P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 7; SP-Issue 6; June 2024; Page No. 16-26

Received: 02-04-2024
Accepted: 06-05-2024

Indexed Journal
Peer Reviewed Journal

Innovative extension approaches for development of fisheries and allied sectors: A comprehensive review

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DOI: https://doi.org/10.33545/26180723.2024.v7.i6Sa.682

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Abstract

Fisheries extension deals with the welfare and development of fishermen and fishing communities with the help of possible latest technologies developed in aiding their culture practices and management. This review delves into innovative approaches for the sustainable development of fisheries and allied sectors, focusing on the socio-economic empowerment of rural communities. Various methodologies, such as the Asset Based Community Development (ABCD) approach, Rural Advisory Services (RAS), Model Village System of Extension (MVSE), Farmer's Field School (FFS), Market-led Extension, Digital Extension, and Disruptive Extension, are outlined. Each approach delineates unique strategies, from leveraging community assets to promoting market-oriented farming practices and incorporating digital technologies for wider outreach. Emphasizing farmer engagement and empowerment, these methods aim to enhance productivity, ensure resource conservation, and improve livelihoods within the fisheries sector. Furthermore, insights into extension systems in India, encompassing key programs like National Demonstrations, Krishi Vigyan Kendra, and the Agricultural Technology Management Agency (ATMA), highlight the pivotal role of research-extension-farmer linkages in technology dissemination and shared ownership. In essence, the integration of modern technologies, community involvement, and effective communication channels catalyzes knowledge dissemination, skill development and fostering sustainability within the fisheries and allied sectors.

Keywords: Fisheries extension, approaches, technologies, demonstration

Introduction

Shellfish and fin fish aquaculture is acknowledged as a key component of rural development, the provision of food, and the security of rural populations' nutrition (Ayyappan and Diwan, 2007) [1]. Fish, which is a major source of a variety of essential micronutrients, minerals, and fatty acids, is thought to be the most readily available, reasonably priced, and often consumed animal-source food in low-income food deficit nations in sub-Saharan Africa, Latin America, and Asia (World Bank, 2006) [28]. The output of aquatic animals worldwide was projected to reach 178 million tonnes in 2020, of which 90 million tonnes came from catch fisheries and 88 million tonnes from aquaculture. 37% of the crop was gathered in inland waterways, while 63% was harvested in marine seas. This demonstrates how ICTs are becoming more and more important in the fishing sector. Over 157 million tonnes, or 89%, of the total production of aquatic animals were consumed for human food. Fishmeal and fish oil (16 million tonnes, or 81 percent) were the principal products of the remaining 20 million tonnes, which were intended for non-food applications. From 9.0 kg (life weight equivalent) in 1961 to 20.5 kg (live weight equivalent) in 2019, the per capita consumption of aquatic animal foods increased by almost 1.4 percent annually. 2020 preliminary data indicates a little decrease to 20.2 kg.

India produced 162.48 lakh tonnes of fish altogether, of which 121.21 lakh tonnes came from the inland sector and 41.27 lakh tonnes from the marine sector. India produced 56.56 million tonnes of fish in 2000–01; by 2021–22, that amount had climbed to 162.48 million tonnes. India, ahead of China and Indonesia, is the third-ranked nation in the world for fish exports. About 1.1% of India's GDP is devoted to the fishing industry, whereas 6.72% is made up of agriculture. India consumes 6.31 kg annually per person (2021–2022). The greatest is around 125 kg year in Lakshadweep, while the smallest is roughly 0.01 kilogramme annually in the Rajasthan desert. (DoF 2023) [5]. Small-scale fishing, which is a labour-intensive industry carried out by traditional fishermen, is often characterised by low capital input, low capital investment, and absence of equipment. Additionally, they typically function as family enterprises with a semi-managed structure, with a portion of the production retained for their own use. The marine industry is dominated by traditional fishermen, who are very strict in their professional conduct, poorly educated, and socially disadvantaged. The production and fishing effort

distribution in marine fisheries is not uniform. Their social security benefits are the lowest and they lack organisation. The transfer of earnings to the community and social organisations, which characterises traditional fishing, is an informal social security that is absent from mechanised fishing. Additionally, production varies greatly by area.

The most significant growth engines are technologies. Aquaculture's sustainability and economic efficiency so depend on methodical technical advances backed by sufficient institutional and regulatory support. Technology and business interventions are often complementary, characterised as capital-intensive, skills-based, and cost-effective, and they have the potential to revolutionise sectors performance. With the goal of reducing the poverty of low-income fisherman, the following tactics were put forth for the faster growth of fisheries:

Asset Based Community Development (ABCD) approach

ABCD reports largely on "building the capacity of community members and associations (the internal view) without reporting on the structural changes caused by the approach (the external view)" (Pretorius and Nel). One critique of the ABCD method is its overemphasis on the role that community members and associations play in development, while professionals—such as the government—are neglected in development interventions (Emmett). The SL method, in contrast, places more emphasis on the responsibility for development as well as the institutional and political framework in which capital or assets exist. According to the SL approach, although particular capitals may be more susceptible to specific disruptions (vegetable gardens to floods or animals to fires), authorities still have an obligation to take action to prevent or at least mitigate possible harm (Scoones). One critique of the SL strategy is that, despite its emphasis on capital or assets, people receive less attention (Carney). The risk is that, in the absence of community members' input and engagement, SL may devolve into a quantitative, mechanical cataloguing system. A holistic approach suggests that community members should only collaborate with other change agents, like local governments, non-governmental organisations, and the private sector, after they have achieved success through their own efforts and resources. Therefore, it is important to include the responsibilities of outside institutions into development efforts while working in collaboration and partnership with the local population. In reaction to the prevalent perception of impoverished neighbourhoods in community development initiatives, asset-based community development was created. Experts in service-learning have highlighted the risks associated with partial conceptions of involvement, elucidating that prioritising community needs over institutional strengths is detrimental to students as well as community members (Boyle-Baise, 1999; Mitchell, Donahue, & Young-law, 2012) [4, 18]. By depicting certain communities as struggling, encouraging students to adopt a heroic responsibility or "rescue" perspective, and hiding the more complex issues, deficit views can contribute to harmful stereotypes of community residents (Baldwin, Buchanin, & Rudisill, 2007) [2, 3]. hinders adherence to excellent practices, such as the notion that "all learn and all serve" (Honnet & Paulson, 1989) [13], and depletes the mental resources of community members (Saltmarsh, Clayton & Hartley, 2009) [23]. The conventional paradigm of development holds that the impoverished regard themselves as individuals with unique needs that can only be satisfied by organisations that provide outside assistance. However, rather than concentrating on issues and wants, the Asset Based Community Development (ABCD) method seeks to build a community based on the idea of recognising and mobilising individual and group assets. It is an expandable method that connects a community's microassets to its macroenvironment. According to this theory, communities may drive their own growth and development by recognising and making use of already-existing, but frequently underutilised, assets. This will help to boost local economic potential and further the communities' own development process. The method is uplifting and concentrates on the community rather than its issues 002E

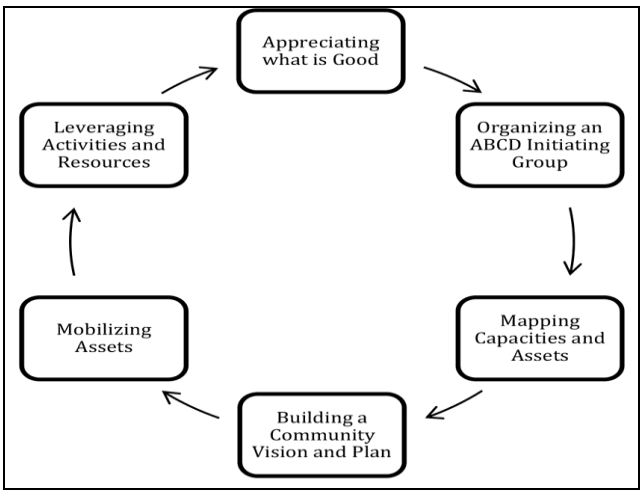


Fig 1: Asset-based community development events (ABCDE) model.

Key Assets in ABCD

As per ABCD approach, there are 5 categories of asset inventories such as individuals, associations, institutions, physical assets and connections

1. **Individuals**: Every person has unique abilities, talents, and traits; this person is the focal point of the ABCD method. The key players in this strategy are fishermen, who possess unique fishing skills and traditional knowledge.
2. **Associations**: Community mobilisation depends on networks of individuals working towards a shared goal. A powerful organisation of fishermen is formed by the combined efforts of skilled labourers and industrious women in their communities who work as fisherman, contributing to the management and distribution of fisheries resources.
3. **Institutions**: The community can better harness precious resources and cultivate a feeling of civic duty thanks to the assets of institutions. Fisheries institutions are tasked with creating regulations to safeguard these priceless resources since they are susceptible to minor environmental disturbances brought on by contaminants dispersed by human activity.
4. **Physical Assets**: Additional assets that can be

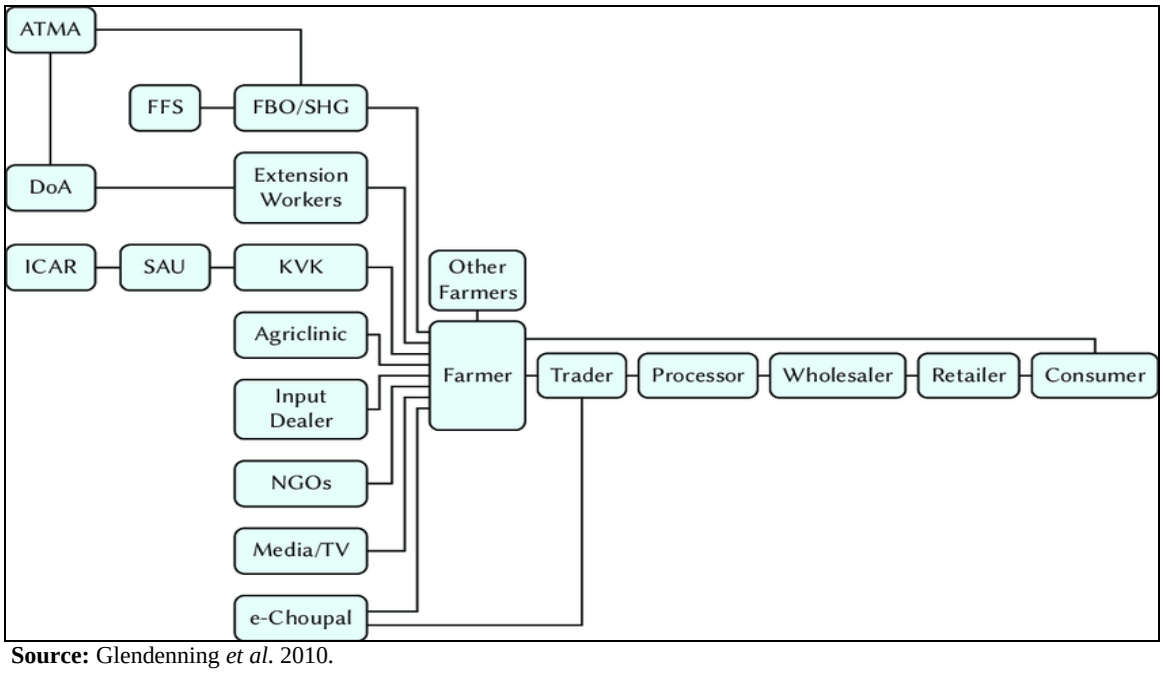
employed include tangible assets like money, property, buildings, and space. Physical assets include land acreage, water quality and availability, which are essential for fish culture and supply chain infrastructure in the fishing industry.

5. **Connections**: These are the exchanges between individuals who share their assets in different ways. Effective communication between innovators and local influencers about sophisticated technologies is crucial for the fisheries industry to function properly and build compact organisational behaviour. People's knowledge gaps in the fishing community can be reduced by using certain ICT-based solutions.

Rural advisory services (RAS)

The majority of fishermen in India have traditional lives, using local tools and crafts, and reside in rural regions. The term "rural extension services" (RAS) refers to all the various programmes that offer the knowledge and assistance that farmers and other rural environment actors require in order to make a living through the improvement of technical, managerial, and organisational skills and practices. Planners and implementers of RAS must acknowledge the variety of actors in the extension and advisory sector (public, private, and civil society); they must also explain the role of facilitation and mediation in rural development and value chains and the need to extend support to Farmer Producer Organisations (FPOs) and rural communities beyond technology and knowledge sharing. Large, medium, and small aquaculture producers need different kinds of RAS subsidies. Medium-sized farms receive regulatory assistance along with mobilisation and incentive support, whereas large farms are generally self-sufficient and require just official help. In addition to promotion, small aquaculture farms require increased input supplies and training (Kumaran, 2016) [15]. The Global Forum on Rural Advisory Services (GFRAS) launched the Global Good Practice (GGP) initiative, which looks at data and experiences from global good practices to generate a series of briefs called Global Good. The goal of this effort is to compile current information about what works in RAS. Useful insights. They provide extension managers and practitioners advice on which techniques to use and how to use them in their particular circumstances. The notes also go into the various applications of the technique and how it has been modified for usage in various settings and nations. The notes will be helpful not just to extension managers and practitioners but also to researchers, decision-makers, staff and students at universities and other educational institutions, producer organisations, and private businesses that purchase agricultural goods. Around the world, several RAS techniques have been tested. Decision-makers and extension managers frequently ponder the optimum RAS strategy and would appreciate a "recipe" for putting into practice a RAS that meets their objectives. Experience, however, demonstrates that such formulaic, standardised, one-size-fits-all techniques are not at all practical to adopt. RAS has to transition from a "best practice" to a "best fit" approach1, where structures, management, and methodologies are tailored to the unique socio-cultural, ecological, political, and economic constraints of the area. The foundation of this argument is the substitution of "good practice" for "best practice."

Policy makers, extension managers, specialists, educators, trainers, farmers, and end users are among the important players who must be involved in the proper design and execution of RAS. To guide development plans and resource allocation, these players require accurate, evidence-based information regarding RAS practices. enhance the ability of diverse players while offering farmers efficient, customised, and evidence-based services and assistance. These programmes, methods, and endeavours further the more general objectives of enhancing livelihoods, ensuring food security and sustainability, and lowering risk and poverty and guarantee that RAS investment continues.



Source: Glendenning *et al.* 2010.

Fig 2: Information flow from agricultural extension agencies in India

Role of RAS in Fishery Sector

1. Providing assistance with management and business growth that is suitable for each fisherman's size, capabilities, and resources.
2. Increased knowledge of the fish and fish product markets, including pricing, standards, seasonality, value addition, etc.
3. Connecting fishermen with other parties who offer a range of services and support.
4. Establishing forums to encourage communication and collaboration amongst the many parties involved, such as FPOs, in order to guarantee coordinated assistance to fishermen.
5. Making use of information and communication technologies (ICTs) to give fishermen access to a variety of data on pricing, weather, extension initiatives, and general fisheries information.
6. Encouraging FPO establishment and working together with them to improve RAS's supply and demand sides.
7. Encouraging policy and institutional reform to make small-scale fishing possible and sustainable.

Model Village System of Extension Approach (MVSE)

In order to advance agriculture and related sectors in the community in terms of socioeconomic upliftment, technological empowerment, and self-governance, MVSE is an integrated and comprehensive extension approach that prioritises community participation in appropriate technological interventions in the field of farmers. futuristic expertise and knowledge base using a framework that is inclusive. The use of probiotics and organic fertilisers in the fishpond helps to promote the holistic management of resources. Fishermen and fish farmers have also been exposed to technology such as net size gear designed specifically to minimise predation of juvenile fish. In order to bring their operations closer together as a component of the food value chain that links the producer to the consumer, MVSE placed a strong emphasis on the engagement of all stakeholders in the process. Government programmes such as the Indian Council of Agricultural Research (ICAR) "Mera Gaon" programme and the "Saansad AdarshGram Yojana," wherein each Member of Parliament adopts a village and builds a model village out of it, are examples of this. Ralegaon Siddhi model village in Ahmednagar district of Maharashtra, which became one of the richest in the country under social reformer Shri Anna Hazare (www.panchayat. gov.in) in management as a result of development; the model village of Hiware Bazar in Maharashtra, known for water conservation in 40,000 deep trenches around the hills and also for Smart Villages in Andhra Pradesh, a programme; and Mera Gaurav, to promote direct communication between agricultural scientists and farmers-laboratory and farmers; Model villages are capable of operating as autonomous, equitable, and sustainable communities. One village may serve as an example for other villages, and if development efforts in this manner encompass all of rural India, India might be featured as an inclusive development case study on international maps. In order to achieve inclusive development and Atmanirbhar Bharat, milestones in the areas of food and nutrition security through scientific agriculture, sustainable ecological balance, improved income and fair distribution, modern infrastructure, social harmony, and brotherhood may be achieved. These sustainable micro-units may be developed by frontline extension specialists from the Ministries of External Affairs and ICAR, and they can be replicated at the district and state levels. It is important to maintain the five districts and their sub-districts in the forefront of the creation of model village development programmes.

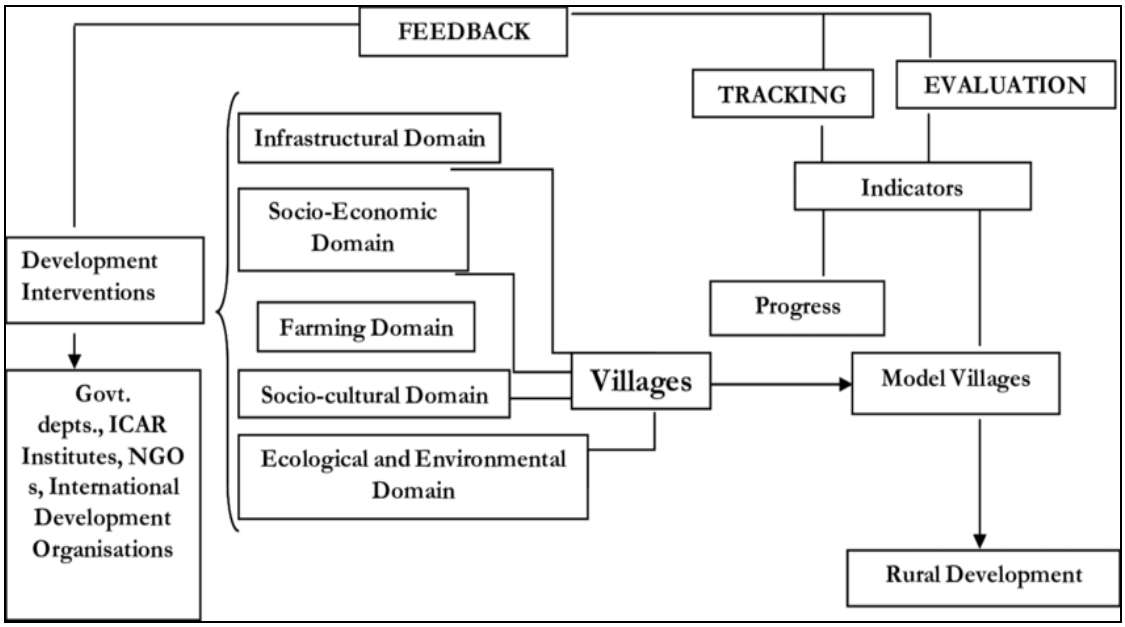


Fig 3: Conceptual Framework of Model Village Indicators used to evaluate Rural Development Interventions

Principles of MVSE Approach

1. Advocates for fish farmers to exercise self-governance.
2. The development of leadership and skill among the community of fishermen.
3. Linking many parties involved in the fisheries industry through pluralistic convergence.
4. Fostering village development based on commodities to take advantage of market possibilities.

Farmer's field school approach

The bottom-up extension technique, which was created as a strategy for resolving challenging field-level issues in agriculture and related sectors, is an alternative to this extension methodology. The FFS method is a cutting-edge, interactive, and participatory learning strategy that places a strong emphasis on learning via problem-solving and discovery. Fishermen may only actively participate in the adoption of innovation and knowledge when they are involved in the spread of technology through technological learning. Fishermen who use a farm school approach might get real-world experience and become more open to novel concepts and methods. In the end, this may result in more productive fishing and better sustainable fishing practices. By contrasting the technologies created in their traditions with their own customs, cultures, and natural resource-use practices, FFS also provides farmers with the chance to practise, assess, and adopt sustainable use technologies. FFS, which is regarded as a farmer-to-farmer extension strategy, seeks to improve farmers' ability to assess their production systems, pinpoint issues, test potential fixes, and persuade participants to embrace the techniques most suited to their particular farming systems. According to its description, the Farmer Field School (FFS) is an open-air learning environment designed to foster local innovation in sustainable agriculture and enhance decision-making within farming communities. Under the supervision of a facilitator, farmers conduct routine field observations, connect those observations to the environment, and use both new and prior knowledge to make decisions about crops or livestock. Leading FFS proponent Kevin Gallagher claims that the Finnish Field School is more about human development than technology. In other words, it's adult education-based, dynamic, useful, creative, and inclusive discovery learning. Teachers need to be technically proficient since every student has the potential to be a coach. Farmers have the chance to learn about integrated management and agroecology through FFS. With this understanding, kids develop into self-reliant, self-assured decision-makers who are authorities in their domain. By including farmers in their own trials, the FFS strategy reduces the time required to perform research from station to deployment in farmers' fields, complementing current efforts in research and extension. the capacity of more employees to serve as mentors for technically proficient and socially conscious farmers, providing them with hands-on training; enhancing farmers' understanding to make informed judgements about what suits them best, based on their own observations.

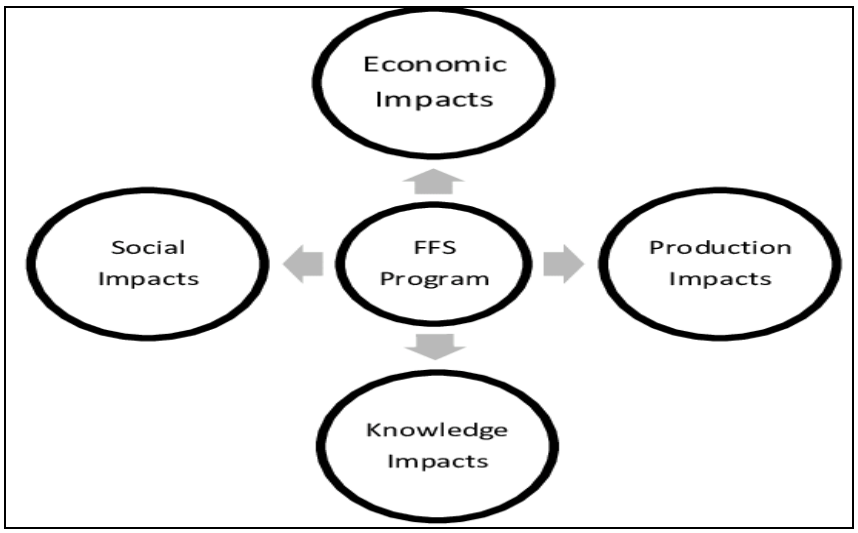


Fig 4: Conceptual framework of the effects of farmer field school on greenhouse owners.

Principles of Farmer Field School (FFS)

1. The field is the site of learning.
2. Places a focus on experiential and inquiry-based learning
3. Farmers acquire expertise
4. Curriculum defined by learners and integrated.
5. Seeing or knowing is inferior to doing.
6. Every learning process begins with an experience.
7. Refer to real-world scenarios and be pertinent to issues and demands in the area.
8. Monitoring and assessment with participation.
9. Farmers have the power to decide.

Market Led Extension Approach

Extension specialists need to take a more proactive approach than only transferring improved technologies to farmers and producers in order to boost entrepreneurship in the fisheries industry. Farmers should, instead, be aware of several product attributes, including value addition, processing, customer preferences, quality, and market information. A farmer's income can double as a result of its assistance in achieving high production yields, lowering production costs, and enhancing the value and marketability of their products.

The extension staff should have expertise and skills in the production and marketing of fish products, as the extension system provides fish farmers with a more dependable supply of farming technology. Therefore, the extension system has to be reformed in order to spur farmer-led and market-led extension, which would ultimately help to reduce poverty and provide livelihood security. In light of this, it is nevertheless difficult to persuade extension agents to pick up new marketing expertise and abilities prior to being given marketing extension responsibilities in order to establish credibility and provide noteworthy advantages for farmers.

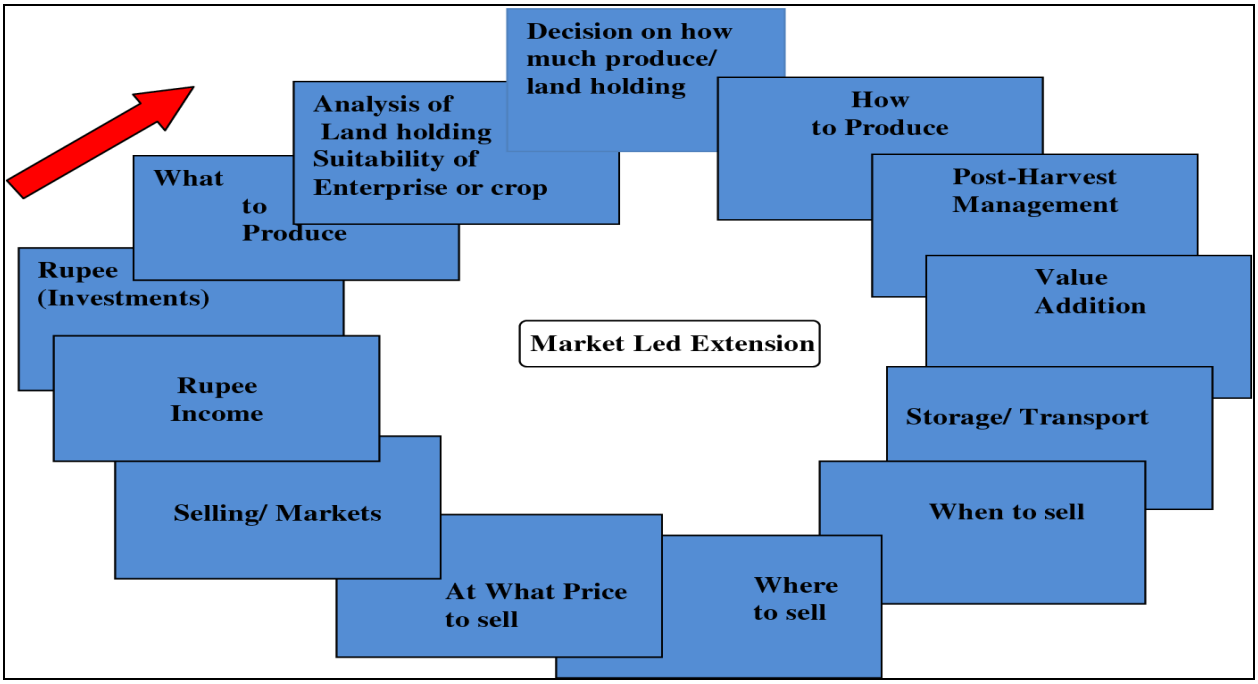


Fig 5: The Flow chart of Market Led Extension

Digital extension approach

Information and communication technology (ICT) was introduced as part of the agricultural extension reforms, which altered the system. By enhancing farmers' access and information sharing through creative e-agriculture efforts, an ICT-based extension system known as Digital Extension can facilitate farmers' empowerment (Saravanan, 2010) [24]. The development of capacity, public involvement, and government ambition to establish a solid infrastructure to operate with cutting-edge technology are all necessary for this novel method to scaling to be effective. It is important to prepare carefully and use communication technologies while distributing farmer-friendly technology. Remote farmers may have a better chance of living near to scientific input if they make use of ICT applications. The role that contemporary information and communication technology (ICT) will play in smallholder agricultural extension services in the future has raised high expectations due to recent technical breakthroughs. The adoption of technology and the enhancement of livelihoods have not always been the goals of traditional approaches like training and dissemination or farmer schools, therefore there is a lot of interest in growing agriculture through digital media. An extensive information system comprising farmers, merchants, processors, extension agents, researchers, and workers leads to inadequate information flows, which is the source of many of the present constraints of agricultural extension services (AES). Still, new avenues for supporting these data flows have been made possible by the pervasive usage of mobile phones. Farmer participation in a more intricate interchange of information is made possible by mobile phones, as opposed to traditional media like radio, television, and posters. Thus, it is anticipated that increased usage of contemporary ICTs would contribute to increased agricultural extension efficiency. Innovative digital agricultural advisory services include SMS-based market information services, call centres offering technical advice to agricultural enterprises, participatory video-based information sharing among farmers, and decision support systems that are mobile applications.

ICT solutions are not a cure-all, either, as demonstrated by the first ten years of experience with digital agricultural advice services for small farmers. Frequently, there was little effect on farmers' decision-making procedures. The absence of feedback mechanisms, inconsistencies with farmers' technical abilities and habits, the timeliness of information transmission, or a lack of confidence in information sources were common problems with digital advising apps. Due to these flaws, some services have had to close after their original financing ran out since they were unable to include enough decision-makers and establish sustainable business models.

There are several potential for gathering, organising, and horizontally sharing farmer information with modern ICT. For instance, the most well-liked feature at the Indian contact centre Avaaj Otalo was a regulated voice-based discussion forum where farmers who wouldn't normally meet in person could share stories and ask questions of one another. (Patel and others, 2010) [22]. According to Eiseninger *et al.* (2019) [6], the "GeoFarmer" system enables users to submit observations and queries using a smartphone application in increasingly technologically sophisticated environments. The programme then displays the most voted comments as best practices and allows other users to remark, react, or vote on comments they find helpful.

Disruptive Extension Approach (DEA)

It is an extension system driven by entrepreneurs that is sustainable and has the power to change every link in the food chain, from farm to fork. This kind of growth is economical and depends on the balance between conserving and using resources, which impacts small farmers' livelihood security and the long-term viability of technology. The significance of excellent governance that upholds farmers' rights to their natural resources in agriculture and allied sectors. emphasis on stakeholders'

increasing desire to examine domain-specific concerns related to technology adoption in detail. Capacity to settle interpersonal disputes in order to guarantee equitable access to communal resources via a Memorandum of Understanding (MoU). based on a system for recovering costs. Make sure there is a commitment to maximising economic gains and resource optimisation in order to enhance food security. social insurance centred around the community. An technique to recruitment that is specifically designed to improve tech retention. Concentrate on using a pluralistic strategy with several partners to build a network with various organisations surrounding the farms. encouraging the Farmer's FIRST method to facilitate communication between farmers and researchers in the creation, assessment, and deployment of technologies.

Approaches and methods in Fisheries and allied sectors

1. Extension Reforms approach

MANAGE successfully piloted the ATMA extension system model between 1998 and 2005, and then launched it under the Technology Diffusion (ITD) component of the Nation Agricultural Technology Project (NATP). Diversification of output in related sectors is the primary goal of the ATMA extension system concept, rather than technology transfer in key crops (Gupta and Shinde, 2013) [11].

The broad-based extension system, group contacts, use of information and communication technology (ICT), gender mainstreaming, alignment of the line department to a gap-filling mode, etc. are the primary changes advocated by the ATMA model. Public extension services will thus change from having a limited focus on technology transition to having a larger focus on the development of human and social capital (Swanson, 2008) [25].

2. Farming System Approach

It is a localised version of a methodical or comprehensive approach. Research ties are essential, and locals work together in an iterative method to build technologies locally tailored to local requirements. The degree to which locals embrace and keep using the technology created by the programme serves as a barometer of success.

3. Project Approach

This method, which frequently involves the assistance of outside resources, focuses efforts in a particular area for a predetermined amount of time. Introducing strategies and tactics that may be continued long after the project is over is frequently one of its goals. Success is frequently measured in terms of immediate results.

Extension system in India

1. Major organizational streams are working for rural development

In India there are 4 major organizational streams are working for rural development:

1. ICAR (Indian Council of Agricultural Research) institutes and Agriculture & Veterinary Universities.
2. Extension System of Ministry of Fisheries and State Departments of Fisheries.
3. Extension System of Ministry of Rural Development and the State Development Departments.
4. Voluntary organizations, business houses etc.

2. First line of Extension system

The involvement of ICAR in extension started with the formulation and implementation of several front-line extension programmes.

3. The programs were as follows

1. National Demonstration

The idea of the national demonstration project is to use proven agricultural technology to increase productivity per unit area and time. The National Major Food Crops Promotion Programme was initiated by ICAR in 1964. The project's main goal was to demonstrate the genetic production potential of new technologies for significant crops per acre and per unit of time, and to persuade farmers to embrace and popularise the methods in order to increase output and enhance farming practices.

Objectives

The goal is to demonstrate a piece of land's potential for production by utilising high-yielding plants, a multi-crop programme, balanced fertiliser application, and effective water management practices. Farmers receive training to enhance agricultural practices through the demonstrations, while researchers gain firsthand knowledge of the challenges farmers have when cultivating high-yielding cultivars. Reducing the amount of time that passes between the completion of the study and its practical application is the aim.

2. Operational Research Project

ICAR introduced ORP in 1975. The primary goal of the ORP was to encourage community involvement and action by introducing farmers and extension agents to technologies from the watershed. Three to four villages or watersheds can be used as a farmer's field to test, implement, and showcase innovative agricultural practices. Determining the new technology's profitability required a large increase in output and revenue. Determine the socioeconomic barriers to the adoption of new technologies in order to evaluate the viability of adopting new farming methods. The project's main goal was to help farmers improve socioeconomically through an integrated strategy that used locally accessible resources for modern crops, horticulture, animal husbandry, homesteading, occupational and health hygiene, nutrition, and other areas. The majority of ORPs were executed by State, ICAR Institutes, and Agricultural Universities.

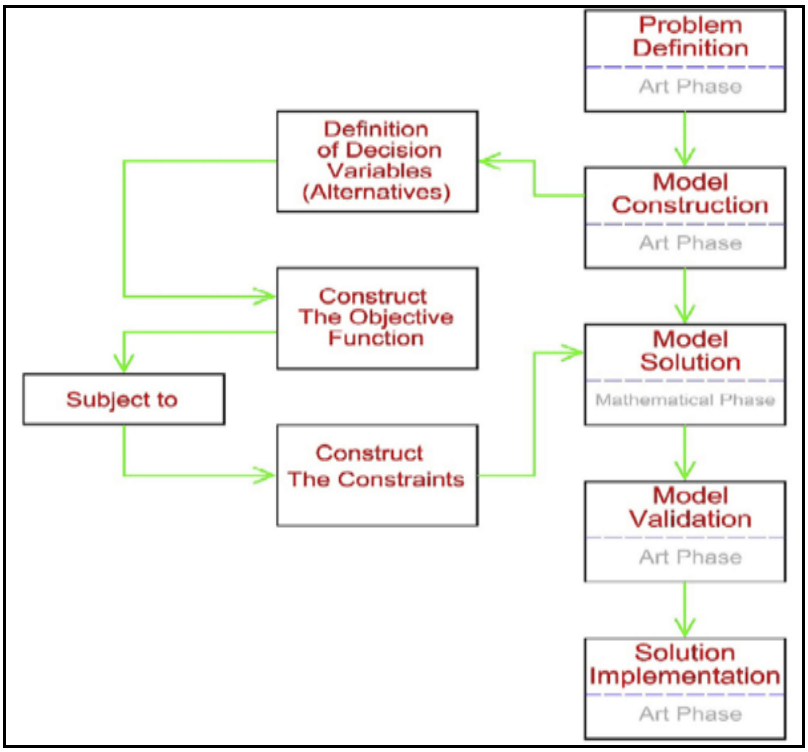


Fig 6: Flow Chart illustrates Construction of Operation Research Model

3. Krishi Vigyan Kendra

In 1974, the Tamil Nadu Agricultural University (Coimbatore) assumed administrative management of the first pilot Krishi Vigyan Kendra, which was located in Pondicherry (Pondichero).

KVKs are assigned to relevant Ministries, ICAR Institutes, Agricultural Universities, and Agricultural NGOs. KVK typically has ties to a nearby agricultural university.

Every KVK is governed by one of India's eleven Agricultural Technology Applied Research Institutes (ATARI). The Government of India provides all funding for these Krishi Vigyaan Kendras.

Objectives of KVK

The aim is to enhance agricultural productivity, empower rural youth and farmwomen, create employment in both farm and non-farm sectors, and improve the socio-economic conditions of rural communities.

Role of KVK

The task involves frontline demonstrations, on-farm testing, and technology dissemination through training to extension workers in various line departments.

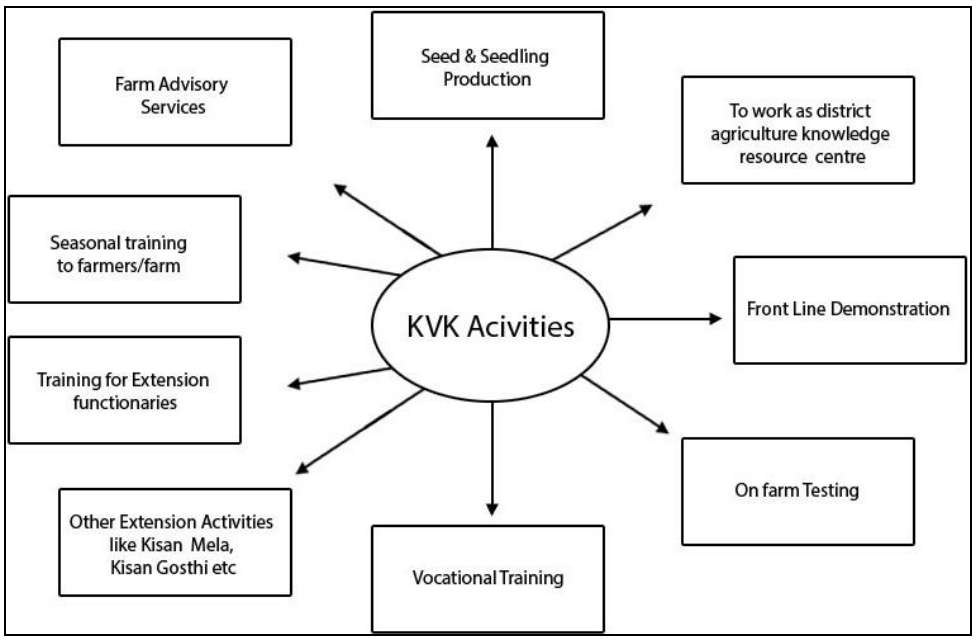


Fig 7: Flow chart of KVK activities

4. Lab to Land Programme

ICAR celebrated its Golden Jubilee in 1979 by launching the Lab to Land Programme (LLP). The program's overarching goal was to transmit better technology created by universities, research institutions, etc. to small and marginal farmers and landless agricultural labourers, particularly those from scheduled castes and tribes, in order to improve their economic situation. Goals of the State Programme Laboratory As stated by Choudhary, Nayar, and Prasad (1987) [29].

1. Research and comprehend the history and available resources of the chosen farmers and agricultural labourers who are landless. to install affordable, pertinent agricultural and related technology on their farms and residences in order to boost employment, output, and revenue.
2. Help the farmers create workable farm plans by considering the technology at their disposal, their requirements and resources, as well as the resources that may be made available from other organisations and sources.
3. Show the farmers the economic viability of new technologies, cultivation techniques, and farm management strategies, and assist them in implementing enhanced technologies in accordance with their farm plans.
4. Arrange extension activities and training sessions relevant to their accepted techniques, and get them ready to take an active role in state-funded agricultural development initiatives.
5. Educate the farmers about the several resources and organisations that they may use to their financial benefit.
6. Create connections and functional relationships with scientists and organisations to facilitate future advice, facilities, and assistance.
7. Make use of this initiative as a means of providing agricultural scientists and extension agents with input.

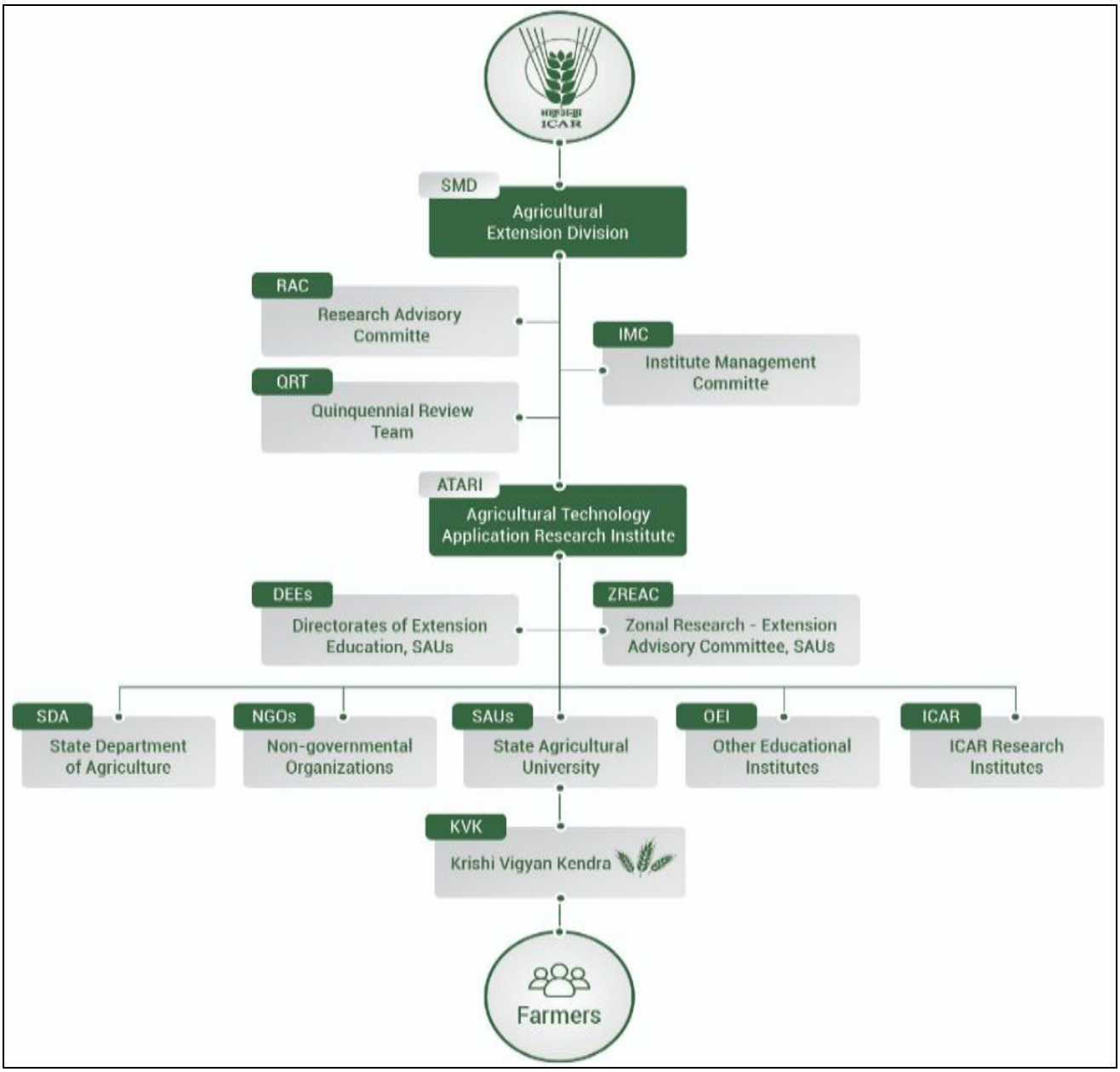


Fig 8: Organization Chart

Role of Lab to Land Program

1. Assist the farmers to develop feasible farm plans.
2. Guide and help the farmers in adopting improved technologies.
3. Organize training programmes and other extension activities.
4. Make the farmers aware of the various opportunities and agencies.
5. Reaching out many of farmers in lab to land programme.

5. Frontline Demonstrations

Front-line demonstrations are field tests carried out under the careful supervision of National Agricultural Research System specialists.

"Seeing is believing" is the main principle behind the demonstrations.

Role of Front-Line Demonstration

1. On the fields belonging to the farmers, showcase the recently launched production technology.
2. Following the identification of issues, plan training sessions tailored to the needs of farmers and subject matter experts.
3. Make the most of their potential within the constraints of the agricultural system.
4. Provide the necessary training to the villagers to prepare them for technical leadership

6. National Agricultural Technology Project (NATP)

A powerful instrument for significantly altering the nation's agricultural research and extension systems and enhancing their ability to handle new problems is the National Agricultural Technology Project (NATP). With funding from the World Bank, the Board of Agriculture, State of India, launched the project, which would be carried out over a five-year period in 28 districts across 7 states (Andhra Pradesh, Bihar, Jharkhand, Himachal Pradesh, Maharashtra, Orissa, and Punjab) with the assistance of MANAGE.

The Roles of ATMA are:

1. Strengthen research - extension - farmer linkages.
2. Provide an effective mechanism for co-ordination and management of activities of different agencies involved in technology adaption / validation and dissemination at the district level and below.
3. Increase the quality and type of technologies being disseminated.
4. Move towards shared ownership of the agricultural technology system by key shareholders.
5. Develop new partnerships with the private institutions including NGOs.

Conclusion

- Attaining the sustainable growth of the fisheries and related sectors depends heavily on creative extension strategies.
- These methods cover a variety of tactics such as embracing technology, developing one's capacity, involving the community, and advocating for policies.
- By enforcing these cutting-edge techniques, stakeholders may improve the socioeconomic well-being of communities reliant on the fishing industry overall, increase production, and encourage environmental protection.
- Knowledge transmission and skill development are facilitated by the integration of contemporary technology, efficient communication channels, and cooperative partnerships, assuring a more adaptable and sustainable future for the fishing industry and related sectors.

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