

## **Extension approaches for rural entrepreneurship development in Fisheries**

**A.K. Mohanty and Sajesh V.K.**  
**Extension, Information and Statistics Division**  
**ICAR-CIFT, Kochi**

Global fisheries have made rapid strides in recent years by establishing its strong hold over increasing food supply, generating job opportunities, raising nutritional level and earning foreign exchanges. These benefits become particularly important when placed in the context of current food production challenges, social change and growing climate change uncertainties. Fish and fishery products are the most traded food commodities in the world accounting for 9% of total agricultural exports and 1% of world merchandise trade, in value terms (FAO, 2014). About 38% of the global fish production enters international trade in various forms and shapes, generating export earnings of US\$148.1 billion with a record import at US\$140.6 billion in 2014. The value of the global fish trade exceeds the value of international trade in all other animal proteins combined. Mostly the developing countries that account for over 60% of global fish catch, which is continued to expand at an average annual rate of 8.8% (FAO, 2009 & 2012), play a major role in the global trade of fish and fish products; about 50% of all fishery exports in value terms and more than 60% in quantity terms are supplied by them (World Bank 2011). At the same time, demand for fish products are likely to rise as a result of rising populations that are expected to reach 9.3 billion by 2050. Furthermore, developing countries now display a positive trade balance due to their increasing involvement in global fisheries trade. It is estimated that fish production generally contributes 0.5 – 2.5 % of GDP globally (Allison 2011). Due to research and technology developments, this vibrant sector has witnessed both horizontal and vertical expansion, with a quantum jump in total fish production in India from 0.75 million tonnes in 1950-51 to 11.41 MT in 2016-17, over 14.5-fold increase in fish production in just 6.5 decades, for which India has established its strong hold in global fish production, next to China. This resulted due to an unparalleled average annual growth rate of more than 4.8 percent in production and 7.5 percent in fish and fish product development over the years. In spite of that globally an estimated more than 1.3 billion people are in extreme poverty (2016), 795 million people (2015-16) are estimated to be chronically hungry and an estimated one third of children in the developing world under five years of age are stunted (Conway 2012). Fish is considered as the most affordable and frequently consumed animal-source food in low income food deficit countries in sub-Saharan Africa, Latin America and Asia (World Bank, 2006) which contains intrinsic nutrients like high quality protein, a range of micro-nutrients, and fatty acids essential for human brain development (Tacon and Metian, 2013) thus contributing to a great extent to food and nutrition security in many Asian and African countries where large numbers of people are still under starvation and under nourished (Kent, 1987). Despite the important contributions by the sunrise sector, global debates on fisheries issues and policies appear to be dominated by concerns over environmental

sustainability, overfishing and overcapacity. In this context, it is alarming to note that the sector did not receive adequate attention from the social scientists to understand its various socio-economic dynamics to prove the sunrise sector fisheries as a potential driver of local and national economic development.

### **Why fishpreneurship is important?**

Entrepreneurship in fisheries means undertaking a new business venture to make it profitable. It comprises of activities as gathering of information, communication with chain partners, market orientation, strategic decision making, learning *etc.* Entrepreneurship deals more with strategic issues than management which focuses more on operational and tactical decisions. Craftsmanship and management can be learned more easily than entrepreneurship; the first two aspects have a more technical or procedural character, whereas entrepreneurship involves a lot of 'special' skills of the farmer, like communication and risk management, and competencies like leadership, initiativeness, openness to signals from society, vision, creativity, self-reflection *etc* (De Lauwere et al., 2004b).

### **Entrepreneur VS Entrepreneurship**

Entrepreneurs are those who manage an enterprise as a viable business. *The word 'entrepreneur' is derived from the French word 'entreprendre' which means 'to undertake'.* Schumpeter has portrayed Entrepreneur as an innovator. He considered entrepreneurship as the catalyst that disrupts the stationary circular flow of the economy and thereby initiates and sustains the process of development (Block et al, 2017). The entrepreneur is characterised by innovative behaviour and employs strategic management practices in the business (Cartland, 1984). Entrepreneurship has traditionally been defined as the process of designing, launching and running a new business, which typically begins as a small business, such as a startup company, offering a product, process or service for sale or hire (Yetisan et al, 2015). Entrepreneurship comprises of any purposeful activity that initiate, maintain or develop a profit oriented business in interaction with the internal situation of the business or with the economic, political and social circumstances surrounding the business (Harvard School).

*Entrepreneur according to E.E. HAGEN is an economic man, who tries to maximize his profits by innovations.* The process of creating something different with value by devoting the necessary time and effort, assuming the accompanying financial, psychic and social risk and receiving the resultant rewards of monetary and personal satisfaction is called entrepreneurship (Fry, 1996). Thus, the entrepreneur is the key agent in transition processes of development.

### **Role of extension for addressing the major concerns in small scale fishpreneurship**

The fishery sector is a major foreign exchange earner for any developing countries. In India, its foreign exchange earnings were estimated to increase by 16 to 20 per cent by 2005

and 26 to 42 per cent by 2015. In view of higher production in fisheries, producers may lose from price fall in the domestic market; where prices were estimated to fall by 15 to 20 per cent by 2005 and 27 to 54 per cent by 2015. Nearly 85 per cent of the export benefits are projected from shrimp export alone. Because of its potential and rich source of animal protein, fish demand has been rising in both the developed and developing world at more than 2.5 percent per year (Peterson and Fronc, 2007) and demand levels were raised in proportion to increase in income in highly populated countries like China and India, (Garcia and Rosenberg, 2010). In spite of the phenomenal success of the sector, still there are concerns for the economic and nutritional conditions of fisher folk in addition to some important concerns in the context of rising environmental hazards, depressing prices world over, emerging new economic order following establishment of WTO, IPR & SPS issues, compliance of several multilateral agreements, etc.

Small-scale fisheries are normally characterized by low capital input activities, low capital investments and lack of equipment, labour-intensive operations followed by traditional fishers. They also usually operate as semi-subsistence, family-based enterprises, where a share of the production is kept for self-consumption (Garcia *et al.*, 2008). Traditional fishers dominate the marine sector and they are socially deprived, educationally weak with very high occupational rigidity. There is inequity in the distribution of yield and effort in marine fishing. They are unorganized with least social security benefits. The informal social security system in the form of sharing of earnings for the community and social organizations prevailing in the traditional fishing is absent in the mechanized fishing. There are also huge regional variations in productivity.

Technologies are the main drivers of growth. Hence, systematic technological interventions backed by adequate policy and institutional support are vital for making the aquaculture operations sustainable and economical. Generally, the technologies and trade interventions reinforce each other which can be characterized as skill-based, cost effective, capital intensive that can bring a change in the performance of the sector. Following strategies have been suggested for an accelerated fishpreneurship development with focus on poverty alleviation of poor fishers:

- ❖ Commodity-centered approach
- ❖ System approach
- ❖ Prioritize technology on the basis of needs and problems at micro and macro levels
- ❖ Innovate and strengthen institutions and policies
- ❖ Upgrade the skills of the fishers
- ❖ Enhance investment and reorient policies to facilitate percolation of benefits to all sections of the society.
- ❖ Follow ecological principles
- ❖ Emphasize on domestic market demand and consumers' preferences

- ❖ Monitoring the technology demonstrations programs and assess the impacts.
- ❖ Strengthen database and share it for a better planning and policy making in the sector.

### **Extension systems for sustainable entrepreneurship development**

Unlike agriculture, fisheries stand on the very complex interaction between biological, climatic and geographical factors in addition to human activities. The information under such a complicated system is unpredictable, unstable, subjective, site specific and reliant on empirical decision given the inherent variability of biological phenomena. In spite of nation's priorities and developmental strategies for reducing poverty, hunger and ensuring quality of life to its people, we are still lagging behind in human development index as expected. People particularly small, marginal and landless farm households are still far from the reach of good education, nutrient nourished diet, better health care facilities and modern age amenities.

Hence, there is an urgent need to reform agriculture in holistic, scientific and systems approach to meet the present day challenges in agriculture due to climate change and global competitiveness so as to achieve sustainable agriculture production and growth through rural agripreneurship.

In agricultural parlance, sustainability means maintaining the crop productivity without enhancing input levels. Sustainable agriculture is a form of agriculture aimed at meeting the needs of the present generation without endangering the resource base of the future generations. According to the concept laid by the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR) "*Sustainable agriculture is the successful management of resources for agriculture to satisfy the changing human needs, while maintaining or enhancing the quality of environment, and conserving natural resources*". Sustainable agricultural systems must be resource-conserving, socially supportive, commercially competitive, and environmentally sound. Hence, the agriculture research system must place emphasis on generation of required technology along with strong linkage between research-extension system and vice versa. It involves design and management procedures that work with natural processes to conserve all resources, promote agro-ecosystem resilience and self-regulation, minimize waste and environmental damage, while maintaining or improving farm productivity and profitability (MacRae et al., 1990).

The rôle of extension in agricultural system cannot be ignored. Strong extension system is the key to the desired change to meet the present day challenges in agriculture. Basically the end product of the extension system is to work with farmers within a climate and economic environment by providing suitable technologies to widen their horizon, enriching knowledge and upgrade skills to improve better handling of natural farm resources and applying scientific production technologies to achieve desired production level. Extension system plays a pivotal role in empowering farmers and other partners to make it more farmers' participatory, demand-

driven, knowledge oriented and skill supportive for disseminating most appropriate technical, management and marketing skill to improve profitability in agriculture that can overcome the emerging challenges and concern thus developing a synergistic pathway for enhancing productivity along with quality produce in order to sustain a viable production base that can easily support the entrepreneurial growth leading to livelihood security. The extension system needs to disseminate a broad array of information starting from seed to seed, field to fork in an integrated manner for safe delivery from field to the consumer concerning all the aspects of conservation and production technologies, post-harvest management, processing and value addition. Such knowledge based decision should be incorporated in reshaping of extension approaches. In present scenario, the extension system envisages a transformation from technology driven to market driven extension where farmers would give emphasis on commercialization of high value products, maintenance of quality control, fulfilling market demands, cost effectiveness etc. thus economic indicators become theme to the program planning process for the effectiveness of any programme.

With the advent of global competitiveness and market liberalization, our prevailing extension system has to be strengthened with innovative extension approaches to tackle the recent challenges in agriculture *viz.*, climate change and weather aberrations, dwindling resources and population stress, so that farmers can adjust their production portfolio keeping eye upon the emerging trends in food consumerism in domestic as well as global markets. Grooming farmers with information support for taking right decision to improve their production in agriculture and allied fields essentially requires a strong network of extension systems, along with government initiatives and strong linkage among extension scientists and functionaries working for agricultural development. This would ensure the livelihood security of millions of farmers by improving the quality production and creating of better job opportunities in rural areas, which intends to bring out planned changes to meet the needs of the present generation without compromising the future generation's requirements.

### **Innovative extension approaches for technology dissemination**

Earlier in developing countries, the extension personnel were involved in diffusion of farm technologies generated by public research organizations, mostly disseminated through appropriate mechanism, *viz.*, On Farm Trials (OFT), frontline demonstrations (FLD), field visits, farmers' meetings, media use, etc. This process had the conceptual backup from the 'diffusion of innovation' model. But in the last two decades, the paradigm shift in development pivots to the enhanced concern for future generations to meet their basic needs, accordingly the nature of agricultural technology design and integration is drawing attention of the extension professionals and practitioners across the globe. In India, different models for transfer of farm technology have been tested and also robust extension education approaches have been validated. Furthermore, the frontline extension system of the country has been sharpened through more farmer-centric approaches for technology adaptation and dissemination. The extension system in India has been designed to move beyond technology

and beyond commodity through ensured reciprocal farmer-research-extension linkages. Farm producers located at far-off and those unreached still suffer from lack of access to appropriate services like credit, inputs, market, extension, technologies etc. Keeping eye upon this, the World Development Report had focused on need to restructure and revamp agricultural extension system as a pivot for realizing the growth potential of farm sector against the widening demand–supply pressures for ensuring sustainable, inclusive, and pro-poor agricultural and economic development. Therefore, farmer’s participatory technology development and client’s participatory extension approaches emerged as a part of integration of the ‘*interdependence model*’ and the ‘*innovation systems framework*’ that offered more inclusive ways of involving the institution in technology generation, diffusion and use of new knowledge. Extension approaches have to be redefined depending upon the components involved for sustainable growth and livelihood security of the farmers for which a conceptual framework has to be developed in response to recognizing and considering different livelihood assets viz., *human, social, physical, natural and financial resources*. Some of the following innovative extension approaches originating from multiple sources must be adopted on trial basis to make agriculture more profitable to provide food, nutrition and livelihood security to farmers, which can be replicated in the fishery sector interwoven with numerous issues including increased production with sustained natural resources, growing market demand for processed products having entrepreneurial opportunities, protection and conservation of environment, and even international trade.

An analysis of national extension systems in the Asia and Pacific region by Qamar (2006) observes that agricultural extension is undergoing a major transformation as a result of failure of public extension systems perceived to be outdated in the context of globalization, decentralization, and information technology revolution. Extension systems in many developing countries are undergoing a paradigm shift to more farmer-oriented approaches to rural innovation that emphasize the importance of interactive, integrated and multidisciplinary oriented mutual learning between formal and informal knowledge systems (Friederichsen, 2009).

#### **a. Asset Based Community Development (ABCD) approach**

As per the traditional approach to development, poor people see themselves as people with special needs that can only be met by outside supporting agencies. But Asset Based Community Development (ABCD) approach intends for the development of community based on the principle of identifying and mobilizing individual and community ‘assets’, rather than focusing on problems and needs. It is an extension approach in which a community’s micro-assets are linked with its macro environment. It believes that communities can initiate and sustain the process of growth and development themselves by recognizing and harnessing the existing, but often unrecognized assets, and thereby promoting local economic potential to drive its development process (Rans & Green, 2005). The approach is optimistic in nature,

because the focus is on what is possessed by the community, rather than the problems of the community.

The focal point in this approach is asset and not the need of the community. Assets of individuals, associations and institutions are identified after an extensive survey and assets are then matched with the need of the people to empower communities to control their futures and create tangible resources such as services, funds and infrastructures etc. (Foot and Hopkins, 2010). In agriculture, ABCD approach gives greater emphasis on reducing the use of external inputs and on a high degree of social mobilization in which the assets of the poor (social, physical, financial as well as human) can be utilized to bring sustainable livelihoods through variety of different agricultural and non-agricultural activities.

### **Five 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 individual has got certain assets, gifts and qualities; such individual is at the center of ABCD approach.
2. **Associations:** Groups of people working with a common interest are critical to community mobilization.
3. **Institutions:** The assets of institutions help the community capture valuable resources and establish a sense of civic responsibility.
4. **Physical Assets:** Physical assets such as land, buildings, space, and funds are other assets that can be used.
5. **Connections:** These are the exchange between people sharing their assets by various methods.

#### **a. Rural advisory services (RAS)**

Rural Advisory Services (RAS) refer to all the different activities that provide the information and services needed and demanded by farmers and other actors in rural settings, to assist them in providing their livelihoods by developing their technical, organizational and management skills and practices (GFRAS, 2011; FAO, 2010). RAS designers and implementers must recognize the diversity of actors in extension and advisory fields (public, private, civil society); the need for extending support to farmers' producer organizations (FPO) and rural communities (beyond technology and information sharing) including advice related to farm, organizational and business management; and explaining the role of facilitation and brokerage in rural development and value chains. In the case of aquaculture, large-, medium- and small-scale farmers need different types of RAS support. The large farms are mostly self-reliant and need only regulatory support, while medium-sized farms need mobilization and facilitation support in addition to regulatory support. Small aquaculture farms need more education and input provision alongside facilitation (Kumaran, 2014). Timely sharing of

research recommendations can address the problem of disseminating information to farmers. In this direction, innovative strategies are being formulated keeping the farmers' needs and capacities in mind to pass on appropriate technologies by combining Internet, telecommunications, video, and print technologies that may bridge the information gap and empower farmers to make better production and marketing decisions (McLaren et al. 2009).

In fishery sector, RAS helps in

- ⇒ Providing management and business development support appropriate to the scale, resources and capacities of each fisherman.
- ⇒ Better understanding markets (prices, seasonality, standards, value addition etc.) related to fish and fish products.
- ⇒ Linking fishers to other stakeholders involved in provision of varied support and services.
- ⇒ Creating platforms to facilitate interaction and sharing among the various stakeholders including FPOs to ensure coordinated support to fishers.
- ⇒ Exploiting information communication technologies (ICTs) to provide fishers with a range of information related to weather, prices, extension programmes and generic information regarding fisheries.
- ⇒ Facilitating the formation of FPOs and also collaborate with FPOs to strengthen the demand and supply side of RAS.
- ⇒ Promoting institutional and policy change to enable and support small-scale fishery.

RAS encourages the formation/ organisation of groups by involving individual family farmers, who have little influence over the social, economic and political processes affecting them, but as a group/ organizations and networks they can deal with their specific challenges and make their voice heard. Such groupings can act as platforms to articulate concerns, exchange knowledge, influence policies and engage in collective action so that their agriculture remains sustainable and profitable. Effective formation of Rural Resource Centres (RRCs), Fishermen Cooperative Society, Farmers producers Organisations(FPOs) can be instrumental by galvanizing collective action in order to ensure better access to markets and to support innovation by their members in related activities (Sundaram, 2014).

#### **b. Model Village System of Extension (MVSE) approach**

**MVSE** is an integrated and holistic extension approach where *community participation* was prioritized for suitable technological interventions in the farmers' field to bring all round development in agriculture and allied sectors in the community in terms of *socio-economic upliftment, technological empowerment, self governance* thereby enhancing the futuristic knowledge base and skills through *participatory framework*. MVSE emphasized on involvement of all stakeholders in the process to converge their activities with a stake in the food value chain *linking producer to consumer*. Nevertheless, MVSE is an action research

taken up in farmers' field based on the principle of leveraging the activities, investments and resources from outside agencies/ externally aided projects resulting higher productivity, ensuring food security and sustainable improvement in overall quality of life by promoting leadership, self-dependency of the community in food chain. Economically viable, ecologically compatible and socially acceptable suitable technologies were successfully intervened in farmers' field in a cluster adopted as model village through participatory mode by integrating the multi-disciplinary research which was later replicated to other villages. The village was developed as a commodity village branding for a particular commodity in the market.

MVSE approach works on the following principles:

- Promotes self-governance among the farmers
- Skill improvement and leadership development among the community members.
- Establishing linkage through pluralistic convergence of different stakeholders associated in the sector.
- Encouraging the market opportunities through commodity based village development.

#### **c. Farmers Field School (FFS) approach**

This extension approach is an alternative to the top down extension approach which was evolved as a method to solve complex field level issues in agriculture and allied sectors. The FFS approach is an innovative, participatory and interactive learning approach that emphasizes problem solving and discovery based learning. FFS also provides an opportunity for farmers to practice and evaluate sustainable land use technologies, and introduce new technologies by comparing with their conventional technologies developed in congruent with their own tradition, culture and resource use pattern. FFS, considered as a farmer-to-farmer extension approach, aims to build farmers' capacity to analyze their production systems, identify problems, test possible solutions, and eventually encourage the participants to adopt the practices most suitable to their farming systems (FAO, 2003 c). This is a learning-by-doing approach which emphasizes group observation, discussion, dissection, modification, and promotes field-based experimentation, analysis for collective decision making followed by actions. The goal of the approach is such that, after observing and comparing the results of field level experimentation farmers will eventually "own" and adopt improved practices by themselves without any external compulsion. Field day is being organized at the end of the season to give visibility to the entire activities to convince the non-adopters. Exchange visits with other FFS is also encouraged to learn by association and comparison. A group of 20-25 farmers can form a farm school under the guidance of a FFS facilitator. Extension workers, NGO workers, farmer organization staff or previously trained farmers can become Farmer Field School facilitators. The facilitators are trained by master trainers, who have expertise in the particular subject matter. FFS is a time bound activity usually covering one production cycle or a year.

It is also significant to note that irrespective of the merits of the technology, farmers' acceptance to them is influenced by the extension method. Farmer Field School (FFS) model has been accepted as a good methodology because it is exclusively participatory. A comparison was made between a 6-year participatory seed selection and multiplication project in Nepal and a 3-year seed distribution relief program in Zimbabwe. The study revealed that the project in Nepal was successful in its scaling up and continuity as the new varieties of crops increased yields by about 45% and improved stability in household food access. In contrast, only 12% of the beneficiaries in Zimbabwe decided to reuse and plant the open pollinated maize varieties the following year because the new varieties were not properly appreciated by the farmers because they had not received sufficient information and training on seed selection (Ministry of Foreign Affairs of the Netherlands, Policy and Operations Evaluation Department 2011). A special feature of this extension approach was that it reached poor and female-headed households and lower-caste households much better than the regular extension services (Tiwari et al. 2010). Other barriers to the adoption of sustainable agriculture practices include social barriers, infrastructure, and incompatibility of technology.

The basic component of FFS is setting up of a Participatory Comparative Experiment (PCE), commonly referred to as Participatory Technology Development (PTD), whereby the farmers put the FFS concept into practice under close monitoring and supervision by the FFS members. A PCE can be developed in the field of agriculture, livestock, fishery, forestry, agro-forestry, livelihood system and others. Principles of Farmer Field School (FFS) are as follows:-

- Field is the learning place.
- Emphasizes hands on and discovery based learning.
- Farmers become experts.
- Integrated and learner defined curriculum.
- Doing is better than learning/ seeing.
- Experiences are the start of all learning.
- Link to actual field situations and should be relevant to local needs and problems.
- Participatory monitoring and evaluation.
- Farmers are decision makers.

#### **d. Market led extension approach**

In order to make agriculture more enterprising, extension professionals needs to be proactive beyond the regular objective of maximizing the productivity of the farmers/producers by transferring improved technologies rather farmers should be sensitized on various aspects of produce like quality, consumer's preference, market intelligence, processing and value addition and other marketing information. This will help the farming community to realize high returns for the produce, minimize the production costs, and improve the product value and marketability that may lead to realize the concept of doubling farmers' income. With the

globalization of agriculture, emphasis on productivity and profitability to the farm enterprises increased and, therefore the demand driven agriculture (and allied sectors) has led to the paradigm shift from production-led extension to market led extension. There are many challenges in the agricultural marketing system which can be resolved through the efforts of market led extension models.

In this approach farmer/producer is viewed as an 'Agripreneur' who expects high returns 'Rupee to Rupee' from his produce by adopting a diverse baskets of package of practices suitable to local situations/ farming systems with optimum cost benefit ratio (C:B ratio) ensuring maximum share of profit by exploring the market demand. Goal of market led extension is to facilitate farmers to get. Market led extension focuses on harnessing the ICT tools to access market intelligence including likely price trends, demand position, current prices, market practices, communication network, etc. besides production technologies.

For farmers, as the extension system is more credible source of farm technologies, the extension personnel ought to be knowledge- and skill-oriented in relation to production and marketing of agricultural goods. Thus, revamping the extension system will have a catalytic role for ushering in farmer-led and market-led extension; which can subsequently alleviate poverty and ensure livelihood security. In the light of this, the challenge remains to motivate the extension personnel to learn the new knowledge and skills of marketing before assigning them marketing extension jobs to establish their credibility and facilitate significant profits for the farming community. SWOT analysis of the market, Organization of Farmers' Interest Groups (FIGs), capacity development, establishing linkage and synergy, harnessing ICTs, digital marketing etc., are the competencies required by the extension personnel in order to effectively implement market led extension.

#### **e. Digital extension approach**

Extension reforms brought a transformation in agricultural extension system through introduction of Information and Communication Technologies (ICTs). The ICT-enabled extension system referred to as Digital Extension has the potential for enabling the empowerment of farming communities by improving their access to information and sharing knowledge with innovative e-agriculture initiatives (Saravanan, 2010a).

With the phenomenal growth in information and communication technology, use of IT application in agriculture will bring remarkable change in the attitude and knowledge level of user. Basic requirement is to provide most appropriate information in such a capsule that can be easily understood and used by them. This approach will strengthen the extension system for better dissemination of technology. As a case study the contribution of Digital Green, a NGO that uses an innovative digital platform for community engagement to improve lives of rural communities across South Asia and Sub-Saharan Africa is remarkable. Digital Green associate with local public, private and civil society organizations to share knowledge on improved

agricultural practices, livelihoods, health, and nutrition, using locally produced videos and human mediated dissemination. As per the study, the Digital Green project (participatory digital video for agricultural extension) increased the adoption of certain agriculture practices seven times higher compared to traditional extension services and the approach was found to be 10 times more cost-effective per dollar spent. Hence, along with ICT-based advisory services, input supply and technology testing need to be integrated for greater impact and content aggregation from different sources require to be sorted in granular format and customized in local language for rapid adoption of technologies (Balaji et al., 2007&Glendenning and Ficarelli, 2011).

The effectiveness of this innovative extension approach depends on capacity building, people's participation along with government initiative to provide strong infrastructure to be worked with the cutting edge technologies. The farmer friendly technology dissemination process needs to be handled with careful planning by the incorporation of information communication technology. The use of ICT application can enhance opportunities to touch the remote farmers to live in close proximity of the scientific input. The computer based web portals namely a AQUA, KISSAN Kerala, TNAU AGRITECH Portal, AGRISNET, DACNET, e-Krishi, ASHA, India Development Gateway (InDG) portal, Rice Knowledge Management Portal (RKMP), Agropedia, KIRAN, AGMARKNET, ITC-e-Choupal, Indiancommodities.com, Mahindra Kisan Mitra, IFFCO Agri-Portal, Agrowatch Portal, iKissan, etc.along-with some mobile based Apps likemKRISHI® Fisheries, riceXpert, Pusa Krishi, Krishikosh, m4agriNEI etc. launched in India are some of the successful digital intervention for technology dissemination.

The use of internet, mobile and video- conferencing assists the IT enabled farmers to utilize the facilities for their favors for which the most suitable permanent infrastructure is the basic requirement. Strong linkages need to be established between direct ICT interventions and it should be part of the national level program on agricultural development.

#### **f. Disruptive Extension approach:**

Recently, a new extension approach christened as 'disruptive extension' comes into limelight which is considered as an innovative extension approach that creates a new paradigm of extension that eventually disrupts an existing approach followed by extension professionals in the field of agriculture and allied sectors. It is an entrepreneurial oriented sustainable extension system that can able to transform every link in the food chain, from farm to fork. It is a cost-recovery extension approach the fulcrum of which lies between resource exploitation on one side and resource conservation on another side that influence the livelihood security and technology sustainability for small scale farm holders. It deals with the following principles:

- Importance of good governance in agriculture (and allied fields) that considers the resource rights of the farmers.
- Emphasis on growing interest among the stakeholders by explicit analysis of field level issues for technology adoption.
- Potential to resolve the social conflicts for equal access to community resources through Memorandum of Understanding (MOU).
- Based on cost recovery mechanism.
- Ensure commitment to optimum resource management and maximum economic benefit to improve food security.
- Provision of community based social insurance.
- Maintaining the sustenance of the technology supports through custom hiring approach.
- Focus on pluralistic convergence of different partners to build a network of linkage with various entities around the farm households.
- Encouraging the farmers-scientist interaction for technology development, assessment and application through Farmers' FIRST approach.

Global agriculture embraces diverse actors in its endeavor to feed about 10 billion people in the planet by the end of 2050. The small, marginal & landless farmers are extremely vital for food security due to shrinking of resource day by day. The contribution of women farmers also cannot be ignored particularly in on-farm operations, harvesting, post-harvest management, processing etc., especially in fishery and animal husbandry sector. Hence, in today's scenario innovation in agriculture extension is the key to address the growing challenges in sustainable agriculture, which need to be validated, integrated and scaled up and further recommended for large scale implementation by the policy makers. The innovative extension approach should be on capacity building, people's participation along with government initiative to provide strong infrastructure to be worked with the cutting-edge technologies. Much effort has been initiated in going beyond the farm and the farmer, and focus on beyond a technology to the wider innovation system. Finally, the concept of sustainability in fisheries articulates to Dr. APJ Kalam's concept of PURA to recommend a *rural entrepreneur-led hybrid model* of fisheries development to solicit sustainable cooperation among the suppliers (i.e., stakeholders to fishery resources), labour (including fishers) and capital (including professionals) that can bring the empowerment among the fisher community and put them at the centre stage of control alongside other stakeholders for fishpreneurship development.

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