Scope of Inland Fish Farming in Ernakulam - A Long Term Rural Development Strategy

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Abstract_ Rural development can be sustainably attained only if a project is economically feasible, environment friendly, and socially acceptable. Development can say to be sustainable only if we keep the resources for the future generation without sacrificing the present needs. Fish farming is one among them. With the increase in demand, our natural sources are already been exploited and over captured. Blue growth is becoming a need of society as the consumption rate is getting higher day by day. Blue revolution includes actions from job creation and decent employment to people's consumption which is a value chain system having many phases where we can add value to make a final product. It can be an alternative livelihood option for the rural poor. The present study enquires into the people's awareness about the new advancements and technologies that help the farmers in fish processing or value addition techniques available in the society and also it studies the benefits receiving by the farmers by running these farms. This paper focuses attention on the scope of fish farming in making rural areas a developed model to society. Besides these, the paper will evaluate the government's supports for running fish farms. From the analysis conducted in the study, we can came to a conclusion that fish farming contributes income to the households and it enhances their quality of living, health and it increases their social well-being. The area of study is limited to the Ernakulam District and it is a limitation to the study.

Key words: Inland fish farming, Rural development, Food security

Introduction

A thriving and flourishing fisheries industry is necessary due to many reasons. The universes catch fish, wild-caught fish are even collected more than the greatest feasible level. To cope up with the situation, aquaculture or fish farming is the only solution and its success purely depends on the customer's demand in the market. Now the trend is towards the value-added products or processed foods like cold storage goods, marinated or coated products, seasoned fishes, cleaned or skin pealed fishes, vacuum-packed goods are gathering huge demand in the present busy life. People will be happier if it is available in instant cook mode. Advancement in technology can improve productivity as well. With the new feeding technologies and methods, we can improve feed change and use. Hereditary designing, hereditary qualities, biotechnology, probiotics, and specific rearing can build fish creation cost efficient. Cage culture and closed system is an advancement in the field providing better results as the cage system is fixing in water bodies with free flow of water ensuring natural feeds and oxygen from the stream itself. It's a low-cost model of fish farming where productivity will be maximum. Cages are available in floatable modes also to cope with floods and other natural disasters.

Nesar Ahmed (2009) states about the scope of fish farming in his paper "The sustainable livelihood approach to the development of fish farming in rural Bangladesh" as a sustainable livelihood option for the people over there. He analyses the role of fish farms in the development of rural poor through SLA and concluded that aquaculture or fish farming boosts the economic and social well-being of the rural people. For a state like Kerala, with plenty of water resources comprising both marine and inland water sources. The estimated inland water area is 1, 60,000 ha, and brackish water about 65,213 ha out of which 14,875 ha are only developed for Aquaculture practices. About 2.22 lakh fisher-folk are dependent on these water resources for their livelihood. Our state is having a long coastline which is of 590kms with 222 marine fishing villages and 113 inland fishing villages in the state. There arises the scope of fish farming not only that, it provides nutritious food but also constitutes towards the economic development, job generation, increased purchasing power and a better standard of living. Nowadays sustainable rural development has become an inevitable factor to become a developed nation. Rural development is as much important as the development of a city. Unemployment rates are increasing in our country which will ultimately result in poverty. As per the United Nations Organisation "Envision 2030, they are focusing on seventeen Sustainable Development Goals (SDG) and Millennium Development Goals (MDG)". This paper is an attempt to tackle the rural development needs through a sustainable ecosystem i.e., fish farming. There are many ways of rearing and breeding fish for the sustainable development of the rural poor. It creates immense employment opportunities which will create a source of income and also a means of food for consumption. We have enough resources under-utilized and unexplored. The ultimate aim of conducting this study is to promote the unexplored horizons of fish farming in the Ernakulam district and to ensure sustainable development.

Dr. Mruthyunjaya and his research team (2004) has made a comprehensive study on "strategies and options for increasing and sustaining fisheries and aquaculture production to benefit poor households in India" to understand the problems and prospects of a rural economy and the research team suggests that fisheries and aquaculture provides all kind of benefits like food security, equity, trade, economic balance etc. The authors have constructed "a socio-economic index to compare the socio-economic status of marine fishers under various technologies". The paper further made suggestions to accelerate fishery development to accelerate fishery development to alleviate poverty of the poor fishers. Fish farming or aquaculture is becoming a larger need of society as the per capita consumption increases along with the increase in population. Not only that with the climate change, rise in temperature, overfishing, pollution, and depletion of marine resources causes a shortage of fishes in coast and estuaries. This will result in a decline of fishes in the home town and we will be forced to purchase from outside to satisfy the domestic needs. Import of fishes from outside will increase the costs also. To cope up with this situation, we have to cherish the fisheries sector through fish farming thereby ensuring our food security. We can cultivate fishes of various species according to the demand of the society and we can utilize them to meet the domestic needs and can export the rest of the farm produce products either as fresh fish or as various value-added products to other countries which will result in earning foreign currency. This will enhance the financial status of the state as well as the farmers. Besides these, this process will ultimately result in sustainable rural development. The production process will enhance the economy of the Nation by way of increasing per capita income. By achieving the above-mentioned development, we are stepping forward to a developed nation. Without developing the slums and rural areas, we could not achieve the goal to become a developed nation.

Statement of the problem

Poverty, malnutrition, unemployment is still there in every nook and corner all across the world. Development can only be done if people exist. For ensuring that we should give prime importance to the food security of all citizens of our nation. This study attempts to reveal the real problems and constraints faced by the fish farmers and the scope of aquaculture. There are so many extension services that can be done through various developmental agencies. Value addition programs in fishing, fish cleaning, ready-to-cook fish, etc. can be made available through the adaption of technologies. This study enquires about the people's awareness about the fish processing technologies and their scope. Such programs are under-utilized and even the common men don't have awareness and technology backup. Rural development cannot be achieved unless the people have stability in their financial position. Farm waste is yet another trigger that should be treated carefully. If it is mishandled, it can lead to being ground for the super spread of epidemics. The study also suggests that the schemes should be budget-friendly and the government supports possess delay and is inadequate for the upliftment of fish farming in Kerala.

Significance of the study

The scope of fish farming is very wide and it can contribute great results with a minimum investment. Fish is a perishable commodity that demands immediate storage and preservation. Unfortunately, our state lacks such amenities. Ernakulam district is having 1156 fish farms that lack marketing aids and storage facilities from the government. This study throws attention to the possibilities of fish farming in sustainable rural development and gives insights into the scope of fish processing. Central Institute of Fisheries Technologies and the Indian Council of Agricultural Research together and on self-capacity offers various kinds of fishing and fish processing technology and even the trial production facility that the common men are not aware of. The present study enquires into that also. With minimum effort and investment, we can earn a better income through economically feasible, socially acceptable, and environment-friendly aquaculture practices which can support them with food security, zero hunger, regular income, and a better standard of living for the public which ultimately contributes to rural development.

Value addition programs can create employment opportunities at various levels like its procurement, pealing, cleaning, processing, packing, preservation, storage, drying, marketing, refining oil, and other extracts. Not only that, through integrated farming practices we can cultivate both rice and fish or prawns together thereby achieving food security and zero hunger. Our technology has been developed so far to achieve rural development. Adaption to such technologies through skill development can contribute greater results in developing our society sustainably and equitably.

Objectives

- To study the contribution of fish farms in the district towards their annual income.
- To study the challenges and possibilities of the fish farmers through the implementation of technologies.

Hypothesis

1. H0: There is no significant contribution from fish farming towards the income of fish farmers in the district.
2. H0: There are no significant challenges causing fish farmers.
3. H0: There are no possibilities in fish farming through the adoption of technologies.

Methodology

Research Design: The study is descriptive cum analytical in nature. Both primary and secondary data were used for the study. Primary data is collected from fish farmers in the Ernakulam district. Secondary data for the study gathered through an extensive and intensive survey of the literature. The analysis of the study has been done through SPSS software. Chi-square test, one-way ANOVA, and correlations were done with the data thus collected.

Table: 1.1
Reliability test
Reliability Statistics

Cronbach's Alpha	N of Items
.702	59

Reliability and validity of the questions and responses were tested to the know accuracy of the study and the Cronbach's alpha is .702.

Population

The total population under study is 1156 fish farms in the Ernakulam district where 232 of these are run by women and the rest 924 were by men.

Sample size

The sample size of respondents is calculated by applying the formula (Yamene, 1967). The calculation of sample size is given below.

Formula = N/ (1+ N (e) ^{2} where N is the population and "e" is equal to the value of 0.05.

Calculated sample size = 1156/ (1+1156(.05)^2) = 399.65 i.e., 400.

According to central limit theorem, normality is assumed as the sample size is 400. Random sampling has been conducted using an online software called randomizer and the system generated forty sets of number consisting of 10 numbers in each lot. It is taken as the sample for the study.

Limitations of the study

- Reluctance from the part of farmers to provide information regarding their income from fish farms.
- The study involves the limitations of the Covid-19 pandemic as they are not willing to provide personal interview and farm visit.

Review of Literature

Jefferey A et.al. (2018) conducted a study to evaluate the performance of aquaponics systems with different materials. The study has been conducted in different treatments based in the Philippines and provides a sustainable aquaponics model for rural development. This paper provides a complete picture of the re-circulatory aquaponics system which is a combination of hydroponics and aquaculture. The author provides a clear picture of the ways in setting up the system in a cost-effective manner. From the results of the analysis, it is evident that Styrofoam's are providing good results when compared with the others. Further, the study makes recommendations favouring both plant and fish needs.

Rizka Amanda Putri, Fitri Eriyanti (2019) portraits the situation of the Pesisir district of Indonesia. It is an autonomous region in a coastal area where this study was undertaken. They focus on the obstacles faced by the fishermen community in fish processing and the author tries to draw the attention of the government in this regard. The prime objective was set to the empowerment of people depending on fish as a means of livelihood. Pesisir Regency is an autonomous region in a coastal area where this study was undertaken. They had classified the empowerment process into three phases, i.e., awareness phase, capacity building, and empowerment phase. The author then defines the factors influencing the empowerment of the fishermen's community.

Rajts F & Shelley CC (2020) state about the Mola fish aquaculture in Bangladesh. Mola is one small indigenous fish species-rich in nutrient value. This study provides information on mola culture practices and investigates the profitability aspects of Bangladesh from fish farming. The study also ascertains the cost of farming and makes a viability study on this basis. From the reproductive biology test results conducted in Ganges- Brahmaputra Delta, it is evident that mola can be cultured profitably along with carps. Further recommendations are made comprehensively to develop marketing models, research, and development for hatcheries and nurseries.

Rajts F & Shelley CC (2020) states the ways of improving live fish transportation techniques that are utilized in Bangladesh during the Covid-19 time. In the pandemic situation majority of our states received tons of toxic and perished fish for consumption. The study cites this particular situation and suggests the ways and guidelines for preserving, conditioning furthermore provides knowledge on giving an aerated live transportation system of fish.

Deogratias et.al (2020) reports the impact of rural fish farming in the selected districts of Tanzania. The main focus is to reveal whether fish farming positively or negatively contributing to household income. From this paper, it is evident that fish farming contributes income to the family which enhances their purchasing power and leads to a greater standard of living. The study has proven the statistical tools ANOVA and multiple regression are fit for analyzing the impact of livelihood diversification on fish and household income moreover assess how fish and

non-fish income explains household income. Lack of skill and government support is treated as a hindrance also. The study concludes by stating that 13% of the income generated by the household is from fish farming.

Florin-Constantin Mihai and Corneliu Iotu (2020) comprehensively study "sustainable rural development under Agenda 2030". The authors provide insights on the sustainable development goals and the targets supported by United Nations Organisation. The study reveals the problems faced by common men in rural areas and mentions the R's in sustainable development. Further discusses the underdevelopment and degradation faced by the rural population and provides the pathways towards attaining development goals sustainably.

Holeh G M et.al (2020) explains about the viability of cage fish farming in the northern and Southern coast of Kenya. It was a socio -economic survey stating that majority of the marine population is working on fishing from their early age's i.e. 10-19 and most of the respondents were men (78.4%). The paper proves that, Kenya has all the properties as it is economically feasible and environmentally viable. It enhances an alternative livelihood option to the coastal people and they are provided with training to do so.

Analysis of data

1. H0: There is no significant contribution from fish farming towards the income of fish farmers in the district.
   H1: There is a significant contribution from fish farming towards the income of fish farmers in the district.

Profit earned	N	Mean	Std. Deviation
Below 1 Lakh	341	1.68	1.572
1L-2L	23	1.48	1.275
3L-4L	36	2.36	1.944
Total	400	1.73	1.602

Table: 4.1
Descriptive of Farm income

Source: primary data

Majorly the income earned by farming is given in 4 groups and the annual income ranges are in 7 groups. When we check the percentage contribution of each head it is nearly half, i.e. profit earned from farming is contributing nearly half the annual income. 36 respondents have an earning between three and four lakhs which possess the highest mean value of 2.36 and a standard deviation of 1.944. Majority of the respondents have an earnings below one lakh and it have a profit below one lakh with a mean value of 1.68 and a standard deviation of 1.572.

Table: 4.2
ANOVA

	Sum of Squares	Mean Square	F	Sig.
Between Groups	16.538	8.269	3.257	.040
Within Groups	1007.839	2.539		
Total	1024.378			

Source: primary data

Table 4.2 indicates the result of analysis between profit earned by the farmers from various farm types and their annual income. The f value of the test is 3.257. The sig value is .040 which means that the value is less than .05 and hence the null hypothesis can be rejected at 5% significance level and can accept the alternative hypothesis that fish farming contributes a significant amount towards the annual income of households.

2. H0: There are no significant challenges causing fish farmers.
   H1: There is significant challenges causing fish farmers.

Table: 4.3
Challenges Experienced By Respondents

CHALLENGES	N	Mean	Std. Deviation

IMPPROPER SITE SELECTION	48	1.31	1.339
CLIMATE CHANGE	65	1.62	2.148
FLOOD	33	1.52	1.938
LOW QUALITY SEED	23	1.00	0.003
BACTERIA/PROBIOTICS SHORTAGE	31	1.00	0.004
POLLUTION	1	1.00	
OTHER	199	1.02	.284
Total	400	1.19	1.170

Source: primary data

The major challenges experienced by the farmers are improper site selection, power failure, lack of probiotics, pollution, climate change, flood, low quality seeds etc.

Table: 4.4

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.097	6	4.016	3.062	.006
Within Groups	515.463	393	1.312		
Total	539.560	399			

Source: primary data

Table 4.4 gives the analysis result of challenges experienced by the farmers. It provides the mean value of 4.016 between the farm-type and have a mean square of 1.312 within the group. The F value of the study provides a value of 3.062 where the sig value is .006. It suggest that the null hypothesis can be rejected at 1% level of significance thereby accepting that there is some challenges faced by the farmers.

3. H0: There are no possibilities in fish farming through technology adoption.
   H1: There are possibilities in fish farming through technology adoption.

Table: 4.5

Possibilities of fish farming

Possibilities	N	Mean	Std. Deviation
ZERO WASTAGE	86	1.00	0.010
FISH PROCESSING	126	1.04	.367
ENTREPRENUERSHIP OPPORTUNITIES	56	1.36	1.577
EMPLOYMENT GENERATION	132	1.39	1.688
Total	400	1.19	1.163

Source: primary data

Major possibilities from technology adoption can be zero wastage, fish processing, many entrepreneurship opportunities, employment generation etc. Table 4.5 provides the farmers opinion on the possibilities that they wish from technological advancement.

Table: 4.6

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.606	3	4.202	3.158	.025
Within Groups	526.954	396	1.331		
Total	539.560	399			

Source: primary data

ANOVA table 4.6 provides the results of analysis based on the opinion of respondents. The sig value of the test is .025 and the f value is 3.158. The mean square within group is 1.331 and the value between groups are 4.202. As the sig value is less than .50 we reject the null hypothesis at 5% level of significance and hence come to a conclusion that there are possibilities in fish farming with technology adoption.

FINDINGS

Rural development is a process of improving the lives of rural poor by providing them with better living conditions, infrastructure, hospitals, and all other necessities. Rural entrepreneurship is the best way to cope with the present under development. Adoption of labour- intensive techniques can eradicate the problem of unemployment in the country. The local self-governments in the district are striving hard to ensure the development of the rural area through various schemes and projects. Fish farming is one among them to provide them with food security, an extra source of income, and employment opportunity, and a way of livelihood. Rural development can be achieved through acquiring benefits from this method and that too in a sustainable manner.

- A significant amount of people were joined fish farming last year as part of the Covid-19 lockdown. During these periods, many of the countrymen lost their job and a small portion of the people adopted farming as a means of livelihood and sustenance.
- Covid-19 has a positive impact on fish farming as the farm income has increased during this period. More than 60% of the respondents came to fish farming as part of the lockdown.
- From the study it is clear that Vengoor Panchayath is having the highest number of farms registered in the district. The places like Kadamakkudy, Chellanam, Kuzhupilly, Ezhikkara, North Paravur, Udayamperoor, Kumbalam, Kumabalangi, Njarakkal, Cheranellur, etc. have wide access to brackish water areas and some panchayaths are marine fishing villages were it is under-utilized as the farms are very low compared to its actual capacity.
- People in the fishing villages mostly live their livelihood through marine and inland catches. Fish farming has great scope over there, but it has the least functioned.
- Cage culture of fish farming has wide scope in the country but its function is very low in the district.
- Fish processing is the least undertaken in the district.
- The educational qualification of the respondents is mostly cited as SSLC.
- Most of the family does fish farming as a side business usually undertaken by the housewives as part of their daily routine. Which means that family participation is ensured.
- Only the least portion of the respondents employed laborers as they are running arms on large scale and some has employed people as they don't have any time to spend on this farming.
- Working hours needed for looking after the fingerling is usually less than 3 hours by the farmers which indeed gives pleasure not stress.
- The majority of the farmers responded as they make the harvest of all the ponds are at the same time.
- The mode of the land occupied by the farmers is mostly self-occupied and opined that running farms on a rental basis creates an additional burden, not profit.
- They think that fish farming creates employment opportunities.
- A large portion of the respondents collects their seeds for farming from the central government hatchery at Vallarpadam and some depend on the state government hatchery.

SUGGESTIONS

- Fish farms can be introduced to all the households in smallholdings of Recirculatory Aquaponics System in a transferable three-tier model with solar panel as the roof and hydroponics in the middle and fish in the lower tank can be a revolutionary change in the rural areas which will result in the people with the energy source, food security, income, employment, and an alternative livelihood.
- It can support the fishermen during trawling ban and in the period of natural disaster. It can be treated as an alternative livelihood option for the fisher folk.

- A model village development scheme can be implemented under government department or in a PPP model.
- Farmer field schools can be implemented regionally as it can be a change in the sector, as they can support and train the individuals willing to start fish farming.
- Establishing agro-based food processing units can be a revolutionary change in the sector as processed goods are gaining demands these days.
- A centralized system for acquiring farm products can be of great use to the fish farmers as they face the problem of marketing.
- Fish farming can be done or developed extensively as the demand for fish increases day by day. It can provide the common men with an extra source of income.
- Fish farming can provide people with a regular income if its productions are processed well or through value addition.
- Fish processing technologies can be adopted at large to use fish fully and without any loss or wastage.
- A farmer's cooperative society can be formulated in the district forming a base or as a nodal agency for their welfare and development.

CONCLUSION

Fish farming in the district is in its beginning stages which is having great scope in providing the people with economic prosperity, better standard of living, food security, better sanitation facilities, and generation of employment opportunities and as an alternative livelihood option. Value addition programs with fishes are underutilized and they have a great future ahead. Fisheries production management is a need of the society as it is facing so many issues like lack of proper procurement, storage, icing, processing, adulterations in the imported fish, transportation, packaging, etc. Rural development is a need of the society as it is very important for the development of the nation as well. Educating and training the rural entrepreneurs through their SWOT analysis can bring a change in the rural area.

The results of analysis proves that fish farming creates great scope in the rural development process. The ANOVA table 4.2 results provides that, they makes income from farming which increases their stability resulting in better annual income and the table 4.3 gives that they faces some problems associated with farming which needs to be addressed carefully and it deems government attention for the better productivity. Further the study proves that fish farming can have greater prospects if we adopt technologies in this sector. The central government institutions in India like Indian Council for Agricultural Research- Central Institute of Fisheries Technologies provides various technologies for supporting fish farmers to promote fish-based entrepreneurship in the country.

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