REVIEW ARTICLE Bhartiya Krishi Anusandhan Patrika

Fisheries Extension Interventions: A Review

Nisha Elizabeth Joshua[1], S.N. Ojha[1], Roshan Maria Peter[2], Amrutha Gopan[3] 10.18805/BKAP650

ABSTRACT

Since India's independence, several extension initiatives *viz*, production oriented programmes, area development initiatives, target group based service schemes and technology delivery mechanisms are implemented with the goal of agriculture and rural development. But most of these programmes failed to meet the needs as well as to utilise opportunities required for the majority of people (MANAGE, 2007). In order to tackle the different constraints as well as to meet the emerging challenges in our extension system, the Innovations in Technology Dissemination component of National Agricultural Technology Project (NATP) implemented Agricultural Technology Management Agency (ATMA) as a pilot project in a few states in India and later it spread to other states. A review of different kinds of extension strategies practised through ATMA is studied here and finally the different factors that can qualitatively contribute to an effective extension service delivery are looked upon.

Key words: ATMA, Extension, Reforms, Strategies.

Fisheries extension is a sectoral extension education system that can assist the Transfer of Technology (ToT) from agricultural technological institutions like Indian Council of Agricultural Research, State Agricultural Universities, *etc*. to farmers and other stakeholders of the fisheries sector in the country and an exclusive extension network in the country facilitates this process of transfer of technology effectively (Joshua, 2023). The fisheries extension systems need appropriate policy backup with respect to financial support as the system is relatively weak for its manpower, budget allocation and are inadequate in meeting the emerging challenges (Sajesh *et al*, 2020). With this background, a review has been done on various kinds of extension interventions that can benefit the stakeholders.

Extension interventions during pre-independence era

During the pre-independence era, some sporadic extension initiatives were attempted by political and social leaders and individuals in different parts of our country. Among these, the noticeable and praiseworthy attempts were done by Rabindranath Tagore at Sriniketan (in 1921), Spencer Hatch at Marthandam (in 1921), Firka development scheme in Madras state (in 1946), Indian Village service of A.T. Mosher at Bombay (in 1946). Economically, India was under huge threat after 1947, as the grain bowls located at West Punjab and East Bengal went to Pakistan. To make the situation worse, a large mass of people migrated to India from across the border. The condition worsened with the occurrence of two severe droughts (Abrol, 2006). To cope up with the declining food grain production, the 'Grow More Food Campaign' was initiated in 1947 by the then Hon. food minister Shri. K.M. Munshi. This formed the basis for the present extension machinery in India.

Extension interventions during post-independence era

The first post-independence extension programme was started by Albert Mayor (in 1948) in Etawah district, Uttar Pradesh, which was the first example which utilised peoples' participation in development programme and the concept of Multipurpose Village level Extension Worker started from this programme. The experiences generated from this programme was used by GoI to start several approaches to deal with the adverse situation that prevailed in India, like Community Development Programme- CDP (in 1952) which was scaled up to National Extension Service- NES (in 1953) so as to provide extension services with peoples' participation at less cost. This framework constituted the permanent extension set up in India. But, in the end, positive results, as expected, were not obtained out of CDP and NES. The human population was going so high, while the agriculture production was declining rapidly during the 1960s. During this critical situation, GoI planned intensification of agriculture through the introduction of high yielding variety crops.

Programmes like Intensive Agriculture District Programme- IADP (in 1960), Intensive Agriculture Area

[1]Fisheries Economics, Extension and Statistics Division, Central Institute of Fisheries Education, Mumbai-400 061, Maharashtra, India.
[2]Department of Aquaculture, Central Institute of Fisheries Education, Mumbai-400 061, Maharashtra, India.
[3]Department of Fish Nutrition, Biochemistry and Physiology, Central Institute of Fisheries Education, Mumbai-400 061, Maharashtra, India.

Corresponding Author: Nisha Elizabeth Joshua, Fisheries Economics, Extension and Statistics Division, Central Institute of Fisheries Education, Mumbai-400 061, Maharashtra, India.
Email: nisha.joshua@gmail.com

How to cite this article: Joshua, N.E., Ojha, S.N., Peter, R.M. and Gopan, A. (2023). Fisheries Extension Interventions: A Review. Bhartiya Krishi Anusandhan Patrika. DOI: 10.18805/BKAP650.

Submitted: 23-05-2023 **Accepted:** 26-09-2023 **Online:** 23-10-2023

Programme- IAAP (in 1964), National Demonstration- ND (in 1964) and High Yielding Variety Programme- HYVP (in 1966) were initiated in this juncture. These programmes were mainly aimed at increasing food production by using high yielding varieties and new production technologies. Thus, due to planned and combined initiatives, by the mid 1960s, India witnessed an agriculture boom, namely, 'Green Revolution'. But such production oriented programmes of GoI failed to consider poor farm households and thus widened inequality, though such approaches paid good dividend. In such an instance, GoI broadened its vision to rural development from the concept of agriculture development by starting up programmes like Small Farmers Development Agency (SFDA) and *Marginal Farmers* and Agriculture Labourers (MFAL) during 1970-71. Employment generation and income was stressed by means of support through credit provision and extension services were aimed in programmes like Drought Prone Area Programme- DPAP (in 1972) and Integrated Rural Development Programme- IRDP (during 1978-79).

The most significant extension initiative was the start of T and V programme (in 1974) which utilised extension for disseminating the research results from scientists to the farmers. The T and V system started in the Chambal command area of Rajasthan and Madhya Pradesh on a pilot basis, which was later extended to 17 states in 1978-'79. In this way, the multipurpose approach in CDP was gradually replaced by single line of command extension system which spotlighted on major food grains and food security (Swanson and Mathur, 2003).

In the midst of such initiatives, ICAR which was a component of first line extension system in the country, also came up with Front Line Demonstration (FLD) programmes like National Demonstration- ND (in 1964), Krishi Vigyan Kendra- KVK (in 1974), Operational Research Project (during 1974-'75) and Lab to Land Programme (in 1979), all of which were later merged with KVK (in 1992) which focused on conducting training programmes, Front Line Demonstration and On farm testing. Then the Institute Village Linkage Programme- IVLP (in 1995) was launched with the objective of technology assessment, refinement and transfer in selected districts of our country.

The National Agricultural Technology Project- NATP funded by World Bank stressing a bottom-up approach was started in 1988 in order to address the problems and constraints observed with the previously practised programmes. The Government of India (GoI) and World Bank focused on technology dissemination through an institutional arrangement namely Agricultural Technology Management Agency (ATMA) at district level, which was initially pilot tested in seven states of India through the Innovation in Technology Dissemination (ITD) component of NATP from November 1988 to June 2005 (World Bank, 2005b). Under ATMA, a shift was observed with respect to gender concerns and extension service delivery through a bottom-up approach and State Agricultural Management and Extension Training Institutes (SAMETIs) were created in order to provide training to middle-level extension functionaries in all the states. Though ATMA had created significant impact on account of yield and income, such an impact had not been found to be uniform in all the districts, as the project was exposed to weak process documentation and internal monitoring and evaluation (Babu *et al.*, 2013; Yadav, 2009).

Reforms in extension-International

Around the world, the major reform trends included decentralisation, contracting, privatisation, cost recovery, involvement of NGOs and forming farmer organisations (Rivera and Alex, 2005; Kidd *et al.*, 2000; Birner and Anderson, 2007). In Uganda, Africa, the National Agricultural Advisory Services (NAADS) programme took steps towards a decentralised, farmer owned and private sector serviced contract extension system in 2001 in order to achieve agriculture sector growth. Likewise, many African countries were facing the challenge of reforming their national agriculture extension systems (Rwamigisa *et al.*, 2011; Van crowder, 2000; Nahdy, 2002). The extension reforms categorised under market and non-market reforms which were practiced in some countries is shown in Table 1.

The strategies mentioned for countries should not be seen as exclusive, but should be viewed as indicative of the reforms undertaken for those countries. Many reform directions might be pursued by a country, for example, Germany having three unique agriculture extension systems (Hoffmann, Lamers and Kidd, 2000). Market reforms included four strategies like revision of public extension, pluralism, cost recovery and total privatisation. Non market reforms consisted of two reform strategies, *viz*, decentralisation and delegation (Porter, 2001).

A number of examples depicting public sector partnership with their private sector counterparts had been explained by Kidd *et al.* (2000) like, Farmers Association in China, where technical services were contracted from government officials, share cropping in Ecuador, voucher system in Costa Rica, sub-contracting and voucher system in Chile, privatised service centres in Ethiopia, contract farming in Kenya and farmer service centres in Srilanka (Rivera and Cary, 1997; Swanson *et al.*, 2003). Social Development Research Initiative (SDRI) in coordination with FAO Investment Centre Division (TCI) and World Bank had been found to support Mozambique by contracting out the extension service in some pilot provinces to NGOs, whilst rest of the country enjoyed public extension service delivery. This is an example of institutional pluralism where public, private and semi-public service providers like NGOs exist (GoU, 1998).

In Netherlands, funding and extension service delivery were shifted to private sector on a large scale. Netherlands transferred public extension agents to farmer associations with initial financial support, only to assign responsibility of such services to a private company later. Commercialisation emerged in New Zealand in 1986, through passing over authority to Government commercialised public agency.

Thus Ministry of Agriculture and Fisheries in New Zealand, presently operates as a company, namely 'Agriculture New Zealand' which would be functioning under a user pay criteria. Likewise, in England and Wales, Ministry of Agriculture, Fisheries and Food security Agency which oversaw delivery of extension services in agriculture and horticulture was privatised to 'Agriculture Development Advisory Service' (ADAS) in 1997 (OECD, 1999).

Several countries adopted a mixture of extension services as in Norway, where its Agricultural Advisory Service (AAS) provided extension service completely financed by the Government, partially financed by the Government or sometimes not financed at all from Government. Each state in Australia maintained its own authority and extension services prevailing in each state differed.

Germany exercises decentralisation in its three regions-North Western, Eastern and Southern (Kidd *et al.*, 2000; Swanson, 2009). Chile had moved from a direct voucher system to subsidisation under contracts where farmers would be hiring private extension service providers (Berdegue and Marchant, 2001; Cox and Ortega, 2004). Decentralisation or devolution was a policy determination different from market reforms where extension authority shifted from higher to lower tiers of government (Parker, 1995, Rondinelli, 1987; Smith, 1997). Decentralisation was practiced in Columbia where extension authority shifted to municipal level, or in Mexico and Latin American countries where the authority was vested with states (Llambi and Lindemann, 2001). Some countries like Malawi were gradually moving towards a decentralised system. In Indonesia, research and extension services had been decentralised and technology assessment institutes were created provincially to establish linkages among research and extension providers and farmers (Qamar, 1998; Rivera and Sulaiman, 2009; Rivera and Gustafson, 1991).

Governments in different countries attempted to decentralise at three levels (1) decentralise the burden of extension cost by redesigning fiscal system (2) decentralise central government authority to local authority through structural reform and (3) decentralise programme management through involving farmers in decision making (Rivera *et al.*, 2001).

In Denmark, Finland, France, Europe and Ecuador, Government shifted authority to farmer associations like cooperatives. In Latin America, Bolivia, Peru and Ecuador, authority had been transferred to private NGOs (Bastos, 1997). Subsidiarity which existed in Peru and Bolivia was another policy determination where authority went to the lowest level and economies and sales were not compromised and there is internalisation of all costs and benefits. In subsidiarity, authority might be shifted partially or fully to other entities. The farmers associations carried out extension activities with partial government support in European countries like Finland and Denmark and partially in France and Germany.

Deconcentration of authority to lower branches of central government might lead to decentralisation in future. In Belgium, England and Wales, Indonesia and Ireland, authority is deconcentrated to field level through grants, local coordination, provincial development planning and regional coordination (Rivera *et al.*, 2001). Sometimes, dual authority was established as in Norway and Sweden, where, power was shared between Government and farmer association, or, as in Japan, South Korea and Taiwan, where, power was shared between Government and sub national Government entity like a state or prefecture. At times, extension services were delegated to an external foreign company as in Africa, South Asia and Eastern Europe, where a French company titled 'Textile Development Company' (CFDT) is functioning (Rivera, 2001).

An extensionist was required to respond effectively to the requirements of institutional reform according to Qamar (2001).

Reforms in extension-National

Concept of ATMA- An extension reform

A background for integrating extension programmes across agricultural line departments like animal husbandry, fisheries

Table 1: Extension reform strategies in selected countries.

	Funding	
	Public	Private
	Market reforms	
Public	Revision of public sector extension *via* downsizing and some cost recovery (Canada, Israel, USA)	Cost recovery (fee-based) systems (OECD countries, previously in Mexico)
Delivery private	Pluralism, partnerships, power sharing (Chile, Estonia, Hungary, Venezuela, S. Korea, Taiwan)	Privatisation (total), Commercialisation (The Netherlands, New Zealand, England and Wales)
	Non market reforms	
Political, Fiscal, Administrative issues	Decentralisation to lower tiers of Government (Colombia, Indonesia, Mexico, The Philippines, Uganda)	Transfer (delegation) of responsibility to other entities (Bolivia, to farmer organisations; Ecuador, mixed with farmer led NGO programmes; Peru, extension devolved to NGOs)

(Source: Rivera *et al.*, 2001; OECD, 2014).

and forestry through research extension linkages and farmer participation in decision making process was created through ATMA (Swanson, 2006). ATMA is an autonomous organisation registered under 'Societies Registration Act of 1960' that could receive and spent government funds, entered into contract, maintain revolving funds and collect charges for services (Ferroni and Yuan, 2011). Singh *et al.* (2005a) and Singh (2006) considered ATMA extension model as semi-autonomous, participatory and market driven (Sulaiman, 2003; Singh *et al*. (2005a and 2005b). ATMA was headed by a Project Director (PD), who coordinated all agriculture and allied research and extension activities in a district, which was reported to Governing Body (GB) as its member secretary (Singh *et al.*, 2005c; Singh, 2006).

Need of ATMA

ATMA was introduced at district level, with aims like (1) Integrating extension programmes across line departments (2) Establishing linkages between research and extension systems in each district and (3) Decentralisation of decision making activities that involved farmers and private sector at block and district levels, that would lead to 'bottom up' planning procedures (Singh *et al.*, 2006; Swanson and Rajalathi, 2010; Swanson *et al.*, 2008; Sulaiman and Hall, 2004). Organisational structure of ATMA from NATP to 'Support to State Extension Programme for Extension Reforms (SSEPER) from 1998 to 2010 was presented below.

Organisational structure of ATMA from NATP to SSEPER (1998-2010)

In a district, the ATMA GB incorporated different line department heads, research units, stakeholders like farmers, women and disadvantaged sections and private sector firms (Adhiguru *et al.*, 2009; Sulaiman *et al.*, 2005). Block Technology Team (BTT) accommodated extension functionaries from various line departments. Farmer Advisory Committee (FAC) acted as a single window delivery mechanism for extension. Farm Information Advisory Committee (FIAC), consisting of heads of different Farmer Interest Groups (FIGs), which were organised around some specific crops, played an important role in bottom up planning. With this organisational set up, ATMA facilitated coordination among government departments as well as between public, private and other agencies (Singh and Reddy, 2009; Singh, 2007).

ATMA personnel consisted of a PD, a deputy PD (DPD), an accountant, a computer operator, a secretary cum stenographer, a peon cum watchman and all other support staff were employed on contract basis. GB guided and directed ATMA through determining program priorities and assessing its impacts. It was presided by district magistrate who would review and approve SREP for a district, work plans and frame operational procedures and policies.

The ATMA MC which served as secretariat of the GB, consisted of line department heads, representatives of NGOs, ZRS, KVK and FOs and coordinated the ongoing research and extension activities in a district and plans and reviewed day to day ATMA activities. BTT was constituted by officers from agriculture and allied departments like horticulture, animal husbandry, fisheries, dairy, forestry and sericulture. FAC consisted of farmers under different socio economic strata in a block. FIAC was an aggregate of members in BTT and FAC.

Participatory methodologies like PRA facilitated the preparation of SREP, which contained information on existing farming systems and research extension gaps in a district. Thus the research extension strategies could be prioritised by means of SREP, which formed ultimately the basis for preparing work plans at block or district level. SEWP would also point out those extension activities that could be carried out under any other central or state Government scheme.

Extension mechanisms followed under ATMA

FIAC in each block acted as the platform for meeting between line department officials and farmers for preparing plans and implementing such plans. The FIAC prepared BAPs, that contained extension activities in detail, which was to be implemented in a block. BAP after being approved by FAC was forwarded to ATMA MC, who ensured that these plans were consistent with SREP and checked for its feasibility technical-wise and administrative-wise. BAP after reviewed by MC was forwarded to GB, for its approval. FAC monitored BAP and also provided feedback regarding its implementation to BTT. At village level, FOs were encouraged, which could evolve into Commodity Associations and other such groups at block and village level. FIGs and WIGs at village level prepared group action plans at village which could be later incorporated into BAPs. Indian Institute of Management, Lucknow, monitored and evaluated the ITD initiative of NATP and came to the conclusion that decentralisation through ATMA model was a huge success among farmers (IIM Lucknow, 2004). Witnessing the success of the pilot project, a working group on agriculture extension for eleventh five year plan critically reviewed the existing extension approaches and finally recommended an agricultural extension approach for the eleventh five year plan (Planning Commission, 2007). Thus an important step towards revitalisation of extension system in states occurred with the centrally sponsored scheme namely 'Support to State Extension Programme for Extension Reforms', based on ATMA model. State Extension Work plan (SEWP) prepared at state level was a consolidated plan including the District Agricultural Action Plans (DAAPs) along with budgetary needs for each activity.

ATMA extension strategies/ reforms in different states in India

ATMA extension strategies followed in different states in India has been classified according to a study done by Singh *et al.* (2012 and 2013), which is presented in Table 2.

Fisheries extension service delivery

There was a suggestion that extension advices could be best delivered by means of contract agreement with private sector (Stilwell, 1997). But all around the world,

Table 2: ATMA extension strategies/ reforms in different states in India (Singh *et al.*, 2012).

*Extension	North						South				Central		East				West				NE	UT	Total
strategies	JK	HP	PB	UK	UP	HR	AP	KA	KL	TN	CG	MP	BR	OR	JH	WB	RJ	GJ	GA	MH	SK	AN	
1.					Y					Y													2
2.			Y				Y	Y		Y		Y		Y						Y			7
3.							Y	Y		Y	Y		Y										5
4.							Y		Y		Y								Y				4
5.					Y		Y																2
6.			Y				Y																2
7.							Y																1
8.							Y																1
9.				Y			Y			Y						Y	Y	Y					6
10.		Y	Y				Y				Y									Y			5
11.					Y								Y										2
12.														Y									1
13.					Y								Y										2
14.				Y	Y								Y	Y			Y	Y					6
15.			Y				Y						Y	Y	Y								5
16.					Y								Y										2
17.			Y									Y							Y				3
18.																		Y					1
19.					Y													Y					2
20.						Y						Y											2
21.						Y																	1
22.						Y																	1
23.		Y																					1
24.	Y																						1
25.									Y								Y						2
26.									Y											Y			2
27.									Y														1
28.									Y														1
29.			Y						Y														2
30.									Y														1
31.													Y										1
32.					Y									Y									2
33.														Y			Y						2
34.																	Y						1
35.					Y												Y						2

Table 2: Continue....

Table 2: Continue....

36.				Y													Y							2
37.										Y														1
38.										Y														1
39.										Y														1
40.				Y																				1
41.																Y								1
42.																						Y		1
43.																						Y		1
44.																							Y	1
Total	1	2	6	4	9	3	10	2	7	7	3	4	7	4	1	2	7	4	2	3	2	1		91

**Source of state abbreviation: SLUSI, 2013.

**State abbreviations used: JK- Jammu and Kashmir, HP- Himachal Pradesh, PB- Punjab, UK- Uttarakhand, UP- Uttar Pradesh, HR- Haryana, KA- Karnataka, KL- Kerala, TN- Tamil Nadu, CG- Chattisgarh, MP- Madhya Pradesh, BR- Bihar, OR- Orissa, JH- Jharkhand, WB- West Bengal, RJ- Rajasthan, GJ- Gujarat, GA- Goa, MH- Maharashtra, SK- Sikkim, AN- Andaman and Nicobar, NE- North East, UT- Union Territory, Y- Yes.

*Extension strategies: 1. Farm school; 2. Awards; 3. Group approach; 4. Action plan; 5. Capacity building programme for officers; 6. Farmers training centres; 7. Scientist's visit; 8. Interdisciplinary field visit; 9. NGO participation; 10. Farmer to Farmer extension; 11. Para extension workers; 12. Demonstration; 13. Farmers' fair; 14. Farmers' training; 15. Market led extension promotion; 16. Public Private Partnership; 17. Progressive farmer participation; 18. Electronic technology packages; 19. Farmers' club; 20. Information dissemination through farmers' children; 21. Information dissemination through sale outlets of input dealers; 22. Tableaus; 23. Extension functionaries at *Panchayath* level; 24. Information centres; 25. Agriclinics; 26. Krishi Bhavan in each Panchayath; 27. On Farm Training; 28. Front Line Demonstration; 29. Participatory Technology Development; 30. Extension delivery through public extension functionaries; 31. Promoting agri entrepreneurship; 32. Farmer friend; 33. Campaign; 34. Exposure visit; 35. Mass media usage for extension; 36. Women empowerment initiatives; 37. Contract farming; 38. Cluster approach; 39. Block level facilitation centre; 40. Mobile extension team; 41. Capacity building on post-harvest technology; 42. One Extension officer per block; 43. One Village Level Worker per block; 44. Rural Knowledge centre.

approximately 80 per cent of the extension services were public funded (Anderson and Feder, 2003). Extension services were delivered through agricultural cooperatives which came under Agricultural Business Chamber in South Africa (Jacob, 2003). The states in India plays a major role in executing the local extension programs through their technical and field-level functionaries in Departments of Fisheries, although both the central and state governments formulate the policy guidelines (Sajesh *et al*., 2018). The Union government extends financial support to aqua farmers through schemes like Pradhan Mantri Matsya Sampada Yojana (PMMSY) to provide technical, financial and extension support (PMMSY, 2021; Kumaran *et al*., 2012). Krishi Vigyan Kendras (KVKs) demonstrate the technologies in farmer's fields to establish its production potential, which is further taken up in massive scale by the extension departments. For instance, KVKs with the technical support of CIBA, Chennai, introduced and popularized intensive shrimp farming in coastal areas in the country, popularized the Mud crab farming and fattening in Kerala, introduced and demonstrated Asian Seabass farming in Kerala and popularized Green Mussel farming as a group venture in the open backwaters in Kerala (Subramannian, 2013).

Facets of quality extension service delivery

As a result of changes happened with communication technologies, education and socio-economic standards, agricultural extension education had undergone a lot of changes according to Patton (1987). To cope up with some change, extension services had to be delivered based upon the following elements. Extension professionals should mainly involve in disseminating information using appropriate teaching strategies because, teaching through appropriate information and technologies could bring about desired change (Maatoung, 1981; Zainuddin and Teh, 1982). The four principles on which the quality of extension service was bestowed on were (1) focus on work process (2) analysis of the variability in services and outcomes (3) management by fact and (4) continuous learning and improvement (Hackman and Wageman, 1995). The first principle stressed the point that an organisation should be very clear on how well it should function and should therefore set performance standards for getting desired results. In any organisation, quality was the direct result of work processes and in extension, the quality could be related with programme delivery and educational interventions (Haile and Israel, 2005).

The extension officers should be competent and should have concern for his client, as customer satisfaction was a measure of quality extension services delivered to its clients (Allen, 2004). When extension services were linked with market opportunities, its quality was enhanced. Traditional extension approaches which were slow, supply driven and expensive, were giving way to demand driven, efficient and responsive approaches according to Madukwe (2006). Steps should be taken in developing and disseminating indigenous knowledge, which could improve the information relevance and its quality.

Experiences of ATMA-NATP vis-à-vis reforms scheme

ATMA model when pilot tested, even though, was observed to be a tremendous success, owing to the different operational and procedural reforms and innovations it had adopted during the time, its performance in various places was found to be mixed. ATMA model achieved its success due to factors like dedicated leadership, vision and need-based strategic planning. But presently, it is struggling to keep up with the same pace and there is an unhidden fear that is also moving towards the fate of earlier extension models which all had a dead end (Singh, 2006). There was no skill training in extension education, for example, organisation skill, communication skill, content writing skill.

CONCLUSION

A brief history of extension interventions in the pre-independence and post-independence period in India has been carried out in this review. Each of the initiatives evolved after recognizing the success and failure of the predecessors. Most of these programmes failed to meet the people's needs as well as to utilise the available opportunities. In order to tackle different constraints, the ITD component implemented ATMA as a pilot project in a few states in India and later it spread to other states. The different kinds of extension strategies practised through ATMA is reviewed and finally the different factors that can contribute to a quality extension service delivery is studied.

ACKNOWLEDGEMENT

The authors acknowledge the support extended by Director and Vice-Chancellor, Central Institute of Fisheries Education, Mumbai.

Conflict of interest: None.

REFERENCES

Abrol, I.P., (2006). Sustaining Indian agriculture- Conservation agriculture the way forward. Current Science. 91(8): 1020-1025.

Adhiguru, P., Birthal, P.S. and Ganesh Kumar, B., (2009). Strengthening pluralistic agricultural information delivery systems in India. Agricultural Economics Research Review. 22: 71-79.

Allen, D.R., (2004). Customer Satisfaction Research Management: A Comprehensive Guide to Integrating Customer Loyalty and Satisfaction in the Management of Complex Organisations. Published by Milwaukee: ASQ Quality Press.

Anderson, J. and Feder, G., (2003). Rural Extension Services. World Bank Policy Research Working Paper, Published by World Bank, Washington DC. No. 2976.

Babu, S.C., Joshi, P.K., Glendenning, C.J., Kwadwo, A. and Rasheed, S.V. (2013). The state of agricultural extension reforms in India: Strategic priorities and policy options. Agricultural Economics Research Review. 26: 2.

Bastos, M. (1997). The technical assistance? A new panacea for agricultural and rural development. Paper Presented at the Workshop 'Current Situation and Prospects of Technology Transfer Complex, Technical Assistance and Agricultural Extension' in San Jose, Costa Rica. 3-5.

Berdegué, J. and Marchant, C. (2001). Chile's Agricultural Advisory Service for Small Farmers, In: Contracting for Agricultural Extension: International Case Studies and Emerging Practices, [Rivera, W.M. and Zijp, W. (ed.)], Published by CABI International, London. 1978-2000.

Birner, R. and Anderson, J.R. (2007). How to Make Agricultural Extension Demand Driven? The Case of India's Agricultural Extension Policy. IFPRI Discussion Paper 00729.

Cox, M. and Ortega, H., (2004). 'Chile: Origin and Evolution of A Privatised System'. In: Extension Reform for Rural Development: [Rivera, W.M. and Alex, G., (ed.)], Case Studies of International Initiatives, Agriculture and Rural Development Discussion Papers, Published by World Bank, Washington, DC. 1-5.

Ferroni, M. and Yuan, Z., (2011). Review of Agricultural Extension in India. Syngenta Foundation for Sustainable Agriculture. [Online]. Available at http://www. syngentafoundation.org/ __temp/FERRONI_ZHOU_REVIEW_INDIA_ EXTENSION. pdf.

FAO, Rome. [Online]. Available at http://www.fao.org/docrep/004/ y2709e/y2709e00.htm#Contents.

GoU- Government of Uganda (1998). Programme implementation manual. PAF General Guidelines (MFPED). Local Government Financial and Accounting Regulations. NAADS Programme Core document and NAADS Act 2001.

Hackman, J.K. and Wageman, R. (1995). Total quality management: Empirical and practical Issues. Administrative sciences. Quality. 40(2): 309-342.

Haile, T.M and Israel, G.D. (2005). A job well done: Clients' satisfaction with extension service. Florida. [Online]. Available at http:/ /edis.ifas.ufl.edu./wco56.

Hoffmann, V., Lamers, J. and Kidd, A.D. (2000). Reforming the Organisation of Agricultural Extension in Germany: What Lessons for Other Countries? AgREN Network ODI Agricultural Research and Extension Network, London. Paper No. 98.

IIM-Indian Institute of Management, Lucknow, (2004). Impact Assessment Report, on the Innovations in Technology Dissemination (ITD) component of the National Agricultural Technology Project, Agriculture Management Centre.

Jacob, P. (2003). Evaluating/and Agrarian Reform in South Africa No 4. An Occasional Paper Services. [Online]. Available at www.uwc.ac.za/plaas.

Joshua, N.E. (2023). Fisheries Extension. Available online at https:/ /vikaspedia.in/ agriculture/fisheries/advisories-for-fisheries -sector/fisheries-extension.

Kidd, A.D., Lamers, J.P.A., Ficarelli, P.P. and Hoffmann, V. (2000). Privatising agricultural extension: Caveat emptor. Journal of Rural Studies. 16: 95-102.

Kumaran, M., Vimala, D.D., Chandrasekaran, V.S., Alagappan, M., and Raja, S. (2012). Extension approach for an effective fisheries and aquaculture extension service in India. The Journal of Agricultural Education and Extension. 18(3): 247-267.

Llambi, L. and Lindemann, T. (2001). State reforms and the decentralisation of the agricultural and rural public sector: Lessons from the Latin American experience. [Online]. Available at http://www.fao.org/sd/2001/N0502a_en.htm.

Maatoung, M.C. (1981). Extension Demonstration Farms as a Teaching Method in Sudan. Unpublished Master's thesis. University of Arizona, Tucson.

Madukwe, M.C. (2006). Delivery of Agricultural Extension Services to Farmers in Developing Countries. [Online]. Available at http//knowledge.cta.int/ en/content/view/full/3009.

MANAGE, (2007). Agricultural extension approach for XI Five-year plan. [Online]. Available at http://www.manage.gov.in/extn ref/XI-RECOMMENDATIONS.pdf.

Nahdy, S. (2002). Uganda: The Ugandan National Agricultural Advisory Services (NAADS). In: Extension Reform for Rural Development: Case Studies of International Initiatives, [Rivera, W.M. and Alex, G. (ed.)], World Bank, Washington, DC. 1-5:

OECD- Organisation for Economic Cooperation and Development, (1999). Summary and Evaluation of Main Developments and Changes in Organisational Forms of and Approaches by the AKS in OECD Member Countries. (Paper prepared by Denis I.F. Lucey). Paris: OECD; Directorate for Food, Agriculture and Fisheries, Committee for Agriculture.

OECD- Organisation for Economic Cooperation and Development (2014). Fishing for Development- Background Paper for session 3: Green Growth in Fisheries and Aquaculture. A Joint Meeting of the OECD Fisheries and Development Assistance Committees, with the Food and Agriculture Organization of the United Nations (FAO) and the World Bank. 10-11 April 2014. TAD/FI(2014)13.

Parker, A.N. (1995). Decentralisation: The Way Forward for Rural Development? Agriculture and Natural Resources Department, World Bank, Washington, DC.

Patton, M.Q. (1987). The extension organisation of the future. Journal of Extension. 25: 22-24.

Planning Commission (2007). Recommendations of Working Group on Agricultural Extension for Formulation of Eleventh five-year Plan (2007-12) by Working Group on Agricultural Extension Constituted by Planning Commission, Govt. of India. [Online]. Available at http://planningcommission.nic.in/ aboutus/committee/wrkgrp11/wg11_ agrext.pdf.

PMMSY (Pradhan Mantri Matsya Sampada Yojana) (2021). Training Manual on Recent Advances in Fish Harvest and Post-harvest Technologies. Published by: Mumbai Research Centre of ICAR-Central Institute of Fisheries Technology, Vashi, Navi Mumbai. Ed. by [Murthy L.N. and Girija Behere (Ed)]. In Chapter 1. PMMSY- An Overview. Pg. 1-5.

Porter, G. (2001). Accountability/Subsidiarity/Diversity. [Online]. Available at http://www.converge. org.nz/pirm/subsidia.htm.

Qamar, M.K. (1998). Research, Extension Farmers linkages: A new Paradigm. Appendix VI of the Report of the World Bank/ FAO Mid-Term Review Mission for Agricultural Research Managment Project II, Indonesia.

Qamar, M.K. (2001). Global Trends in Reforming Extension Services: Implications for Rural Development Education and Training. Paper Presented at an International Workshop on Technical Training for Rural Development: Looking to the 21st Century, Held at Baoding, China. 17-21.

Rivera, W.M. and Alex, G. (2005). Extension Reform for Rural Development. Case Studies of International Initiatives. Washington, D.C. World Bank and United States Agency for International Development. 1-5.

Rivera, W.M. and Cary, J.W. (1997). Privatising Agricultural Extension. In: Improving Agricultural Extension: A reference manual [(ed) Swanson, B.E., Bentz, R.P. and Sofranko, A.J.)], Rome: FAO.

Rivera, W.M. and Gustafson, D.J. (1991). (eds.). Agricultural Extension: Worldwide Institutional Evolution and Forces for Vhange, Amsterdam, Elsevier Science Publishers.

Rivera, W.M. and Sulaiman, V.R. (2009). Extension: Object of Reform, Engine for Innovation. Outlook on Agriculture. 38(3): 267-273.

Rivera, W.M., Qamar, M.K. and Van Crowder, L. (2001). Agricultural and Rural Extension Worldwide: Options for Institutional Reform in the Developing Countries.

Rivera, W.M. (2001). Knowledge Generation and technical change. Natural Resource Management and Policy. 19: 291-311.

Rondinelli, D.A. (1987). Administrative Decentralisation of Agricultural and Rural Development Projects in Asia: A Comparative Analysis. In: Agricultural Extension Worldwide: Issues, [Rivera, W.M. and Schram, S.G. (eds)], Practices and Emerging Priorities; London: Croom Helm.

Rwamigisa, P.B., Mangheni, M.N. and Birner, R. (2011). The challenge of reforming national agricultural extension systems in Africa: The case of Uganda's policy reform process-1996-2011. Innovations in Extension and Advisory Services International Conference Proceedings. Pp: 1-9.

Sajesh, V.K., Suresh, A., Mohanty, A.K., Sajeev, M.V., Ashaletha, S., Rejula, K. and Ravishankar, C.N. (2018). Trend and pattern of expenditure on fisheries extension in India: Implications for policy. Indian Journal of Extension Education. 54(2): 32-40.

Sajesh, V.K., Suresh, A., Mohanty, A.K. and Sajeev, M.V. (2020). Streamlining Fisheries Extension. Model Training Course on 'Pluralistic Extension for Upscaling Secondary Fisheries' from 17/01/2020 to 24/01/2020 at ICAR-CIFT, Kochi.

Singh, K.M. (2006). Impact of ATMA Model in Agricultural Extension System in Bihar- A Case Study of Pilot Project Districts, World Bank, India Office, New Delhi. pp: 78.

Singh, S. and Reddy, V.R. (2009). Changing contours of Asian agriculture: Policies, performance and challenges: Essays in honour of Professor V.S. Vyas. Published by Academic Foundation, Business and Economics. Pp: 597. ISBN 8171887260, 9788171887262.

Singh, J.P., Swanson, B.E. and Singh, K.M. (2005a). Developing a Decentralised, Market Driven Extension System in India: The ATMA Model. Good Practice Paper Prepared for the World Bank, Washington DC.

Singh, J.P., Swanson, B.E. and Singh, K.M. (2005b). Organising and Linking Farmers with Markets: Experience of the NATP Project in India, Presentation at the 15th Annual World Food and Agribusiness Symposium, Chicago, June 27.

Singh, K.M., Swanson, B.E. and Singh, J.P. (2005c). Development of Supply Chains for Medicinal Plants: A Case Study Involving the Production of Vinca Rosa by Small Farmers in Patna District of Bihar, India, Paper Presented at the Workshop on Building new Partnerships in the Global Food chain, Chicago, June 29-30.

Singh, J.P., Swanson, B.E. and Singh, K.M. (2006). Developing a Decentralised Market Driven Extension System in India: The ATMA Model. In: Changing Roles of Agricultural Extension in Asian Nations. [Van den Ban, A.W. and Samanta, R.K. (ed.)], Delhi, India: B.R. Publishing. Pp: 203-203.

Singh, K.M., Swanson, B.E., Jha, A.K. and Meena, M.S. (2012). Extension Reforms and Innovations in Technology Dissemination- ATMA Model in India. Munich Personal RePEc Archive. MPRA Paper No. 48734. [Online]. Available at http://mpra.ub.uni-muenchen.de/48734/.

Singh, K.M., Meena, M.S. and Swanson, B.E. (2013). Extension in India by Public Sector Institutions: An Overview. Munich Personal RePEc Archive. MPRA Paper No. 49107. [Online]. Available at http://mpra.ub.uni-muenchen.de/49107/.

Singh, O.P. (2007). Acceleration of Transfer of Technology Through Public Private Partnership- A case of Hoshangabad District, Madhya Pradesh, India, National Symposium on plant protection - Technology interface, December 28th and 29th.

SLUSI- Soil and Land Use Survey of India, (2013). List of State Abbreviations. Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India. [Online]. Available at http://slusi.dacnet.nic.in/watershedatlas/ list_of_state_ abbreviation.htm.

Smith, L.D. (1997). Decentralisation and rural development: The role of the public and private sector in the provision of agricultural services. A Technical consultation on decentralisation, FAO, Rome. 16-18.

Stilwell, T., (1997). The Farmer Support Programme Revisited: Partnership in the Economic Survival Strategies of the Poor. Midrand: Development Bank of Southern Africa. (DBSA Discussion Paper. no 3.

Subramannian, S. (2013). Role of Krishi Vigyan Kendra (KVK) In Fisheries Extension. Winter School on ICT-oriented Strategic Extension for Responsible Fisheries Management. Pp: 327-336.

Sulaiman, R. and Hall, A.J. (2004). India: The Emergence of Extension -plus: Future for Extension Beyond Technology Transfer? In: Extension Reform for Rural Development, [Rivera, W.M. and Alex, G.E. (ed.)]. World Bank, Washington, DC.

Sulaiman, R., Hall, A and Suresh, N. (2005). Effectiveness of Private Sector Agricultural Extension in India: Lessons for the New Extension Policy Agenda. ODI Agricultural Research and Extension Network (AgREN) Paper, No. 117.

Sulaiman, V.R., (2003). Innovations in Agricultural Extension in India. Sustainable Development Department, FAO. [Online]. Available at http://www.fao.org/sd/2003/KN0603a_ en.htm.

Swanson, B.E. and Mathur, P.N. (2003). Review of the Agricultural Extension System in India, The World Bank.

Swanson, B.E. and Rajalathi, R., (2010). Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming and Evaluating extension systems. Agricultural and Rural Development Discussion Paper 45, World Bank, Washington, D.C.

Swanson, B.E., Nie, C. and Feng, Y. (2003). Trends and developments with the Chinese agro-technical extension system. Journal of the Agricultural and Extension Education Association. 10(2): 17-24.

Swanson, B.E., Singh, K.M. and Reddy, M.N. (2008). A Decentralised, Participatory, Market Driven Extension System: The ATMA Model in India. Paper Presented at Advancing Agriculture in Developing Countries Through Knowledge and Innovation, Addis Ababa, Ethiopia.

Swanson, B.E. (2006). The changing role of agricultural extension in a global economy. Journal of International Agricultural and Extension Education. 13(3): 5-17.

Swanson, B.E. (2009). Changing Extension Paradigms Within a Rapidly Changing Global Economy, In: Proceeding of the 19th European Seminar on Extension Education. Assisi, Italy. [Online]. Available at http://www.agraria.unipg.it/ESEE2009PERUGIA/files/Proceedings.pdf.

Van Crowder, L. (2000). National Agricultural Advisory Service (NAADS), FAO/World Bank Formulation Mission, Uganda.

World Bank, (2005b). Turning the Tide. Saving Fish and Fishers: Building Sustainable and Equitable Fisheries Governance. The World Bank, Washington, DC, USA, pp. 20. [Online]. Available at: www.seaweb.org/resources/documents/reports_turningtide.pdf.

Yadav, K. (2009). Agricultural Extension in India: A journey Since 1952 (Part-I). Agropedia. [Online]. Available at http://agropedia.iitk.ac.in/content/agricultural-extension-india-journey-1952-part-i.

Zainuddin, A.P. and Teh, S.B. (1982). Approaches Towards District Development Models for Multi-agency Team Work: Training for Agricultural Development, FAO, Rome.