	0.24
5.	Bird protection net, Equipment (dragnet, hand net, bucket, tubs, thermocol box etc), Wire/chain link fencing, outlet, screens etc.	LS	1.50	1.50
				Total= 8.24 lakhs

Inputs for Assamese Kingfish rearing Units (for 3 units)

S.No.	**Particulars**	**Total**
1.	Cost of Seed (fingerlings) including transportation @ ₹6/pc for 18,000 nos. (6000 nos./running water system)	1.08
2.	Cost of Feed @ ₹50/kg for 6 MT	3.00
3.	Man power @ ₹8,000 per month for 12 months	0.96
4.	Transport & Miscellaneous	0.24
		Total = 5.28 lakhs

Inputs for Common Carp and Water Chestnut/ Singhada nut culturing unit (wetland)

S.No.	**Particulars**	**Total**
1.	Cost of Seed (fingerlings) including transportation @ ₹5/pc for 200 nos. (Common Carp) + Cost of Seed including transportation @ ₹1/pc for 50 nos. (Water Chestnut/Singhada nut) + Tadpoles	0.01

Economic Feasibility for 1-year production

S.No.	**Particulars**	**Amount (₹In lakh)**
1.	Capital cost	8.24
2.	Operational cost	5.29
3.	Total project cost	13.53
4.	Gross income from one crop season (1 year)	14.31
5.	Depreciation @15% on Capital cost	1.23
6.	Interest @ 12% on Total Project Cost	1.62
7.	Repayment @1/7th of Total Project Cost	1.93
8.	Operational cost for next crop	3.48

*****Note: The operational cost for the next crop is decreased after first year taking into account that the Common carps are prolific breeders and the whole population will not be harvested at the end. The tadpole feed and the plant-based feed also abide by the same concept in their own ways.

Running water system Scheme under PMMSY

S.No.	**Sub-component and activities**	**Unit**	**Unit cost (₹Lakhs)**
A	Enhancement of production and productivity		

1	Development of fisheries in North-Eastern and Himalayan States/UTs		
1.1	Construction of running water systems of minimum of 60 cubic meter	3	3.00
1.2	Inputs for Assamese kingfish Rearing Units	LS	1.50

Monetary benefits to be obtained by farmers through the project

1.	Net profit after the end of 1st year (Gross profit – Total project = cost)	0.78
2.	Net profit after the end of 2nd year [(Gross income) = (Depreciation + Interest + Repayment + Operational cost for the next crop)]	6.05

This concludes that upon investment of ₹ 13.53 lakhs, a net profit of ₹ 0.78 lakhs is gained after a period of 1 year and a net profit of ₹ 6.05 lakhs in the succeeding years from our commercial model.
*Note: This net profit as well as the investment is subject to change depending upon the inflation or deflation in the market values of the input raw materials.

SWOT analysis of the project

A. Strengths

- ✓ The idea reduces the natural pollution caused and the general BOD addition to the natural water bodies due to aquaculture practices. Treated water to an optimum level is drained back to the nature and wastage is minimized
- ✓ Integrated system produces new employment opportunities for rural people requiring easy learning skills and no special expertise
- ✓ The new species gives farmers a whole new market to enter with lesser competition.
- ✓ The wetland adds up to the biodiversity of the region
- ✓ No extra cost of electricity is generated as it in turn reduces the investment due to self-produced energy
- ✓ The model contributes to the preservative activities conducted for *Cyprinionsemiplotum* by indulging in its culture
- ✓ Feed cost is reduced due to self-manufactured natural feed and also the flexible feeding habit of the *Cyprinion semiplotum* (Assamese Kingfish).
- ✓ High profit expectations due to integration of Aquaculture and agriculture in more than one domain
- ✓ Running water system culture is exclusively practiced in the hilly terrain which increases a risk of diseases if performed in series. This model practices parallel running water system culture, thus, reducing the risk of water spread diseases in the system

B. Weaknesses

- ✓ Extra land is needed than in general to accommodate the wetland in the premise
- ✓ The seeds of *Cyprinion semiplotum* may enter the natural water bodies which may/may not result into an invasive introduction; considering it's an Indian native fish species but still exotic if introduced outside Assam and its neighbouring regions

C. Opportunities

- ✓ Growth of sustainable and eco-friendly fisheries
- ✓ Good market output and reputation
- ✓ Less competition
- ✓ Integrated farming gives an edge in net profit due to culture of *Cyprinus carpio* (Common Carp) together with *Trapa natans* (Water Chestnut/Singhada nut) which relatively reduces the succeeding years' operational cost as compared to first year

D. Threats

- ✓ Tough retail market
- ✓ Low profit margins than general artificially advanced systems of aquaculture

Contribution of the project in transforming rural poverty to prosperity

- ✓ The idea promotes sustainability and conservation of bio resources by taking up the production of an Indian native as well as a highly exploited and vulnerable species. This not only aids nature but also contributes to a good production with low seed costs.
- ✓ It raises awareness among the people in and out of fisheries about minor carps and their conservation too instead of focusing solely on the monetary benefits.
- ✓ It generated employment opportunities in this time of need when people are leaving their homes behind to migrate to cities and towns for livelihoods.
- ✓ We promote the lesser use of artificial chemical-based feed and additives which decreases the input cost.
- ✓ We encourage more new ideas and plans that can be added to this model without any new additional cost or harm to nature.
- ✓ Once rural people are satisfied, it would become a great venture and fisheries will be promoted as a new and evolved profession.
- ✓ Land which was used to build different water treatment plants or was eroded due to pollution would be conserved by our wetland and can be used for agricultural purposes, etc.

A NEW ADVANCEMENT IN FARMER-FRIENDLY RECIRCULATING AQUACULTURE SYSTEMS UTILISING IOT: AN OUTLOOK ON ENVIRONMENTAL SUSTAINABILITY

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Details of Innovation/project

Genesis of the Idea

Recirculating Aquaculture System or RAS, provide constant or controlled condition for growing fishes in adequate manner. RAS are used in home aquaria and for fish production where water exchange is limited and the use of bio filtration is required to reduce ammonia toxicity. This system rears fish at high densities, in indoor tanks with a "controlled" environment. This system is now performing all over the world in large scale. It also gives a major impact in aquaculture fish production. As we know that now a days, culturing of fishes through RAS plays a crucial role in the development of aquaculture sector.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

The flexibility to choose the scale and module is the greatest advantage of this system, where the entrepreneur can measure and control most of the production and marketing related variables.

Objectives of the project

Through this we can able to collect data of previous production, cost, or investment and also the species which are growing according to their required conditions. Each state has different environment conditions so the data of investment, seed maturity is also different. All necessary details will be given to the authorized unit after the fishes grown into marketable size. Likewise, all states give their production data to the central Base Data Units.

Project component and functioning

A. Raspberry Pi
B. Temperature Sensor
C. pH Sensor
D. Turbidity Sensor

Is the project in use?

The project is used in different fields till now.

Target areas of its operation

To maximize the farmers' or entrepreneurs' profit by minimizing losses.

Cost for Implementation and operation of this project

For IOT set-up is around Rs. 6000/-

Monetary benefits to be obtained by farmers through the project

More accuracy and minimum loss

SWOT analysis of the project

A. Strengths: Effective, innovative and profitable
B. Weaknesses: Very Costly
C. Opportunities: Revolutionary Change
D. Threats: Growing of Ban Fishes

Contribution of the project in transforming rural poverty to prosperity

The farmer can easily access the pervious production rate, investment, profit, feeding schedule, sale value, seed maturity, breed, and total project cost. This type of fishing will reduce the extra afford for maintaining record in paper. In smart fishing any farmer from any states or country can easily know and able to apply those techniques in their own farm according to their investment. By the help of this strategy the mortality rate of fishes will decrease. Smart fishing will be a new era for the fish supply. Because every farmer also wants to be sure that they purchase good-quality seeds, and so on. So, smart technology can assist in providing information about the quality of products. This will also allow farmers to track the data about raw material they want to buy. The transparency of a supply chain increases the effectiveness of audits enabling financial institutions and insurance companies to have a clearer insight into operations. Similarly, public administrations would be able to improve their license management and monitoring.

INTEGRATED MULTI TROPHIC ORGANIC AQUACULTURE FOR SUSTAINABLE SOLUTION

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Details of Innovation/project

Genesis of the Idea

The farming community of India is highly diverged with respect to land holdings (Large progressive farmers to small/ marginal farmers) and farming activity (crop cultivation, horticulture, floriculture, animal husbandry and also fisheries activity). Nowadays in rural village areas operating the small farms has become a great challenge due to socio-economic problem, inadequacy of inputs, lack of scientific knowledge and not having proper integration among the available resources etc. Due to all these the productivity and farm income is declining and farmer community is sinking into poverty, indebtedness, and distress. So, In order to safeguard the fish farmers, to provide nutrition security and to fulfil the dream of Hon'ble Prime Minister for doubling the farmers income (on 28th February 2016), 'Integrated Multi trophic Organic Aquaculture for Sustainable Solution', this idea could be a great solution to increase the ultimate farm productivity by using all the tropic level of fish pond with integrating all the locally available resources.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

Aquaculture contributes significantly to the rural economy of most of the Asian and other developing countries by providing part- and full-time occupation to the farmers, fishermen and landless agricultural labours. India, and other developing countries of the South Asian region are endowed with ample water resources in the shape of freshwater ponds, wetland, naturally created lakes etc. Despite having vast water areas these are not optimally utilized. In most of the village pond of India the production is very less due to the over depth of pond (but for commercial fish farming ideal pond depth is 1 to 1.5 m), high organic load, lack of integration between available resources and lack of scientific knowledge for farming of fishes. So, to increase the income of farmers by increasing overall fish production in those village ponds, everyone must focus on optimum utilization of all the tropic level of the water bodies. So, this idea can be a great problem-solving tool for those over depth village ponds, It will also provide a holistic security and additional income to the farmers as different fish species and other aquatic animals and plants can be culture in the same pond by proper utilization of all the tropic levels of ponds. Apart from all these other materials and manures required for farming, all locally available resources can be used. In some extent it will also reduce the burden of input cost.

Objectives of the project

i) This culture system will create balanced systems for environmental sustainability by converting by-products and uneaten feed as input for the harvestable crop

ii) As different type of species cultured together, if any species is unable to provide good production, then other species can give good results, which ultimately compensate the production cost, by this system due to diversification the risk of production can be reduced

iii) Properly managed multi-trophic aquaculture accelerates growth of aquatic organisms without detrimental side-effects. This increases the site's ability to assimilate the cultivated organisms, thereby reducing negative environmental impacts

Project component and functioning

Component

As this model mainly focus on transforming rural poverty to prosperity through sustainable fisheries, so, different types of farming units are combined in a single pond and the major components of this farming system are-

A. **Fish Farming unit:** Seed, feed, manure, lime etc
B. **Cage culture unit:** Bamboo frame, net, stone as sinkers,
C. **Mussel faming unit:** Bamboo poles, ropes, mother pearl mussel
D. **Weed farming unit:** Floating trays made of bamboo and plastic bottles

Functioning: This practice will combine the cultivation of different fed aquaculture fish species such as IMC, catfish (magur, pabda, singhi etc.), freshwater prawn (*M. rosenbergii*), freshwater mussel (*L. marginalis*) and also freshwater weeds (Eg. Marsilea, Ipomoea). As depth is more bottom layer of the pond is not used but it will help to use all the trophic level of the pond. In the cage catfish will be kept, carp will be the out of cages, water spinach kept on floating tray, Marsilea in the pond side.

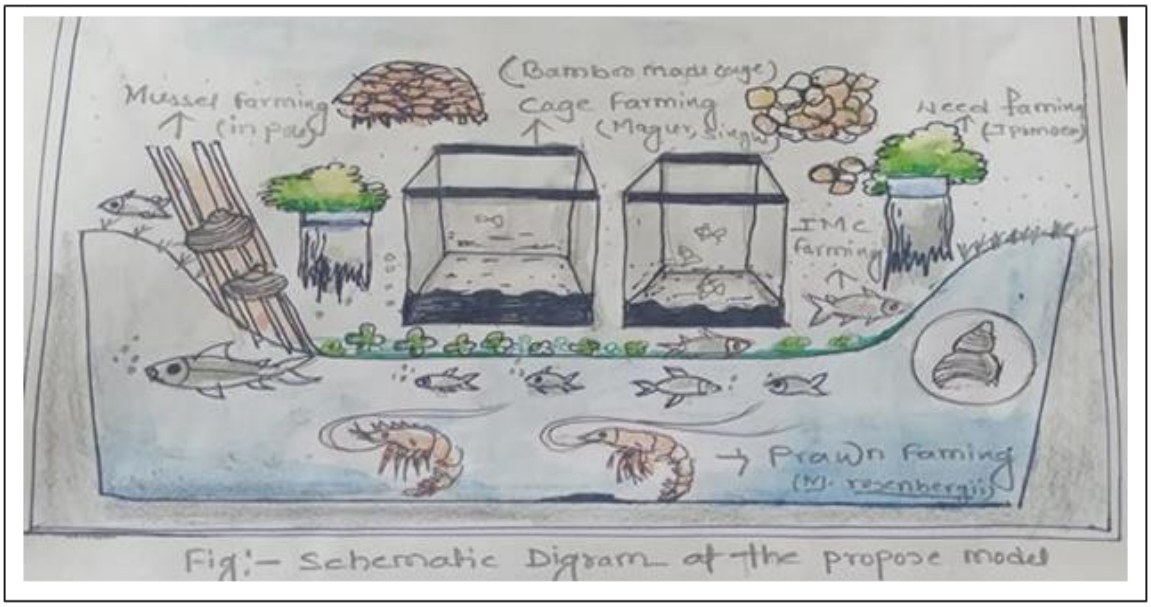

Fig:- Schematic Digram of the propose model

Freshwater mussel will be kept in the pond side through bamboo stick these bamboo stick will act as a hideout for other fishes and periphyton will grow in these bamboo poles which is one of the favourite food items for rohu. Organic waste materials will be generated from the fishes and weeds extracted inorganic waste (nitrogen, phosphorus, carbon), when these different species culture together it also helps to increase the nutrient content in the pond which help to increase the productivity. Organic matter of the pond bottom will be effectively utilized by the freshwater prawn.

Target areas of its operation

i) The ponds of rural areas where the depth is more than required level and organic load is very high
ii) The farms located at the remote corners of the country where transportation is a big task as more interest has been given to the locally available resources
iii) The farmers having domestic animals, this idea can also be used as the waste of the domestic animals (e.g. Cow) can be used as input for culturing fishes
iv) The practice of such idea can enhance the profit margin
v) Implementation of this idea can effectively utilize the total area of the ponds

Cost for Implementation and operation of this project

Economics of the project (Rs/ha/year)(approx.)

Fish farming (carp & Prawn)	Cage farming (catfish)	Mussel farming	Weed farming	Total
450000	300000	50000	30000	30000

Monetary benefits to be obtained by farmers through the project

Fish farming (carp & Prawn)	Cage farming (catfish)	Mussel farming	Weed farming	Total
800000	600000	200000	250000	1850000

So, Total profit from this system is Rs.1020000/ha/yr (approx.)

SWOT analysis of the project

A. Strengths

- ✓ Ecologically sustainable farming model
- ✓ Proper utilization of all the trophic levels of water body
- ✓ Provide additional financial security to the farmers

B. Weaknesses

- ✓ Initial investment is more as compared to other extensive culture system
- ✓ Disease spread
- ✓ Lack of idea for all the farming units
- ✓ Difficulty in netting

C. Opportunities

- ✓ Proper usage of land and other resources.
- ✓ Less waste generation and major group of consumers can be covered

D. Threats

- ✓ Occurrence of diseases in different organisms is of serious concern in this project.
- ✓ Poaching

Contribution of the project in transforming rural poverty to prosperity

In this farming system all the trophic levels of ponds will be utilized properly, this farming system combines different farming units in a single pond so the waste generated from the one unit will act as input for other unit and a diverged variety of crop can be grown in a single pond by using this idea so ultimately it will provide an additional income to the farmer's pocket. For small land holdings farmers, this idea could be a better solution to increase the income.

HARVESTING HORIZON

Raghvendra Katiyar, Sushant Tomar, Jyoti Saroj and Shashank Singh

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Details of Innovation/project

Genesis of the Idea

"Harvesting Horizons" transports us into a future where innovative solutions combat the challenges of land scarcity and the pressing need for sustainable food production. This compelling project delves into the world of multilevel aquaculture farms, where diverse species thrive in a vertical ecosystem, re-defining the possibilities of farming.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

i) Optimal resource utilization
ii) Concerns around water circulation
iii) Waste management

Objectives of the project

The farm becomes a beacon of hope, demonstrating how vertical farming can overcome land constraints and contribute to food security.

Project component and functioning

A. Multilevel farm

The multilevel farm will describe the optimal utilization of all the resources, including sunlight, water, nitrogenous wastes, and gravitational force.

B. Hydroponics based water purifying plant

The hydroponic purification unit shows the way of utilising nitrogen, which is available as a free source in the excreta of various aquatic species that are being cultured in the multilevel farm. This will generate additional income for the farmer as well.

Is the project in use?

No, this project is currently not in use.

Target areas of its operation

The areas like Uttar Pradesh, Bihar and some most populated areas of the world and our nation.

Cost for Implementation and operation of this project

The cost of implementation will be very high due to the construction cost of the multi-storey building. It varies according to the material used for construction and the area.

For one hectare [100/100m] material steel: 20,0000

Concrete: 10,00,000

Monetary benefits to be obtained by farmers through the project

Sl. No.	Investment cost	Rupees in Lakhs
1.	Cost of implementation on ground	20 lakhs
2.	Cost of operation include feed	10 lakhs
3.	Estimated fish sale	40 lakhs
4.	Net profit approx.	10-40 lakh

SWOT analysis of the project

A. Strengths

- ✓ Minimizes use of land' Optimal resource utilization' High profits & Sustainability

B. Weaknesses

- ✓ High investment ; Technology adoption & Labour intensive

C. Opportunities

- ✓ Revolutionize aquaculture as the industrial sector
- ✓ Technical jobs were created at local level

D. Threats

- ✓ Its implementation & Awareness about this modern farming method

Contribution of the project in transforming rural poverty to prosperity

This project will create technical jobs and high production rates in lower land will initiate the development of small-scale fish processing plants, which in the future can lead to form a market in that region. In the long term, the economics of the region will also improve.

FISH MEAL PRODUCTION UNIT IN VILLAGE AREAS

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Details of Innovation/project

Genesis of the Idea

The normal cost of setting up a fish making machine is around 10 lakh not everyone can afford to set up fish meal setup production unit. So, we have decided to work on it and find some technique and machines which are affordable and can easily make fish meal from fish waste. Fish farmers have less quantity of fish waste which can be easily processed small quantity of fish waste. This fish meal production unit as its production capacity is less and affordable. This fish meal production unit will help convert fish waste into fish meal and generate new employment opportunities.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

Due to various factors like low oxygen content, salinity, pH changes and due to other such factors fishes die and farmers throw them away. These dead fishes reduce their income and also create diseases and foul odour. Similarly, in Fish Mandies and Slaughter Houses waste product of fishes and other animal are thrown away which is totally a waste in their eyes. To use this waste and generate income sources we have come up with a new innovation of a "Portable Fish Meal Production Unit". Install various type of machineries which will convert fish waste & slaughter house waste into "Fish Meal" which will be used by farmers as Fish Meal, Poultry Feed and Fertilizer.

Objectives of project

i) Generate employment opportunities
ii) Extra source of income for fish farmers
iii) Reduce garbage
iv) Make value added products.

Project component and functioning

The machines employed in making fish meal from fish waste are small in size and can only process small quantities of fish waste. The machines are simple in operation and have different components. The different components are operated together to make fish meal from fish waste. The output from one machine is handled manually and inserted into another machine. The work of conveyor belt has been eliminated. The various machines employed in this unit are –

A. Storage unit: This unit will contain small compartment for storing fish waste.

B. Cooking unit: This unit will be used for cooking the fish waste.

C. Pressing unit: It will extract the liquid content of fish waste.

D. Drying: This unit will be used to dry the fish.

E. Grinding unit: This unit will be used to convert fish waste into small pieces.

F. Packing unit: This unit will be used to pack final product.

Dead fishes & fish waste are collected from various sources and inserted into cooking machine. The cooking machine cooks the fish & then the cooked fish is inserted into pressing machine. The pressing machine works manually & fish oil and fish meal are separated. As the fish oil will float over the water & it can be filtered easily from there. Now, air blower is used to dry the fish meal & then it is inserted into hammer mill grinder which will convert the fish meal into

powder form. The powder form of fish meal is the cooled manually & we will get the desired fish meal.

Target areas of its operation

Fish farm, village, Hatcheries, fish mandies, slaughter houses

Cost for Implementation and operation of this project

Sl. No	Machine/Equipment	Cost (Rs.)
1	Cooking machine	20,000
2	Pressing machine	10,000
3	Air blower	15,000
4	Hammer mill grinder machine	30,000
5	Thermacol box	649
	Total	75,649

Monetary benefits to be obtained by farmers through the project

Sl. No	Operational Cost (Approx.)	Cost
1	Fish waste cost from farmer-	Rs. 10 per kg
2	Fish waste collected from fish mandies	Rs. 5-7 per kg
3	Cost of operation of machines	Rs. 10-12 per kg
4	Fish meal sold at	Rs. 30-35 per kg

SWOT analysis of the project

A. Strengths

- ✓ Easy to operate
- ✓ Requires less labour
- ✓ Cost effective

B. Weaknesses

- ✓ Not affordable
- ✓ Space problem

C. Opportunities

- ✓ Slaughter house, poultry waste to generate income and employment opportunities
- ✓ Low cost fish waste can be used to make fish meal and fertilizers.

D. Threats

- ✓ Death of fishes on the fish farm and availability of fish waste in fish mandies and slaughter houses.
- ✓ It is not a dependable source of income.

FOSTERING RURAL AQUAPRENEURS THROUGH REVITALIZATION OF DERELICT WATER BODIES INTO AQUACULTURAL POOLS

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ICAR-Central Institute of Fisheries Education, Mumbai-400061

Details of Innovation/project

Genesis of the idea

The genesis of the idea lies in the rural areas of Tamil Nadu, where people in my village actively participate in the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). Through this scheme, water conservation and water harvesting structures are created by local individuals. Unfortunately, these water bodies are often abandoned and left unused, serving solely as storage facilities. However, it is believed that with proper utilization, minimal investment, and effective management, these derelict water bodies can be transformed into profitable aquacultural pools. The integration of fish and duck farming within these neglected water bodies is proposed, as it has been reported to yield a maximum benefit-cost ratio of 3.84. By harnessing these abandoned resources in an efficient manner, the emergence of aquapreneurs can be fostered, thereby uplifting the economic status of rural communities.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

The project aims to address the problems faced by rural areas in fisheries and aquaculture. One of the key issues identified is the lack of awareness among rural communities regarding the potential use of derelict water bodies. By providing comprehensive training programs through Krishi Vigyan Kendras (KVKs) and the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), rural individuals will become aware of the income-generating opportunities associated with these water bodies.

Objective of the project

i) To effectively utilize the abandoned water bodies by establishing collaborations with existing schemes.

ii) To enhance the socio-economic status of rural communities by empowering them to become aquapreneurs.

Project components and functioning

A) Awareness and training Programs: Due to the lack of awareness regarding aquaculture in derelict water bodies, the project will initiate training programs conducted by government entities such as Krishi Vigyan Kendras (KVKs), non-governmental organizations (NGOs), the Fisheries Department in each district, and the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). Individuals genuinely interested in engaging in aquaculture will be selected for these programs.

B) Creation of water conservation bodies: Through the MGNREGS, water conservation bodies will be established to prepare ponds for aquaculture practices. This aspect of the project allows individuals to participate, irrespective of age or gender, as the work involved is unskilled.

C) Pond preparation and common management practices: During the summer months when the water level in the ponds is minimal, various common management practices will be implemented. These practices include applying bleaching powder, constructing partitions, removing weedy plants, implementing netting to eliminate predatory and weedy fishes, and constructing duck houses.

D) Introduction of fish seeds and ducklings: As the monsoon arrives and the ponds begin to fill with water, the Fisheries Department in each district will supply fish seeds to interested individuals, granting them certain concessions. Additionally, juvenile fish and ducklings will be introduced into the ponds. Ducks, known as "moving carbon machines," naturally aerate the water and contribute to pond fertilization through their droppings. In around six to seven months, the ducks and fish will reach table size.

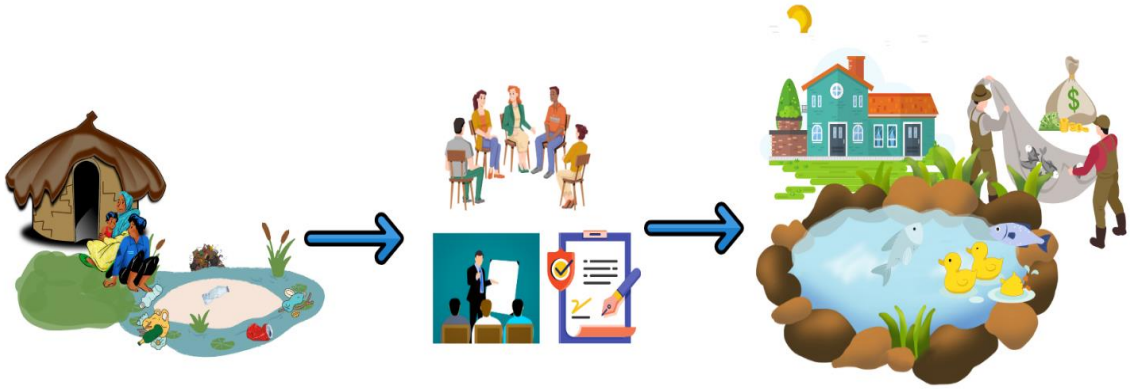
E) Sale of fish, ducks, and eggs: After the culture period, the fishes, ducks, and their eggs will be sold. This phase enables individuals to generate income from their aquaculture activities.

F) Pond drying and preparation for next culture: Following the harvesting of fish and ducks, the ponds will be dried once again in preparation for the next culture cycle.

G) Initial period incentives: During the initial stages of the project, individuals interested in aquaculture may receive concessions when purchasing seeds and feed. This strategy aims to boost their interest and involvement.

H) Leasing-out of derelict water Bodies: Another potential approach is to lease out derelict water bodies to farmers in need who are interested in engaging in aquaculture.

Is the project in use?



No, the project is currently not being practiced.

Target areas of its operation

The target areas of operation for the project are derelict water bodies located in rural areas.

Cost for Implementation and operation of this project

For 1 hectare culture period of 8 months (in Indian Rupees)

Sl.No.	Particulars	Amount	Total Amount(Rs.)
Capital Investment			
1.	Pond construction		(Rs. 2 Lakhs) Mostly done through MGNREGS
2.	Duck house construction	Rs. 50/duck	Rs. 10,000
3.	Feeder for ducks (20)	Rs. 400/feeder	Rs. 8,000
Operating expenses			
1.	Pre-stocking management Lime(200kg/ha) Cow dung (3 to 4 tonnes/ha)	 Rs. 20/kg Rs. 10/kg	 Rs. 4,000 Rs. 30,000
2.	Seeds (5000 fingerlings/ha)	Rs. 5/fingerling	Rs. 25,000
3.	Ducklings (200-300 Chicks)	Rs. 150/duck	Rs. 30,000
4.	Feed for fishes (rice bran and oil cake) Feeding for 8 months	Rice bran Rs. 15/kg Oil cake Rs. 50/kg	Rs. 1,900 Rs. 6,160
5.	Post Stock Management (Fort nightly) Cow dung (500 kg/ha) Single super phosphate (15kg/ha) Urea (10kg/ha)	 Rs. 10/kg Rs. 235/kg Rs. 360/kg	 Rs. 80,000 Rs. 57,600 Rs. 57,600

6.	Feed for ducklings (poultry feed and rice bran) Feeding for 8 months	Poultry feed Rs. 40/kg Rice bran Rs. 15/kg	Rs. 68,600 Rs. 51,450
7.	Miscellaneous (if hapa, injection for ducklings)		Rs. 5,000
	Total		**Rs. 4,05,310 approx. (excluding the cost of land)**

Monetary benefits to be obtained in 8 months (Indian rupees)

Sl. No.	Particulars	Quantity obtained	Per kg/ Per egg	Total amount (Rs.)
1.	Fishes	4000 ton	Rs. 250/kg	Rs. 10,00,000
2.	Duck Eggs	30,000	Rs. 10/egg	Rs. 3,00,000
3.	Duck Meat	700kg	Rs. 500/kg	Rs. 3,50,000
Total (Approx)				**Rs. 16,50,000**

SWOT analysis of the project

A. Strengths

- ✓ Use of unutilized water bodies in a productive way
- ✓ Foster aquapreneurs
- ✓ Boosts rural economy
- ✓ Sustainable contribution to meet fish demand

B. Weaknesses

- ✓ Lack of awareness among rural people
- ✓ Needs sufficient management and motivation
- ✓ Needs cooperation among NGOs, KVKs and Fisheries department

C. Opportunities

- ✓ Increased Aquatic productivity
- ✓ Participation irrespective of gender and age
- ✓ Empowerment of rural farmers and women
- ✓ Judicious utilization of human resources

D. Threats

- ✓ Uncertainty about rain
- ✓ Poaching
- ✓ People may not be interested
- ✓ Entry of predator and weed fishes

UTILIZATION OF TEA LEAF WASTES IN FISH FEED FOR INCREASING PRODUCTION AND PRODUCTIVITY FROM AQUACULTURE

Megha S Vinod and Ashutosh D Deo

ICAR-Central Institute of Fisheries Education, Mumbai-400061

Details of Innovation/project

Genesis of the Idea

The idea got evolved when we got to know about the tea cultivation in Kishanganj that is successfully reaping huge profits and providing livelihood opportunities to the weaker sections of the said place. The very thought of where and how all these processing waste would be disposed keeping in consideration the environmental health, led to the development of such an idea. This led us to think of ways to incorporate this waste into fish feed so that the load on fish feed industry in search of better alternatives to fish meal can be reduced at the same time utilising tea waste in a fruitful manner not damaging the environment which otherwise would have been done.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

i) Tea waste disposal and no cost feed ingredient procurement are the prime objectives.

ii) Suitable alternative feed ingredient which can ensure good nutrient balance as well as acceptability, is the motto of the fish feed industry today, hoping that this project helps the industry in this line.

iii) Integration of tea cultivation with fish farming is yet another valid integrated aquaculture system with zero wastage.

Objectives of the project

The prime objective is to reduce waste dumping and incorporation of any such useful materials in fish feed to serve the need of the industry in producing best quality feed at the lowest possible rate.

Project component and functioning

The components are tea processing waste collected from processing plants, transport facilities to bring it to feed mill, feed mill and its equipment, labourers (it can be women), field trials and demonstration.

Target areas of its operation

It will be operated in those areas where huge tea plantations are present. This technology would help fish farmers in this zone.

Contribution of the project in transforming rural poverty to prosperity

The farmers will benefit by getting a good fish feed ingredient that can contribute to overall growth, survival and development. Since this ingredient is obtained free of cost, there is cost effectiveness in preparing and using such a feed. As feed forms the maximal cost part, a relief in this will help farmers a lot. Better production will thereby contribute to better income in alleviating rural poverty.

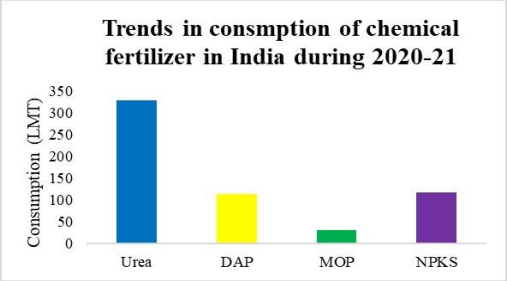
SUKHET MODEL: A WASTE TO WEALTH APPROACH

Manish Kumar[1] and Yashwee[2]
[1]College of Fisheries, Kishanganj-855107
[2]ICAR- Central Institute of Fisheries Education, Mumba-400061

Details of Innovation/project

Genesis of the Idea

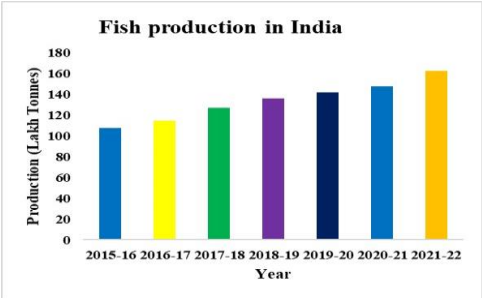
In India about 70% of the population engaged in agriculture. It contributes about 17.5% of the GDP. On an average India consumed 500LMT of fertilizer per year in last 10 years. The most consuming fertilizer are Urea, DAP, MOP and NPKS and trend a as follows:



Fisheries sector:

Provide income to more than 28 million people. About 17% of agriculture export of our country is fish and fish products.

Fish waste generated in India about is 2 metric million tons waste per year



Harmful effect of chemical fertilizer

- ✓ Soil acidification
- ✓ Ground water pollution
- ✓ Harmful effect of fish waste

Improper fish waste disposal and their subsequent decomposition releases organic materials that impose a deleterious impact on aquatic environment.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

Through this project we can develop a fish waste into fertilizer that can help farmer to improve fertility of land and relief from dependence from chemical fertilizer its concept was making farmers self-resilient.

Method of Liquid fertilizer

Objective of project

Purpose of Sukhet Model: A Waste to Wealth Approach. Establish the waste management model of Sukhet. Present model is an eco–friendly and pollution free model enhancing the cleanness drive in the village. The management in Sukhet model addressing the cooking fuel issues of village by supplying gas cylinder in lieu of biodegradable waste .It promote not only use of clean energy but also cleaning of the surrounding .The collected fish waste into fertilizer management at KVK and supplied them to improve the soil heath and safe disposal of non-biodegradable waste .It is therefore become one stop solution for waste and soil fertility management.

Project component and functioning

A. Fish Waste B. Plastic Bucket & C. Brown Sugar /Molasses

SWOT analysis of the project

A. Strengths

- ✓ Generate employment & Generate high revenue

B. Weaknesses

- ✓ Not any weakness in this project

C. Opportunities

- ✓ High revenue generation
- ✓ High employment generation
- ✓ One stop solution for waste to wealth approach

AQUACOSMOS

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Details of Innovation/project

Genesis of the Idea

Aquacosmos is the plan to increase the sustainability, production and tourism in the same confined area. In this process of setting up techniques from the conventional method we also gear up with advanced methods. We are showing various aspects of the fisheries that how the fishes are caught in traditional way and with the advancement of the technologies how these methods of catching the fish are changing, how that we adopt new techniques and technologies like raceways, biofloc system aquaponics, RAS, ornamental culture, angling unit i.e. sport fishing, etc.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

This project is totally trying to cover max. aspect regarding fisheries. On one hand it will provide quality seed for nearby fish farmers via its hatchery setup. On the other hand, it will provide training to the fish farmer and laymen too. This will surely decrease the losses and increase their productivity. Thus their lifestyle will be changed gradually.

Objectives of the project

Where could you get a platform, where different aqua unit sums up to sustainability, production, tourism, vocational training or angling unit etc? Aquacosmos is an aqua innovative park which is aimed to develop a new niche for fisheries sector i.e. Blue Economy. It is a plan for the introduction of new and improved services for farmers to establish an aqua hub. And it can also be considered as a business management plan. It is a revolutionary idea for the flourishment of interest and growth of fisheries sector.

Project component and functioning

AQUACOSMOS is an aqua innovative park which is aimed to develop a new universe for fisheries sector i.e. blue economy. At present in our country VC national parks had been the centre of conservation of endangered species since many years. Keeping this in mind our aim is to create such an environment which not only conserve the endangered species of fishes but also increase sustainability production tourism as well as vocational training etc. in this aquaculture system there is aim of small scale production of various varieties of fishes but it is not an experimental process. This system will not only increase the knowledge of the farmers and trainers but also provide opportunity of employment for many unemployed peoples. It is an economical viable plan to enhance tourism with respect to fisheries. Though it is a little bit expensive phenomena but we can take help of government undertakings or can start with partnership among the people. In this setting up techniques from the conventional method we also gear up with advanced methods. We are showing various aspect of the fisheries that how the fishes are caught in traditional way and with the advancement of the technologies how these method of catching the fish are changing, that how be adopt new techniques and technologies like raceways, biofloc system aquaponics, RAS, ornamental culture, angling unit, etc. Environment will be sustainable with zero pollution.

Reason of setup

Aquacosmos is helpful for providing effective and authentic knowledge for farmer, attraction toward people fisheries sector and creating interest of common people towards fisheries or aquaculture, for commercialization of fisheries.

Target areas of its operation

Till now fisheries have mainly confined to fisherman, fisheries scholars, teachers, fish eater community and worker of fish sector only but our aim is to establish Aquacosmos and attract people from children to old age people towards the world of fish. The main beneficiaries are the fish farmers.

Cost for Implementation and operation of this project

The approximate cost will be almost 2 crore.

Monetary benefits to be obtained by farmers through the project

Farmers will get good quality seed for culture practices & free consultancy by fisheries expert, the establishment of an aqua park can lead to the creation of jobs in the surrounding area & provide free marketing of local product of village.

SWOT analysis of the project

A. Strengths

- ✓ Generate a good capital
- ✓ Increase tourism in rural area

B. Weaknesses

- ✓ Initial cost of the project is quite high
- ✓ Development of the project will be time taking

C. Opportunities

- ✓ Provide training to fish farmers & entrepreneurs with practical knowledge & employment to local people as well as fisheries graduate

UTILIZATION OF WATER-LOGGED SALT AFFECTED LANDS OF SOUTH-WEST DISTRICTS OF PUNJAB FOR UPLIFTMENTOF SOCIO-ECONOMIC STATUS OF DEBIT RIDDEN FARMERS

Prapti Sudan, Sahil and Prabjeet Singh
College of Fisheries, GADVASU, Ludhiana, Punjab – 141004

Details of the Project

Genesis of the Idea

Punjab has about 0.15 million ha salt affected and waterlogged lands in six South-West districts viz., Fazilka, Ferozepur, Sri Muktsar Sahib, Bhatinda, Faridkot and Mansa (CSSRI, 2010; Singh et al., 2019; Singh et al., 2021). Due to the problem of soil salinization, these areas are unproductive, zero earning lands and unfit for any agricultural or livestock farming practice.

Litopenaeus vannamei (Vannamei shrimp), with a total production of 4.97 million tonnes, vannamei shrimp constitutes 6.6% and more than 10% of global aquaculture in terms of quantity and trade value, respectively (FAO 2022, Sudan et al., 2023). Because of its high global demand, export potential and low salinity tolerance of vannamei shrimp, inland saline areas, previously considered wastelands, have emerged as attractive destinations for shrimp farming of inland saline areas of Punjab (Singh & Ansal 2021, Sudan et al., 2023). The development of shrimp farming in these areas has transformed the socio-economic status of farming community, which otherwise were forced to work as daily wagers or farm laborers. Therefore, now the farmers of Punjab are looking forward to a brighter future, through an effective and optimized utilization of salt affected lands to support their food and livelihood security(Ansal & Singh, 2019).

Problems of rural areas in fisheries & aquaculture which are addressed through this project

Soil salinization is a serious global threat affecting the crop outputs, severely impacting the agricultural productivity and rural economies of many developing countries including India (Ansal and Singh, 2019, Singh et al, 2020). Punjab, due to unique north-east to south-west drainage topography, the south-west low-lying and poorly drained regions have high accumulation of salts in soils. Poor rainfall and leaching of salt also contribute to the soil salinization (Ansal & Singh, 2019; Kumar & Sharma, 2020).

i) The intensive irrigation of agricultural lands with underground saline water without the adequate provision of drainage (natural or man-made), has led to another serious problem i.e., water-logging or the rise of the underground water table and hence, over the years fertile lands of these areas has transformed into non-productive wastelands (Ansal and Singh, 2019).

ii) The task of pumping out the ground water which is the only measure to control the soil salinization is a critical job; and it is only possible through evapo-transpiration, which itself is a very costly process and beyond the reach of poor and marginal farmers in these areas (Pathak et al*,* 2013, Kumar & Sharma, 2020).

iii) Thus, development of region specific and viable aquaculture technologies is need of the hour to overcome the dual problems of salinity and water-logging as well as for economic upliftment of rural societies in these areas.

Objectives of the Project

i) Validity of Technology through demonstration in selected districts.

ii) Doubling farmers' income through this technological intervention.

iii) Skill developments of farmer through training.

Project component and functioning

Shrimp farming involves the cultivation of shrimp in controlled environments such as ponds or tanks. Following are the main components and its functioning:

A) Shrimp Hatcheries: Hatcheries are responsible for breeding and producing shrimp larvae, also known as nauplii. These facilities provide the controlled conditions necessary for the hatching of shrimp eggs and the initial growth stages of the larvae.

B) Nursery and quarantine facilities: Before releasing to the production pond, the shrimp larvae are transferred to nursery facilities. These facilities provide a suitable environment for the post-larvae stage, where the shrimp undergo rapid growth before being transferred to grow-out ponds or tanks. Additionally, nurseries often serve as a quarantine area where the shrimp undergo a quarantine procedure to ensure they are free from diseases or pathogens before being transferred to the main farm system.

C) Grow-out Ponds or Tanks: Shrimp are typically grown in large ponds or tanks that are carefully managed to provide the optimal conditions for growth. Ponds can be either earthen or lined with plastic to hold water. Water quality, temperature, salinity, and oxygen levels are monitored and adjusted as needed to ensure healthy shrimp growth.

D) Water Management Systems: Shrimp farming requires effective water management system which includes aerators, filters, and water circulation systems to maintain oxygen levels, waste removal and control diseases to maintain proper water quality and environmental conditions.

E) Feed storage unit: Proper ventilation should be ensured to prevent the feed from spoilage.

F) Foot dips and Hand washing: This biosecurity protocol should be included at the entrance of the farm in order to prevent the introduction of pathogens by ensuring that personnel's footwear and hands should be disinfected before entering the farm.

G) Environmental Sustainability: Sustainable practices are essential in shrimp farming to minimize the environmental impact. This includes efficient utilization of water and energy, responsible waste management, Therapeutic and prophylactic measures for disease prevention and management, habitat conservation and the use of environmentally friendly practices.

Target areas of its operation

i) Farmers from zero earning salt affected and water-logged waste land

ii) Entrepreneurs interested in shrimp farming

Cost for implementation and operation of this project

Cost Benefit ratio = 1:1 (Net profit is expected is approx. 4 lakhs per acre per crop)

Monetary benefits to be obtained by the farmers through the project

i) Utilisation of zero earning waterlogged salt affected non-productive/ water resources.

ii) Skilled development of farmers through training and demonstration

iii) Development of complete package of practices for shrimp farming in inland saline areas of Punjab.

SWOT analysis of the project

A. Strengths

- ✓ **Saline Land Availability:** Some regions of Punjab have saline land that is suitable for shrimp farming. Utilizing this land can provide an opportunity to turn around underutilized areas for productive shrimp cultivation.
- ✓ **Growing Demand for Shrimp:** Globally, shrimp is one of the most popular seafood products. Its increasing demand creates opportunity for the farmers to tap into lucrative domestic and international markets, thereby generating income and economic growth.
- ✓ **Suitable Climate and Water Resources:** Punjab has a warm climate, which is favourable for shrimp farming. Additionally, the availability of saline water sources such as ground water or seawater can provide a sustainable water resource for shrimp cultivation.

B. Weaknesses

- ✓ **Lack of Experience and Knowledge:** Shrimp farming is a specialized field that requires technical expertise and knowledge. Punjab farmers have limited experience and familiarity with shrimp farming techniques, thus creates a challenge in adopting and implementing successful farming practices.
- ✓ **Limited Infrastructure and Support Systems:** Good infrastructure and support systems such as hatcheries, water quality laboratories, feed suppliers, processing facilities and market links are underdeveloped or absent in this region. The lack of these essential components can hinder the growth and success of the shrimp farming industry.
- ✓ **Lack of Supply chain and Domestic market:** One of the weaknesses in the shrimp industry specific to the Punjab region is the lack of a well-established supply chain and a strong domestic market. This weakness presents unique challenges for shrimp farmers in Punjab and can hinder the growth and profitability of the industry within the region.

C. Opportunities

- ✓ **Diversification of Agricultural Activities:** Integrating shrimp farming with existing crops or livestock contribute to income stability and reduce dependence on traditional agricultural practices.
- ✓ **Government Subsidies:** Governments often provide direct financial assistance to shrimp farmers, which can be in the form of grants or subsidies may also be allocated for the development of necessary infrastructure. This financial aid helps farmers cover various operational costs such as pond construction, purchase of shrimp fry, feed, equipment, and other necessary inputs.
- ✓ **Employment and Rural Development:** The industry can create jobs in farming, processing, transportation, and other supporting sectors, resulting in economic growth, rural development and poverty alleviation in the region.
- ✓ **Sustainable and Zero Waste Practices:** Implementing efficient water management, waste recycling and nutrient capture systems minimizes environmental impact but also enhances the long-term viability of shrimp farming.

D. Threats

- ✓ **Disease Risks:** Shrimp farming is susceptible to various diseases that can cause significant losses if not managed properly.
- ✓ **Regulatory and Policy Challenges:** Shrimp farming is subject to regulations and policies governing water usage, environmental protection, and food safety standards. Compliance with these regulations can be a challenge for farmers, especially if the regulatory framework is not well-established or accessible.
- ✓ **Market Volatility and Competition:** The shrimp market is subject to fluctuations in demand, pricing, and consumer preferences. Farmers of Punjab faces competition from established shrimp farming regions and must adapt to market dynamics to remain competitive.

Contribution of the project in transforming rural poverty to prosperity

Shrimp farming has the potential to contribute to transforming rural poverty into prosperity for shrimp farmers in several ways:

- ✓ **Economic Opportunities:** It creates employment for local residents, both in direct farming activities and in associated sectors such as hatcheries, feed production, processing, and transportation. This generates income and improves livelihoods, thereby lifting people out of poverty.
- ✓ **Income Diversification:** Along with other agricultural activities, shrimp farming can be done, adding another source of revenue. This can increase overall household income and stability and even lessen reliance on a particular crop.
- ✓ **Value Chain Development:** As the shrimp sector expands, it creates opportunities for small-scale entrepreneurs to establish businesses that support the industry. This includes supplying inputs, transportation services, equipment, and other related products and services, which promotes economic development in rural areas. Also, leads to the growth of a wider value chain, which includes processing, packing, and export, as a result.
- ✓ **Technology Transfer and Knowledge Sharing:** Farmers are given improved methods for disease control, water management, feed management, and production efficiency through the transfer of information and skills. The productivity and profitability of shrimp farming are increased through access to technology and training, which raises income and wealth.
- ✓ **Infrastructure Development:** Infrastructure not only supports shrimp farming but also benefits the rural community by improving access to amenities and services. This includes the construction of ponds, water management systems, hatcheries, processing facilities, and transportation networks.
- ✓ **Market Access and Export Potential:** Shrimp farming provides opportunities for small-scale farmers to access domestic and international markets. The export-oriented nature of the industry enables shrimp farmers to access higher-value markets, resulting in increased profits.
- ✓ **Social Development:** Farmers' ability to invest in education, healthcare, and improved living conditions for their families enhancing the overall well-being of the community

UTILIZATION OF BLACK SOLDIER FLY (BSF) IN FISH FEED (BIO-WARRIORS FOR FISH-FARMERS)

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Details of Innovation/project

Genesis of the Idea

Due to overutilization of fish-based feed in aquaculture industry, the amount of wild fish catches is declining due to overfishing and anthropogenic activities. Due to excessive demand, excess of fishing, fish oil shortage and high expense (price of fish feed is increasing) and thus there is need to find the substitute. Insect meal (BSF) is the best substitute to fish meal. BSF meal has protein (30 – 60%) that incorporates essential amino acids, vitamin and minerals.

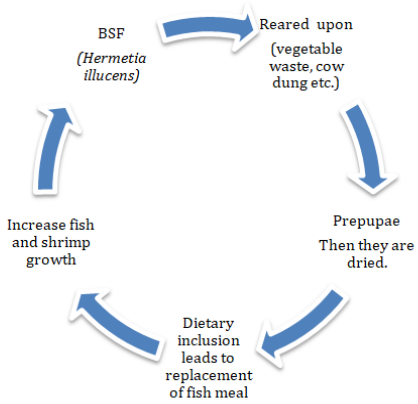
Problems of rural areas in fisheries & aquaculture which are addressed through this project

This project focuses upon providing the solutions to high feed cost, declining of fish species, generating income for fish farmers, nutrient requirement of cultured fishes and utilization of waste for sustainable development.

Objective of project

The project's objectives include-

i) Decrease in feed cost
ii) Increasing fish population
iii) Generate more income for fish farmers
iv) Achieve sustainable development goals
v) Utilize waste sustainably



Project component and functioning

A) Black Soldier Fly
B) Reared over vegetable waste, cowdung etc.
C) Production of prepupae and drying of prepupae
D) Dried prepupae introduced in dietary inclusion
E) Given as feed to fish and shellfish

Is the project in use?

No, the project is currently not in use.

Target areas of its operation

i) Decrease in feed cost
ii) Increasing fish population
iii) Generate more income for fish farmers
iv) Achieve sustainable development goals
v) Utilize waste sustainably

SWOT analysis of the project

A. Strengths and Opportunities

- ✓ Decrease in feed cost and generate more income for fish farmers
- ✓ Increase fish production and achieve SDGs
- ✓ Utilize waste sustainably

B. Weaknesses and Threats

- ✓ Acceptance of insect meal fed fish by consumers

Contribution of the project in transforming rural poverty to prosperity

Project focuses upon the cutting down the feed cost which is major achievement in terms of aquaculture prosperity. For generation of BSF meal a nominal amount is needed that is affordable by fish farmers. Farmers can also culture BSF and sell it to the industries. These bio warriors for fish farmers will help to generate surplus income and thus it will help them in transforming rural poverty to prosperity.

MULTI-ENTERPRISE FLOATING IMTA FARM IN CHAUR AND MAUNS

Yashwee

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Details of Innovation/project

Genesis of the Idea

The concept for this project came from integrated multitrophic aquaculture systems and floating farms, two aquaculture practices. The main goal, in keeping with the competition's theme, was to present a solution for underprivileged farmers who cannot afford to adopt highly advanced aquaculture farming methods. This concept was developed with the following considerations in mind: utilising floodplain wetlands in rural areas; utilising less land to create multiple enterprises; lowering the cost of feed since 60% of the input cost for aquaculture comes from the cost of feed; and utilising natural resources as input to make this technology affordable for farmers.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

This project primarily addresses issues like a lack of capital to establish high-tech aquaculture methods, high feeding costs, a lack of employment, ignorance concerning utilization of floodplain wetlands, landlessness among poor farmers, a lack of farmers' willingness to adopt modern aquaculture farming techniques, etc.

Objective of project

This project's goal is to generate wealth in rural areas, in keeping with the competition's theme. By modifying farmer's conventional methods of farming and by adding minimum input, low-income farmers can launch their own multi-enterprise business. High-value, fast growing fish species like Carps, Tilapia and Catfishes can be raised by farmers. Additionally, they can establish their own farm atop a body of water and incorporate horticulture, poultry, duck, shellfish, and other farming practices.

Project component and functioning

A) Carp culture system unit
B) Ren method for the culture of mollusc species
C) Horticulture unit
D) Duck farming unit

Carnivore fish that demand a lot of protein in their diet can be raised in bamboo cages. Bamboo catwalks or cages can be used as racks to create mollusc culture units for bivalve or gastropod species. These bivalve species can grow to 8–10 cm in 6 months, they can be used to make high protein meals. Additionally, this bivalve cultivation system is minimal risk culture system. Furthermore, due to the intensive nature of this sort of aquaculture, these filter feeder animals can aid in maintaining the water quality of a body of water. The catwalk of a bamboo cage can be used to build a duck farm unit. Ducks can give aeration, and their excrement aids in fertilising water bodies. Products from horticulture such as vegetables, citrus fruits, climbers, water spinach, and many other aquatic plants can be grown on this floating farm. For example, some aquatic plants such as Ipomea, which may be cultivated and utilised as food for humans as well as for phytoremediation in water body. This farm is a low input culture system made by modifying traditional means of farming. And farmers can utilize a single water body for multiple purposes.

Target areas of its operation

This project focus areas include raising fish with varied feeding habits in the same pond, feeding carnivore fish high protein diets, integrated farming entirely in water, and treating water by raising filter feeders and by growing plants that contribute in phytoremediation.

Cost for Implementation and operation of this project

One time installation cost**-** Rs. 50000 Variable cost-Rs.20000

Monetary benefits to be obtained by farmers through the project

2 cycles per year Net profit- 4 lakhs per year

SWOT analysis of the project

A. Strengths

- ✓ Low input needed
- ✓ Economically feasible

- ✓ Environment friendly
- ✓ Low land requirement
- ✓ Multi-species culture
- ✓ Source of livelihood for farmers
- ✓ Source of high protein diet
- ✓ Increased farm productivity
- ✓ Use of flood prone areas
- ✓ Self production of feed and fertilizers

B. Weaknesses

- ✓ Crop should be protected from predators
- ✓ More labour input
- ✓ More management required
- ✓ Require cage construction
- ✓ Poaching possibility

C. Opportunities

- ✓ Can generate employment
- ✓ Can contribute to women empowerment
- ✓ Integration of aquaculture, Agriculture and Animal husbandry

D. Threats

- ✓ Conflicts in use of water bodies
- ✓ Public perception of fish production
- ✓ Predator invasion

Contribution of the project in transforming rural poverty to prosperity

Through the supply of food with a high nutritional value, money, and employment, these can help to alleviate food insecurity, malnutrition, and poverty. This provide greater access to water, improved management of natural resources, reduced danger of monoculture production failure, and higher farm sustainability. This model of aquaculture system can reduce external costs, such as feed and fertilizers, allowing farmers to intensify production.

RACEWAY MINI TURBINE

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Details of Innovation/project

Genesis of the Idea

The Fish Farm Hydroelectric Generator Project endeavours to harness renewable energy by leveraging the natural flow of water in raceway farms for the generation of electricity. This innovative approach not only addresses the imperative for sustainable energy sources but also advocates for eco-friendly practices within the aquaculture industry, particularly focusing on raceway cultivable species. As a fourth-year student, undertaking a visit to the raceway trout farms situated in the rural and backyard sector of Jammu and Kashmir, I encountered a glaring deficiency: the conspicuous absence of electricity. These farms, situated in remote locales, suffer from the lack of a dependable power supply, posing a considerable hurdle to their operational requirements.

Regrettably, due to the unavailability of a reliable power source, farmers in these regions have shown reluctance in embracing modern equipment and technological advancements. The additional costs associated with power consumption dissuade them from embracing these tools, thereby impeding their ability to optimize operations. However, a compelling solution presents itself - harnessing the kinetic energy of flowing water to create a mini turbine capable of generating electricity. This novel approach would yield sufficient energy to power the farm's essential equipment and cater to the electricity demands of smaller household units with lower power requirements.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

The provision of a consistent and cost-free power supply year-round holds the potential to bestow significant benefits upon farmers engaged in raceway aquaculture systems. Such a power supply would not only enable the operation of small household units but also foster self-reliance and sustainable farming practices. Moreover, it would facilitate improvements in the quality of life for farmers, while offering the means to store fish without incurring any additional costs, courtesy of the power generated by the system. Major uses of power supply in farms-

i) Lighting
ii) Operation of small pumps
iii) Operation of communication equipment
iv) Installation of automated feeding and parameter devices

Objectives of the project

i) Enhance Farm Productivity and Efficiency: The availability of a reliable power source can significantly enhance farm productivity and efficiency. By powering farm equipment, and other low wattage essential devices, the project aims to enable farmers to optimize their operations, automate certain processes, and potentially introduce advanced technologies for monitoring and control.

ii) Improve Livelihoods and Quality of Life: By providing a consistent and cost-effective power supply, the project aims to improve the livelihoods of farmers engaged in raceway trout farming. Access to electricity for small household units and fish storage facilities can enhance the overall quality of life for farmers, reduce operational costs, and enable them to utilize their resources more effectively.

iii) Address the Need for Sustainable Energy Sources: One of the primary goals of the project is to meet the demand for sustainable energy in raceway trout farms, particularly in remote areas. By providing a reliable and renewable power source, the project aims to address the electricity requirements of these farms, enabling them to operate efficiently and sustainably.

iv) Harness Renewable Energy: The project aims to utilize the natural flow of water in raceway farms to generate electricity, effectively harnessing renewable energy sources. By tapping into this sustainable resource, the project seeks to reduce dependence on non-renewable energy and contribute to a cleaner and greener energy mix.

Overall, the project aims to contribute to the development of sustainable aquaculture practices, improve energy access in remote areas, and promote the adoption of eco-friendly technologies within the raceway trout farming sector.

Project Components and functioning

The equipment works on the flow of the water used in raceways and can be constructed with household products as well as can be taken to an industrial form for bigger better production of electricity and equipped with batteries and additional things to expand the resourcefulness of the project .The equipment is a simple turbine which works on the principle of kinetic energy of water falling from a certain height. The products required are listed below-

i) Generator Motor: This is the key component that converts mechanical energy into electrical energy. It can be an AC or DC motor, such as a repurposed washing machine motor. The rotation of the motor is driven by the water turbine.

ii) Water Flow Fan: This is the turbine itself, which is designed to harness the energy of the flowing water. The water flow causes the fan blades to rotate, transferring mechanical energy to the generator motor.

iii) Belt Drives or Chain Drives: These are mechanisms used to connect the water flow fan to the generator motor. They transmit the rotational motion from the turbine to the generator, allowing the motor to generate electricity.

iv) Armature Shaft: This is the shaft connected to the water flow fan, and it rotates along with the fan blades. The rotational motion of the shaft is transferred to the generator motor via the belt or chain drive.

v) Wires: These are used to connect the output of the generator motor to the desired electrical load or storage system. The generated electricity can be used to power various devices or stored in batteries for later use.

vi) Inverter Battery: If you want to store the generated electricity, an inverter and battery system can be added to the setup. The inverter converts the DC output of the generator motor into AC power, which can be used to charge the battery. The stored energy can then be used when the turbine is not producing electricity, such as during low water flow or at night.

Target areas of its operation

The target areas of operation for the Fish Farm Hydroelectric Generator Project can include various regions where raceway farms for cultivable species, such as trout, are prevalent. The specific areas can be determined based on several factors, including:

i) Geographical Suitability: The project would ideally focus on areas with suitable water resources, such as rivers or streams that have consistent and reliable water flow throughout the year. These areas should be conducive to the installation and operation of hydroelectric generators.

ii) Rural and Remote Locations: The project can primarily target rural and remote regions that lack access to a reliable power supply. These areas often face challenges in sourcing electricity and can benefit significantly from the implementation of renewable energy solutions.

iii) Aquaculture Hubs: Regions with a significant concentration of raceway farms and a thriving aquaculture industry would be the ideal target areas. This includes areas where raceway trout farming is a prevalent practice and holds economic significance.

iv) Energy-Intensive Farming Operations: The project can focus on raceway farms that require a substantial amount of energy for various operations, including aeration, water circulation, temperature control, and other equipment-dependent activities. Targeting farms with higher energy demands can maximize the impact of the project.

v) Areas with Government Support: Regions where there is government support and initiatives promoting renewable energy adoption, sustainable aquaculture practices, or rural development can be prioritized for the project. Government incentives and policies can facilitate the implementation and scalability of the hydroelectric generator project.

Cost for Implementation and operation of this project

The cost of the hydroelectric turbine system can indeed vary based on factors such as size, water flow rate, and the amount of electricity it can generate. The estimates you provided are approximate and can give a general idea of the cost range for different-sized units. However, it's important to note that these figures are based on the information provided and may vary depending on specific factors and local market conditions. For a small unit that can power two to three bulbs, with a minimal cost of 5-6 thousand rupees, it suggests a basic setup with lower power output. This type of system would typically have a smaller turbine, a lower-capacity generator motor, and fewer electrical components. On the other hand, a larger unit capable of charging three 105Ah inverter batteries in a day, with an

estimated cost of 25-30 thousand rupees, indicates a more powerful system. It would require a larger turbine, a higher-capacity generator motor, and additional components such as an inverter and batteries for energy storage. If you opt for heavier and more advanced machinery to create a more robust and reliable unit, the initial cost will likely be higher. This could include components like more efficient turbines, higher-quality generator motors, advanced control systems, and improved electrical connections. It's important to consider that the estimates provided are rough figures and actual costs can vary based on factors such as geographical location, availability of materials, labor costs, and the level of customization required for the specific project.

SWOT analysis of the project

A. Strengths

- ✓ **Renewable Energy Source:** The project harnesses the natural flow of water, a renewable energy source, providing a sustainable and environmentally friendly power generation solution.
- ✓ **Cost Savings:** By utilizing hydroelectric power, the project can potentially reduce or eliminate energy costs for raceway farms, leading to significant cost savings for farmers.
- ✓ **Increased Productivity:** Access to a reliable power supply can enhance farm productivity, allowing for the implementation of advanced technologies, automation, and improved livestock management practices.
- ✓ **Environmental Benefits:** The project promotes eco-friendly practices, reducing carbon emissions and dependence on non-renewable energy sources, thus contributing to environmental sustainability.
- ✓ **Potential for Revenue Generation:** Excess electricity generated by the project can be sold back to the grid or neighbouring communities, providing additional revenue streams for farmers.

B. Weaknesses

- ✓ **Initial Investment:** Setting up hydroelectric generators requires an initial capital investment, which may pose a financial challenge for some farmers or farm owners.
- ✓ **Site Specificity:** The project's feasibility is dependent on suitable water resources and farm locations that provide sufficient water flow to generate significant electricity.
- ✓ **Environmental Considerations:** Careful assessment and management are required to ensure the project does not negatively impact local ecosystems, fish populations, or water resources.

C. Opportunities

- ✓ **Government Incentives and Support:** Governments often provide incentives and support for renewable energy projects, which can help alleviate the initial investment burden and accelerate project implementation.
- ✓ **Partnerships and Collaborations:** Collaborating with energy agencies, aquaculture associations, and research institutions can enhance knowledge sharing, access to funding, and technical expertise.
- ✓ **Replicability and Scalability:** The success of the project can inspire similar initiatives in other regions, leading to the widespread adoption of fish farm hydroelectric generators in the aquaculture industry.

D. Threats

- ✓ **Regulatory Challenges:** Compliance with regulations and permits related to water usage, environmental impact, and electricity generation may pose challenges and delays.
- ✓ **Technical Limitations:** The effectiveness of hydroelectric generators may be affected by variations in water flow, seasonal changes, and potential maintenance requirements.
- ✓ **Economic Viability:** The economic feasibility of the project depends on factors such as energy prices, market demand for raceway cultivable species, and the overall profitability of the aquaculture industry.

Contribution of the project in transforming rural poverty to prosperity

The Fish Farm Hydroelectric Generator Project has the potential to contribute to transforming rural poverty into prosperity through several avenues:

- ✓ **Economic Empowerment:** By providing a reliable and cost-effective power supply to raceway farms in rural areas, the project enables farmers to enhance their productivity and efficiency. With access to electricity, farmers can adopt advanced technologies, automate processes, and improve livestock management practices. This can lead to increased production, higher yields, and improved profitability, thereby lifting farmers out of poverty and creating economic empowerment.
- ✓ **Sustainable Farming Practices:** The project promotes eco-friendly and sustainable farming practices by utilizing renewable energy sources. By reducing dependence on non-renewable energy and minimizing carbon emissions, farmers can contribute to environmental conservation and meet the growing demand for sustainable agricultural products. This can open doors to premium markets and enhance the value of their produce, thus improving income potential and overall prosperity.
- ✓ **Diversification of Income Streams**: The excess electricity generated by the hydroelectric generator system can create opportunities for farmers to diversify their income streams. By selling surplus power to the grid or neighboring communities, farmers can generate additional revenue sources beyond their core farming activities. This diversification reduces reliance on a single income stream and increases financial stability, contributing to long-term prosperity.
- ✓ **Infrastructure Development:** The project involves the establishment of power transmission and distribution infrastructure to connect the hydroelectric generator system to farms and nearby communities. This infrastructure development not only facilitates the supply of electricity but also opens doors for further economic activities, such as small-scale industries, agro-processing units, and rural electrification initiatives. These developments can spur economic growth, create job opportunities, and uplift the standard of living in rural areas.
- ✓ **Knowledge and Skill Enhancement:** The implementation of the project necessitates knowledge sharing, technical expertise, and capacity building initiatives. Training programs and workshops can be organized to educate farmers on sustainable practices, efficient energy utilization, and advanced technologies. By enhancing the knowledge and skills of farmers, the project empowers them to adopt innovative practices, improve productivity, and explore new opportunities, leading to improved livelihoods and prosperity.

ECO FARMING: LIFE TOWARDS SUSTAINABILITY

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Details of Innovation/project

Genesis of the Idea

Food and Nutrition insecurity is an evident sign of poverty in developing countries. The capture fisheries sector contribution is inadequate to meet the needs of growing human population; hence there is a need for sustainable aquaculture production technologies to bridge the huge differences between the demand and supply. In, all over the world we have already expanded the utilization of land and water resources, reaching the heights of anthropogenic exploitation. The arable land has been already white washed with the excess usage of insecticides and pesticides to grow more and more nutritious food. The water resources have been even deadly polluted by industrialization and heavy aquaculture systems. Thus, there is a huge demand of sustainable aquaculture system that can solve our problems without damaging the environment. In the advent of aquaculture sector, 60% of the input cost is only incurred by the feed. Thus, making it an important index in raising the price of aquaculture products. Thus, Eco Farming is a boon to cater the needs of Fish farmers by mitigating the huge cost of Feed.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

i) This Farming System is easy and simple. Hence, it can be easily adopted.
ii) In Eco farm system less input cost is needed, thus it is a cost-effective system.
iii) Usage of electricity can be minimised by the use of Renewable Energy Sources, thus toning down the Carbon Footprint.
iv)Operational cost is reduced.
v) Problem of water shortage can be alleviated.
vi)The waste is utilised in effective manner.

Objectives of the project

i) Increase farmer income
ii) Decrease Feed Cost
iii) Minimise water shortage
iv) Effective Utilization of Waste

Project component and functioning

The Project basically consists of three principal components the solar panels, which would cater the needs of electricity supply from a renewable source. Second, the Incorporation of insects in diet (as an unconventional feed source). Third, the usage of rain and flood water for managing the needs of water supply to run the whole system for a production cycle.

Target areas of its operation

i) Increase farmer income
ii) Decrease Feed Cost
iii) Minimise water shortage
iv) Effective Utilization of Waste

SWOT analysis of the project.

A. Strengths

- ✓ Increase farmer's income
- ✓ Decrease feed cost
- ✓ Minimise water shortage
- ✓ Effective utilisation of waste

B. Weaknesses

- ✓ Proper management of different systems
- ✓ Some parts of the system are seasonally effective by nature.

Contribution of the project in transforming rural poverty to prosperity

- ✓ Increase in farmers' income
- ✓ Decrease Feed Cost
- ✓ Minimize water shortage
- ✓ Effective utilization of waste

FISH MICROCHIP TECHNOLOGY

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Details of Innovation/project

Genesis of the Idea

In Australia illegal fish farming operators were using slave labor to rear Tuna species. To protect human right and stop illegal activities they came up with a revolutionary block chain technology in which a code was attached to a package of Tuna fishes which gave information about their culture and source of origin and this was successfully started in 2018 to stop illegal fishing of Tuna in Pacific ocean of Australia. This technology or digitalization can also be utilized in fish processing where organic certification number will be provided on product packaging. It will also use to do it on traceability purposes. The applications of this technology in fisheries sector will help provide maximum information of the products.

Problems of rural areas in fisheries and aquaculture which addressed through this project

The prime target of fish processor is to provide safe and quality food to consumer that is completely dependent on the quality of raw material received. Therefore, if the raw material will haver all the information such as type of feeding , time of harvesting, method of transportation , data about the fish produced and its expiry date to prevent wastage in the form of codes and chips . It will specify the location of culture and the area of production will be mentioned. Codes present on the packaging will also contain payment process which can reduce the transaction chain i.e., transaction can directly be done from producers to consumers. Our codes will also contain an expiry date of that fish which will help the retailers to sell that fish before that date or to segregate it as a waste a product. By this waste products in fisheries can be identified and controlled. These codes can be useful for fish farmers for direct selling of their product in online platforms also. Farmers or small firms operators will be benefited the most as they will get the value for their product which they deserve due to transparency which will be created by these codes. It will promote sustainable fisheries and stop illegal fish capturing and poaching. This innovation will create a systemic network for the fish markets.

Objective of project

i) To provide a systemic networking in fisheries sector with a detailed database of fishes sold and wasted to know the exact market demand. Fish can be sold to a much larger area and customer base with correct information.

ii) To reduce the spread of diseases through fish contamination

iii) Rapid increase in income of farmers as it will limit the transaction chain and the involvement of middle man will be minimal.

iv) It will increase transparency in fisheries sector.

v) To maintain hygiene in this sector by providing recycled packets for fish packaging.

Project component and functioning

The Primary component of the project are- QR code and Bar code. These codes will be stuck to fish packets or to icebox. Bar codes will contain the entire information about the fish species from its origin. QR code will provide a transaction method. These codes can easily be scanned through a digital device to know entire information about that fish. QR codes can easily be pinned in the mouth of big fishes. These codes are easy to operate and will revolutionaries the fisheries sector of our country .These codes are easy to make and should be operated by a competent Authority which can be trusted. It will provide easy access to online information and can be easily be scanned by a Smartphone. These codes can be used to track data about the fish market through track records. These codes can be a standard for the healthy fishes.

Target area of operation

It can target freshwater as well as marine water fishes .It can be useful in exporting of fishes across the world. It can be used by a government Authority or an big Competent firm to operate it on a large scale. The main target is to know the exact market demand of fishes and fulfilled accordingly. The market demand can be quantified by analyzing the data of expired fish packets. The primary target area of usage in fish market and secondary target area is online platforms.

Cost for implementation and operation of this project

Cost is minimal as the process involved in our technology is simple. A team of few members can be sufficient to account all the data and transaction involved through the codes. The basic cost include – Team for making of codes for a particular fish species. Formation of operating team for analysis of data from the codes.

Monetary benefits to be obtained by farmers through the project

A farmer will be able to know the exact market demand of fishes and will produce fishes according to market needs following the government norms. Farmers will sell their products to the Authorized firm and they don't have to search for market places to sell their fishes which will provide a huge relief to them and will stop fish wastage. This digitalization in fish retailing will help in make more profit as these codes will improve the networking of products and the involvement of middleman will be reduced.

SWOT analysis of the project

In this project we aim to organize and increase transparency in fisheries sector through the use of QR code and bar codes. It will help in development of a co operative society for fishery where standardized fish and fish product will be sold on a big scale. These codes will keep track records of production and consumption of a particular fish, by this it will help farmers to know about the exact market demand. It will have expiry date mentioned which will reduce fish wastage and prevent spread of diseases through fish. It will create an simple transaction process through these codes. It will create a system in which farmers will culture fish and sell it to the Authority (government Authority or big private firm) which will diagnose the fish and put label on them so as to sell them in markets. The transaction will be done directly by the customers to the Authority and a part of a revenue will be credited to the retailers by the Authority. By this process fisheries sector will be revolutionized and sustainable development will be done.

Contribution of the project in transforming rural poverty to Prosperity

Farmers will know the exact fish species to rear according to market demand and after maturation of fishes they don't have to search for markets. It will reduce post harvest losses and increase the profit margin. The consumer will get safe food with all information regarding the origin to final processing of fish.

VALORIZATION OF AQUATIC WEEDS TO VALUE ADDED PRODUCTS

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Details of Innovation/project

Genesis of the Idea

One day I (SAKET BHARDWAJ) with my 3 friends (PRASSAN, HARSH and DEEPAK) went to tea stall for having a cup of tea in the evening time there we arediscussing the classifications of aquatic plants due to our 2nd semester end term examsuddenly one of my mind friend Prassan Pandey has said that in her village there aresome people make incense stick soap from the leaves of the plants after that suddenly an idea come into my mind that whether it would be possible or not to make the soap, phenyl and incense stick from aquatic plants and aquatic weed which are generallyconsidered as waste.

Problems of rural areas in fisheries & aquaculture which are addressedthrough this project

In Jharkhand a state in eastern India, the aquatic weed control project in fisheries and aquaculture aims to address several problems faced by rural areas. Some of the issues that can be mitigated through this project include:

i) Weed infestation: Aquatic weeds can grow rapidly and cover large areas of water bodies, including ponds, lakes, and reservoirs. This overgrowth can hinder the growth of desired aquatic plants and lead to a decline in fish populations. The project focuses on controlling and managing the growth of these weeds, allowing for better fish production and improved water quality.

ii) Oxygen depletion: Aquatic weeds have the potential to deplete oxygen levels in water bodies, particularly during their decay. Oxygen depletion can negatively impact fish and other aquatic organisms, leading to poor growth, increased disease susceptibility, and even fish mortality. By controlling the growth of weeds, the project helps maintain adequate oxygen levels for fish and other aquatic life.

iii) Habitat degradation: Overgrown aquatic weeds can disrupt the natural habitat of fish and other aquatic organisms. They can impede movement, reduce available food sources, and alter the structure of aquatic ecosystems. Through weed control efforts, the project aims to restore and maintain a healthier habitat, which in turn supports the overall productivity and biodiversity of the aquatic ecosystem.

iv) Water quality deterioration: Aquatic weeds can contribute to the deterioration of water quality. Excessive weed growth can lead to nutrient imbalances, increased turbidity, and reduced dissolved oxygen levels. This degradation adversely affects fish health and growth. By managing and controlling weed growth, the project helps in preserving water quality, ensuring a conducive environment for fish and aquaculture activities.

v) Socio-economic impact: Rural communities in Jharkhand often rely on fisheries and aquaculture for their livelihoods. Weed infestation and associated problems can significantly impact the income and livelihoods of the local population. The aquatic weed control project seeks to address these challenges, enhance fish production, and provide economic opportunities for rural communities engaged in fisheries and aquaculture.

Objective of project

By implementing effective valorization of aquatic weeds to value added products can enhance the social economic status in rural areas, women empowerment and generate employment as well.

Project component and functioning

The aquatic weed control project in Jharkhand consists of various components and functions to effectively address the issues related to weed infestation in fisheries andaquaculture. Here are the key components and their functioning:

A) Weed Identification and Monitoring: The project begins with the identification and monitoring of different types of aquatic weeds present in the target water bodies. This involves surveying and documenting the weed species, their growth patterns and their impact on the ecosystem.

B) Weed Control Methods: The project employs a range of weed control methods to manage and control weed growth. These methods may include mechanical, chemical, biological, or integrated approaches. Mechanical methods involve physically removing or cutting the weeds, while chemical methods use herbicides to selectively control weed populations. Biological methods utilize natural predators or herbivorous fish to feed on the weeds.

C) Capacity building and training: The project conducts capacity building programs and training sessions for local communities, fish farmers, and stakeholders involved in fisheries and aquaculture. These sessions aim to enhance their knowledge and skills in weed identification, control techniques, and sustainable practices. Training programs also focus on promoting awareness about the importance of weed control and its impact on fish production and water quality.

D) Research and Development: Research plays a vital role in the project, focusing on studying the local ecosystem, weed dynamics, and the effectiveness of different weed control methods. This research helps in identifying innovative and sustainable approaches to tackle weed infestation and supports evidence-based decision-making.

E) Monitoring and Evaluation: Continuous monitoring and evaluation are integral to the project's functioning. Regular assessments are conducted to measure the progress, effectiveness, and impact of the weed control measures implemented. This feedback loop allows for adaptive management, ensuring that strategies can be adjusted or improved based on the outcomes and feedback received. By integrating these components and their respective functions, the aquatic weed control project in Jharkhand aims to effectively manage and control weed infestation, improve fish productivity, preserve water quality, and support the sustainable development of fisheries and aquaculture in rural areas.

Target areas of its operation

The main target areas of operation are local ponds, rivers, reservoirs etc.

Cost for Implementation and operation of this project

Right now we have started working on it, cost or budget not calculated.

Monetary benefits to be obtained by farmers through the project

Yes, the fishermen will get the monetary benefits as a main/additional income source.

SWOT analysis of the project

A. Strengths

- ✓ **Improved Fish Productivity:** The project has the potential to significantly enhance fish production by controlling weed infestation, providing a more favorable environment for fish growth and reproduction.
- ✓ **Local Community Engagement:** The project promotes the active involvement of local communities, which can contribute to better project implementation, ownership, and long-term sustainability.
- ✓ **Capacity Building:** The project's training and capacity-building programs help equip stakeholders with knowledge and skills related to weed control and sustainable fisheries and aquaculture practices.
- ✓ **Research and development:** The project emphasizes research, enabling evidence based decision-making and the identification of innovative approaches for weed control in aquatic systems

B. Weaknesses

- ✓ **Resource Constraints:** Limited financial resources, equipment, and manpower may pose challenges in implementing comprehensive and large-scale weed control measures across all targeted water bodies. Sustainability Challenges: Ensuring the long-term sustainability of weed control efforts may be challenging due to factors like limited awareness, inadequate enforcement of regulations, and potential re-infestation of weeds.

C. Opportunities

- ✓ **Economic Development:** Successful weed control can lead to increased fish productivity and improved water quality, creating economic opportunities for rural communities engaged in fisheries and aquaculture.
- ✓ **Ecosystem Restoration:** The project can contribute to the restoration of aquatic ecosystems, promoting biodiversity conservation and ecological balance.

D. Threats

- ✓ **Environmental Impacts:** Inappropriate use of chemical herbicides or other control methods may have unintended negative consequences on non-target organisms and overall ecosystem health. Climate Change: Changing climatic conditions can influence weed growth patterns and introduce new invasive species, requiring adaptive management strategies to address emerging challenges.

INTEGRATED FISH FARMING BY MULTIPLE CROPPING PATTERN

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Details of Innovation/project

Genesis of the Idea

Integrated fish farming is an innovative approach that utilizes a multiple cropping pattern, wherein the waste generated from one component becomes the input for another. This principle ensures the efficient recycling of animal waste, reducing environmental pollution, maximizing resource utilization in an eco-friendly and sustainable manner with an innovative approach towards doubling the farmers income from the unit area.

One of the significant outcome of integrated fish farming is reduction in input cost mainly the feed apart from reducing the chances of insect and pest infestation. Furthermore, addition of other components like Agri-Fish integrated system or Fish-live stock integrated system or Fish-Horticulture integrated farming system not only makes the system eco-friendly but also makes the system economically sustainable and viable too from the farmers perspectives.

Moreover, integrated fish farming leads to a reduced use of agro-chemicals. Since the system relies on a symbiotic relationship between different components, the application of chemical fertilizers and pesticides is significantly decreased. This reduction in chemical inputs helps to preserve soil health, water quality, biodiversity and opens up a path for production of safe fish for human consumption. Integrated farming utilizes the principle of waste utilization, fishes are produced only on sustainable production of natural fish foods produced through waste recycling thereby reducing the cost on single most critical and expensive input i.e. the feed which also results with reduced cost of production of fish.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

The common problems faced by fish farmers in rural areas are:

i) Improper and under-utilization of available resources: The resources available in rural areas are not utilized by the farmer in a proper scientific way because of lack of technical knowledge. Hence, the farmers must be up dated with the knowledge of proper land utilization pattern. And in this context, the concept of Integrated farming towards proper resource utilization for maximization of profit from the available area needs to be emphasized.

ii) Improper dissemination of technology: The adoption of advanced techniques and technologies is crucial for the success of integrated fish farming. However, the lack of proper dissemination of these technological know-how to the farmer is a bottle neck which hinder their ability to implement those technologies in an efficient manner.

iii) Dependence on mono cropping system: Farmers always use the traditional knowledge of mono-cropping system for utilization of their available resource whereas utilization of the same available land through Integrated fish farming system emphasizes the integration of multiple commodities such as fish, crops, fruits, vegetables and livestock along with fish with an objective that, if one crop fails, the farmer can depend upon the other crops for sustenance.

iv) Poor economic and financial condition of farmers: 85% of the rural farmer comes under the category of small and marginal farmers category. They are resource poor as well as financially weak to take up the advanced farming systems. Hence, the way forward is to develop farmers feasible technologies under integrated farming system for its wider applicability.

v) Climatic constraints: Climate plays a crucial role in fish farming, and certain climatic conditions can pose challenges to integrated fish farming systems. Extreme temperatures, droughts, floods, or other weather-related events can disrupt the balance of the farming system and affect fish production, crop growth, and livestock health.

vi) Institutional constraints: Adequate institutional support is essential for the successful implementation of integrated fish farming. However, institutional constraints, such as limited access to credit, lack of training and extension services, and inadequate policy frameworks, can hinder the development and expansion of integrated fish farming initiatives.

Objectives of the project

Objectives of Integrated Fish Farming with Multiple Cropping Pattern are:

i) Sustainability on Production: There will be production of different farm produce at a given point of time which includes fish (fry / fingerlings / yearlings / table size fish), production of poultry

products (egg, meat, feathers), Dockery products (egg, meat, feathers), piggery products (meat, individual piglets), cattle products (milk, and milk products) depending upon the component selected.

ii) Interim Cash Flow: Integrated fish farming aims to provide a consistent and stable cash flow for farmers through the integration of multiple crops and fish species. This helps farmers to generate income throughout the year, reducing dependency on seasonal crops or single crop and ensuring regular cash flow.

iii) Step towards Sustainability of Resources: Integrated fish farming promotes the sustainable use of resources by optimizing the utilization of available land, water, and nutrients. By integrating fish with other crops, farmers can effectively utilize resources such as water and organic waste, reducing adverse environmental impacts and promoting proper resource utilization and conservation too.

iv) Utilization of Available Resources: The objective of integrated fish farming is to make efficient use of available resources on the farm. By utilizing unused or underutilized land, water bodies, and agricultural by-products, farmers can maximize productivity and economic returns. This approach helps optimize the use of resources without the need for extensive investments.

v) Recycling of Farm Resources: Integrated fish farming emphasizes the recycling and reuse of wastes produced in farm. Waste produced from livestock commodities and unused left-over feed utilized as a valuable input towards nutrients supplementation for other crops, such as fish, faecal matter and other wastes for manuring of Agri-Horti crops etc. This recycling process reduces waste load and improves overall farm productivity towards achieving a sustainable farming system.

vi) Helping Poor Farmers: Integrated fish farming can play a crucial role in poverty alleviation by providing alternative income sources for small-scale and marginal farmers. The diverse cropping pattern allows farmers to diversify their income source to mitigate risks associated with single-crop dependence. It can contribute to improving the livelihoods of poor farmers and reducing their vulnerability to economic fluctuations.

vii) Generation of Employment Opportunities: Integrated fish farming requires a diverse range of skills and activities, creating additional employment opportunities in rural areas. Along with fish rearing, other activities such as crop cultivation, livestock production, marketing, and value addition can generate employment opportunities in rural sector with an objective to reduce rural unemployment and provide better livelihood options to a larger sector of rural population.

viii) Back-up Plan for Any Loss: Integrated fish farming with multiple cropping patterns offers a built-in risk management strategy for farmers. If one crop or fish species faces any unexpected losses or challenges, the other crops can act as a buffer and provide an alternative income source. This helps farmers withstand potential setbacks and reduces the overall vulnerability of their farming operations.

Project component and functioning

The different project components and their functioning is detailed below:-

A) Fish Ponds or Tanks

These are the primary infrastructure for raising fish. Ponds or tanks are designed to provide a suitable aquatic environment for fish growth and reproduction.

- ✓ **Nursery:** The nursery pond is a smaller pond where fish fingerlings are initially stocked and raised to provide a controlled environment for young fish, protecting them from predators and enabling them to grow to a size where they are less vulnerable.
- ✓ **Rearing pond:** It is a water body designed and managed for fish rearing. Here, fish are stocked and allowed to grow until they reach marketable size. The pond is equipped with infrastructure like water inlets and outlets, aeration devices, and feeding systems to maintain optimal conditions for fish growth.
- ✓ **Stocking pond:** The stocking pond is used to store hatched fish fingerlings before they are introduced into the main rearing pond. Ducks can also be farmed in this pond along with the fishes.

B) Fish Species

Different fish species of compatible nature may be selected based on their market demand, growth rate with other components of the integrated system. Common species include Indian major carps, exotic carps, cat fishes and GIFT tilapia.

C) Aquaculture Feeds

Fish require a balanced diet for growth and development which is managed through the left-over feed of livestock component and sustainable production of natural food items through recycling of organic wastes.

D) Fish Stocking

The process of introducing juvenile fish into the ponds or tanks for rearing. The stocking density depends on factors such as fish species, pond size, water depth and water quality.

E) Water quality Management

Maintaining proper water quality is crucial for fish health and growth. Components of water management include water supply, circulation, aeration, and filtration systems in physical terms and dissolved oxygen, hardness, alkalinity, un-ionized ammonia, nitrite, nitrate etc in chemical terms. Proper water quality management is a must for better growth and biological activities of fish towards obtaining desired production level.

F) Integrated Pest Management (IPM)

Inclusion of duck keeps the pond eco system free from many pests, tadpoles, molluscs and helps to maintain pond sanitation in an environmentally friendly manner. .

G) Cowshed

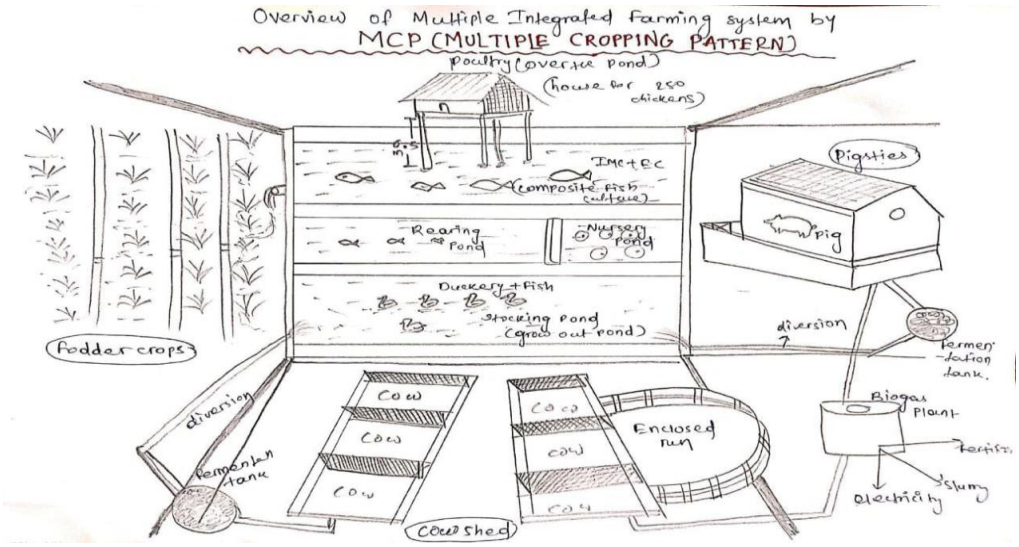
Cowshed is a sheltered facility used for keeping cows. In integrated fish farming project, from where the cow dung, urine and cow shed washings are applied to the fish farming systems and other components selected for manuring purpose. Furthermore, the farmer can go for establishment of bio-gas plant for production of bio-gas for the domestic purpose like cooking and lighting. The bio-gas slurry thus produced during the process serves as a good source of manure for the fish farming component.

H) Pigsties

Pigsties are used for pig farming. Pigs contribute semi-digested pig manure for recycling in the pond-based farming system for enhancement of pond productivity.

I) Farm for layers and broilers

This component refers to the poultry farm where layers and broilers are reared. Poultry waste, such as chicken manure and leftover feed, can be recycled and utilized in fishponds as a supplementary feed source or as a fertilizer.



Is the project in use?

No, this project is currently not in use. This integrated fishing project is based on our idea that includes fishery, poultry, farming, biogas production and cattle rearing. For commercial use any vast amount of land can be used, but for this project we have assumed the total model occupies an area of 1 hectare. The water area including ponds takes 0.5 acre and rest poultry, piggery and cowshed 0.6 acres each.

Target areas of its operation

The target areas of integrated fish farming can include:

i) Providing self-sufficiency to the farmers: This method provides security to the farmers by ensuring them a backup plan in any worst case

ii) In Food production: Integrated fish farming aims to produce both fish and crops simultaneously, providing a sustainable source of protein (fish) and vegetables or herbs (plants).

iii) Water conservation: The closed-loop system of aquaponics minimizes water usage compared to traditional farming methods. The water is recycled between the fish tanks and plant beds, reducing the need for large volumes of fresh water.

iv) Nutrient recycling: Fish waste contains valuable nutrients such as nitrogen and phosphorus, which serves as a natural fertilizer for the plants, while the plants act as a filter, purifying the water for the fish.

v) Environmental sustainability: Integrated fish farming reduce the need for chemical fertilizers and pesticides, minimize water pollution, and decrease the carbon footprint associated with food production.

vi) Enhancing profit: If done with proper ways, this method can increase profit

Cost for Implementation and operation of this project

We can provide you with a rough estimate of the costs involved in setting up and running such a project. It's important to note that these estimates are approximate and can vary significantly based on the farming location. Additionally, there may be miscellaneous costs such as licenses and permits, consultancy fees, insurance, and contingency funds that should be considered while planning a fish farming project.

1. Land and Infrastructure: The cost of acquiring land and constructing infrastructure like fish ponds, hatcheries, feeding systems, water supply, and fencing can range from INR 2,00,000 to INR 10,00,000 or more, depending on the size and complexity of the project. This cost can be completely neglected if we carry out the project in rural areas where pond and suitable land is present beforehand.

2. Fish Stock: The cost of procuring fish seeds (fingerlings or juveniles) will depend on the species and quantity required. On average, the cost can range from INR 10 to INR 50 per fingerling, depending on the species and market conditions.

3. Feed: Fish feed is a significant expense in fish farming. The cost of fish feed varies depending on the quality and type of feed used. It can range from INR 30 to INR 70 per kilogram, depending on the brand and nutritional composition.

4. Labour: The cost of labour will depend on the size of the project and the number of employees required. In rural areas of India, labour costs can vary widely, but a rough estimate could be between INR 5,000 to INR 15,000 per month per worker.

5. Equipment and Miscellaneous: This includes the cost of equipment like aerators, nets, pumps, water quality testing kits, harvesting and processing equipment, etc. The cost for these items can range from INR 1,00,000 to INR 5,00,000 or more, depending on the project scale and requirements.

6. Marketing and Distribution: Marketing and distribution costs will vary depending on the project's marketing strategy and distance to the market. It is essential to consider expenses related to packaging, transportation, and marketing activities. A rough estimate could be between INR 50,000 to INR 2,00,000 per year.

Monetary benefits to be obtained by farmers through the project

Integrated fish farming projects can provide several monetary benefits to farmers. The monetary benefits of integrated fish farming projects can vary depending on factors such as the scale of operations, market demand, management practices, and local conditions. Here are some potential advantages:

i) Additional Income: Fish farming can serve as an additional source of income for farmers. By utilizing their existing land or water bodies, farmers can raise fish alongside their traditional agricultural activities. Fish can be sold in the market, providing an extra revenue stream.

ii) Diversification: By combining fish farming with crop cultivation or livestock rearing, farmers reduce their reliance on a single source of income. This diversification can help stabilize earnings and mitigate risks associated with fluctuations in market prices or crop failures.

iii) Value-Added Products: Farmers can add value to their fish , milk and milk products etc

iv) Manure Production: Integrated fish farming involves using fish waste as a natural manure for crops. Fish excreta and uneaten feed are rich in nutrients that can be used as organic manure, reducing the need for chemical fertilizers. This not only saves costs but also improves soil fertility and crop productivity and better water holding capacity.

v) Increased Crop Yield: The nutrient-rich water from fish ponds can be used for irrigation purposes in agricultural fields. This nutrient-laden water acts as a natural fertilizer for plants, promoting their growth and potentially increasing crop yield. This can result in improved agricultural productivity and higher profits for farmers.

vi) Employment opportunity: Integrated fish farming projects may create employment opportunities within rural communities. Additional labour may be required for fish care, pond maintenance, processing units, marketing, and distribution. This can contribute to local economic development and provide income for individuals involved in these activities.

SWOT analysis of the project

A. Strengths

- ✓ Diversification of income
- ✓ Efficient resource utilization
- ✓ Reduced environmental impact
- ✓ Risk diversification

B. Weaknesses

- ✓ Technical knowledge and expertise
- ✓ Initial investment costs
- ✓ Protection
- ✓ Scientific cropping pattern

C. Opportunities

- ✓ Increasing demand for fish
- ✓ Sustainable agriculture practices
- ✓ Government support

D. Threats

- ✓ Disease outbreak
- ✓ Market competition
- ✓ Regulatory challenges

Contribution of the project in transforming rural poverty to prosperity

An integrated fish farming project has the potential to contribute significantly to transforming rural poverty into prosperity in several ways:

- ✓ Economic Opportunities and social empowerment
- ✓ Food Security
- ✓ Employment Generation
- ✓ Value Chain Development
- ✓ Technology Transfer and Training

FISH WASTE TO WEALTH: A PRACTICAL APPROACH

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Details of Innovation/project

Genesis of the Idea

Fish wastes are highly perishable and directly disposed into the environment which can pollute the environment. To avoid such problem, we have channelized an effective way to utilise the waste products to wealth. We are very friendly with the Madhubani paintings of Bihar. Similarly, we want the fishermen of Jharkhand to prepare their own artefacts, ornaments and fertilizer from fish waste and sell them to gain some additional income benefits to uphold their socio economic status.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

In rural areas, fisheries and aquaculture play a significant role in the local economy and food security. However, they also face several challenges, particularly regarding fish waste. Here are some of the problems associated with fish waste in rural areas:

i) Environmental pollution: Improper disposal of fish waste can lead to environmental pollution, especially in rural areas with limited waste management infrastructure. Fish waste, if not properly handled, can contaminate water bodies, degrade water quality, and harm aquatic ecosystems.

ii) Health hazards: Fish waste, when left untreated, can create foul odours and attract pests, including flies and rodents. This can lead to health hazards for local communities, increasing the risk of disease transmission and compromising the quality of life for residents in rural areas.

iii) Loss of potential value: Fish waste contains valuable nutrients and organic matter that can be utilized in various ways. However, in many rural areas, fish waste is often discarded or left unused, resulting in a loss of potential economic value and resource efficiency.

iv) Lack of infrastructure and resources: Rural areas often have limited infrastructure and resources for waste management. The absence of appropriate facilities, such as fish waste processing plants or composting facilities, makes it challenging to handle and utilize fish waste effectively. The lack of awareness, technical knowledge, and financial resources further exacerbate the problem.

Objectives of the project

i) To improve the economic condition: The economic condition of the fish farmers will be improved by providing them source of additional income generation.

ii) To generate employment: The processing of the value added products will create employment opportunities in rural areas.

iii) Women empowerment: The creativity of the women will help them to prepare the artifacts and ornaments on their own which will lead them to generate additional revenue.

Project component and functioning

Implementing the use of fish waste involves several components and processes, depending on the specific product or application. It's important to note that the specific components and processes involved may vary depending on the intended application and the technology being utilized. Advances in biotechnology, waste management, and sustainable practices continue to expand the possibilities for fish waste utilization, driving innovation and creating new avenues for product development. Here are some common components and their functioning for the implementation of fish waste product uses:

A) Collection and pre-processing: The farmers will collect the fish and extract the fish waste like viscera, bones and scales. This waste may include fish offal, heads, bones, scales, and other discarded parts. The collected waste is then pre-processed, which typically involves sorting, cleaning, and removing any non-biodegradable materials.

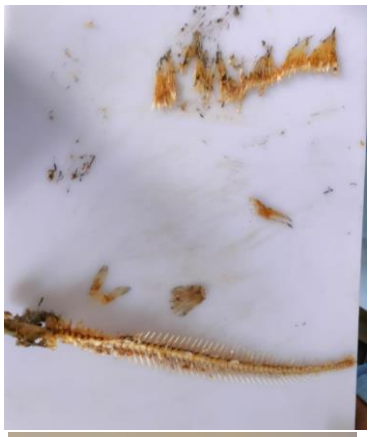
B) Extraction and separation: Depending on the desired end product, different extraction and separation methods are employed.

C) Processing and refinement: Once the desired components are extracted or separated, further processing and refinement may be required. This can involve purification, filtration, centrifugation, or chemical treatments to enhance the quality and purity of the extracted materials.

D) Quality control and testing: Throughout the process, quality control measures are implemented to ensure the safety, purity, and efficacy of the final products.

E) Waste management and sustainability: Implementing the use of fish waste products should also address proper waste management practices. Any by-products or residues from the processing can be further utilized, such as using leftover biomass for composting or converting organic waste into biogas or fertilizer through anaerobic digestion. Minimizing waste generation and maximizing resource utilization contribute to overall sustainability.

F) Market development and commercialization: Finally, to fully implement the use of fish waste products, market development and commercialization efforts are essential. This includes identifying potential customers, creating awareness about the benefits of these products, and establishing distribution channels.






Is the project in use?

No, this project is currently not in use.

Target areas of its operation

The main target areas of this project are:-

i) To provide additional income to the farmers

ii) To generate the employment in rural areas

iii) To utilise the fish waste in effective way to prevent environmental pollution

iv) Women empowerment

v) To convert the rural poverty to the prosperity

Cost for Implementation and operation of this project

No, right now we have started working on this project so the cost is not fixed yet.

Monetary benefits to be obtained by farmers through the project

Yes, the farmers will obtain the monetary benefits as an additional income. But the revenue is still not specified as the work is still going on the project.

SWOT analysis of the project

Certainly! Here's a SWOT analysis for implementing a fish waste products project:

A. Strengths

- ✓ **Resource availability:** Fish waste is abundantly available as a by-product of the fishing industry and fish processing plants, ensuring a consistent supply of raw materials for the project.
- ✓ **Sustainable and circular approach:** Utilizing fish waste aligns with sustainability goals, resource efficiency, and the principles of a circular economy, contributing to environmental conservation.
- ✓ **Generation of additional income:** The processing and production of the products from the waste will have some market value and will help farmer to generate the additional income.

B. Weaknesses

- ✓ **Processing and refinement challenges:** The processing of fish waste can be complex and require specialized equipment and technologies, which may involve high initial investment costs.
- ✓ **Waste collection logistics:** Collecting and transporting fish waste from different sources can pose logistical challenges due to its perishable nature and the need for proper handling and storage to maintain product quality.
- ✓ **Seasonal variations:** Availability and quality of fish waste may fluctuate seasonally, requiring effective planning and management to ensure a consistent supply throughout the year.
- ✓ **Market acceptance and awareness:** The market for fish waste products may still be developing, requiring efforts to create awareness, educate potential customers, and build acceptance for these novel products.

C. Opportunities

- ✓ **Growing demand for sustainable products**: There is an increasing consumer demand for sustainable and environmentally friendly products, providing an opportunity to position fish waste products as attractive alternatives.
- ✓ **Generating employment:** the need for the workers foe preparing the value added products and the collection of the waste products will make the employment opportunities in the rural areas.
- ✓ **Women empowerment:** the products prepared by the women in the village will provide them employment and make them self dependent.

D. Threats

- ✓ **Competition and substitutes:** Fish waste products may face competition from alternative sources of proteins, oils, and nutrients, as well as synthetic substitutes or cheaper alternatives in certain markets.
- ✓ **Price volatility and market fluctuations:** Market prices for fish waste products can be influenced by factors such as changes in fishery stocks, market demand, and global economic conditions, leading to price volatility.
- ✓ **Regulatory and compliance challenges:** Meeting regulatory requirements for product safety, quality control, and environmental standards can be demanding and may pose challenges during implementation.
- ✓ **Public perception and misconceptions:** Some consumers may have concerns or misconceptions about fish waste-derived products, such as quality, odour, or environmental impact, which could affect market acceptance.

Contribution of the project in transforming rural poverty to prosperity

Our project will contribute in transforming rural poverty to prosperity by providing them employment and income generation, make them self dependent they can also create their small scale business form with little capital and they can sell their product into the market for revenue generation.

DIESEL FOR RS. 50

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Details of Innovation/project

Genesis of the Idea

Fuel is something which is essential for the fisherman to catch the fishes. This idea of converting the plastics to fuel can uplift the life offisherman. Plastic waste is a huge problem in the world. Because of its durability, plastic waste accumulated in landfills and oceans tends to be trapped for centuries, causing a global environmental crisis. Even though we produce about 300 million tons of plastic waste eachyear, only 9% is recycled. But why are we only recycling so little?

The reason is the current inefficiency and high cost of recycling plastic waste, resulting in a lack of incentives. Recently, researchers from Washington State University discovered a more efficient method that can drastically improve the efficiency of chemically recycling plastic waste. Currently, there are three types of plastic waste recycling: mechanical recycling, incineration, and chemical recycling.Mechanical recycling is the most widely used recycling option, and it involves mechanically grinding or compounding plastic waste for re- use in similar products. However, this process will result in poorer plastic quality, and thus these recycled products are not widely used by industries. Incineration can convert plastic waste into heat and electricity, but the process may result in the emission of toxic pollutants such as acid gases and heavy metals. Therefore, the last option, chemical recycling, where plastics are converted to fuels, is considered to be the most promising plastic waste recycling process with the least adverse effects. However, the current technology of chemical recycling requires extremely high temperatures (over 300°C), which is expensive and inefficient. In order to improve this, using different metals as catalysts, which are materials that can speed up the conversion process, while also varying other process conditions such as temperature and pressure. Using a combination of ruthenium metal and carbon as the catalyst, they can convert 90% of plastic waste into fuel in just one hour, at a lower temperature of 220°C. This condition is significantly more efficient and cost- effective than the current chemical recycling standard. If we continue our current rate of only recycling 9% of plastic waste, our ocean will contain more plastic than fish by 2050. This may provide a promising and more incentivized approach for ramping up the recycling process of plastics in the near future. As the fuel (diesel) plays a major role in the catching of fishes, the cost of fuel exceeds their fish catch. This isa major drawback to the fisherman. Plastic fuel is harmful but it can be treated and used. As a measure of converting their rural poverty toprosperity this free fuel from the plastics can be a great boon to the fisherman and the environment.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

As we visited many landing centres for our field visits, we gathered information about the problems they face, one of them was the amount they spend on diesel they use and sometimes there are no fishes caught which is a great loss to the fisherman. So this innovation of low cost fuel boats by obtaining fuel from the non- degradable plastics can change their lives.

Objectives of the project

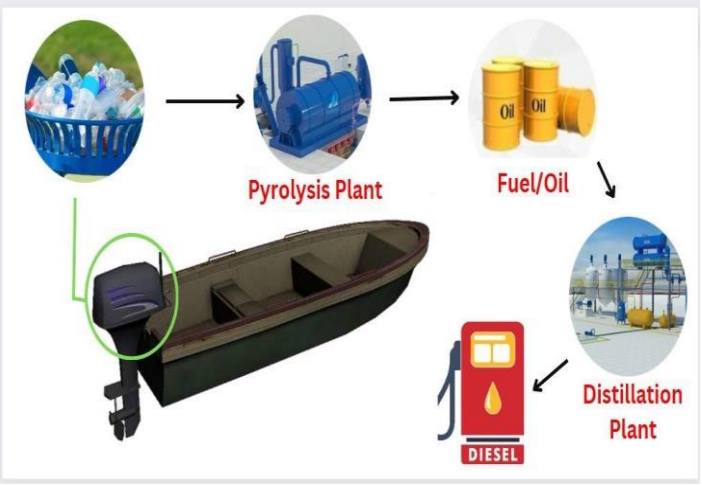
To give low cost diesel to the fisherman by reusing the harmful nondegradable plastics simultaneously protecting our environment.

Project component and functioning

The boat runs by means of fuel obtained from non -bio degradable plastics by means of pyrolysis (chemical conversion of plastic wastesto fuel by adding catalysts and bio additives). In the pyrolysis process,waste plastics are converted into alternative energy as fuel for diesel engines. Waste plastic fuel has a wide range of chemical characteristics that vary depending on the grade of plastics utilized and the pyrolysis technique employed. The low calorific value and high viscosity of the waste plastic fuel are the two most significant drawbacks of utilizing plastic fuel as a diesel engine. HDPE is known for its structure as a linear long-chain polymer with a considerable degree of crystallinity and little branching that ends up with high endurance characteristics. According to forecasts, global demand for HDPE will reach roughly 95 billion tonnes by 2025, making it one of the most significant contributors to plastic pollution. HDPE offers good resistance to alkalis, dilute acids, and greases. Because of its exceptional strength, it is widely used to produce milk containers, lubricating oil containers, shampoo bottles, detergent bottles, recycling bins, and grocery bags, among other things.

HDPE wastes have a high potential for use as a feedstock for pyrolysis and can be recycled many times. Energy from the waste polymers and used it to solar energy applications. It is not only environmentally friendly, but it also offers a green way of creating porous carbons for a wide rangeof applications by converting low-cost waste polymers into high- value-added energy utilization.

The catalytic process is characterized by the use of a catalyst to affectconversion. The pyrolysis of plastic waste involves several process factors, such as temperature, heating rate, catalyst usage, particle size, retention time, moisture content, and feedstock composition, amongst other things. Compared to thermal pyrolysis, the method showed a high likelihood of the transformation of synthetic waste into oil and improved quality at lower reaction durations and temperatures than was previously thought. These variables can reduce energy consumption while simultaneously increasing the output of the whole pyrolysis process. In the pyrolysis process, thermal degradation occurs while the material is held under a vacuum. According to the manufacturer, the catalytic pyrolysis transformation of the HDPE polymers was carried out in a pyrolysis reactor. The shredded plastic trash is put into a muffle furnace that can be operating continuously at 600 °C. A digital controller which monitors and adjusts the temperature via the thermocouple. The catalytic pyrolysis reactor included with a vacuum pump to aid the conversion. The catalyst thatis employed in this procedure will avoid the formation of any dioxins.Depending on the type of plastic materials, the reaction occurs at a specified temperature and time. Sixty minutes of response time was required for HDPE testing, and at 450 °C, HDPE was converted to pyrolysis oil. According to the results, the oil output for HDPE is 50%weight of pyrolysis oil with 25% wax formation and 25% gas, and coke formation is observed. The different additives that may improve the performance of alternative fuel produced from recycled plastics are oxygenated additives. With its renewable bio-resources and oxygenated properties, ethanol is an attractive alternative fuel for diesel engines. These oxygenates are often used in engines due to their higher volatility and latent heating properties. Alcohol mixes as alternate fuels in CI engines. However, there are significant drawbacks, including decreased heating value, phase separation, pour point, and hazardous storage and transit circumstances for ternary blends. Ethanol can be blended with diesel as a engine fuel, which has many favourable properties, including higher oxygen content, low viscosity, less sulfur content, high hydrogen-to-carbon ratio, and a high rate of evaporative cooling. Ethanol has a lower viscosity than pure diesel, ensuing in better atomization of fuel injected into cylinders and improved mixing with air when combined with diesel. Additionally, since ethanol has a high latent heat of evaporation, blending it with diesel fuel may increase volume efficiency via the evaporative cooling effect of the ethanol during the intake and compression strokes.



Waste plastic fuel blends and their performance with oxygenated additives

Utilize of oxygenated fuels seems to be a viable option for lowering emissions from diesel engines, both current and future. The term "oxygenated fuel" refers to a chemical substance that contains oxygen. Hence, the addition of additives is preserved at 10% on a volume basis, which is considered the optimum ratio. In this research, a combination of 10% ethanol and 10% ethoxy ethyl acetate was addedwith three incremental ratios of waste plastic fuel as a quaternary fuelto evaluate the emission characteristics and performance of a single- cylinder diesel engine. In this research, waste plastic fuel obtained from the pyrolysis processwere blended with diesel at different ratios of 20%, 30% and 40% on a volume basis, along with oxygenated additives. The quaternary fuel named as WEE, formed by the blends of Waste Plastic Fuel, 10% ethanol and 10% ethoxy ethyl acetate on volume basis mix with pure diesel. The quaternary fuel blends prepared as WEE20 (60% diesel + 20% WPF + 10% Ethanol + 10% ethoxy ethyl acetate), WEE30 (50% diesel + 30% WPF + 10% Ethanol + 10% ethoxy ethyl acetate), and WEE40 (40% diesel + 40% WPF + 10% Ethanol + 10% ethoxy ethyl

acetate).

Target areas of its operation

It can be used in fishing boats.

Cost for Implementation and operation of this project

With plastic waste costing about Rs 15 a kg, and a conversion cost of Rs 7 per kg of waste, the diesel produced would cost around Rs 22 perkg.

- ✓ 1KG PLASTIC= 0.7 LITRES
- ✓ 1500KG PLASTICS=1000 LITRES OF DIESEL
- ✓ Cost of implementation and operation= Rs.2000

Monetary benefits to be obtained by farmers through the project

Trawlers use nearly 1200-1400 litres of diesel to travel 12 nautical miles which costs approximately 1,30,000. 80 feet boats consume nearly 1000-1200 litres of diesel and it costs around Rs.1,17,000 and less than 80 feet sized boats consume consume 500-1000 litres which sum upto Rs. 85,000. The cost of the diesel will be reduced by half if the technology comes into action.

SWOT analysis of the project

A. Strengths

- ✓ Fuel at a low cost, non -biodegradable plastics can be used as a engery source, Service to society

B. Weaknesses

- ✓ Lack of field experience

C. Opportunities

- ✓ New technology, Easily afforded by fishermen

D. Threats

- ✓ Diesel may be unsuitable for the marine engine, the diesel should undergo several chemical treatments.

Contribution of the project in transforming rural poverty to prosperity

Yes, this project contributes in transforming rural poverty to prosperity because it reduces the cost of diesel by half and cost of fishing trip will be reduced. So this can improve the financial status of the fisherman.

SMART AQUA PURE

AN INTEGRATED TREATMENT SYSTEM FOR REMOVAL OF EMERGING POLLUTANTS FROM WASTEWATER TREATMENT PLANTS EFFLUENT WATER

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Details of Innovation/project

Genesis of the Idea

Nearly 70 percent of the municipal sewage holding different organic and inorganic toxic contaminants is released untreated into the natural aquatic system in highly populated cities of India Many emerging pollutants arising from human settlements, especially from daily care products find their final endpoint in natural aquatic systems posing a greater risk to almost all aquatic organisms and humans in different ways. (eg. Triclosan, Benzophenone can act as an potential Endocrine disruptors) There are no improved methods so far developed for the removal of emerging contaminants in wastewater treatment plants before their release into the natural systems. As a result, these compounds were released into the natural aquatic system and thereby aquaculture setups as silent killers in large quantities. Further, these contaminants have more stability in natural conditions and some of their degraded compounds are furthermore persistent and toxic to the organisms. The negative effect of such contaminants may not seem so significant unless it causes drastic ecosystem collapse. Hence it is an immediate felt need for the remediation of such contaminants from the effluent waters carrying its load with the integration of artificial intelligence (AI).

Problems of rural areas in fisheries & aquaculture which are addressed through this project

i) Due to the increased urbanization, the effect of a new group of contaminants called emerging contaminants comes to light.

ii) Pharmaceuticals and personal care products serve as a major source of ECs in wastewater. Since the Wastewater treatment plants are inefficient in removing the ECs from the effluents, there is a need for a technique to remove the ECs in water.

iii) **High levels of untreated municipal sewage:** Approx. 70% of municipal sewage of highly populated cities are released into natural aquatic systems without proper treatment. This untreated sewage contains a wide range of organic and inorganic toxic contaminants.

iv) Presence of emerging pollutants: Human settlements, particularly daily care products, contribute to the presence of emerging pollutants in wastewater. These emerging pollutants, such as triclosan and benzophenone, have the potential to act as endocrine disruptors, posing risks to aquatic organisms and humans.

v) Lack of effective removal methods: Currently, there are no improved methods developed for the efficient removal of emerging contaminants in wastewater treatment plants before their release into natural systems. As a result, these harmful compounds are discharged into the natural aquatic environment, including aquaculture setups, in significant quantities.

vi) Persistence and toxicity: Some of the emerging contaminants have high stability in natural conditions, and their degraded compounds can remain persistent and toxic to organisms. This persistence amplifies the negative effects of these contaminants on the ecosystem and poses long-term risks.

vii) Silent killers in large quantities: The continuous release of these contaminants into the natural aquatic system and aquaculture setups can have detrimental effects on aquatic organisms, including fish and other wildlife. The cumulative impact may not be immediately noticeable but can lead to ecosystem collapse over time.

viii) Immediate need for remediation: There is an urgent need to address the remediation of these emerging contaminants from effluent waters before they are discharged into natural systems. The integration of artificial intelligence (AI) can play a crucial role in developing innovative solutions for effective removal and remediation processes.

ix) This innovative idea deals with the removal of potent ECs from the wastewater using the integrated principle by a developed column with the integration of Artificial intelligence (AI).

x) The developed column has a wide range of selectivity toward the contaminants and concentrates it

when wastewater is allowed to flow through. The concentrated contaminants in the column are then eluted using a proper solvent and treated enzymatically in an invitro condition.

Limitations of Already Existing Treatment Process

i) Physical Adsorption causes transfer from the liquid phase to the solid phase.
ii) Chemical methods may lead to the generation of toxic by-products
iii) In the Biological process, pre-treatment steps are required to degrade the pollutants.

Objectives of the project

i) To develop an integrated treatment column for concentrating and separating out emerging pollutants from wastewater treatment plants effluent water
ii) Integration of the enzymatic method for degradation of the contaminant
iii) To test out the removal efficiency of column using one of the most potent emerging contaminant triclosan (TCS)
iv) To implement artificial intelligence for complete monitoring of such contaminants in the polluted and treated waters

Project component and functioning

The multi-component working model system for the treatment of emerging contaminants in wastewater integrates various compartments and employs physical, chemical, and biological methods of removal. This system aims to effectively address the issues of adsorption, desorption, and degradation of these pollutants. Additionally, artificial intelligence (AI) with the sensors mounted to respond and quantify the ECs. It is implemented to monitor the presence of emerging contaminants and facilitate reflex-based treatment systems. The following components and functioning of the system can be described:

A) Adsorption Compartment: This compartment utilizes different mechanisms such as electrostatic interaction, hydrophobic interaction, and hydrogen bonding to adsorb the emerging pollutants present in the wastewater. Adsorbent materials with high surface area and affinity for contaminants are employed to facilitate efficient adsorption.

B) Desorption Compartment: Once the pollutants are adsorbed onto the adsorbent material, the desorption compartment comes into play. Suitable effluents are used to desorb the pollutants from the adsorbent, effectively separating them from the treatment system.

C) Degradation Compartment: The desorbed pollutants are then directed to the degradation compartment, where they undergo enzymatic degradation. Enzymes such as Laccase, horseradish peroxidase, and manganese peroxidase are employed to catalyze the degradation of the pollutants into non-toxic metabolites. This enzymatic degradationprocess helps in the complete removal and transformation of the contaminants.

D) Temperature, Flowrate, and Pressure Maintenance: To ensure the optimal performance of the system, various components such as heat exchangers, flow control devices, and pressure maintenance systems are incorporated. These components help maintain the required temperature, flow rate, and pressure conditions for each compartment, thereby maximizing the efficiency of the treatment process.

E) AI Monitoring and Reflex-Based Treatment: Artificial intelligence is integrated into the system to continuously monitor the presence and concentration of emerging contaminants. AI algorithms analyze the real-time data and provide feedback to the treatment system. Based on this feedback, reflex-based treatment mechanisms are implemented, allowing the system to adapt and optimize its operations to effectively remove the contaminants. AI also enables predictive modelling and optimization of treatment processes, improving overall system performance.

Sample collection in the Versovawastewater treatment plant

Column development

Experiments on Enzymatic degradation(2022)

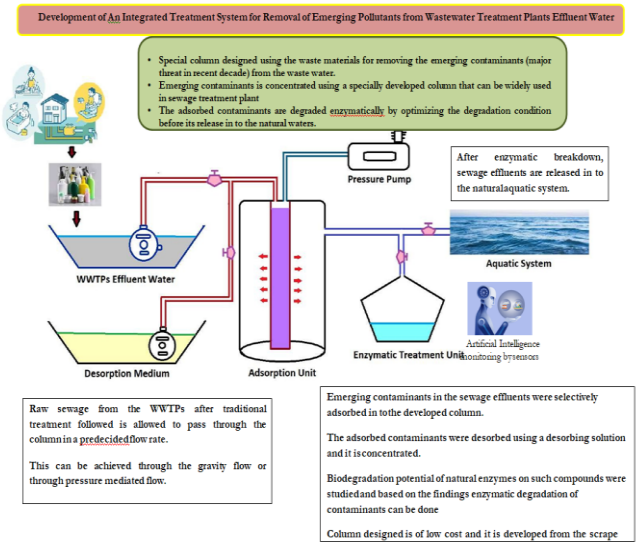
Method Development for validation of an Emerging contaminant (TCS)

Is the project in use?

Testing with the prototype has been done and it is still under complete development.

Target areas of its operation

i) Policymakers and authorities involved in the preparation of wastewater legislation
ii) Environmental NGOs
iii) Technology development and the advisory committee at the state level
iv) Research institutes and municipalities
v) Large industries manufacturing pharmaceuticals and personal care products
vi) In sewage-fed fish culture, this methodology is used to reduce bioavailability
viii) Wastewater treatment plant treating both domestic sewage and industrial sewage



Cost for Implementation and operation of this project

1) For treating 50,000 L of WWTPs effluent water, the estimated cost required for this treatment system is Rs. 5000 (excluding miscellaneous).
2) The developed methodology using the integrated methods of using column and enzymatic degradation is cost-effective since the raw materials for the development of the column are availed from the scrape. This may reduce operation cost by 40%.
3) This technology can be scaled up on a massive scale by the implementation of this technology as a part of a wastewater treatment plant.
4) Majority of its cost goes as operational cost for pumping down the effluents, but this can be sorted

out by using the gravity tanks for separation.

5) The column utilized for the separation is reusable and its separation efficiency increases with time. Separation and remediation on an industrial scale are completely designed specific (customized design can be developed) with the same principle.

SWOT analysis of the project

A. Strengths

- ✓ **Enhanced Treatment Efficiency:** The integration of physical, chemical, biological methods, and AI monitoring allows for a more comprehensive and efficient treatment of emerging pollutants in wastewater. The system can adapt and optimize its operations in real-time, leading to improved pollutant removal rates. It adopts an eco-friendly pathway of removal of pollutants.
- ✓ **Real-Time Monitoring:** AI integration enables continuous and real-time monitoring of emerging contaminants. This provides valuable data on pollutant concentrations, trends, and potential risks, allowing for prompt intervention and adjustments in the treatment process.
- ✓ **Reflex-Based Treatment:** The AI component allows for reflex-based treatment mechanisms, where the system can automatically respond and adapt to changing pollutant concentrations and conditions. This flexibility enhances the system's ability to address varying pollutant loads and optimize treatment strategies accordingly.

B. Weaknesses

- ✓ **Technological Complexity:** The integration of multiple treatment methods and AI monitoring adds complexity to the system. It may require specialized expertise for operation, maintenance, and troubleshooting, making it more challenging to implement and manage compared to conventional treatment systems.
- ✓ **Initial Investment and Operational Costs:** The integration of AI technology and the multiple components in the system may involve higher initial investment and operational costs. The expenses associated with equipment, AI infrastructure, and maintenance could be a potential drawback, especially for smaller wastewater treatment facilities.

C. Opportunities

- ✓ **Improved Environmental Protection:** The integrated treatment system with AI integration presents an opportunity to significantly reduce the release of emerging pollutants into natural aquatic systems. By effectively removing and degrading these contaminants, the system can contribute to improved water quality and safeguard the environment and aquatic ecosystems.
- ✓ **Technological Advancements:** As AI technology continues to evolve, there are opportunities for further advancements in monitoring capabilities, predictive modeling, and optimization algorithms. These advancements can lead to more accurate and efficient treatment processes, enabling better pollution control and management.

D. Threats

- ✓ **Regulatory Compliance:** The emergence of new regulations and stricter standards regarding emerging pollutants in wastewater can pose challenges for the integrated treatment system. The system must continuously adapt and comply with evolving regulatory requirements to ensure its effectiveness and legality.
- ✓ **Data Security and Privacy:** The integration of AI involves the collection and analysis of sensitive data. It is crucial to address concerns related to data security, privacy, and compliance with data protection regulations. Adequate measures should be in place to protect confidential information and prevent unauthorized access to the AI system.

Contribution of the project in transforming rural poverty to prosperity

The integrated treatment system of emerging pollutant-contaminated wastewater with AI integration has the potential to contribute to the transformation of rural poverty to prosperity in aquaculture and environmental protection in the following ways:

- ✓ **Improved Water Quality:** By effectively removing emerging pollutants from wastewater, the system helps improve the overall water quality in the rural areas. This cleaner water can support healthier aquaculture systems, reducing the risk of disease outbreaks and enhancing the growth and productivity of aquatic organisms.
- ✓ **Sustainable Aquaculture Practices:** The integrated treatment system promotes sustainable

aquaculture practices by addressing the environmental impacts associated with emerging pollutants. By mitigating the release of these contaminants into natural aquatic systems, the system helps maintain a healthy and balanced ecosystem, ensuring the long-term viability of aquaculture operations.

- ✓ **Enhanced Productivity and Income Generation:** Cleaner water resulting from the treatment system can lead to increased productivity in aquaculture. Improved water quality supports better fish growth, higher survival rates, and increased yields. This, in turn, can contribute to increased income generation for rural communities engaged in aquaculture, lifting them out of poverty.
- ✓ **Diversification of Livelihoods:** Implementation of the integrated treatment system can facilitate the diversification of livelihoods in rural areas. By improving the environmental conditions for aquaculture, it opens up opportunities for farmers and local communities to engage in sustainable aquaculture practices. This diversification reduces dependency on traditional livelihoods, contributing to poverty reduction.
- ✓ **Technology Transfer and Knowledge Sharing:** The implementation of the integrated treatment system requires knowledge and expertise in wastewater treatment, AI integration, and sustainable aquaculture. The introduction of such technology into rural areas provides opportunities for technology transfer, training, and knowledge sharing. This can empower local communities with new skills and knowledge, enabling them to adopt and implement innovative solutions in aquaculture and environmental protection.
- ✓ **Environmental Conservation:** By reducing the release of emerging pollutants into natural aquatic systems, the integrated treatment system contributes to environmental conservation. It helps preserve biodiversity, protect fragile ecosystems, and maintain the overall health and resilience of aquatic environments. This ecological balance is crucial for the long-term sustainability of aquaculture and the well-being of rural communities.
- ✓ **Strengthened Resilience:** The integrated treatment system can enhance the resilience of aquaculture systems and rural communities to environmental challenges. By mitigating the impacts of emerging pollutants, it reduces the vulnerability of aquaculture operations to water contamination and related risks. This resilience contributes to long-term prosperity and sustainable development in rural areas.

FOSTERING SURVIVAL: INNOVATING FISHER-FRIENDLY INCUBATORS FOR SAFEGUARDING MOUTHBROODING CATFISH EMBRYOS IN VEMBANAD LAKE

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Details of Innovation/project

Genesis of the Idea

The project is proposed based on the success achieved in rescuing the embryos of three species of mouth brooding catfishes of the family Ariidae, when the parent individuals were caught in the artisanal fishery from Vembanad Lake, a Ramsar site in Kerala, India. The project is planned to proceed in four phases: a) collection of embryos from the mouth of the freshly dead male individuals of the catfish species viz., *Arius* and *A. subrostratus* from the fishers in specially designed Styrofoam mobile incubators and transportation to the hatchery facility of Kerala University of Fisheries and Ocean Studies (KUFOS), Kochi; b) incubating the embryos in FRP tanks with brackishwater and temperature regulated by a thermostat and heater; c) rearing of the larvae to juvenile stage for two months in FRP tanks or hapas set in ponds with supplementary feeding; d) Release of the juveniles in to the natural habitat from where they were actually obtained with the parents. Once the project is realized, it will ensure the recruitment into the natural systems and will conserve the stock of the species, which in turn will add to the fishery and ensure the sustainability of fishing as well as provide nutritional security to the region and ensure livelihood security to the local fishermen.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

The proposed project intends to rescue the embryos and juveniles of the mouth brooding marine catfishes of the family Ariidae, while they are caught by the local fishermen, on the way of their breeding migration into the Vembanad-Kol wetlands, a Ramsar site in Kerala. The ariid catfishes are known for a peculiar type of parentalcare in which the males incubate the fertilized eggs in the buccal cavity, until the development of juveniles is complete (Lima *et al.,* 2014). Among the Ariid catfishes in India, three species viz*., Arius, A. maculatus* and *A. subrostratus* are the species forming a significant fishery in Vembanad Lake (Kurup *et al.,* 1995). The major threat being faced by the Ariid catfishes in estuaries is the indiscriminate exploitation of the stock including the mouth brooding males during the breeding season, i.e., the south west monsoon months. The species constitutes as a major bycatch in the stake net fishery in Vembanad Lake along with other demersal fishes. Once the adults especially the mouth brooding males of the species, are caught in bottom set gears especially the bottom set gill nets and stake nets, they are prone to death along with the embryos and juveniles. Considering the specific biological attributes of the species especially with regard to 'the parental care', and the prevailing threats in the habitat, there is a need to conserve the stock of the species by preventing the catching of the species during the southwest monsoon or to rescue the embryos and juveniles at various stages of development.

Objectives of the project

i) To rescue the embryos of the three species of mouth brooding catfish genus *Arius* in Vembanad Lake by collecting them from wild fishery followed by artificial incubation and rearing to juvenile stage

ii) To carry out aqua ranching of the juveniles of the rescued individuals in Vembanad Lake

iii) To create networking with fishers for facilitating future rescue programmes

iv)To create awareness among fishermen regarding sustainable fishing practices and its significance for conservation and sustainable exploitation

Project component and functioning

The current project aims to collect the embryos and juveniles from the mouth brooding males and transferring them immediately for transportation to the mobile incubation facility set in polystyrene boxes before placing them to the actual incubation tanks. The project is planned to proceed in four phases:

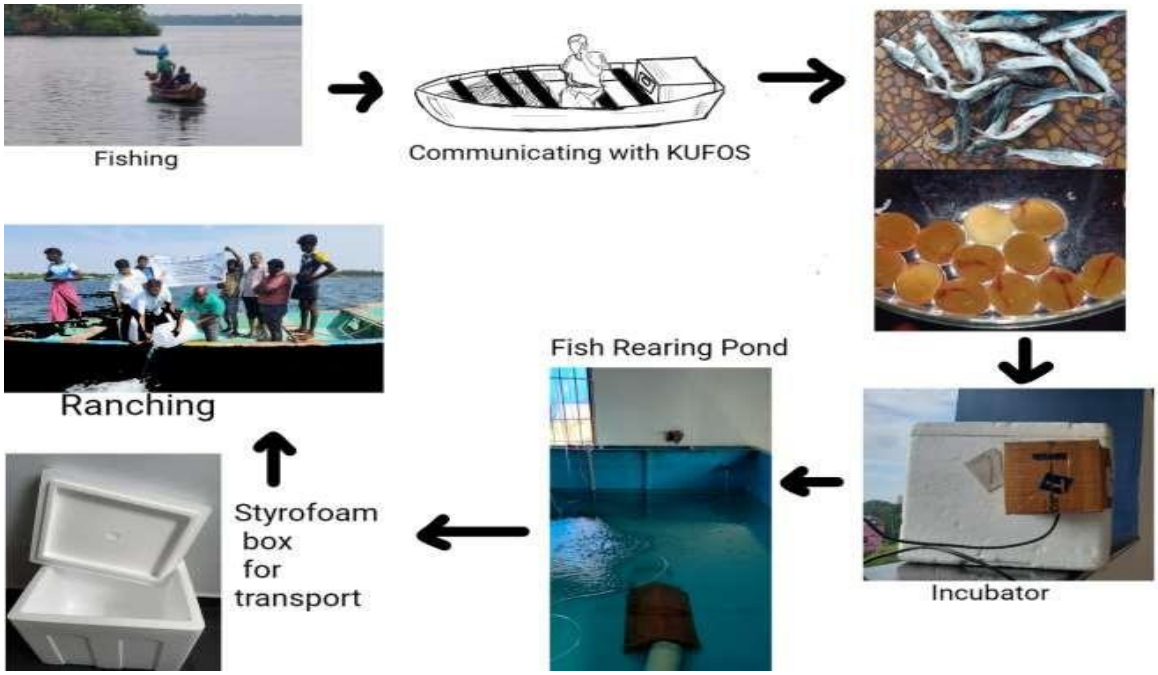
A) Collection and transportation of embryos and juveniles: A prior awareness programme will be conducted on the need of conserving this fish group and the rescue programmes, contact information of the rescue team will be delivered. Based on this fisherman will be informing about the details of the mouth brooding catfishes fished in dead condition. Each fisher also will be provided

with a thermocol box of 50-liter capacity to hold the water from the fishing location. They will also be provided with a battery aerator, tubing and stones to provide diffused air for the juveniles and larvae. Once they reach the landing center, the embryos and juveniles at various stages of development, obtained from the mouth of the freshly dead male individuals of the catfish species viz., *Arius* and *A. subrostratus* from the fishery will be transported to the hatchery facility of Kerala University of Fisheries and Ocean Studies (KUFOS), Kochi.

B) Incubating the embryos in hatchery: Once the embryos reach the hatchery facility, they will be shifted with utmost care to one tonne FRP tanks with brackish water having the same salinity of the natural habitat and temperature provided with heater and maintained with a thermostat. The embryos will be reared in these tanks for a period of one month till the absorption of the yolk sac.

C) Rearing phase of larvae to juvenile: Once the yolk is absorbed completely, the larvae will be transferred to well fertilized earthen rearing ponds or silpaulin lined ponds ranging in area from 40 to 200 square meter, provided with aeration and brackish water of 15ppt collected directly from the estuary or prepared by diluting sea water. Attempts can also be made with rearing the larvae in specially fabricated nylon cages (2x1x1m) placed in the estuarine habitat or in the pen enclosures (5x4x1m) erected at the shore areas of the estuary. The juveniles will be weaned to take clam meat, mollsucan meat and shrimp meat.

D) Aqua ranching of juveniles to natural habitat: After two months of rearing in Silpaulin/ earthen ponds/ cages/pens, the juveniles will be harvested using a seine net of fine meshed soft nylon material. The advanced fingerlings will be transported in Styrofoam boxes provided with aeration and batter operated filtration system to reach the natural habitat from where they were actually obtained. Once reaching the natural habitat, the fishes will acclimate gradually to ensure the no stressful exit and subsequent survival.



Is the project in use?

The project is proposed based on the success achieved in rescuing the embryos of three species of mouth brooding catfishes of the family Ariidae, when the parent individuals were caught in the artisanal fishery from Vembanad Lake, a Ramsar site in Kerala, India. The project proposed in its current form can be expanded to any habitat to rescue the mouth brooding catfishes.

Target areas of its operation

Targeted areas of operation include Kumbalangi, Arookutty, Mulavukadu, Edakochi, Varapuzha in Ernakulam District, part of Vembanad estuary.

Cost for Implementation and operation of this project

Approximate cost is around Rs. 5000/- operation including incentives to thefishermen.

Monetary benefits to be obtained by farmers through the project

As the number of eggs carried by the mouth brooding male varies depending on size from 18 to 40, one rescuing operation is expected to yield more than 80% of the embryos/ juveniles. The species is expected to reach an average body weight of around 150 gm and fetching a market price of Rs. 200/Kg in the domestic market. Other than ensuring direct monetary benefit to the fisher, the proposed project ensures the continuous recruitment of the species in natural system. The activity ensures conservation and sustainable exploitation and livelihood creation to local community.

SWOT analysis of the project

A. Strengths

- ✓ Easily accessible
- ✓ Communication with fishermenpossible in vernacular language
- ✓ Easy networking
- ✓ Cheap, durable and easily fabricable

B. Weaknesses

- ✓ Intensity of casualty among seedsare unpredictable
- ✓ Poor cooperation from the fishingcommunity in the concept of mobile hatchery
- ✓ Water quality of natural habitat is subjected to fluctuation

C. Opportunities

- ✓Sustainable fisheries
- ✓Higher survival rate in catfishes
- ✓High consumer preference for catfish
- ✓Contribution to rural prosperity

D. Threats

- ✓ Difficulty of the fishermen in communicating with professionals
- ✓ Fatality of fingerlings due to poor nurturing
- ✓ Containers might restrict the fishing area

Contribution of the project in transforming rural poverty to prosperity

Once the project is realized, it will ensure the recruitment into the natural systems andwill conserve the stock of the species, which in turn will add to the fishery and ensure the sustainability of fishing as well as provide nutritional security to the region and ensure livelihood security to the local fishermen.

SOLAR OXY-BICYCLE

Shubham Patidar, Shubham Banchhod & Talib Khan

College of Fishery Science, NDVSU, Jabalpur

Details of Innovation/project

Genesis of the Idea

This project is based on aerating the water body. Aerators are connected to Bicycle tyre rings via Shaft to enable mixing of air with water. These devices are used for the addition of oxygen to the water. This Project is based on the principle of Centrifugal Force (RPM). If user will drive Bicycle, free wheel of back rim will rotate and free wheel connect to the Paddle Wheel (Impeller) Aerators through long Iron Shaft, then Impellers rotates continuously and Split the large water droplets to small water droplets as a result for gaseous exchange increases thereby leading to increase in DO level. Use of Oxy-Bicycle aerators in aquaculture is important for ensuring better survival, optimal oxygen supply, higher production, and disease free environment. As in India, mostly fish culture is done in ponds and in rural areas where people don't have access to electricity can use Oxy-Bicycles which will lead to an appropriate environment for the management of ponds with optimum level of DO. Oxygenated ponds are also a disease free environment, because many bacterial, fungal and viral infections are spreading in anaerobic conditions and presence of CO2. It also removes waste and odor caused due to organic gasses. Increase Dissolved Oxygen content and decrease CO2.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

From our perspective to run a profitable fish farm, two biggest obstacles are fish loss and poor growth rates. Aeration is the one factor which kills two birds with one stone for the above mentioned cause. But aerators available in the market are found to be costly and require continuous electricity supply which makes them unaffordable for the small scale fish farmers. Here comes the concept of OXY-Bicycle which will be working as a Paddle wheel aerator and can be operated manually through the bicycle. It will help in saving the electricity as well as reduce the cost of service and maintenance.

Objectives of the project

i) Electricity free design
ii) Manually Operated
iii) High Aeration Capacity
iv) Low maintenance cost

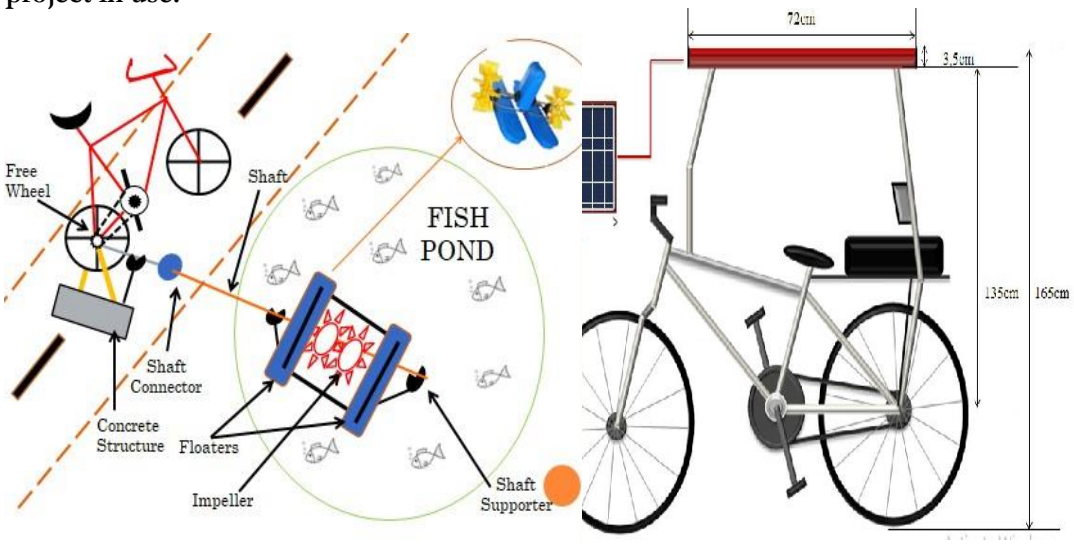
Project component and functioning

Basic component /equipments needed in Establishing and Utilizing this idea (Minimal scale and commercially viable scale)

A) Bicycle
B) Watt Solar Pannel
C) Shaft (Iron) 10ft
D) Floaters (HDPE) - 2 no's
E) Impeller (HDPE) – 2 no's
F) Bush stand – 2 no's
G) Fringes -1 no's
H) Shaft supporter - 4 no's
I) Iron frame – 4\2 ft
J) Iron pipes (Structure supporting) 10ft
K) Concrete structure \ Block 2 no's

Functioning - This Project is based on the principle of Centrifugal Force (RPM). If user will drive Bicycle, free wheel of back rim will rotate and free wheel connect to the Paddle Wheel (Impeller) Aerators through long Iron Shaft, then Impellers rotates continuously and Split the large water droplets to small water droplets as a result for gaseous exchange increases thereby leading to increase in DO level. Use of Oxy-Bicycle aerators in aquaculture is important for ensuring better survival, optimal oxygen supply, higher production, and disease free environment.

Is the project in use?



No, this project is currently not in use.

Target areas of its operation

Small scale fish farmers can use this to improve aeration in fish farms. It can be installed at various recreational parks/gardens to utilize the benefit of aeration in their ponds and also it will attract the tourist as Oxy-Bicycle provides joy and recreational vibes of cycling. According to our data, if anyone drives this OXY-BICYCLE daily 1 to 2 Hrs.' in early morning, It is estimated that additional 500 kg of fish production can be achieved per KW of aeration. Our farmers during the culture of fishes, they mostly focus on feeding, but oxygen is prerequisite for growth and body metabolism.

Cost for Implementation and operation of this project

Approximate cost involved in establishing and utilizing this idea (minimal scale and commercially viable scale).

1. Bicycle	- Rs. 5000
2. Solar Plate 200 Watt	- Rs. 10000
3. HUB Motor & controller	- Rs. 6000
4. Shaft (Iron) 10ft	- Rs. 1500
5. Floaters (HDPE) - 2 nos.	- Rs. 5000
6. Impeller (HDPE) – 2 nos.	- Rs. 2000
7. Bush stand – 2 nos.	- Rs. 1500
8. Fringes -1 nos.	- Rs. 1000
9. Shaft supporter - 4 nos.	- Rs. 4000
10. Iron frame – 4\2 ft	- Rs. 1500
11. Iron pipes (Structure supporting) 10ft	- Rs. 2500
12. Concrete structure \ Block 2 no's	- Rs. 3000
13. Man Power	- Rs. 2500
14. Transportation	- Rs. 2500
TOTAL	Rs. 48000

Note: All the expenditures are calculated as per the approximate cost which can be further reduce as per the level of production.

Monetary benefits to be obtained by farmers through the project

i) Avoids high cost of engine aerators
ii) Electricity Free.
iii) Easy to use.
iv) Low Cost.
v) High Aeration Capacity.
vi) Easy to install and operate.
vii) Low maintenance cost.
viii) Raising fish growth.

ix) Cost effective.
x) Along with the fishes, they also help in our health improvement

SWOT analysis of the project

A. Strengths

- ✓ Limitless, Environment friendly, Ease of usage/harvest , Less overall cost , Versatile.

B. Weaknesses

- ✓ Solar power is available only in day time, Solar panels are inefficient in compare to other mechanical and electrical aerators.

C. Opportunities

- ✓ Create a new business opportunities and entrepreneurship, manageable & easy to install everywhere, availability of subsidy and support, cost reduction.

D. Threats

- ✓ Low efficiency, Energy storage requirement are some of the challenges in addition , shifting the energy sources is lengthy.

Contribution of the project in transforming rural poverty to prosperity

This Solar Oxy-Bicycle will enhance livelihood prospects. It improves efficiency in rural areas of pond water body. However with a drop of capital cost of culture fisheries nearly 60 percent expense/inputs to be saved by farmers to operate this solar oxy-bicycle aerator. Solar aerator, for example not only provide a high quality solution to improve rural productivity but also sustainable to our environment by enabling replacement of diesel/kerosene or mechanical/electrical aerators.

WETLAND UTILIZATION FOR THE WELFARE OF THE FARMERS

Sonali Kumari and Samrat Kumar Nirala

Central Institute of Fisheries Education, Mumbai-400061

Details of Innovation/project

Genesis of the Idea

As we all are aware about the problem of frequent flood in bihar, due to which water gets stored in wetlands (chaur & maun) and farmers are unaware about the benefit that they can generate from this untapped potential resource and thus we bring the revolutionary idea for sustainable utilization of this abundant resources.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

Around 88% of the total population of Bihar lives in villages. The economy of the state is largely agriculture-based and a high proportion of the population lives below the poverty line. Therefore, any attempt at the state's development should primarily focus on rural development. Bihar is bestowed with rich inland-fishery resources and better utilization of these fishery resources can not only boost the economy of the state but also can significantly contribute to the overall improvement in the living standards of the rural communities.

The geography of Northern Bihar is such that the depressed floodplains or lowlands (chaur and maun) are drained by the northern tributaries of the river Ganga such as the Gandak, Budhi Gandak, and Koshi. A total of around 7,000 ha of floodplain lakes is available in Northern Bihar which accounts for about 5.2 percent of the total cultivable land of Northern Bihar. These water-logged areas can be unfit for agriculture but can be efficiently utilized for 'Fish Culture'. Culture-based fisheries with proper management practices would be the best solution to make the best out of these under-utilized natural resources.

Objectives of the project

i) To solve the problem of farmers by generating employment and providing monitory benefits to the farmers and promoting women's empowerment and reducing malnutrition and as well as wastewater treatment

Project component and functioning

The chaur land can be utilized in the following ways -

A) Capture Fishery

Local fishermen utilize these resources using simple gear like traps, long lines, etc. for their food and daily income.

B) Culture Fishery

Technological intervention and infrastructures to support culture fishery:

Hatchery unit - The present culture practices largely focus on the introduction of medium or large-size fishes with commercial importance. However, this has terribly affected the ecology of these wetlands. Importance must be given to the culture of locally available species such as shellfish, carp, etc. which have commercial value. The potential of the small fishes 'Minnows' which forms about 30% of wetland fishery is totally unexplored. Minnows form the major group of bait fishes and are also widely used in research. Some of them are having ornamental value also. Hence the naturally available seed resources can be used for commercial culture in systems such as bio floc.

Cage and pen culture - Culture technologies like 'Pen culture' or 'Cage culture' are ideal for aquaculture in Chaur and maun. While the deeper areas can be utilized for capturing fisheries, shallow marginal areas can be utilized for these culture systems to increase production. The installation costs are not too high and once installed can be utilized at least for a period of three years.

Cost for establishing 1 unit of the cage - ₹9000/m^2
Capacity - 350kg/module
Cost for installing pens - ₹11, 350/ 0.1 ha of land
Output - ₹ 29,688 in the 1st year, 58,957 in 2nd and 3rd year

Ornamental Fishery - Wetlands of Bihar are habitat to a variety of ornamental fishes like glass fish, loaches, etc. which can be exported to different parts of the world.

Industrialization and Employment Generation - Weed infestation by water hyacinth is a major threat, However, this 'biomass' can act as an excellent source of 'Green Energy' and convert them into compost, paper or fiberboard.

With the increase in fish production through culture technologies the scope of establishing associated industries like feed mills, hatcheries, preservation units, processing centers etc. will increase which can contribute to the multi-faceted development of rural Bihar. Women can organize into self-help groups (SHGs) and can find financial security by involving in food processing activities. When their parents have financial stability, more of the rural children will attend regular schooling which is the basis of a country's development.

C) Ecotourism

It should be considered as a flagship venture to the rural development. Wetlands of Northern Bihar shelter thousands of migratory birds during winter. Through ecotourism during the winter season artisanal fishery and bird watching can be promoted. Tourists can now be attracted to these wetlands more than ever before as they have gained an international attention after the Kanwar Taal or 'Kabartal Wetland' of Begusarai district was declared as a Ramsar site. Aqua-parks can also be created.

D) Integrated farming

In addition to all these, these land can be used for the integration of aquaculture with other components like agriculture, horticulture, poultry, duck, goat etc. can ensure maximum utilization of resources and increased income. Through this system, 20-25% higher return can be obtained in comparison to aquaculture alone.

E) Wastewater treatment through the algae culture

Is the project in use?

No, this project is currently not in use.

Target areas of its operation

All the unutilized wetlands and the untapped resources of nutrition present in that area for uplifting the economic condition of rural farmers.

Cost for Implementation and operation of this project

It will vary depending on the practice adopted in utilizing the wetland by the rural people.

Monetary benefits to be obtained by farmers through the project

It will vary depending on the practice adopted in utilizing the wetland by the rural people.

SWOT analysis of the project

A) Strength: Utilizing the untapped potential resources of wetlands for the employment generation for the rural people through various practices as well as the culture of useful algae as an alternate source of feed for fish and treating the water

B) Weaknesses: It is practically impossible to utilize the entire resource of the wetlands, it requires more advanced technologies.

C) Opportunities: Rural employment generation, women empowerment, reducing malnutrition, and sustainable resource utilization

D) Threats: Less technological adoption by laggards and poaching.

Contribution of the project in transforming rural poverty to prosperity

Proper utilization of these resources from a fisheries perspective can contribute to the economic and cultural development of the rural people of Bihar and can also augment the economy of the entire state. As many as 42 percent of children under 5 are stunted in Bihar, which is the highest in the country. Sufficient fish production can tackle the issue of malnutrition as fish is an excellent and cheap source of dietary protein. A culture of algae will help in water treatment and can also be used as alternate source of feed for the fish.

EFFECTS OF FREQUENCY OF SOUND AND LIGHT ON GROWTH AND HEALTH OF FISHES

Kumari Priya, Ankita Suman and Showkat Ahmad Dar
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Details of Innovation/project

Genesis of the Idea

Because frequency of light and sound are most primitive way of distribution of energy & which is available in infinite amount in our nature. Frequencies are mostly naturally occurring &if we understand it motion [physics] and by taking help of natural atomic molecules. So, basically, I am trying to explain how integrated use of chemistry and physics will affects the organisms (fish) behaviour & evolution.

Problems of rural areas in fisheries & aquaculture which are addressed through this project

Mostly I have tried for advance aquaculture for abolition of harmful bacterial diseases which is most common problems in fishes due to excess mucus secretion. Secondly, this can be boon for ornamental fishes which are highly priced fishes sold for their beauty and aesthetical purpose. Some fishes like *Poecilia reticulata*, Arowana, Oscar & many others are overpriced. So, by this technique we can increase pigmentation in fishes and more survivals rate. For rural people who are less educated will need a skilled maneuver to implement once & after that they can be kept under control conditions by them.

Objectives of the project

To alter frequency &it's intensities by quantitative characterization and understanding the effects on fishes' biological system at different levels of complexity

Project component and functioning

A) Control the intensity of different wavelengths of light. It will show effect on growth and pigmentation. It will also increase oxidation process which would help in early nutrient leaching & circulation in aquaponics.

B) We can use ultrasonic sound by help of piezoelectric effect. It functions by using sonotrode in we use SiO_2 molecules their repulsive forces. As sound is mechanical energy but in water with help of magnetic fields line, we can convert it into electrochemical energy. Fishes have lateral line system & some are highly evolved for having electroreceptors. Therefore, they can sense ultrasonic waves and react on that & they are less harmed by these waves. Bacteria (or any other pathogens which are most problematic) do not have this system so they can be eliminated. So, we can eliminate bacteria from water by short time exposure of ultrasonic cavitations. It will show interference with biological system. It will eliminate the riskiest common bacteria.

Target areas of its operation

Growth ;Pigmentation ; Survival rate ; Eradication of bacteria & Purification of well water

Any new aquaculture technology implementation is bit costly earlier but after its success it easy & not costly and depend on size of area we would use.

SWOT analysis of the project

A. Strengths

Strength is that light is naturally occurring and it's basically based on principle of frequency.

B. Weaknesses

Some weaknesses are we need skilled maneuver and good knowledge of frequency.

C. Opportunities

There are lots of opportunity as once this project is well established as it is one time investment for enhancement of pigmentation, growth &eradication of bacteria.

D. Threats

As there is not threat if operated by proficient person but lack of knowledge on any improper activity can be lethal.

Contribution of the project in transforming rural poverty to prosperity

Yes, it will contribute to rural people in transforming them from poverty to prosperity by increasing production, controlling death of costly fishes &many more.

सत्यमेव जयते

PRADHAN MANTRI MATSYA SAMPADA YOJANA

ENTREPRENEURS MODEL IN FISHERIES & AQUACULTURE

Eligible beneficiaries

- Individual Entrepreneurs & Private firms
- Fishers, Fish Farmers, Fish workers, & Fish Vendors
- Fisheries Cooperatives/SHGs/JLGs/FFPOs

Eligibility

- Applicant having own land /leased land for a minimum period of 10 years.
- Should have necessary clearance/ permission etc required for the project.
- Should not have availed similar assistance/subsidy for any similar activity under any Government scheme/Government agency.

Subsidy/Funding patterns

- Back-end subsidy linked Scheme with the bank loan from nationalized/Scheduled banks.
- The total project cost for subsidy sanction is restricted up to 5 Crore.
- Ceiling limits of NFDB Subsidy (Central Assistance)- General- 25 % of TPC (Rs 1.25 Crores) & SC/ST- 30% of TPC (Rs 1.50 Crores).
- Bank loans can be availed (Max Limit)-General Category- up to 65% of TPC & SC/ST/Women- up to 60% of TPC
- Beneficiary Contribution-Min 10% & Max up to 40% of the Total Project Cost
- The eligible subsidy will be released in 3 Instalments- (20:50:30) to the bank directly.

GROUP ACCIDENT INSURANCE SCHEME

- NFDB is a nodal agency for implementing GAIS under PMMSY through M/s Oriental Insurance Company Limited (OICL).

Eligible Beneficiaries

- Fishers, Fishermen, Fisherwomen, Fish Workers, Fish Farmers, and person who are all directly involved in fishing and other allied activities in the age group of 18 to 70 years.

Eligible Insurance Coverage

- Rs.5.00 lakh against accidental death or permanent total disability (PTD)
- Rs.2.50 lakh against permanent partial disability (PPD)
- Rs. 25,000 against accidental hospitalization
- The premium amount of Rs 72.44/- per fisher is shared between Central and State.
- No beneficiary contribution

Exclusive Portal for claim Intimation is. gaispmmsy.com

National Fisheries Development Board,
Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying,
Government of India

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