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Research Article

Prospects And Challenges Of Fish Farming Business In Manipur: A Study In Wangoi Assembly Constituency, Imphal West District, Manipur (India)

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ABSTRACT

The fishery sector occupies a significant place in the country's socio-economic development. Fisheries, ranking second only to agriculture, play a crucial role in offering employment opportunities and contributing to the food supply. Manipur, situated in the North Eastern Region of India, encompasses a land area of 22,327 square kilometres which constitutes 0.7% of the total land surface of India. According to the final 2011 census data, the population of the state is 28.56 lakh, giving a population density of 128 people per square kilometre. Although the state has no marine fisheries, it does have extensive inland fisheries resources such as ponds, tanks, natural lakes, wetlands, rivers, reservoirs, submerged agricultural lands, shallow paddy fields, etc. Loktak Lake is the largest source of fish in Manipur. Fish production in Manipur was 32.52 thousand tonnes in the year 2019-2020.

This study aims to analyse the overview of the fish market in Manipur, understand the different modes of fish production and study the present status of fish farming, particularly in Wangoi assembly constituency. By doing so, it seeks to provide a comprehensive understanding of the feasibility and potential pathways for establishing a successful fish farming business in the region.

This paper centres on examining the role of the fish farming business as a small-scale agribusiness under the pisciculture/aquaculture sub-sector in improving livelihoods in the Wangoi region of Imphal West District, Manipur, India. It documents the challenges, prospects and potentials of the fish farming business of the local people in the area.

Keywords: Agribusiness, Aquaculture, Fish Farming, livelihood, Pisciculture

INTRODUCTION

On a global scale, aquaculture is continuously expanding its production capabilities, reaching approximately 114.5 million tonnes in 2018 with an assessed value of USD 401 billion. Worldwide fish production is anticipated to increase to 204 million tonnes by 2030, playing a vital role in ensuring food security, generating employment and boosting income. Aquaculture products encompass a diverse range of flora and fauna types, with 328 varieties identified in 2017, ranging from the cultivation of unicellular Chlorella algae in ponds to rearing Atlantic salmon in cages. In 2018, a significant portion of global aquaculture output originated from Asia, while developing nations contributed around 6 per cent annually. There is a noticeable growth in both the production and consumption of aquaculture products globally, with developing countries increasing their consumption from 5200 tons in 1961 to 18800 tons in 2013.

The pursuit of sustainable fish production aligns with the fundamental goals of sustainable development outlined in the 2030 agenda, emphasising the need for international collaboration to achieve positive outcomes for Sustainable Development Goals (SDG) 14. Projected expansions in fish farming aim to meet future global nutritional demands, provide resilience, improve the well-being of local communities, ensure food supplies, create job opportunities, and alleviate poverty. Fish farming stands as the fastest-growing sector within the global food economy, contributing approximately 42% to the global supply of 58 million tons of fish.

Fish Farming

Fish farming or Pisciculture is a procedure of raising, breeding and transporting fish for domestic and commercial purposes. When it comes to healthy, nutrient-dense foods, fish tops the list as it is rich in protein and other minerals. Fisheries and Aquaculture is a science, an art, and a business, all bundled into one. It is a science when it comes to fish breeding and production procedures and an art when it comes to dealing with fish and other aquatic goods.

Methods of Fish Farming

Cage System: In this approach, fish are cultivated in submerged metal cages in water bodies, allowing for artificial feeding. Typically, these cages are buoyant on rafts, either anchored to the reservoir floor or linked to the shore via a wooden walkway. The cage fish farming method is intricate, requiring expertise in technology, social considerations, financial management, and biology. Widely adopted globally, this form of aquaculture varies in scale, serving purposes from sustenance to commercial operations.
Pond System: This technique involves using small ponds or tanks for fish cultivation, offering a valuable method as it utilises fish waste-infused water to fertilise agricultural fields. Enclosed areas, artificially constructed as ponds, house aquatic animals such as shellfish and finfish. This system can be occupied with rainwater, canal water, bore well water, or other water sources. Proper site selection for pond construction considers climate, topography, water availability, and soil quality. Two main types of ponds emerge based on these factors:

Watershed Pond: These ponds solely rely on water from watershed runoff, although additional sources like groundwater (bore wells) and surface water (streams and reservoirs) can be used.
Levee Pond Systems: Created in flat land areas lacking adequate water from the watershed and, these ponds are typically filled using groundwater.

Integrated Recycling System: This method employs a large plastic tank within a greenhouse for fish cultivation. Adjacent hydroponic beds utilise water from the fish tanks to grow herbs called basil and parsley.
Classic Fry Farming: This system encompasses rearing fish from eggs to fingerlings and subsequently releasing them into stream water.

Biofloc: Biofloc refers to suspended growth in ponds/tanks, comprising living and dead organic matter, phytoplankton, bacteria, and bacteria grazers.
Biofloc Technology: An innovative approach, biofloc technology utilises a dense probiotic formulation containing specific bacteria essential for biofloc fish farming. This technology maximises productivity by facilitating the breakdown of nitrate and ammonia, promoting healthy proteinaceous floc formation. It enhances Feed Conversion Ratio (FCR) and reduces the need for water exchange. Biofloc fish farming is recognised as a sustainable farming method.

Fish Farming in Manipur

Manipur is considered to be the third largest fish-producing state among the North Eastern states. Fish production mainly comes from Loktak Lake, the largest freshwater lake in NE India and people consume fish in various forms including sun-dried, fermented, smoked, pickled, fresh cooked etc. The state comprises 32.50 thousand tonnes of farmed fish, including Catla, Rohu, Mrigal, Bighead, Pengba and some other species of common carp i.e. silver carp, grass carp, common carp etc. Among the various fish species of Manipur, freshwater fish is the most preferred by consumers (32.22%), followed by fermented fish (22.77%), frozen fish (22.22%), smoked (15.55%) and others, including canned fish (7.22%).
Fish and Manipuri Culture and Traditions

Right from birth to the death ceremony, fish is one of the essential menus. Some of the important occasions and celebrations which involve fish menus in the Manipur culture are Maning-Kumba (confinement during childbirth), Potyengba (gifting of channa fish on 6th day of birth to the mother of the newly-born child), Chak-Umba (first feeding of child with food and dishes made with fish, vegetables and legumes), Nahut Nareng Tamba (first shaving of hair, which was with the child when the child was born and piercing in the ear for wearing earrings), Ngakra Pijaba (feeding of walking catfish), Mangani Chakouba/Mapam Chakouba, Chaphu-Uyan Thinba (gifting of cookeries), Ngatangba (feast held on the night of the Sharada ceremony on the 14th day of the departed soul or the next morning), Phiroy, Ningol Chakouba (grand feast with daughters and sisters), Yum Shangaba (Inauguration of a newly-built house) etc.
Apart from the above, there are many traditional rituals and ceremonies which involve fish, viz:
- Ushinshinba (ritual to cure sicknesses),
- Meitei Ngamu Thaba (related to the free away of channa fish in the pond on some occasions)
- Athithi/Guru Seva (feast with fish dishes offered to either 3, 5 or 7 selected Gurus (a Hindu religious teacher or leader)
- Lamtagee-Thangja (rituals programme of the Saturdays of the Lamta month)
- Epan Thaba (offering for a newborn child)

PURPOSE AND OBJECTIVES OF THE STUDY

The demand for fish in Manipur cannot be satisfied by domestic production only. Thus, we need to encourage more farmers to increase the production of fish. This research will be conducted in the Wangoi Assembly Constitution of Imphal-West district. This A/C is also an important area for fish production. In this research, the productivity of fish and the situation of the fish market will be presented. This study will also help the policymakers to provide further institutions of aquaculture in order to educate the farming community. Achieving sustainable and productive fisheries and aquaculture is crucial to ensure food and nutrition security, higher incomes and better livelihoods, as well as to encourage economic growth and protect the location and natural resources. However, the benefits and interdependence of lakeside communities are significant but remain poorly understood.

Thus, in a state like Manipur, where fish holds immense importance, there is a shortage in the production of fish. An extensive gap exists between the demand and supply of fish in Manipur.

The objectives of the study are as follows:

1. To know the income and expenditure of the farmers from the fish farming business.
2. To explore the customer preferences and market trends both in urban and rural areas.
3. To identify the challenges and constraints faced by the fish farmer.
4. To contribute knowledge on fish farming and its market dynamics, filling research gaps and guiding future studies in the field.

RESEARCH METHODOLOGY

Descriptive research was adopted with the view of it being suitable to serve the purpose of drawing an authentic and convincing conclusion for the given topic. The data was obtained from both primary and secondary sources of data. The primary data collection was done through an offline questionnaire format, where most of the questions were close-ended. And secondary data were compiled from the State Department of Fisheries' Websites and some information from various sources was also used in successfully completing the project.

By narrowing the study's focus to Wangoi region, the research aims to gain an in-depth understanding of the local dynamics and nuances related to fish farming within this specific geographic area. This approach allows for a more concentrated and targeted analysis of the fish farming potential and its implications for the local community and economy in Wangoi assembly constituency in Imphal West District, Manipur. The specific period of the study on the prospects and challenges of the fish farming business in Wangoi region takes around six months for the research design and data collection, analysis, and reporting. The study's timeframe encompasses various stages, including preparation, data collection, analysis, and final reporting.

For the current study, a self-developed questionnaire is used to collect the primary information from the cultivators in the Wangoi region. The present study covered 45 people from 45 different households of different age groups who practice fish farming as their primary livelihood.

DATA INTERPRETATIONS

This part deals with the analysis of data collected from the fish farmers. The findings are based on the analysis of primary as well as secondary data, interviews, and personal interactions.

Table 1: Profile of Fish Farming

TYPE OF FISH FARMING (Descriptive Statistics)						
Type	Frequencies	%	σ	$\bar{X}$	Variation	Coefficient of Variation
Pond farming	30	66.7	1.031	1.60	1.064	0.969
Biofloc farming	9	20				
Cage farming	0	0				
Others farming	6	13.3				
Valid N (listwise)	45	100				

AREA OF FARMING (IN HECTARE)					
Type / Area	0-1(Ha)	1-2(Ha)	2-3(Ha)	3-more (Ha)	N
Pond	11	13	6	0	30
Biofloc	6	3	0	0	9
Cage	0	0	0	0	0
Others	3	3	0	0	6
Total	20 (45)	19 (42)	6 (13)	0 (0)	45

KIND OF FISH CULTURED					
Particulars	Major carps	Minor Carps	Exotic Carps	Indigenous	N

Pond	4	4	5	17	30
Biofloc	1	1	2	5	9
Cage	0	0	0	0	0
Others	3	1	0	2	6
Total	8 (18)	6 (13)	7 (16)	24 (53)	45

HARVESTING PERIOD FROM THE TIME OF CULTURED					
Particulars	3-6 months	6-8 months	8-12 months	1yrs-2yrs	N
Pond	18	9	3	0	30
Biofloc	7	2	0	0	9
Cage	0	0	0	0	0
Others	4	2	0	0	6
Total	29 (64)	13 (29)	3 (7)	0 (0)	45

TYPE OF FISH FEEDING				
Particulars	Artificial	Natural	Commercial	N
Pond	12	15	3	30
Biofloc	5	0	4	9
Cage	0	0	0	0
Others	2	3	1	6
Total	19 (42)	18 (40)	8 (18)	45

TOTAL PRODUCTION OF FISH IN A YEAR					
Particulars	500kg-1 tons	1 tons-2 tons	2 tons-3 tons	3 tons-more	N
Pond	13	8	6	3	30
Biofloc	0	3	3	3	9
Cage	0	0	0	0	0
Others	2	3	1	0	6
Total	15 (33)	14 (31)	10 (22)	6 (14)	45

Source: Primary data *figures in the parenthesis indicates the % of the corresponding data

The above table offers insights into the prevalence of various types of fish farming among respondents. Here's a summarised interpretation:

Dominant Method (66.7%): Pond farming emerges as the most widely practised method, with 66.7% of respondents engaging in this form of fish farming. This indicates its popularity and widespread adoption within the surveyed group.

Significant adoption (20%): Biofloc farming represents a significant portion, with 20% of respondents choosing this method. While not as prevalent as pond farming, its adoption is noteworthy, suggesting a level of interest or recognition among the respondents.

No Adoption (0%): Cage farming is not represented in the surveyed sample, indicating that none of the respondents reported practising fish farming using this method. This could be due to various factors such as regional preferences, economic considerations, or suitability of the method.

Diverse Practices (13.3%): A smaller but still noteworthy proportion (13.3%) of respondents reported engaging in other, unspecified forms of fish farming. This diversity suggests that there are alternative methods being employed within the surveyed group.

Comprehensive Coverage (100%): The table encompasses the entire sample of 45 respondents, providing a comprehensive overview of the distribution of fish farming types within the surveyed group. This data is valuable for understanding the landscape of fish farming practices among the surveyed population.

In short, pond farming dominates the fish farming landscape among the respondents, while biofloc farming represents a substantial alternative. Cage farming is not reported, and a smaller percentage engages in other, unspecified forms of fish farming. This information is crucial for industry stakeholders, researchers, and policymakers to understand the prevailing trends and preferences in fish farming practices. It shows that the majority of the fish farmers in Wangoi area are adopting fish farming in the pond. The average or mean value for pond farming is 1.60. The standard deviation is 1.031, indicating the variability in the data points around the mean. The variation is 1.064, providing information about the distribution's skewness. The coefficient of variation is 0.969, representing the relative variability in pond farming. It is calculated by dividing the standard deviation by the mean and is stated as a percentage. In summary, the table provides a breakdown of the frequencies and descriptive statistics for different types of fish farming. Pond farming has the highest frequency, and the descriptive statistics offer insights into the central tendency, variability, and distribution of farming types within the dataset. Keep in mind that for Biofloc, Cage, and Other farming, some statistics are not provided, likely because there are no valid cases or farms practising these methods in the dataset.

About the area of farming, the above table shows that 45% of farmers are farming in the area between 0-1 Hector (Ha), 42% in the area about 1-2 Ha, 13% in the area 2-3 Ha and none of them in the size larger than 3-4 Ha. It depicts that the majority of the farmers are doing fish farming on a small scale and large-scale farming is less in the Wangoi region. The above table depicts the kind of fish cultured and it is found that 18% of the respondents cultured major carp,13% cultured minor carp, 16% cultured exotic carp and 53% cultured indigenous fish. Although many types of fish are available nowadays, fish farmers still prefer to culture the indigenous fish as their first choice. The above table portrays the harvesting period from the time of culture and it is found that 64% of respondents harvest in 3-6 months, 29% in 6-8 months, 7% in 8-12 months and 0% in 1-2 years. In the above table, the amount of total production in a year is illustrated and it is found that 33% of the respondents produce 500Kg-1tons, 31% produce 1tons-2tons, 22% produce 2tons-3tons and 13% produce 3tons-more. Further, the above table exhibits the type of feeding and it is found that 42% of the respondents use artificial feed, 40% use natural feed and 18% use commercial feed.

Table 2: Aspects of Fish Market

MARKET DEMAND OF FISH PRODUCTION				
Particulars	Low	Medium	High	N
Pond	2	19	9	30
Biofloc	0	5	4	9
Cage	0	0	0	0
Others	0	4	2	6
Total	2 (5)	28 (62)	15 (33)	45

WHOM DO YOU SELL THE FISH					
Particulars	Wholesalers	Retailers	Consumers	Any others	N
Pond	12	12	4	2	30
Biofloc	3	3	3	0	9
Cage	0	0	0	0	0
Others	3	2	1	0	6
Total	18 (40)	17 (38)	8 (18)	2 (4)	45

DEMAND OF FISH IN URBAN AREA AND RURAL AREA			
Particulars	Rural	Urban	N
Pond	12	18	30
Biofloc	4	5	9
Cage	0	0	0
Others	2	4	6
Total	18 (40)	27 (60)	45

FLUCTUATION IN THE PRICE LEVEL OF FISH					
Particulars	Seasonal	Festivals and Occassions	Natural Calamities	External factors	N
Pond	10	8	6	6	30
Biofloc	6	2	1	0	9
Cage	0	0	0	0	0
Others	6	0	0	0	6
Total	22 (48)	10 (23)	7 (16)	6 (13)	45

PROBLEMS OF MARKETING				
	Low	Moderate	High	Total
Transportation	4 (9)	6 (13)	35 (78)	45 (100)
Competition	2 (5)	10 (22)	33 (73)	45 (100)
Lack of order	25 (56)	15 (33)	5 (11)	45 (100)
Lack of finance	1 (2)	4 (9)	40 (89)	45 (100)
Price Variation	11 (25)	32 (71)	2 (4)	45 (100)
High costs of inputs	2 (5)	5 (11)	38 (84)	45 (100)
Storage problems	10 (22)	25 (56)	10 (22)	45 (100)
Total	55 (17)	97 (31)	163 (52)	315 (100)

Source: Primary data *figures in the parenthesis indicates the % of the corresponding data

In the above table regarding the market demand, it is found that 5% of the respondents think demand is low, 62% think the demand is moderate, and 33% think the demand is high. It means that the majority of the farmers in different types of farming techniques believed that the market demand for fish is high. In connection

with the selling of their product, it shows that most farmers sell 40% of their products to wholesalers, 38% to retailers, 18% to end consumers and 4% to miscellaneous buyers. In the above table, whether the fish demand is higher in Urban or Rural areas, both areas have a high demand, with the urban area having a slightly higher of 60% to 40% in rural areas.

The above table also depicts the fluctuation in price level and it is found that the price fluctuates seasonally according to 48% of respondents, 23% due to festivals and occasions, 16% due to natural calamities and 13 due to various external factors.

The lower part of the above table provides insights into perceived challenges in marketing, categorised by their impact levels. Here's a summarised interpretation:

Transportation: High Impact (78%): A significant concern, indicating that a large majority of respondents view transportation costs as a substantial problem in marketing.

Competition: High Impact (73%): The majority of respondents consider competition to be a significant challenge in marketing, with a substantial impact on their activities.

Lack of Order: Low to Moderate Impact (89%): While lack of order is mentioned, it seems to have a lower impact compared to other challenges, with the majority of responses falling into the low and moderate categories.

Lack of Finance: High Impact (89%): Lack of finance is a widespread and highly impactful issue, with almost 9 out of 10 respondents categorising it as a significant challenge.

Price Variation: Moderate to High Impact (71%): Price variation is seen as a notable challenge, with a significant percentage of respondents considering it to have a moderate to high impact on marketing.

High Costs of Inputs: High Impact (84%): The majority of respondents view high costs of inputs as a substantial problem, indicating that it significantly affects marketing activities.

Storage Problems: Moderate Impact (56%): Storage problems are seen as a moderate challenge, with more than half of the respondents categorising it as having a moderate impact on marketing.

Overall: The overall distribution indicates that respondents identify finance-related issues, transportation costs, competition, and high costs of inputs as the most impactful challenges in marketing. These findings can guide strategies to address and mitigate these concerns in marketing efforts.

Table 3: Financial Overview of Fish Farmers

TOTAL INPUT COST (BOTH VARIABLE AND FIXED)					
Total cost inputs	5-7 L	7-10 L	10-15 L	15 L- more	N
Pond	21	9	0	0	30
Cage	0	0	0	0	0
Biofloc	0	2	5	2	9
Others	4	0	2	0	6
Total	25 (56)	11 (24)	7 (16)	2 (4)	45

TOTAL ANNUAL INCOME FROM FARM					
Total Income (Annual)	3 - 5L	5 - 8L	8 - 12 L	12 L - more	Total
Pond	18	9	2	1	30
Cage	0	0	0	0	0
Biofloc	1	2	4	2	9
Others	4	1	1	0	6
Total	23 (51)	12 (27)	7 (15)	3 (7)	45

FINANCIAL AID FROM GOVERNMENT OR PRIVATE BANKS/ FINANCIAL INSTITUTIONS			
Particulars	Yes	No	Total
Pond	3	27	30
Cage	0	0	0
Biofloc	8	1	9
Others	2	4	6
Total	13 (29)	32 (71)	45

Source: Primary data *figures in the parenthesis indicates the % of the corresponding data

The table provides insights into the distribution of total input costs across different expenditure ranges for various aquaculture production methods.

Pond Production: The majority of instances (21 out of 30) fall within the 5-7 L expenditure range, suggesting that a significant proportion of respondents incur total input costs in this range. No reported instances for the 10-15 L and 15 L or more expenditure ranges indicate that respondents in the sample did not incur costs in these higher ranges for pond production.

Cage Production: There are no reported instances of cage production in any expenditure range, suggesting that respondents in the sample did not incur any total input costs for this production method.
Biofloc Production: Instances are distributed across multiple expenditure ranges, with the 10-15 L expenditure range having the highest number of instances (5 out of 9).
This suggests variability in total input costs for bio floc production, with some respondents incurring higher costs in the specified range.
Others: Instances are reported in the 5-7 L and 10-15 L expenditure ranges, with the majority falling in the 5-7 L range (4 out of 6 instances).
Similar to pond production, there are no reported instances in the higher expenditure ranges for "Others."
Overall: The data indicates diversity in total input costs across different production methods and expenditure ranges. Pond production, in particular, seems to have a concentration of instances in the lower expenditure range, while bio floc production shows variability across different ranges. The absence of reported instances for cage production suggests no reported costs in the provided expenditure ranges for this method.
This information can be valuable for understanding the cost distribution in aquaculture and may guide further analysis or decision-making related to budgeting and financial planning in these production methods.
The second section of the table presents insights into the annual income distribution across various aquaculture production methods and income ranges. Here's a summarised interpretation:
Pond Production: A substantial proportion of respondents (18 out of 30) reported annual incomes in the 3 - 5 L range for pond production. The number of instances decreases as the income range increases, indicating a trend of lower reported incomes for pond production.
Cage Production: There are no reported instances of cage production across any income range, suggesting that respondents did not disclose any income within the specified brackets for this production method.
Biofloc Production: Biofloc production exhibits income variability, with the highest number of instances (4 out of 9) falling within the 8 - 12 L income range. This suggests that some respondents reported higher annual incomes in biofloc production, indicating potential profitability.
Others: The majority of instances for the "Others" category fall within the 3 - 5 L income range (4 out of 6 instances), indicating that this production method is associated with relatively lower reported incomes.
Overall, across all production methods, the largest share of reported incomes (51%) falls within the 3 - 5 L range, followed by 27% in the 5 - 8 L range, 15% in the 8 - 12 L range, and 7% in the 12 L or more range. The absence of reported instances of cage production suggests a lack of disclosed income in the provided brackets for this method. This information provides an overview of the income distribution in aquaculture, highlighting income trends for different production methods and income ranges. It can be valuable for assessing the financial performance of various aquaculture practices and informing decisions related to income expectations in the industry.
The table's last section provides information on receiving financial aid from government or private banks/financial institutions for different aquaculture production methods. Only 3 out of 30 respondents reported receiving financial aid, while the majority (27) did not receive any assistance for pond production. The percentage of respondents receiving financial aid for pond production is 10%. There are no reported instances of receiving financial aid for cage production. A notable proportion of respondents (8 out of 9) reported receiving financial aid for biofloc production, indicating a high level of support in this category. The percentage of respondents receiving financial aid for biofloc production is 89%. A minority of respondents in the "Others" category (2 out of 6) reported receiving financial aid, while the majority (4) did not receive any assistance. The percentage of respondents receiving financial aid for the "Others" category is 33%. Across all production methods, 29% of respondents (13 out of 45) reported receiving financial aid, while the majority (71%) did not receive any assistance. This suggests a varied level of financial support for different aquaculture practices, with biofloc production having a relatively higher incidence of financial aid compared to pond and other methods.
In summary, the data indicates that financial aid is not widely reported among respondents, with a notable exception in biofloc production, where a significant proportion received support. This information can be valuable for understanding the financial landscape and support structures in the aquaculture industry.

MAJOR FINDING

- Pond Farming Dominance: Pond farming emerges as the predominant method of fish farming in Wangoi A/C. This suggests that local farmers favour the use of ponds for cultivating fish.
- Small-Scale Operations: The majority of fish farming areas are relatively small, ranging from zero to one hectare. This indicates a prevalence of small-scale operations among the surveyed farmers.
- Preference for Indigenous Carps: Indigenous carps are the most popularly cultivated fish species in Wangoi A/C. This is followed by major carps, minor carps, and exotic carps, revealing a diversity in the types of fish species being farmed.
- Short Harvest Cycles: Most farmers harvest their fish between 3-6 months, indicating a relatively short production cycle. Additionally, the annual production is reported to be in the range of 500 kg to 1 ton per farmer, reflecting a moderate level of production.

- Balanced Feed Approaches: The most common feeding practice involves a combination of both natural and artificial feeds. This balanced approach indicates a conscious effort by farmers to provide a varied and nutritious diet for their fish.
- Moderate Demand: The market demand for fish is reported as moderate. Wholesalers are the primary buyers, followed by retailers and consumers. This suggests a structured supply chain within the local fish market.
- Transportation and Financial Constraints: High transportation problems and a lack of financial assistance are identified as significant challenges. These challenges could hinder the efficiency and profitability of fish farming operations.
- Annual Investment Levels: The majority of farmers invest between 5-7 lakhs annually in their fish farming activities. This signifies a considerable financial commitment to the industry.
- Income Distribution: Most farmers report annual incomes ranging from 3-5 lakhs and 8-12 lakhs. This diverse income distribution indicates variations in the success and scale of fish farming operations.
- Limited Financial Assistance: Most farmers report never having received any financial assistance. This suggests potential gaps in support mechanisms for fish farmers in the region.
- Benefits and Biofloc Adoption: Fish farming is pursued due to its perceived benefits. Additionally, the rising popularity of biofloc farming suggests a recognition of its advantages over other methods.
- Transition from Traditional Methods: There is an observed shift in participation from traditional fishing methods to the modern fishery sector. This shift may indicate an acknowledgement of the changing dynamics and opportunities in the industry.

  In summary, these detailed findings provide a nuanced understanding of the fish farming landscape in Wangoi A/C, encompassing practices, challenges, market dynamics, and the evolving nature of fish farming in the region.

CONCLUSION

In conclusion, the findings suggest several key recommendations and areas for improvement in the fish farming sector in Wangoi A/C, Manipur. There is a need to update fish farming techniques and implement new methods to enhance productivity and profitability. This could involve the adoption of modern practices such as biofloc and cage farming, which offer potential benefits. Recognising the lack of financial assistance for farmers, there is a call for increased government attention and support. Given the high demand for fish in the state, supporting the farmers financially can contribute to the growth of the industry. The fishery department should take proactive measures to prevent diseases in fish farms. Disease prevention is crucial for maintaining the health and sustainability of fish stocks. Awareness programs should be initiated to highlight the benefits of bio floc and cage farming. Educating farmers about the advantages, ease of implementation, and potential market for products from these methods can encourage more farmers to adopt them. Cage farming, particularly in locations like Loktak Lake, Khuga Reservoir, and Maphou Dam, should be encouraged due to perceived benefits. This expansion can contribute to meeting the high demand for fish in Manipur. Encouraging the production of a variety of fish species is recommended. This can be achieved through increased research and development, collaboration with foreign countries to introduce new varieties, and providing necessary training to farmers. The significant problems in transportation and storage identified in the data call for the establishment of more cold storage facilities. This can help reduce post-harvest losses and ensure the freshness of fish products in the market. To address the lack of financial assistance, efforts should be made to increase investments from the government and other investors. This can have a positive impact on fish production. Government-led awareness programs conducted by professionals should be implemented. These programs can educate farmers on best practices, new technologies, and market trends, ultimately contributing to increased production and reduced reliance on fish imports. With increased production and quality improvements, there is potential for the state to not only satisfy local demand but also explore opportunities for fish export. Government initiatives can play a crucial role in promoting export activities.
Finally, a holistic approach involving financial support, technological advancements, awareness programs, and infrastructure improvements is essential to boost the fish farming industry in Wangoi A/C and contribute to the overall economic development of Manipur.

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