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## Impact of trainings in increasing farmers income: Evidence from Bihar, India

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### Abstract

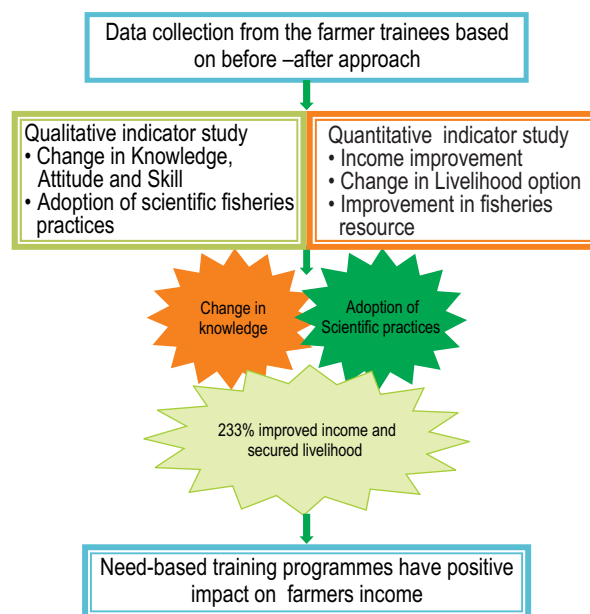
**Aim:** Impact of trainings conducted by the ICAR-Central Inland Fisheries Research Institute on the income and livelihood of trainee farmers of Bihar state of India.

**Methodology:** Data were collected from trainee farmers across fourteen districts of Bihar who had undergone training at least one year ago. The information regarding knowledge/awareness, attitudes, skill of trainees were recorded by using three point continuum scales. Data were also collected on adoption of various fishery related scientific practices. The study was conducted in 2018-19 by selecting 25% of the farmers trained on inland fisheries management over seven years in ICAR-CIFRI from 2012-13 to 2018-19.

**Results:** Significant improvement in knowledge, attitude and skill (KAS) was noticed as a result of training. Change in knowledge of the farmers of Madhubani district was higher in comparison to other districts, while the skill and attitude change was found more for the farmers of Begusarai and Darbhanga district. Around 82% of the farmers adopted composite fish culture followed by Pangasius culture (70%) after training programme. About 67%, 53% and 43% of the trainees adopted scientific fish disease control, technique of pond renovation/preparation/construction and fish feed preparation technique, respectively. It was found that 7% of the farmers had adopted fisheries as their principal occupation and 23% of the farmers had taken up fisheries as secondary occupation after undergoing training programmes. About, 36% of the trainees had dug up new ponds after training to start fisheries or to expand fisheries venture. It was found that adoption of scientific practices led to 233% improvement in income of the farmers from fisheries.

**Interpretation:** Training programmes were able to improve the knowledge, attitude and skill of the trainees which improved the income and livelihood. The findings of the study would be useful for trainers, researchers and policymakers to devise training programmes and impact assessment studies in future.

**Key words:** Adoption, Impact, Income, KAS, Livelihood,



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## Introduction

People of low socio-economic status lack purchasing power of nutritious foods due to income poverty. Inadequate diet and disease leads to malnutrition (Black *et al.*, 2008). In India, the irony is that the majority of farmers who supply food to the nation are undernourished due to low income. The annual earning of 70% farmers is less than Rs. 15000 per capita (Kumar and Chahal, 2018). For shaping the future of Indian agriculture, there is an urgent need to promote farming as productive, proficient and economically attractive business to the marginal and small farmers. *Niti Aayog* of India has set seven point strategies to achieve the ambitious goal of doubling farmers' income during the period 2015-16 and 2021-22. Experts opine that more investment, more on-the-ground resources, new collaborative models combining the knowledge and resources of diverse stakeholders, best practices, risks and mutual accountability are the keys in doubling farmers' income process (Chand, 2017).

Diversification of farming and skill development or capacity building are two important areas suggested in the seven point strategy of NITI AAYOG for doubling farmers' income. Apart from the conventional agriculture, allied sectors like animal husbandry, dairying, fisheries serve alternative profitable enterprises which can avert the risks of crop failure and ensure sustained income to the farm family vis-à-vis ensuring the food and nutritional security of the nation. But every enterprise demands the knowledge and skill set which once acquired can lead to successful remunerative ventures. Paroda (2018) in his strategy paper mentioned 'Capacity building' as one of the major action plans to make agriculture both remunerative and attractive as an occupation, and particularly to double the farmers' income. A well trained and guided farmer can do cost effective and profitable scientific farming than a farmer who does not have the updated knowledge and skill.

ICAR-Central Inland Fisheries Research Institute (ICAR-CIFRI) is a premier research organization under Ministry of Agriculture and Farmers' Welfare, Government of India which has been conducting inland fisheries research and development activities since 1947. CIFRI regularly conducts on campus and off campus trainings for various clientele viz., fishers and fish farmers, extension personnel, State Fishery Officers, and students. During seven years (2012-13 to 2018-19), ICAR-CIFRI imparted training to 5211 farmers including 2622 farmers from Bihar State alone systematic impact assessment of the training programmes are imperative to form a strong base for bringing progression in training input, procedure, output and outcome to overcome many local, regional and national problems regarding inland fisheries development. Since training evaluation study was found to be highly effective for the fish farmers and fishers (Roy *et al.*, 2018). The present study aimed to assess the impact of training programmes imparted to the farmers of Bihar on inland fisheries management.

## Materials and Methods

Fish farmers from Bihar state of India form the bulk of the trainees trained during 2012-13 to 2018-19 by ICAR-CIFRI. Therefore, the present study takes Bihar as a case state for assessing the impact of training programmes. For this study, both qualitative and quantitative indicators were measured, which showcase the changes of a situation over time. An interview schedule was devised for impact assessment survey. The farmers who underwent training at least one year ago were included in the sample. District-wise distribution of trained farmers is shown in Fig. 1.

25% of the farmers trained on inland fisheries management over seven years in 14 districts were included in the sample. The selected districts and number of samples are: Buxar (15), Nawada (20), Khagaria (37), Begusarai (35), Darbhanga (15), Sitamari (24), Samastipur (21), Jamui (34), Madhepura (14), Lakhisarai (28), Gopalganj (18), Siwan (23), Madhubani (19) and Banka (15).

Data were collected on various socio-economic parameters viz. occupation (primary and secondary), income, number of ponds, knowledge, skill and attitude, adoption level; before and after training. The information regarding knowledge/awareness, attitudes, skill of the trainees were recorded using three point continuum scales: low, medium, high and scores of 1, 2 and 3 were assigned to the responses, respectively, following the methodology of Ghosh *et al.* (2013). Data was also collected on adoption of various scientific practices. The adoption of techniques by the farmers was determined by the following formula (Ghosh *et al.*, 2013):

$$\frac{\text{Number of farmers adopted } p^{\text{th}} \text{ practice}}{\text{Total number of farmers surveyed}} \times 100$$

Where,  $p = 1, 2, \dots, 15$

$p$  is the specific practices /technique

The responses were analyzed using appropriate statistical techniques like frequency and percentage; Mean and Standard deviation, Wilcoxon test.

## Results and Discussion

**Socio-economic profile of the farmers :** The analysis of socio-economic characteristics of farmer-trainees depicts that most of the farmers belonged to young age group (40.5%) followed by middle aged group. Only 10% of the trainees were of more than 50 years of age (Roy *et al.*, 2018). However, studies conducted by Kumar *et al.* (2018) at Darbhanga district and Rout *et al.* (2016) at Madhubani District Bihar depict that most of the fish farmers belong to middle age group followed by young age group (less than 35 years). Therefore, the age profile of trainees confirm that

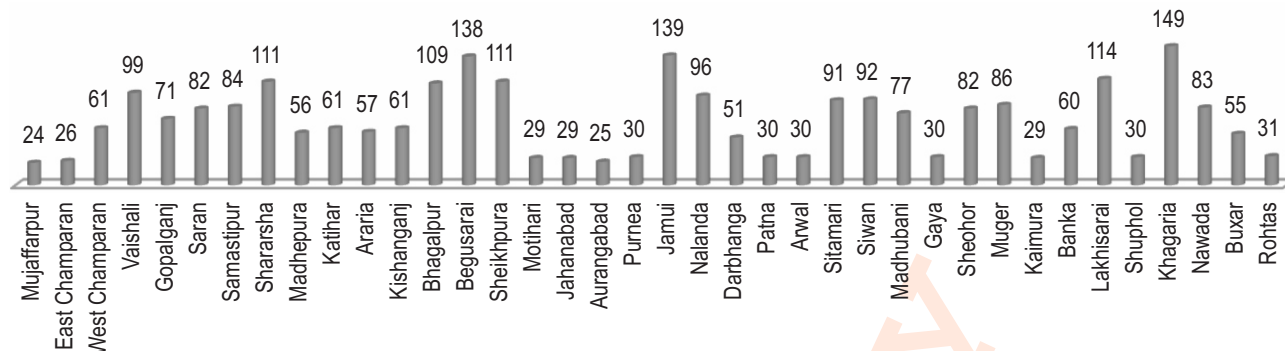


Fig. 1 : Number of farmers trained from districts of Bihar.

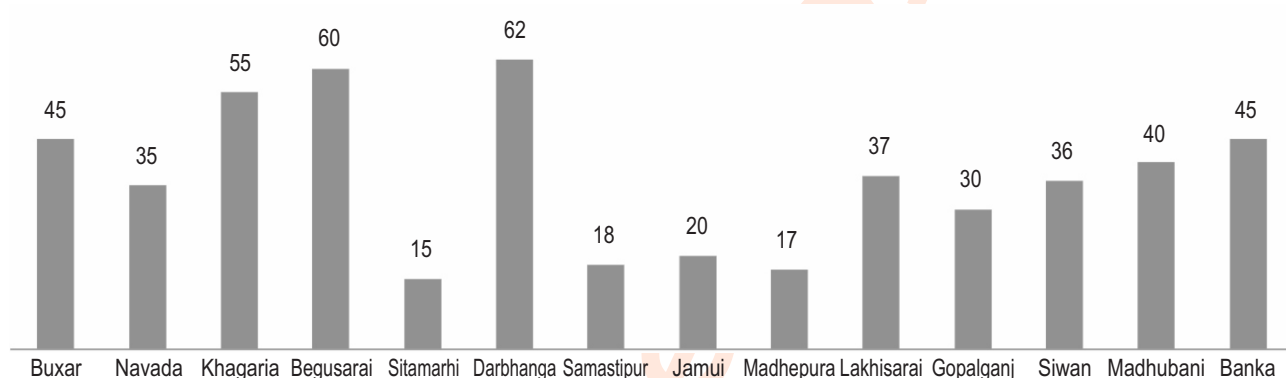


Fig. 2 : Construction of new ponds by trainees.

young age group had more inclination towards learning new practices and acquiring new skills. Agriculture was the primary occupation of 65% of the farmer trainees whereas 21% of the trainees were dependent on fisheries for their livelihood earning. Most trainees (42%) were having secondary level of education whereas 29% of the trainees were graduates. Majority of the farmer trainees were small to marginal farmers as their average land holding was less than 2 acres. Only 59% of the respondents had their own ponds. About 25% of the farmer trainee had taken ponds on lease. However, 26% of the respondents were interested to dig new pond on government subsidy and to start up fisheries management. Participation in social organizations of the respondents was not very encouraging. Only, 15% of them were member of cooperative societies.

**Impact of training :** Impact assessment of trainings was done by measuring the qualitative and quantitative indicators by employing before-after or with-without approaches.

**Change in knowledge, skill and attitude :** The results of this study showed that training enabled the fish farmers to build up their knowledge, skill and attitude. Table 1 depicts the mean values of

improvement in knowledge, skill and attitude due to training on inland fisheries. It was found that knowledge or awareness of the farmers of Madhubani district was higher in comparison to other districts. Change in skill was found more for the farmers of Begusarai, while, more change in attitude was found in farmers of Darbhanga district. The farmers of Sitamari, Jamui, Madhepura, Lakhisarai were also found to have significant improvement. The findings depict that the training programmes significantly contributed in improved the knowledge, skill and attitude of the respondents and it is in conformity with the findings of Das and Sharma (1998); Sharma *et al.*, (2017); Sweta *et al.* (2020).

**Adoption of different scientific practices:** The farmers adopted various practices of fish farming after training programmes. Table 2 depicts that most of the farmers (82%) adopted composite fish culture practices, followed by Pangasius culture (70%) after the training programme. Adoption of composite fish culture practices help the farmers to increase the fish productivity. Scientific pangasius culture also supports the income of fishers due to good growth rate within a short period of time. Hence, culture of this species is possible even where water scarcity is a major issue. About 67% of the trainees adopted

**Table 1** : Improvement in knowledge, skill, attitude of trainee farmers of different districts of Bihar

Name of the Districts	Knowledge/Awareness		Skill		Attitude	
	Mean	SD	Mean	SD	Mean	SD
Buxar	2.04	0.64	1.95	0.66	1.96	0.65
Nawada	2.17	0.38	2.04	0.64	1.78	0.45
Khagaria	2.01	0.59	2.05	0.67	1.76	0.43
Begusrai	2.52	0.64	2.13	0.64	2.04	0.64
Darbhanga	2.05	0.51	1.95	0.66	2.33	0.49
Sitamari	1.98	0.85	1.92	0.74	1.84	0.53
Samastipur	2.31	0.67	2.04	0.64	2.01	0.59
Jamui	2.04	0.38	2.05	0.67	2.04	0.5
Madhepura	2.18	0.71	1.85	0.59	2.10	0.61
Lakhisarai	2.05	0.51	1.35	0.65	2.17	0.38
Gopalganj	2.33	0.49	2.52	0.64	2.31	0.67
Siwan	2.01	0.59	1.90	0.57	2.04	0.64
Madhubani	2.73	0.45	2.17	0.35	2.01	0.59
Banka	2.17	0.38	2.05	0.67	2.05	0.51

**Table 2** : Adoption of practices/techniques by the trained farmers (N=318)

Practices /Techniques	Number of farmers adopted
Composite fish culture	82%
Fish disease control	67%
Fish feed preparation	43%
Pond preparation: renovation of old pond and construction of new pond	53%
Soil water chemistry of water bodies	47%
Economic evaluation of fish production	21%
Induced breeding of carps	22%
Pangasious culture	70%
Nursery and rearing pond management	51%
Hatchery management	-
Inland ornamental fisheries	-
Freshwater prawn culture	-
Availing different schemes in fisheries development as beneficiaries	39%
Wetland fisheries management	12%
Integrated fish farming	24%

scientific fish disease control, as it had helped them to enhance their fish production. Some of the farmers (43%) have adopted fish feed preparation technique as it is useful to prepare fish feed by using locally available material, which also led to reduction of production cost of inland fish farming. The technique of pond renovation/preparation/construction was adopted by 53% of the trainees. About 37% of the trainees had availed different schemes as beneficiaries. However, only 12% of the trainees adopted wetland fisheries management as wetlands are common property resources and governance is a major reason for less adoption of Wetland fisheries management in Bihar. Most of the fishermen cooperative societies exist in Bihar are either defunct or not well organized. For implementation of successful wetland fisheries management protocols conflict resolution and participatory co-management is mandatory as reported by Roy and Hassan

(2013). It implies that the adoption of scientific practices/techniques by farmer trainees is considerably influenced by the training programmes imparted to them. In fact, Information management behaviour, training and exposure have positive correlation with the adoption level of scientific fish farming practices and findings are in conformity with the results reported by Bhaumik *et al.*(1992), Meeran (2000) and Borah *et al.*(2019).

However, the study found that none of the farmers had adopted hatchery management, inland ornamental fisheries and freshwater prawn culture as they perceive that all these techniques are costly and high skill oriented. Moreover, marketing is a major problem for ornamental fishes in Bihar. It was noticed that the average age of adopters ranged between 33.2 years to

**Table 3** : Improvement /Change in livelihood indicators (N=111)

Livelihood indicators	Increase/improvement/Change (%)
Number of fish farmers switched to fisheries as principal occupation	7
Number of fish farmers taken fisheries as alternate source of income/secondary occupation	23
Number of fish farmers constructed new ponds	36
Income from fisheries	233

**Table 4** : Comparison of income of trainee participants before and after the training programme

District	Income (INR/year)		p-value
	Before training	After training	
Buxar	45000	100000	.005
Navada	20000	70000	.005
Khagaria	30000	100000	.005
Begusarai	45000	125000	.005
Sitamarhi	47500	100000	.005
Darbhanga	60000	175000	.005
Samastipur	65000	250000	.005
Jamui	50000	200000	.005
Madhepura	12500	125000	.005
Lakhisarai	22500	125000	.005
Gopalganj	22500	120000	.005
Siwan	35000	90000	.005
Madhubani	30000	122500	.005
Banka	45000	100000	.005
Overall	30000	100000	<.001

Note: Data presented as median and p-value (Wilcoxon test)

39.9 years for all the districts indicating that younger people are more keen to adopt new knowledge and practices. The findings are also in line with the findings of Bhaumik *et al.* (1992); Borah *et al.* (2019); FAO (2013); Ofuku (2018). The result designated that age had a positive and significant correlation with the adoption level of beneficiaries.

**Livelihood improvement:** Estimating the effects of training programmes on livelihood improvement gives a clear picture about the impact of imparted trainings. As training imparted was on inland fisheries management, so the livelihood indicators for this study were related to inland fisheries. Table 3 shows the improvement/increase/change in livelihood indicators over the time due to training. It was found that 7% of the farmers had switched over to fisheries for their principal occupation. It was also found that after adoption, the fish farming contributed significantly to their household income. About 23% of the farmers had taken up fisheries as secondary occupation. About, 36% of the trainees had dug up new ponds after training to start up fisheries or to expand fisheries venture. Fig. 4 shows district wise picture of percentage of the trainees who had constructed new ponds. It was found that enhancement of knowledge due to training resulted in adoption of scientific practices which has led to 233% improvement in the

income of farmers from fisheries. Comparison of income of trainee participants before and after training programme depicts that the average income from fisheries (INR per year) considerably increased from INR 30000 to INR 100000/-. District wise change in income from fisheries (INR per year) was found significantly improved (Table 4). Paying more attention to training of rural populace is becoming more vital as the challenges connected with adopting improved Practices/ Techniques for sustainable and climate-smart fish production. Trainings imparted to the farmers of Bihar on inland fisheries management has helped the farmer trainees to perk up their life and livelihoods.

Evaluation of impact is one of the most important yet less explored areas of training. The present study finds significant improvement in knowledge, attitude and skill among the trainees after the training programmes imparted by the ICAR-CIFRI. Composite fish culture, fish feed preparation technique, scientific fish disease control, technique of pond renovation/preparation/construction were adopted by significant percentage of trainees due to gain in knowledge and skill. Statistically significant increase was noticed in the income level of trainees after they underwent training programmes. If the institute continues to impart capacity development among the fishers or fish farmers



along the same line it is expected to make visible impact on the lives and livelihoods of thousands of farmers in future leading them towards enhanced income and livelihood security by adoption of improved inland fisheries practices.

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### Add-on Information

**Authors' contribution:** A. Roy: Concept, writing, analysis, data collection; S. Som, S. Bhattacharyya: Data collection; B.K. Das, A. Pandit: Guidance and concept; A.K. Yadav: Analysis.

**Research content:** The research content is original and has not been published elsewhere

**Ethical approval:** Not Applicable

**Conflict of interest:** The authors declare that there is no conflict of interest.

**Data from other sources:** Not Applicable

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