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Institution based intervention on promoting composite fish culture in rural Odisha: A case of KVK-Khordha

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Abstract
The present study deals with an institution driven technology dissemination approach in promoting composite fish culture in Khordha district of Odisha. A sample of 42 fish farmers benefitted from Krishi Vigyan Kendra (KVK) were analysed to understand the adoption of Scientific Management Practices (SMP), effectiveness of KVK activities and constraints faced by farmers. Majority of the farmers were of middle aged group, practicing grow-out culture by utilizing their own financial resources. The adoption of SMPs was found to be higher after the intervention of KVK in the respective villages by practicing soil and water analysis, scientific stocking density, supplementary feeding techniques and other relevant practices to increase fish production. The respondents of the study perceived that the Front Line Demonstrations was the most effective method compared to other activities/services of KVK. Constraints faced in practicing aquaculture were high cost of feed, lack of financial support, poor retention of water in ponds, disease outbreak and issues related to lease period and value. The study concludes that institutions are vital for the welfare and also updating with technical know-how to achieve higher fish production.

Keywords: Composite fish culture, Scientific Management Practices, Front Line Demonstrations, Krishi Vigyan Kendra

1. Introduction
Aquaculture in India provides food and nutritional security to millions of people. Significantly large number of rural population in India depends on aquaculture as their primary livelihood activity. Carp production is increasing tremendously throughout the India and caters to the tastes of all classes of people ranging from aristocratic urban consumers to the rural poor [3]. Carps contribute more than 80% of the share among the aquaculture production from inland sector. Among the 33 districts of Odisha state, Khordha district contributes 5525 MT of fish from 1929.24 ha of water area in terms of pond and tanks [2]. Majority of the freshwater resources in rural Odisha falls under community ponds vested with community or local level institutions, religious bodies without and/or with resources and local self government for multiple use and multiple users [7]. It is understood that large efforts have been taken by development agencies towards promotion of freshwater aquaculture in the district.

Krishi Vigyan Kendra (KVK), Khordha is fully funded by Indian Council of Agricultural Research (ICAR), New Delhi works under the administrative control of ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar was established in 1977. Since its inception the KVK has been working on farm trials, Front Line demonstrations and trainings to fish farmers on latest technologies. The KVK has successfully demonstrated freshwater technologies viz., induced breeding of carps, seed rearing and carp culture with due integration with other farming practices in the farmers field. The KVK has been working at the interface of technology growing and technology adoption systems, playing a key role in the process of technology dissemination through various means [4]. Rapid expansion of the freshwater aquaculture sector across the country though has been visibly demonstrated, the increasing role played by the sector in poverty alleviation, livelihood support and nutritional security has often been ignored due to the lack of documentation. Institutional support for motivating the farmers to adopt scientific management practices is a key in a developing country like India.

Present study therefore aims toward promoting composite fish culture in the mandated district. With the above background this study was conducted with the following objectives:

1. To study the socio-economic characteristics of fish farmers benefitted from KVK interventions
2. To understand the adoption of Scientific management practices on composite fish culture by KVK benefitted fish farmers
3. To assess the effectiveness of KVK activities in adoption of composite fish culture through technology assessment and intervention

2. Materials and Method

The study was conducted in Khordha district of Odisha State. The respondents of the study are the beneficiaries of KVK benefitted from the mandatory activities of technology assessment, demonstration and training. The respondents were selected from 21 villages from five blocks of the district. A total of 42 beneficiaries were selected for the study through random sampling technique. Data was collected through a pretested structured interview schedule developed for this purpose and administered through personal interviews. Technical indicators like adoption of different management practices, impact through different indicators of success, involvement of KVK through different programmes and constraints to fish production were measured by using scales and scoring procedures. The study was conducted during the period 2013-14.

3. Result and Discussions

3.1 Socio-economic characteristics

The socio-economic characteristics of the respondents indicated that they were equally of middle and old age group constituting (80.94%) and only 19.06 per cent belonging to young age (Fig.1). This clearly indicates that young aged people have not been in practicing agriculture compared to that of the middle and old aged groups. The educational status of the respondents inferred that majority had high school education (40.47%) followed by primary education (28.57%) and high secondary level (19.04%) and few were graduates and above (Fig.2). High educational status of the respondents is an important factor must for or adoption of modern practices and it is relevant that Khordha is one of the most literate districts in Odisha which paves way for adoption of innovations. It was also recorded that majority of the respondents belonged to general caste (42.85%) followed by Other Backward Caste 35.71 per cent (Fig.3). The inferences on the annual income reflect mixed income generation from fishery activities. Water area possession indicates that 26.19% farmers possessed more than 5.0 acre and 38.09% farmers possess less than 1.0 acre (Fig.5). In terms of number of pond with individual farmers, only 14.28% have more than three ponds with them (Fig.6). While accessing the year experiencing in fish culture activities, it was found that 47.61% farmers have experience between 5-10 years.

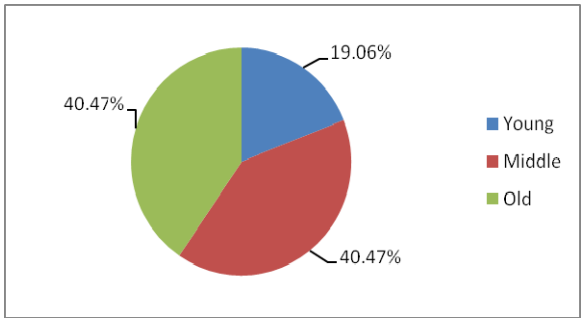

Fig 1: Age group of the respondent

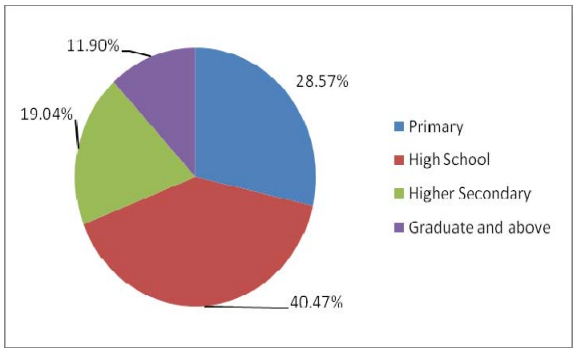

Fig 2: Educational status of the respondent

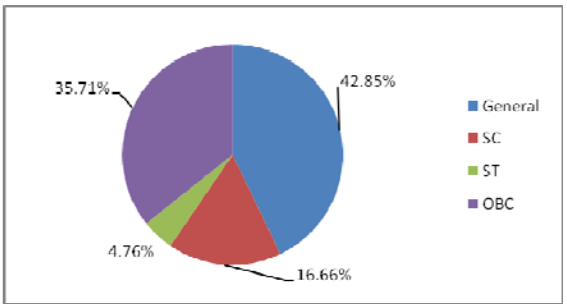

Fig 3: Caste category of the respondent

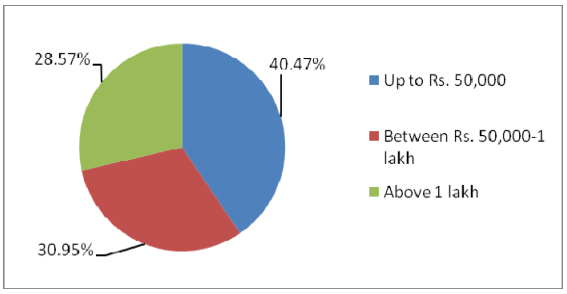

Fig 4: Annual income of the respondent

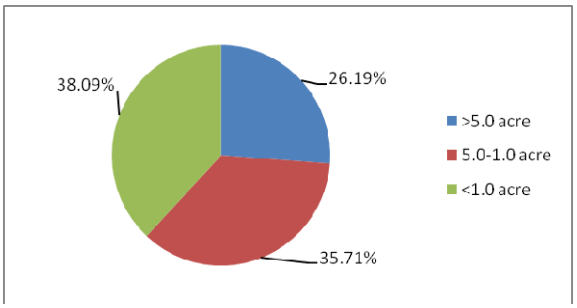

Fig 5: Pond (water) area by the farmers

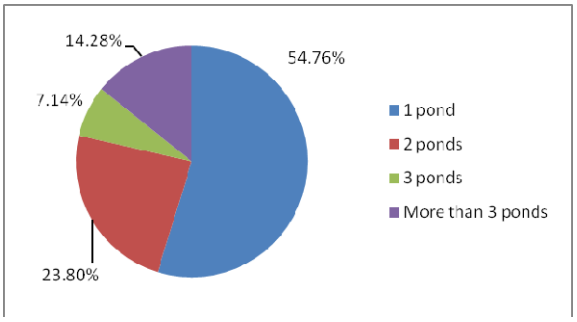

Fig 6: Number of individual ponds possessed by the farmers

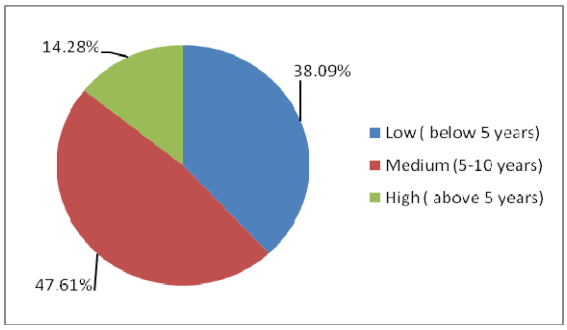

Fig 7: Experience in fish farming

3.2 Pattern of Income generation

In this study the pattern of income generation options of fish farmers was restricted to seed production, grow out culture and both (seed production and grow out culture). It was found that majority of the farmers (76.19%) had grow out culture as an income source followed by both seed production and grow out culture (Fig.8). This indicates a lack of seed producer in rural areas of the district. The reason for low number of farmers to practice seed production was due to the reason that it is labour intensive and being a seasonal mode. The prominent freshwater species cultured were Indian Major Carps viz., Catla (*Catla catla*), Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*) and few cultured minor carps.

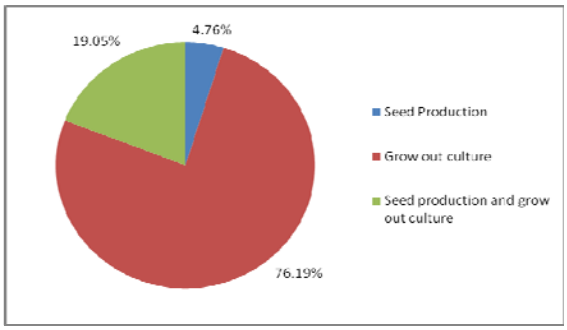

Fig 8: Income generation pattern of the respondents

3.3 Source of water for pond

Water is the most critical resource and must be available in abundant and concurrently a good quality to achieve and maintain harvests. The source of water for aquaculture operations is one of the key factors for successful production. In the present study equal proportion of respondents (28.57%) used rain water and bore well (28.57%) followed by Lift Irrigation point (26.19%) and canal (16.66%) as sources of water for aquaculture production (Fig.9). This indicates that rainfed aquaculture is predominant and aquaculture operations are clearly dependent on rain which is highly seasonal.

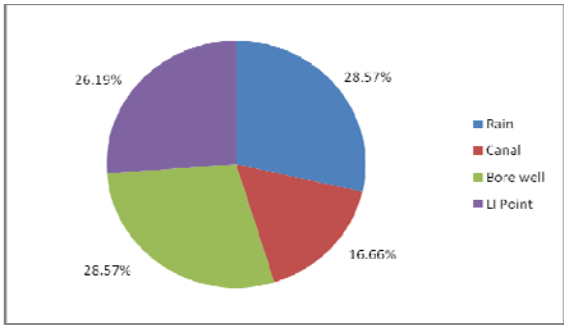

Fig 9: Water sources used by respondents for fish culture

3.4 Credit Orientation

Credit is another important source for the farmers to sustain fish culture at the initial phase and during the culture period. Majority of the farmers under the study has used their own credit sources and only 26.19 per cent of them used credit sources for practicing fish culture (Fig.10). It is reported that high cost of feed, non-availability of quality seed, absence of organised marketing, poor technical skill of farmers, paucity of credit and social problems hinder aquaculture development [6].

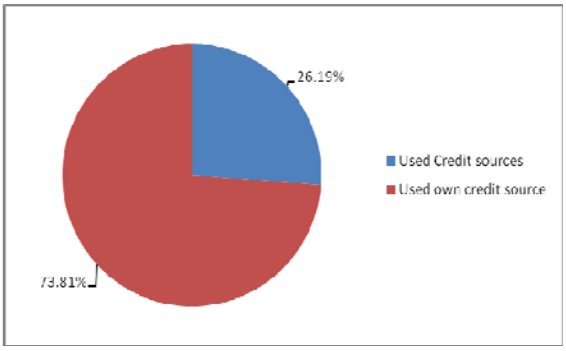

Fig 10: Credit sources used by respondents for fish culture

3.5 Membership in Societies and other institutions

Communication sources are very much important for adoption of any agricultural technology and its scientific management practices. In this study it was observed that majority of the respondents (38.10%) had no membership in any of the formal and informal institutions (Fig.11). However, 33.33 % of the respondents were members of farmers clubs and 28.57% were members of Self Help Group (SHG). It is inferred that 61.90% of the respondents were members of farmers club and SHGs, which indicates that the members are well aware about the informal and formal institutions in the study area and the advantages being a member for information and other input resources to be used.

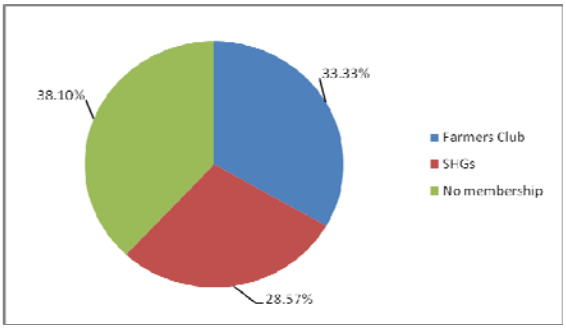

Fig 11: Membership in Societies and other formal and informal institutions

3.6 Contact with KVK

In the study area KVK-Khordha has been working for more than 20 years and the contact has helped the respondents to adopt management practices and also to seek advisory services. The study indicated that 50% of the respondents had contact with KVK below five years and between 6-10 years contact were 30.95% and above 11 years were 19.05% (Fig.12). KVK has been working with its mandatory activities viz., on-farm testing, frontline demonstration and training in the study area. All the respondents of the study are KVK beneficiaries who have been benefitted with the advices provided over the period of time.

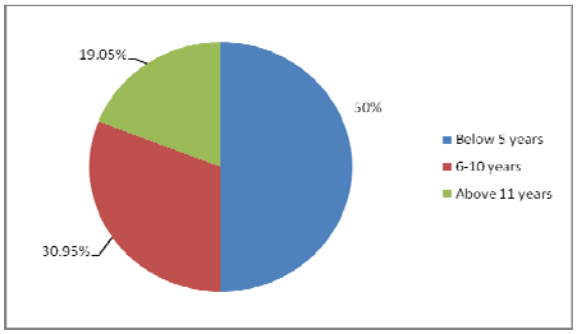

Fig 12: Contact with KVK-Khordha

3.7 Adoption of management practices by farmers after KVK intervention

Adoption of management practices in composite fish culture depends upon the extension participation, information from different sources and skill development through capacity building activities. The adoption behaviour of composite fish culture practices was positively influenced by the factors like extension participation, economic motivation, cosmopoliteness, scientific orientation and knowledge of fish farmers, and negatively by their age [8]. From the present study it could be observed that after the intervention of KVK the adoption of scientific management practices have increased (Table 1). The Scientific Management Practices (SMPs) adopted are eradication of predatory and weed fishes, removal of aquatic weed, fertilization of pond (both organic and inorganic), water quality testing using institutions, stocking of pond (with proper stocking density and ratio), regular observation of water colour for plankton availability, water level/depth and other significant practices. After KVK intervention water quality testing through lab was one of the highest with 95.24% along with proper stocking density (94.24%), use of extension agencies (92.85%) followed by liming the pond (87.51%). It is evident that the intervention of KVK on all means has improved the adoption of scientific management practices in composite fish culture by the fish farmers.

Table 1: Before and after Adoption of Scientific management practices in composite fish culture through KVK intervention

S. No	Items	Before KVK intervention	After KVK intervention	No change
1	Eradication of predatory and weed fishes	26.19	69.05	4.76
2	Removal of aquatic weeds	42.85	52.38	4.76
3	Pond preparation (dyke, pond bottom etc)	30.95	64.28	4.76
4	Fertilization of pond (organic)	9.52	88.1	2.38
5	Fertilization of pond (inorganic)	9.52	88.1	2.38
6	Water quality testing in laboratory (KVK, ICAR-CIFA, other institutions)	2.38	95.24	2.38
7	Regular observation of water colour, water level/depth	21.3	62.0	16.7
8	Stocking of pond (with proper stocking density and ratio)	4.76	95.24	0
9	Liming of pond at regular interval	7.14	85.71	7.14
10	Use of Supplementary / balanced feed for fish	23.81	73.81	2.38
11	Natural food/ plankton availability investigation	4.76	83.34	11.90
12	Daily removal of left over feed	4.76	61.90	33.34
13	Regular observation of fish behaviour	30.95	57.14	11.90
14	Multiple harvesting practice	40.47	57.14	2.38
15	Restocking practice	19.04	54.76	26.19
16	Extension services for technical guidance (from KVK, NGO, Govt Machinary)	7.14	92.85	0

Participatory impact evaluation after the intervention of KVK

The overall impact evaluation of KVK intervention was studied and the inferences on over all knowledge on fish culture, positive attitude towards fish culture practices, skill on different management practices, increase in culture area (new pond constructed / pond taken for lease etc.), managerial ability and self confidence, fish production (over traditional method), involvement in different activities like stocking, feeding, selling have increased after the intervention of KVK. The increase in knowledge and skill have been due to the interventions of KVK as the activities have targeted towards influencing communities towards adoption of scientific management practices. The parameters for understanding the impact tailored towards information, knowledge and skill that has increased and decreased before and after the intervention of KVK (Table 2). Substantial increase on overall knowledge on fish culture, skill to practice the SMPs, modern fish production was observed followed by positive attitude and other activities related to fish farming.

Table 2: Parameters of impact assessment with before and after intervention of KVK

S. No	Parameters	Increased than before	Decreased than before	Equal as before
1	Over all knowledge on fish culture	97.61	2.38	0
2	Positive attitude towards fish culture practices	83.33	4.76	11.90
3	Skill on different management practices	92.85	4.76	2.38
4	Involvement in different activities like stocking, feeding, selling	85.71	4.76	9.52
5	Fish production (over traditional method)	90.47	4.76	4.76
6	Increase in culture area (new pond constructed / pond taken for lease etc.)	33.33	4.76	61.9
7	Managerial ability and self confidence	85.71	11.90	2.38
8	Fish consumption in family	76.19	16.66	7.14
9	Relation with your neighbour and fellow friends	57.14	14.28	28.57
10	Exposure with other fish farmers	69.04	14.28	16.66

Perception on the Effectiveness of KVK activities

KVK has been a prime mover in the district with other agencies towards promoting composite fish culture. The study also identified the effectiveness of different activities of KVK in terms of technology assessment, refinement, demonstration, training and provision of advisory services. Among the different activities of KVK the front line demonstrations organised were most effective followed by training, technical guidance through regular contact (Table 3). The perceived high effectiveness of demonstration programmes has been due to the nature of activities involved in demonstration viz., explanation of practice, demonstrating the skill and the one time input provided for adoption. The perception on the effectiveness of KVK activities has also been high in terms of learning through training as KVK organises concurrent training upon completion of the demonstrations. Regular contact/field visit for technical guidance has also been effective perceived by the beneficiaries of KVK as the subject matter specialist in fisheries provides constant information and appropriate advice to the beneficiaries in regular intervals through personal and online services.

Table 3: Effectiveness of KVK activities

S. No	Activity	Effectiveness		
		High	Medium	Low
1	Demonstration programmes	92.85	7.14	0
2	On-farm trial programmes	76.19	21.42	2.38
3	Support through critical inputs	78.57	19.04	2.38
4	Learning through training	83.33	14.28	2.38
5	Regular contact / field visit for technical guidance	78.57	21.42	0
6	Accounting and record keeping	73.80	26.19	0
7	Linkage development with other institutions	69.04	21.42	9.52

Constraints to fish production

The study also elicited constraints faced by fish farmers in fish production in relation to input availability, adoption of scientific management practices, marketing and other aspects of fish farming. The responses indicated that the most important constraint faced based on scores were cost of feed, lack of financial support, poor retention of water in ponds, disease outbreak, high lease value of ponds, period of lease, difficulty in eradicating weeds in ponds, infestation of aquatic weeds and high cost of net hiring charges (Table 4). The increasing feed cost is one of the prime concerns in the sector in terms of access and affordability of fish feed which has been raised as one of the serious issue. The issue of poor retention of water in ponds indicted by the respondents in line with the study of Laxmiappa, 2014 as the tank/pond resources of the country are mostly rain fed, an erratic rainfall or reduction in rain increases the risk of drying up or water depth reduction to critical level, rendering them unsuitable for providing optimal growing condition of carps [3]. Ananth *et al*., 2014 reported that high production costs, risks of poaching and other constraints were also elicited by members who adopted the practice [1]. The results of the study are also in line with the observations of Radheysham, 2001 that weed infestation, poor water quality and disease outbreak in fish were also constraints in community aquaculture [4]. Lease value and period of ponds were also a concern, which indicates that 78% of the village community ponds were leased for short-term period (1-3 years) [5]. It was observed that 22% of community ponds were leased for 1 year, 56% for 3 years and 15% for 5 year.

Table 4: Constraints in fish production

S. No	Constraints	Most important	Important	Less important
1	Period of leasing ponds	54.76	38.09	7.14
2	High lease value of ponds	57.14	33.33	9.52
3	Difficulty in eradicating weed and predatory fishes	47.61	47.61	4.76
4	Infestation of aquatic weed	42.85	38.09	19.04
5	Poor water retention capacity of pond	66.66	21.42	11.9
6	Less availability of good quality seed	54.76	28.57	14.28
7	High cost of supplementary feeding	73.80	21.42	4.76
8	Disease outbreaks	64.28	19.04	16.66
9	High cost towards net hiring	38.09	35.71	26.19
10	Fear of fish poaching during night	47.61	30.95	21.42
11	Lack of financial support	69.04	23.80	7.14

Conclusions and Recommendations

It is evident from the above study that institutional support is essential towards promotion of scientific management practices for better production of fish. The essential factors though being farmers' interest and commitment as binding there is also need of institutions to play a vital role in advisory services and providing timely services. The study also indicated the adoption of scientific management practices in fish culture can increase fish production. It was also observed that Front Line Demonstration of KVK has been found to be more effective than any other activity performed by KVK as with the principle of "Seeing is believing". The process of promotion of composite fish culture by KVK through study has clearly indicated that institutional support carries a desirable impact on fish farmers. Policy issues on land use rights, lease period and value and other constraints faced by fish farmer's needs strong interference from the governments to support farmers for better production and a sustainable livelihood.

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