

ADAPTABILITY OF UPDATING TECHNOLOGY VIS-À-VIS FISH PRODUCTION ECONOMICS—AN EFFECTIVE LINKAGE OF RURAL FARM-FISHERIES IN INDIAN SUBCONTINENT

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ABSTRACT

To disseminate update technologies and to enhance capabilities of resource poor farm families for the production of capture as well as culture fisheries, using natural and socio-economic resources an extensive study on linkage between resource availability and production potentiality were undertaken in the study area (under New Alluvial Zone of West Bengal situated in between 21°31' and 27°14' North latitude and 85° 51' and 89°53' East) of the regions. The study was emphasized to use the extensive floodplains wetlands in the form of oxbow lakes (mauns, chauras, jheels, beels, nayanjali - as they are called locally), which dominated in the north-eastern part of the country (25-30%) because of their divergence as well as their production potential. The precise objectives is to find out the magnitude and matching of interrelation between available socio-economical factors, natural resources, adaptability of agro-techniques in farm fisheries ecosystem through TOT, development of economical and eco-friendly feeds etc. for fish variables, in one side and the production as well as enhancement of farm economy for the fishermen as well, the other side. In the study emphasis was also paid to use best possible efforts to accustom with update technologies, which were facilitated in a very organized way (demonstrations, short term training programme, farmers' day, local or trade study etc.). However, results are very promising and thus, able to meet up of shortfall of production in the zones, and bringing about social changes as well in the farming community. In conclusion, the country has adapted chronologically modern fish production system to mitigate the ever long crisis of fish demand/head/day or annum, notably, presently production of inland as well as marine fishes increased in its significant level to about 10.2 and 46.0 times over 0.25 and 0.5 million tones, respectively over the last 50 years.

Keywords: Adaptability linkage, update technology, production economics and social changes

INTRODUCTION

Technology and changing national and international economic policies have enabled world's population to come closer not only by space and time but also by trade and exchange of information and this evolving process has been recognized and given a name - Globalization. The recent trends in globalization and increased interest in factory and corporate farming should not be allowed to jeopardize the roles of millions of small and marginal farmers and landless agriculturists who form the back bone of the agricultural economy in several developing countries. The growing importance of aqua farming had been felt in recent year, it is most important part of a country.

In order to solve the acute fish problems, which India had been facing since independence, one of the most important ways is to facilitate a technological breakthrough in the field of aquaculture. As a result, attention had been paid towards finding out newer types of aquacultural innovation, which may contribute significantly in boosting up aquacultural production system to in its saturated level. But the success of achieving a real goal is solely depends upon the adaptation outcome by the farmers as most of them residing in remote village level. So for facilitating the technological revolution in the field of aquaculture, ways of communicating to the

prospective clientele should be given its due importance as success of any innovations depends largely on how the individuals of particular social system (adoption, modernization, acculturation etc.) will react on it [1]. It may be stated that increased adoptions of modern aquacultural techniques will lead to increase productivity in the field of fish production, both in inland as well as marine fisheries. In this sense the adoption of innovations may be treated as a means to an end, not an end itself. In other words the success of the adoption of modern techniques of fish production system will be reflected through increased productivity.

However, fisheries sector plays a pivotal role in the natural economy in view of its contribution to the food basket. The total fish production during last few years was around 6.15-6.50 million tones, with marine and inland fisheries contributing 46.2 and 53.8 per cent, respectively to the total. Fish is a source of cheap animal protein and the current per capita consumption of fish in India is around 9.0 kg per annum as compared to 11.0 kg recommended by WHO. Fortunately, presently the contribution of fisheries sector to the GDP and agriculture GDP has been estimated to 1.2 and 4.2 per cent, respectively [2]. Keeping the above mentioned points in mind, the present study had been conducted under New Alluvial Zone of West Bengal, India with the objectives as I. To analyze the interrelation among the different dependent and independent variables, II. Finding out the relationship between different selected social and economic variables with the fish yield index.

METHODOLOGY

The pilot study was emphasized to use the extensive floodplains wetlands in the form of oxbow lakes (*mauns, chaus, jheels, beels, nayanjali* - as they are called locally), which are dominated in the north-eastern part of the country (25-30%) because of their divergence as well as their production potential. The precise objectives is to find out the magnitude and matching of interrelation between available socio-economical factors, natural resources, adaptability of agro-techniques in farm fisheries ecosystem through TOT, development of economical and eco-friendly feeds etc. for fish variables, in one side and the production as well as enhancement of farm economy for the fishermen as well, the other side. In the study emphasis was also paid to use best possible efforts to accustom with update technologies, which were facilitated in a very organized way (demonstrations, short term training programme, farmers' day, local or trade study etc.) in New Alluvial Zone of West Bengal under the Republic of India situated between 21°31' and 27°14' North latitude and 85° 51' and 89°53' East Longitude and the tropic of cancer running across the middle of this state. Before set on field demonstration trials in the farmers' fish ponds, a composite structured schedule was formulated for collecting information regarding the background characteristics of the respondents and standardization of their socio-economic status by the scale (0, 1, 2, 3, 4, 5, 6), developed by [3]. Test-retest reliability of the scale was 0.87. The other measurement on dependent and independent variables such as extension contact, cosmopolitaness [1] of the respondent, management orientation [4] and fish yield index of the region had also been taken in to consideration.

The field project trials cum demonstrations were launched a massive and constructive extension programme under extension commanding area in the zones. According to programming on fish groups (FG₁: live-fishes, magur - *Clarias batrachus*, singi, *Heteropneustes fossilis*, sol, *Channa striatus* and gager *C. marulius* and FG₂: sweet water fishes, rohu - *Labeo rohita*, katla, *Katla katla*, mrigal, *Cirrhinus mrigala* and silver carp, *Hypophthalmichthys molitrix*) was restricted, using improved and judicious eco-friendly fish feed materials (F₁: powered mustard oilcake + rice husk in 1:1 ratio, F₂: neem oilcake, F₃: poultry droppings + cowdung (1:1) @ 6 times body weight of fish at weekly interval, which compared with F₄: without feed material as local practice) in cluster basis in villages (4 clusters) to develop centers for further dissemination of new technologies on fish production as well as quality of produce. Actually, before starting of the programme, fish farm families, they were mostly habituated to use very little fish feed, even sometimes without of it. Improved technical guidelines, use of improved feed materials and

proper protection cares was little behind of that area. For this, several short-term training meeting of the farmers, field day programmes, local or trade centre study and timely observations of the fish ponds were the regular manner that's why they could not feel any difficulties regarding their farming system with encouragement for further development in community basis.

RESULTS AND DISCUSSION

Relationship Between Socio-economic Status and Other Dependent and Independent Variables

The results indicated that socio-economic status of the respondents under the present investigation was found to be significantly related with the different dependent and independent variables (Table I). Authors [1] argued the logic behind these type of findings was the fact that more effective communication with client occurred when the sources and receiver were homophiles. They furthered emphasized that almost every such analysis in this field showed that change agent had more communication with higher status than with lower status members of a society. As a consequence of higher social and economic status the fish farmers under the present investigation had been to be move outside their community for seeking information regarding farming. Actually the farmers with higher socio-economic status had to become more cosmopolite in nature in order to establish higher extension contact. Significant relationship between utilization of communication sources and socio-economic status were awarded due to utilization of more mass media by the respondents than the individuals who were utilizing personnel localize sources information. The significant relationship between management orientation and socio-economic status might be explained in terms that in order to become oriented towards planning, production and marketing, some of the socio-economic status of an individual contributed significantly. This might be education, pond holding, materials possession and infra-structural facilities, though the contribution of them had not been tested at the empirical level. The socio-economic status and fish yield index of the respondents was found to be significantly related in the present investigation. It may be presumed that the productivity is influenced by the extent of adoption of scientific aquacultural practices. The fish yield index, which had been chosen as the dependent variable might be thought of as the ultimate effect of adoption of scientific techniques. Adoption behavior of the fish farmers had been found to be associated with proper training, education, economic status, pond holding size and also with the socio-economic status of an individual as a whole [5]. Therefore it might be argued that higher status farmers were observed in the present study to have higher fish yield index due to their sophisticated adoption behavior.

Relationship Between Extension Contact and Other Dependent and Independent Variables

Extension contact had been evident to be significantly related with all the variables. Higher degree of contact with the extension personnel resulted into greater motivation on the part of such fish farmers, which led them towards greater planning regarding the mode of production, adoption of scientific aquacultural practices and marketing of the produce. As a result of these, the respondents with higher extension contact exhibited higher degree cosmopolitaness, utilization of communication sources, management orientation and fish yield index.

Relationship Between Cosmopolitaness and Other Dependent and Independent Variables

Cosmopolitaness in the present study had been found to be significantly related with utilization of communication sources and management sources. The reason behind that the movement of an individual outside his social and encouraged the motivational components behind the variable management

orientation. The study however failed to find any significant relationship between the cosmopolitanism and fish yield index. This was due to the fact that fish yield index was more affected by the economic factors than the social factors.

Relationship of Utilization of Communication Sources and Other Dependent and Independent Variables

Significant relationships were obtained between the utilization of communication sources and the management orientation and fish yield index. Management orientation involves attitudinal predisposition of an individual towards planning, production and marketing. This involve gathering of knowledge regarding the techniques of this aspects, as knowledge function had been thought of by [1] to be the prerequisite of the persuasion function in the innovation-decision procession. On the other hand it had been earlier stated that the fish yield index was the resultant of adoption behavior and hence it might be argued that due to the increased adoption of aquacultural practices by the utilization of mass media and cosmopolite channels of communication, the respondents' productivity were increased.

Relationship Between Management Orientation and Fish Yield Index

A dearth result indicated the significant relation between management orientation and fish yield index was observed in this field study. It might be expected that that more prone a fish farmer became towards managing his farm efficiency, the more would he consider the scientific aquacultural technology and more productivity would result. Hence, the management orientation was found to be significantly associated with the fish yield index among the thorough survey studied.

Table I: Distribution of the results of the inter-correlation between different variables

Variables	Socio-economic status	Extension contact	Cosmopolitaness	Utilization of communication sources	Management orientation	Fish yield index
Socio-economic status		0.486**	0.541**	0.531**	0.567**	0.240**
Extension contact			0.510**	0.507**	0.412**	0.241**
Cosmopolitaness				0.617**	0.495**	0.154**
Utilization of communication sources					0.689**	0.272**
Management orientation						0.371**
Fish yield index						

** Significant at 1% level of significance

Relationship of Fish Yield Index and Selected Social and Economic Variables

The results indicated significant relationship between crop yield index in one hand and farm power and land holding on the other (Table II). Such findings indicated that the productivity of the respondents was influenced by the economic factors. Several research workers found that the earlier adopters had large sized units (farms and so on) than the late adopters [6]. In view of these findings, it might once again be stated that the contribution of the economic variables on the extent of adoption of scientific aquacultural practices, which had been, thought of as the essential prerequisite to increase the productivity. The study however did not find any significant relationship between fish yield index and education, a social variable.

Table II: Correlation of Different Selected Social and Economic Variables with Fish Yield Index

Variables	Infra-structural facilities	Pond holdings	Training/education
Fish yield index	0.295**	0.221**	0.058

** Significant at 1% level of significance

Production Potential

Intensification of practices, improved and economic fish feed as organic sources, comprehensive environmental management, systematic measures against fish diseases, community aquaculture and proper guidance are the prominent strategies to increase fish production, not only in the country but also equally important to other fish growing countries in the world.

Individual Fish Yield

In the study, all the fish variables were cultured individually but for convenience for presentation individual fishes were grouped in to two; e.g. FG₁, composed of magur, singi, sol and gager; and FG₂, which composed of rohu, katla, mrigal and silver carp. These were reared with normal but improved nutritional status (powdered mustard oilcake + rice bran in 1:1 ration @ 4-5 times body weight of fish at weekly interval) along with proper management practices. Fingerlings, fish feed and other necessary inputs were supplied to the farmers timely from the institutional sources.

Individual fish yield in cluster I & II in both the groups comparatively least performed than that of cluster III & IV, may be due water quality and depth of submergence of the respective ponds. It is more contrasting and comparable enough with the local practice. The magnitude of yield increased in all the individuals were to the tune of 46.0 to 78.0 per cent, more prominent in magur, singi, mrigal and silver carp (Table III).

A significant price differences were noted in between local market or *hat* and zonal trade centres in the zones. In most of the cases, fish farmers are sell out their output directly to the middlemen in the trade centres, with reasonable profit margins. Fewer cases they sell out their fishes locally with small harvests (Table III).

Table III: Individual fish yield and their price study

Variables	Av. yield (t ha ⁻¹)						Av. price of fishes (Rs. t ⁻¹)	
	Cl. I	Cl. II	Cl. III	Cl. IV	Av. yield	Av. local yield	Local market	Zonal trade
FG ₁								

Magur	0.57	0.59	0.68	0.64	0.62	0.38	1,30,000 (2,826.1)	1,50,000 (3,260.9)
Singi	0.52	0.56	0.62	0.58	0.57	0.32	1,20,000 (2,608.7)	1,40,000 (3,043.5)
Sol	1.32	1.38	1.46	1.52	1.42	0.96	1,10,000 (2,391.3)	1,30,000 (2,826.1)
Gager	1.38	1.44	1.50	1.52	1.46	0.92	1,10,000 (2,391.3)	1,30,000 (2,826.1)
FG ₂ Rohu	1.14	1.19	1.27	1.24	1.21	0.83	50,000 (1,086.9)	60,000 (1,304.3)
Katla	1.28	1.35	1.43	1.38	1.36	0.86	40,000 (1,086.9)	55,000 (1,195.6)
Mrigal	1.09	1.15	1.26	1.22	1.18	0.68	40,000 (1,086.9)	50,000 (1,086.9)
S. carp	1.18	1.26	1.39	1.33	1.29	0.74	40,000 (1,086.9)	45,000 (978.3)

Av., average; Cl., cluster; Parenthesis indicates US\$ (1US \$ = Indian Rupees 46)

Group Fish Yield

Application of eco-friendly and judicious fish feed, applicable on fish variables in grouped basis were remarkably influenced the fish yield, practiced in farmers' fish ponds on community basis. Almost all the feed items were more or less equally effective for such increment of fish yield and it significantly differed from control pond, where fishes were nourished without any fish feed (Table IV). The increment was to the tune of 82.2 to 116.4% in FG₁ and 98.5 to 131.0%, respectively in FG₂. However, among the 3 fish feed materials highest results obtained with F₁ (powered mustard oilcake + rice husk in 1:1 ratio @ 6 times body weight of fish at weekly interval), although it quite statistical at par with other treatments in the field studies. The practice of proper fish feed was quite effective to rearing and to increase fish yield irrespective of fish variables in the different 4 clusters of the zones.

Table IV: Fish yield in groups as influenced by fish feeds

Variable s	Cl. I		Cl. II		Cl. III		Cl. IV		Av. of clusters	
	FG ₁	FG ₂	FG ₁	FG ₂	FG ₁	FG ₂	FG ₁	FG ₂	FG ₁	FG ₂
Fish feed	1.02	1.28	1.19	1.34	1.21	1.33	1.18	1.32	1.15	1.32
F ₁	1.00	1.22	1.12	1.18	1.18	1.26	1.15	1.21	1.11	1.22
F ₂	1.04	1.18	1.13	1.22	1.12	1.24	1.09	1.22	1.09	1.21
F ₃	0.56	0.59	0.55	0.58	0.64	0.67	0.61	0.64	0.59	0.62
F ₄										

Av., average; Cl., cluster; FG, fish group

Trend of Fish Production in India

The country is endowed with vast and varied resources possessing river ecological heritage and rich biodiversity. The share of inland fisheries sector, which was 29 per cent in 1950-'51, has gone up over 49 per cent in 2001 indicating increasing contributions of the inland sector to the total fish production [5]. Carps in freshwater aquaculture and shrimps in brackish water aquaculture have mainly contributed to the quantity as well as value in inland aquaculture sector. However, at now the results are very promising

and thus, able to meet up of shortfall of production of the country as well as in the zones, and bringing about social changes as well in the farming community. Indeed, the country has adapted chronologically modern fish production system to mitigate the ever long crisis of fish demand/head/day or annum which was the regular scenario of the country, notably, presently production of inland as well as marine fishes increased in its significant level to about 10.2 and 46.0 times over 0.25 and 0.5 million tones, respectively over the last 50 years (Figure 1).

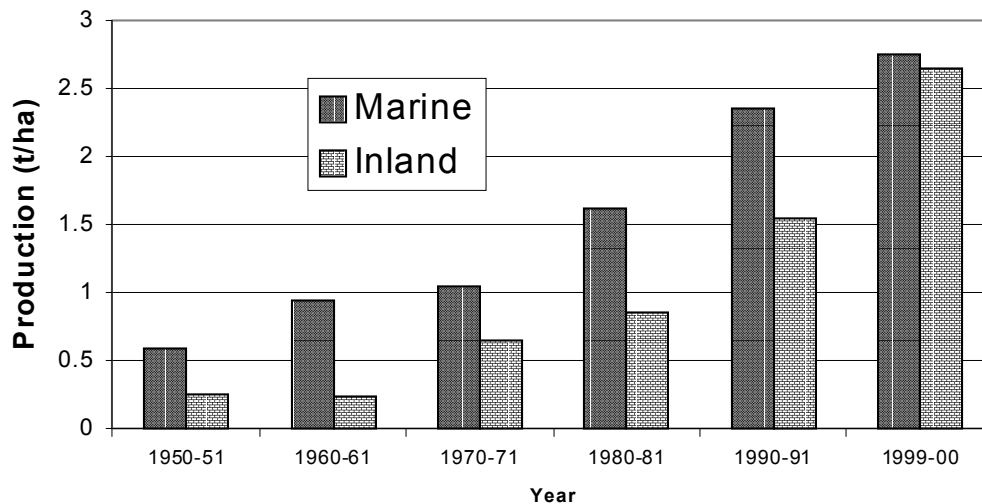


Figure 1. Trend of fish production in India

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ENDNOTES

The adoption process or modernization is influenced by the socio-psychological and socio-personnel variables and adoption of updating techniques is quite capable for development and to increase the fish productivity as well as farm improvement including socio-economic status of poor to marginal farm families in the sub-continent.