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Identifying training needs in inland fisheries management for the fishers in the state of Bihar, eastern India

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ABSTRACT

The training needs of 450 fish farmers/ fishermen from 15 randomly selected districts of Bihar (30 trainees from each district) who received training from ICAR-Central Inland Fisheries Research Institute (ICAR-CIFRI), Barrackpore, India were analysed in this study. For training need assessment (TNA), a close ended interview schedule with twenty topics was developed by ICAR-CIFRI keeping in mind the type of fisheries and water resources existing in Bihar. The trainees were asked to respond in a three point continuum scale based on the importance of the topic to them. Composite fish culture ranked highest followed by fish disease control, fish feed preparation and soil and water chemistry. Prawn culture and induced breeding of Magur were perceived as least required topics by the trainees. Cumulative cube root frequency (CCRF) method was used to classify farmers based on training needs and it was found that majority (49%) of the respondents were having medium level of training needs (0.43-0.66). Trainees with higher level of education had significant interest to know about the Government schemes related to fisheries. Trainees with non-farm related enterprises as primary/secondary occupations were highly inclined towards learning economic evaluation and hatchery management, whereas trainees with farm related enterprises as primary/secondary occupations were interested in integrated fish farming. It was also found that the fishers of different districts had varied training needs but overall 'high training need' was observed in composite fish culture and pond construction. Trainees' expectations from the trainings were improvement in income, reduction in migration and debt clearance. Hence it could be inferred that need based skill development programmes are essential to ensure success of any human resource development (HRD) programme.

Keywords: Bihar, Fishers, Inland fisheries management, Socio-economic background, Training need assessment

Introduction

India is a land of teeming millions and more than half of its population (54.5%) is dependent on agriculture and allied activities as main source of livelihood (Arjun, 2013; DoACFW, 2021). Almost 80% of rural India (Tongia, 2019), form part of agrarian sector which provides employment to nearly 52% of labour force of India (http://www.hillagric.ac.in). Human resource development emerges as the primary requirement for economic and social development of our nation. Skill development and capacity building of farmers through training programmes have been a time tested approach targeted towards economic empowerment of farmers which in turn contribute to India's economic growth (Paroda, 2018; Roy *et al*., 2021). The fisheries and aquaculture production contributes around 1% to India's gross domestic product (GDP) and over 5% to the agricultural GDP (PIB, 2019) and to increase this contribution, skill development of fishers and fishermen in inland fisheries management through training is the need of the hour. Training involves activities which essentially aim at providing skills, knowledge and attitude required for employment in a particular occupation; group of related occupations or for exercising a function in any field of economic activity. It plays critical role in human resource development and is widely regarded for faster socio-economic development of trainees (Misra, 1990). The planet is moving towards 'knowledge economy', therefore, training and skill development has become an essential part of human resource development (Som *et al*., 2020). (Som *et al*. (2019) conducted a study to assess the effectiveness of training programmes on inland ornamental fisheries and overall training effectiveness score (TES) was found to be 80.66%. Another study conducted by Roy *et al.* (2021) on the impact of inland fisheries management trainings revealed that there was a significant improvement in knowledge, attitude and skill (KAS) as an outcome of the trainings. Trainings also enhanced the entrepreneurial ability of the farmers involved in feed mill establishment and integrated wetland development in the field of inland fisheries management (Roy *et al*., 2018). Singh and Singh (2014) reported that 58.3% farmers perceived that the

training programmes helped them to gain knowledge and skills (48.3%) and 15% of the farmers were willing to start new enterprise as a result of Agricultural Technology Management Agency (ATMA) training.

Considering the importance of capacity building, the Government of Bihar had chosen ICAR-Central Inland Fisheries Research Institute (ICAR-CIFRI) to impart training to progressive fishers and fish farmers of Bihar in ICAR-CIFRI, Barrackpore (www.ahd.bih.nic.in) with financial assistance from Government of Bihar. ICAR-CIFRI successfully trained 3505 fishers from 38 districts of Bihar in 11 years (from 2007-08 to 2018-19). Fig. 1 shows the year-wise distribution of fisher trainees from Bihar who received training from ICAR-CIFRI.

With respect to fisheries and aquaculture, Bihar has huge potential for production of freshwater fishes as the state is situated along Ganga river basin. The state has an area of 68050 ha of ponds and tanks, 43500 ha of chaurs, 9000 ha of ox-bow lakes (*mauns*), 7200 ha of reservoirs and 2800 km is drained by major and minor rivers. Numerous fish farmers and fishermen derive their livelihood from these water resources and contribute to the economy of the state and nation as a whole.

Among the different steps in training, the first step of training need assessment is the most important and crucial step, which ensures the training programme to be tailor-made to bridge the skill gap in trainees adequately (Mishra, 1990).

A training need exists anytime when actual condition of an individual differs from a desired condition. It relates to knowledge, skills, attitudes and attributes required for any work or job performed by an individual. Training need is the gap between job requirement and job performance. The gap once assessed correctly can make the curriculum of training programmes more need based and meaningful to trainee farmers. The present study elaborates about the training needs of fish farmers and fishermen of different districts of Bihar and how these needs have an interesting correlation with the socio-economic profile of the trainees as well as water resources of the districts.

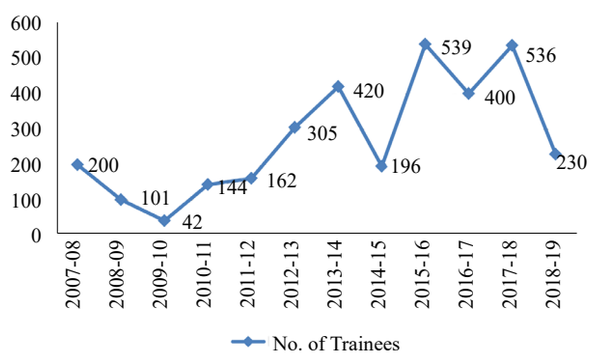

Fig. 1. Year-wise distribution of fishers trained from Bihar by ICAR-CIFRI, Barrackpore

Materials and methods

Sample selection

ICAR-Central Inland Fisheries Research Institute (ICAR-CIFRI), Barrackpore, India has successfully trained about 3505 fishers and fishermen from 38 districts of Bihar till date and Training Need Assessment (TNA) has been an integral part of each training programme. ICAR-CIFRI successfully trained a total of 3505 fishers from 38 districts of Bihar in a span of 11 years on "Inland Fisheries Management". From the 38 districts, 15 districts *viz*. Sitamarhi, Jamui, Darbhanga, Buxar, Navada, Khagaria, Begusarai, Rohtas, Sheikhpura, Munger, West Champaran, Lakhisarai, Saran, Banka and Saharsa (Fig. 2) were randomly selected for the study and again from the selected districts, 30 trainees were selected randomly. So, the training needs of 450 fish farmers and fishermen from 15 districts of Bihar (30 trainees from each district) were analysed in this study. On request of the Government of Bihar, ICAR-CIFRI arranged training programmes at Barrackpore, West Bengal for fishers of Bihar. Just after registration, before the class room sessions, need assessment of trainees were conducted. The responses of trainees were collected in a semi-structured interview schedule containing both close ended and open ended questions.

Training need assessment

Training need is a dependent variable. The training need for trainees in the present study can be defined in terms of gap between Knowledge, Attitude, Skill (KAS) required for scientific fish production and their existing KAS. Actually, the training needs of the farmers vary in different states according to the agro-climatic conditions, demographic pattern and prevalent farming system

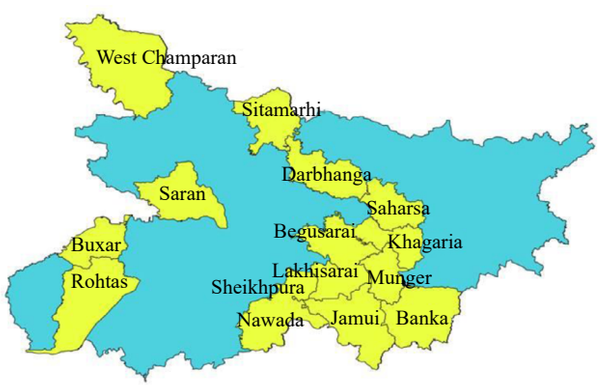

Fig. 2. Map showing the districts in Bihar chosen for the study

(Pourouchottamane, 2012). In this particular study, for training need assessment, a close ended interview schedule with twenty topics was developed keeping in mind the type of fisheries and water resources existing in Bihar. The methodology adopted by Roy *et al.* (2019) to quantify the training needs was administered for the present study, with some modifications. The trainees were asked to respond in a three point continuum scale based on the importance of the topic to them. The responses revealed the topics which trainees deemed important and demanded training on. The responses ranged from Very Important, Important and Not Important. The score for a particular topic was calculated as below:

$$\text{Score of a Topic} = \frac{n1 * 3 + n2 * 2 + n3 * 1}{(\text{Total no. of trainees} * 3)}$$

where n1 = No. of trainees who stated the topic as Very Important

n2 = No. of trainees who stated the topic as Important

n3 = No. of trainees who stated the topic as Not Important

The Training Need Score of individual farmers was also calculated by summing up their responses on each topic. After that, normalisation of the scores was done for carrying out further parametric tests from the ordinal data. The topics were then assigned ranks according to their degrees of importance as revealed by their normalised scores.

$$\text{Normalised Score} = \frac{(\text{Maximum Score} - \text{Actual Score})}{(\text{Maximum Score} - \text{Minimum Score})}$$

Based on the normalised scores, the farmers were ranked into high, medium and low training needs through cumulative cube root frequency (CCRF) method. The formula for determining the strata is as below:

$$\text{Strata I} = CLh + \left[\frac{(h - CCRF\ ah)}{CRFh}\right] * W$$

CLh = Lower limit of the class interval in which h falls

H = Sk/L (Cumulative cube root frequency)

CCRFah = Cumulative cube root frequency of the class above the class in which h falls

CRFh = Cube root frequency of the class in which h falls W = Class width

$$\text{Strata II} = CL2h + \left[\frac{(2h - CCRFa2h)}{CRF2h}\right] * W$$

CLh = Lower limit of the class interval in which h falls

2h = 2Sk/L (Cumulative cube root frequency)

CCRFa2h = Cumulative cube root frequency of the class above the class in which 2 h falls

CRF2h = Cube root frequency of the class in which h falls

W = Class width

Socio-economic variables selected for the study

The following variables were selected to study the socio-economic profile of the trainees (Table 1). Accordingly their operationalisation was done and the units of measurement fixed. All the variables were ordinal in nature hence scores were assigned for measurement.

Participatory method to ascertain trainees' expectations

A livelihood changes diagram was developed through Venn diagram technique to document major changes in livelihood activities and to obtain a comparative notion of how communities believe the changes may happen that will impact their livelihoods. The motive was to assess the expectations of the sample trainees and was done in a participatory method.

Results and discussion

The socioeconomic profile (Table 2) depicted that majority of the participants (45.78%) were middle aged ranging from 35-50 years, followed by 44.67% young aged and only 9.55% were more than 50 years old (Rajan *et al.*, 2013; Roy *et al.,* 2018). Majority of the participants (56.89%) were dependent on agriculture followed by fisheries (34.4%) for their major source of income, whereas 35.11% of the participants were dependent on agriculture and allied enterprises for their ancillary income. But, about 56% of the respondents did not have any subsidiary occupation. So, inland fisheries might play a crucial role for generating an alternative source of income for such trainees. Most of the trainees (41.33%) were having secondary level of education and majority of them were small to marginal farmers. Only 58.22% of the respondents who came for training had their own ponds while rest of them did not have their own pond, while 25.11% of the respondents reported that they had taken pond on lease. The respondents who did not have pond were interested to excavate new pond on government subsidy and to start up new business based in inland fisheries. Only 16% of them were members of cooperative societies and 4% were members of farmers' club.

Perceived training needs of the farmers on various aspects of inland fisheries

The trainees were asked to rank the topics as per their perceived need of each topic. For inland fisheries management, ICAR-CIFRI imparted trainings on twenty topics and ranking was done based on the need score. Perusal of Table 3 shows that composite fish culture ranked highest followed by fish disease control, fish feed preparation, soil and water chemistry. A study conducted

Table 1. Socio-economic variables selected for the study

Sl. No.	Socio-economic variables	Operationalisation	Measurement
1.	Age	Number of chronological years completed by the respondent at the time of investigation	• Young (18-35 years)=1 • Middle aged (35-50 years)=2 • Above 50 years=3
2.	Main occupation	Livelihood means which generates more than 50% of an individual's monthly earning	• Agriculture=5 • Dairy=4 • Fisheries=3 • Business=2 • Govt. employee=1
3.	Sub-occupation	Livelihood means which generates less than 50% of an individual's monthly earning	• Agricultural and allied enterprises=2 • Non-Farm employment=1 • No sub-occupation=0
4.	Educational qualification	Level of formal education attained by an individual respondent	• Illiterate=0 • Primary school=1 • Secondary=2 • Graduate=3 • Post-graduate=4
5.	Size of land holding	Number of hectares of land both owned and leased, but not leased out.	• 0-2 ha=1 • 2-4 ha=2 • 4-6 ha=3 • 6-10 ha more than 10 ha=4
6.	Type of ownership of pond	Individual legally owns the pond or not	• No pond=0 • On lease=1 • Self owned=2
7.	Social participation	Respondent is an active member	• No participation=0 • Fish producers' organisation=1 • Cooperative society=2 • Fish farmers' club=3 • Private organisation=4 • Others=5

at Gorakhpur, Uttar Pradesh revealed similar type of results with pond construction, feeding management and seed stocking perceived as most important topics by the fish farmers (Tiwari *et al.,* 2007). Economic evaluation of fish culture, induced breeding and pangasius culture were also perceived as important topics by the trainees. The respondents also perceived hands-on sessions on fish feed preparation and water chemistry as important topics and were ranked by them as 9th and 10th among the twenty topics. Prawn culture and induced breeding of Magur were perceived as least required topics by the trainees. A similar study was carried out on fish growers in Darbhanga District of Bihar in which disease management was ranked as the most important topic and marketing as the least important topic by the trainees (Kumar *et al.,* 2018).

Classification of the farmers based on their training needs

The training need of the respondents were quantified by calculating individual training need score. The training need scores were categorised as High, Medium and Low by CCRF method. Farmers with individual training need score from 0-0.43 were grouped as having low training need, with 0.43-0.66 as medium and from 0.66-1.00 as high training need and it was found that majority (49%) were having medium level of training needs (Fig. 3). The finding is also similar to the finding of (Kumar *et al.,* 2018).

Socio-economic characteristics vis-a'-vis training needs

Table 4 depicts training needs of the fishers in the context of their socio-economic profile. All categories of trainees had considerable interest in learning about composite fish culture. Young aged trainees had more need in almost all items except prawn culture and induced breeding of magur. This is because young farmers tend to have updated information about technicalities involved in a practice like induced breeding of magur which is difficult (Maurya *et al*., 2018). Also they have more knowledge about current market trends of prawn seeds, non-availability of quality seeds (Selvaraj and Kumar, 2003), disease outbreak due to which they do not feel inclined towards prawn culture as prawn has less consumer acceptability in markets of the region due to higher market price. Being wary of the consequences of adopting the production of these fishes, they had less inclination and hence lesser training need score in this topic

Trainees with higher level of education (secondary school and onwards) had significant interest to know about

Table 2. Socio-economic profile of the trainees (N=450)

Particulars	Frequency (%)
Distribution based on age	
Young (18-35 years)	201 (44.67%)
Middle aged (35-50 years)	206 (45.78%)
Above 50 years	43 (9.55%)
Distribution based on main occupation	
Agriculture	256 (56.89%)
Dairy	10 (2.22%)
Fisheries	155 (34.44%)
Business	24 (5.33%)
Govt. employee	5 (1.11%)
Distribution based on sub-occupation	
Agricultural and allied enterprises	158 (35.11%)
Non-farm employment	40 (8.89%)
No sub-occupation	254 (56.44%)
Distribution based on educational qualification	
Illiterate	9 (2%)
Primary school	54 (12%)
Secondary	186 (41.33%)
Graduate	161 (35.77%)
Post-graduate	40 (8.89%)
Distribution based on size of land holding	
Landless	10 (2.22%)
0-2 ha	228 (50.67%)
2-4 ha	105 (23.33%)
4-6 ha	61 (13.56%)
6-10 ha	32 (7.11%)
More than 10 ha	14 (3.11%)
Distribution based on type of ownership of pond	
No pond	75 (16.67%)
On lease	113 (25.11%)
Self owned	262 (58.22%)
Distribution based on social participation	
No participation	179 (39.77%)
Fish producers' organisation	50 (11.11%)
Cooperative society	75 (16.67%)
Fish farmers' club	19 (4.22%)
Private organisation	46 (10.22%)
Others	81 (18%)

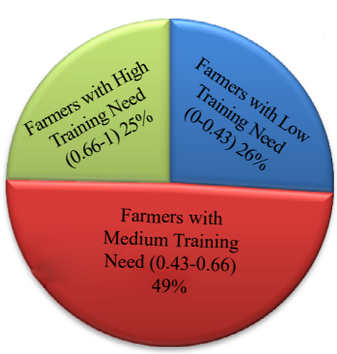

Fig. 3. Classification of farmers according to their Individual training need scores (CCRF method)

the Government schemes for fish farmers and fishermen. They also had more training need scores in all of the items as compared to trainees with no or low education (illiterate or educated up to primary level).

Trainees with non-farm enterprises as primary and secondary occupation were highly inclined towards learning economic evaluation and hatchery management. It should be noted that this group included the business men who not only wish to have more knowledge of economics but also felt significantly interested by the idea of a hatchery enterprise. For entrepreneurship development, knowledge of economics can help them to have better command over their business (Lichtkoppler, 1993; Desai, 2009). Whereas trainees with farm enterprises as primary and secondary occupation were highly inclined towards integrated fish farming. Trainees with land holdings of more than 10 ha were interested to invest in induced breeding of magur, for which other trainees had shown less interest because of its low profitability and cumbersomeness. This showed the risk taking ability of large farmers. Trainees who did not have pond were keen to learn about pond preparation than those who already had ponds either own or on lease. Trainees with higher social participation score had more training need scores than those with lesser social participation score.

The study was conducted covering fifteen districts of Bihar. It was also found that the fishers of those districts are having varied needs in terms of inland open water fisheries. Fishers from almost all the districts were having 'high training need' in composite fish culture and pond construction as well. Though Bihar is rich in wetland resources (chaurs and mauns), fishers are not much interested in open water fisheries management. Though Saharsa (5433 ha), Saran (86941 ha), Begusarai (10,000 ha), Darbhanga (12141 ha) and Sitamarhi (1486 ha) districts have considerable area under Chaur (tectonic lakes), fishers are more interested in pisciculture than that of wetland fisheries management (Fig. 4). That may be due to less awareness level of the fishers about wetland fisheries and also the wetlands are common pool resources. More than 50% trainees from Sitamarhi (57.5%), Jamui (56%) and Buxar (50%) expressed 'high training need' towards Pangasius culture which may be because of the fact that the available water resources are rainfed in nature.

Trainees' expectations from the need-based training on inland fisheries management

Trainees' expectations were also identified by participatory method. The livelihood changes diagram (Fig. 5) was prepared using Venn diagram to document how major changes in livelihoods may occur. Trainees anticipate that the need-based trainings may provide them

Table 3. Topic-wise training need scores

Training topic no./ Item no.	Topics for need assessment	Need scores	Rank
1	Composite fish culture	0.914848	I
2	Fish disease control	0.867407	II
3	Fish feed preparation	0.795555	III
4	Pond preparation	0.783703	IV
5	Soil water chemistry of water bodies	0.759275	V
6	Economic evaluation	0.725925	VI
7	Induced breeding	0.702222	VII
8	Pungasius culture	0.7	VIII
9	Fish feed preparation practical	0.697777	IX
10	Water chemistry practical	0.671111	X
11	Nursery and rearing pond	0.644444	XI
12	Hatchery management	0.628888	XII
13	Ornamental fishery	0.620740	XIII
14	Schemes in fisheries development	0.591111	XIV
15	Wetland fisheries management	0.58	XV
16	Integrated fish farming	0.574814	XVI
17	Broodstock management	0.497777	XVII
18	Pen culture	0.483704	XVIII
19	Induced breeding of magur fish	0.434814	XIX
20	Prawn culture	0.430370	XX

Table 4. Socio-economic characteristics *vis-a-vis* training needs

Socio-economic characteristics	Item-wise need score																		
	CO	IB	SWC	DC	PP	PU	FE	FEP	WC	EE	WFM	OF	HM	NRP	BSM	PW	IFF	PE	IBM	SC
Age																				
i) Young aged	2.76	2.22	2.35	2.64	2.36	2.12	2.42	2.06	2.04	2.17	1.73	1.85	1.9	1.81	1.57	1.29	1.68	1.6	1.28	1.81
ii) Middle aged	2.69	2.02	2.18	2.58	2.28	2.11	2.36	2.02	1.89	2.21	1.78	1.82	1.76	1.81	1.47	1.36	1.74	1.51	1.34	1.74
Education																				
i) High	2.75	2.14	2.28	2.64	2.33	2.07	2.37	2.10	2.03	2.21	1.72	1.87	1.9	1.81	1.51	1.3	1.77	1.5	1.31	1.87
ii) Low	2.53	1.91	2.22	2.5	2.45	2.19	2.42	1.98	1.8	1.95	1.87	1.77	1.79	1.68	1.38	1.2	1.48	1.45	1.24	1.19
Main occupation																				
i) Farm	2.72	2.08	2.27	2.62	2.33	2.08	2.37	2.07	1.98	2.15	1.72	1.83	1.85	1.75	1.47	1.29	1.77	1.48	1.31	1.74
ii)Non-farm	2.69	2.34	2.31	2.55	2.55	2.17	2.58	2.27	2.13	2.57	2	2.2	2.27	1.77	1.68	1.24	1.37	1.48	1.2	2
Sub-occupation																				
i) Farm	2.77	2.06	2.26	2.65	2.22	2	2.34	2.18	2.03	2.15	1.65	1.8	1.81	1.88	1.53	1.33	2.4	1.48	1.38	1.81
ii) Non-farm	2.82	2	2.52	2.97	2.45	2.22	2.25	2.02	1.92	2.27	1.85	1.97	1.97	1.61	1.5	1.17	1.27	1.47	1	2.17
Land																				
i) 0-4 ha	2.72	2.12	2.27	2.63	2.39	2.10	2.42	2.05	2	2.17	1.74	1.8	1.86	1.78	1.46	1.29	1.72	1.44	1.31	1.8
ii) >10 ha	2.71	1.64	2.07	2.35	2.35	2.07	2.42	2.14	2	2.28	1.85	2.28	1.64	1.64	1.35	1.57	1.78	1.21	1.57	1.78
Pond																				
i) Don't have	2.64	1.86	2.05	2.54	2.92	2.96	2.24	1.92	1.96	1.96	1.64	1.84	1.78	1.58	1.4	1.25	1.38	1.36	1.3	1.72
ii) Have	2.74	2.15	2.32	2.64	2.23	2.12	2.41	2.12	2.01	2.22	1.76	1.86	1.9	1.8	1.51	1.3	1.79	1.52	1.3	1.79
Social participation																				
i) No	2.76	2.05	2.29	2.67	2.43	2.06	2.37	2.03	1.98	2.14	1.76	1.92	1.86	1.65	1.38	1.3	1.71	1.35	1.29	1.74
ii) Yes	2.7	2.14	2.26	2.59	2.3	2.11	2.39	2.13	2.01	2.2	1.72	1.81	1.9	1.84	1.57	1.28	1.74	1.59	1.31	1.8

CO = Composite fish culture, IB = Induced breeding, SWC = Soil water chemistry, DC = Fish disease control, PP = Pond preparation, FE = Feed preparation, FEP = Feed preparation practical, WC = Water chemistry practical, EE = Economic evaluation, WFM = Wetland fisheries management, OF = Ornamental fisheries, HM = Hatchery management, NRP = Nursery and rearing pond management, BSM = Brood stock management, PW = Prawn culture, IFF = Integrated fish farming, PE = Pen culture, IBM = Induced breeding of Magur, SC = Schemes of Govt. in fisheries development

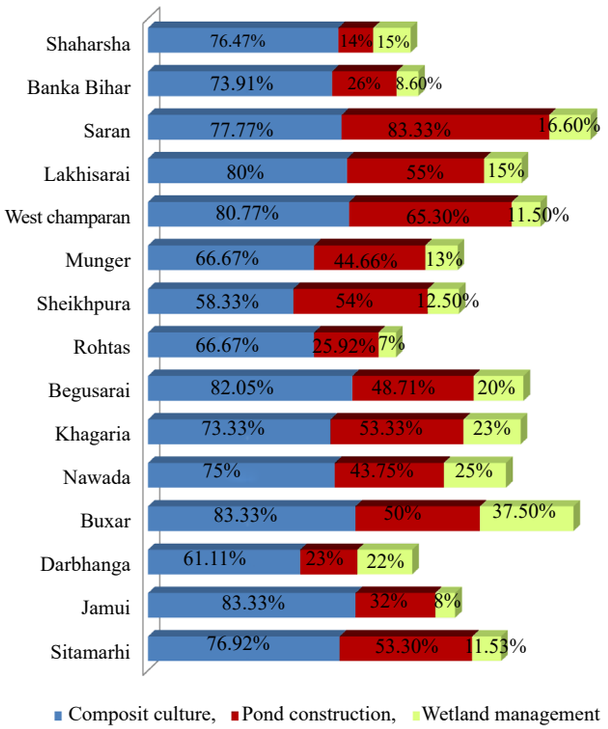

Fig. 4. District-wise distribution of 'high training need' of the fishers on selected items/topic

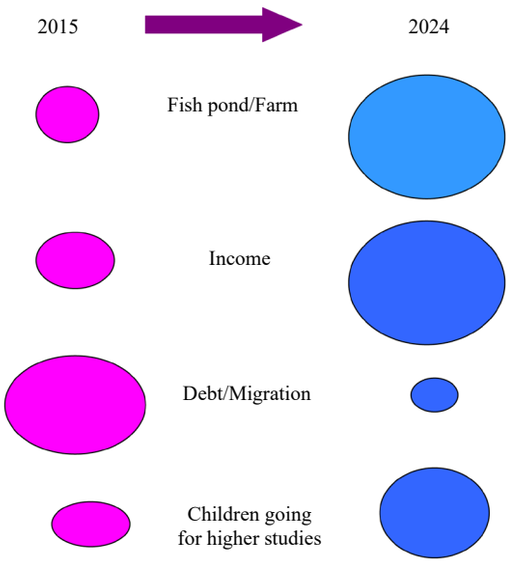

Fig. 5. Livelihood change diagram

enhanced income and reduce migration to urban areas for improved livelihoods. Their debt reduces as well. Within ten years their assets like fish pond and fish farm may also increase. The fishers also expected that overall socio-economic improvement might make their children more inclined towards formal education.

Aquaculture and fisheries are profitable ventures when adopted scientifically. It has a prominent role in the economy of India and world as well. Fish is a good source of protein which can be a vehicle to combat the food and nutritional insecurity of the country. To improve the livelihoods of the fishers/fish farmers, it can play pivotal role. But the fisheries production would be more remunerative if scientific package of practices are transferred to the fishers and fish farmers based on their need. Training and capacity building of farmers is a critical input for transfer of technology. The study provided some useful insights into the socio-economic background and training needs of fishers of Bihar. Majority of fishers were young but they did not have any subsidiary occupation. The trainees who did not have ponds were positive about excavating new ponds after training. Majority of the trainees also had medium level of training needs towards fish farming. The trainees had higher training need for composite fish culture, fish disease control, fish feed preparation, soil and water chemistry. The training needs of trainees were related to their socio-economic background. This implied that training need assessment proves useful not only for the trainees but also helps trainers in planning and customising future training programmes more effectively. Bihar is considered as a sleeping giant of Indian agriculture (Kumar *et al*., 2018) and the National Commission on Farmers has predicted that Bihar may emerge as another "fertile crescent" (NCF, 2006) in upcoming decade. In order to improve the livelihoods of fishers and farmers, capacity building is of utmost priority.

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