

Agricultural Extension in Nagpur and Amravati Districts of Maharashtra State

Discussion Paper 13

MANAGE- Centre for Agricultural Extension Innovations,
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About the Publication

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Background of the study

Agricultural extension is believed to be an important pillar for the progress of rural community as well as a part of a strategy of agricultural development for improving the sustainability of farming systems, stimulating agricultural diversification, and to involve farmers into dynamic markets. All over the world agricultural extension service delivery has been concerned with communicating research findings and improved agricultural practices to farmers (Kabir and Roy, 2015). The importance of agricultural extension in transferring relevant knowledge and information to farmers as well as in translating policy directions into action is well known. India has a long tradition of agricultural extension. Agricultural extension in the post-Independence era was largely the function of State Departments of Agriculture. Some voluntary organisations were also involved in agricultural development activities in different parts of the country, but with limited outreach. The Indian Council of Agricultural Research (ICAR) began its participation in agricultural extension through National Demonstrations in 1964. As technology improves by the day, several approaches have evolved and been applied to ensure effective dissemination of extension service to improve the living standard of rural farmers. Also, farmers need an extension on a diverse range of rural development options including information on markets, rural industry and other income opportunities (Farrington et al., 2002). It is within this ambit that the role of rural farmers is considered vital pertaining to increase in productivity and living standard of the farmers. Extension service is particularly important to farmers in order to increase their agricultural production by transferring information aimed at increasing knowledge, attitude and skills of the farmers. In many developing countries, agricultural development is hinged on extension services by helping farmers to identify, analyse and link with research on their production problems. They also create awareness on opportunities for improvement of farm yields leading to increased income and a better standard of living (Van den ban and Hawkins, 1998; Balantyne and Bokre, 2003). Agricultural extension as a system aims to spread information and skills between farmers, extension workers and researchers to help recognize farming problems. This is achievable through an off-the-cuff, adult coaching communicating with individual members of the farming community; advice assistance concerning knowledge and methods of technical agriculture considering the economic and social circumstances of the individual and other people collectively. In a nutshell, extension is an educational process that uses varieties of methods designed to help farmers improve their living standard. Similar extension methods could be used for understanding the best ways to handle farmers so as to meet their need. Traditionally, extension was focused on training farmers, increasing production, and transferring technology. Today's understanding of extension goes beyond technology transfer to facilitation; beyond training to learning and helping farmers to help themselves; in other words, assisting farmers how to think not on what to think.

Objective of the study

The study was undertaken with the following objectives:

1. To identify the major extension organizations that provide different types of advisory services to farmers.
2. To examine the good extension practices in agriculture among the farmers.
3. To elicit the constraints regarding dissemination of extension.

Problems

The most significant issue with extension system is the lack of technical human resource. A large number of positions in public extension system in India are vacant, leaving the extension workers personnel to overwork, thus, decreasing their efficiency (Mukherjee and Maity, 2015). The need for agricultural information is the basic necessity for the farmers as it plays an important role in illuminating them, raising their level of knowledge and eventually support their decision-making process regarding farming activities and extension workers with their extension services are doing this work. In this rapidly changing world, food and agricultural innovation system are facing new and increasingly complex challenges which include fighting poverty, ensuring food security and improving the living standard of farmers. A new mechanism to foster development and dissemination of innovation is needed to strengthen the ways in which information, knowledge and technology are developed and distributed to make sure that the global changes benefit smallholder farmer.

Importance of the Study

An extension is basically how some new knowledge and innovative ideas are familiarised into rural areas in order to bring about change and progress in the lives of farmers and their families. Extension, therefore, is of critical importance. Without it, farmers would lack access to the support and facilities required to develop their agriculture and other productive activities. The importance of extension can be understood better if its three key components are considered: knowledge, communication, and farm family. In its role of providing knowledge related inputs for enhancing agricultural production, agricultural extension can be loosely defined as 'a service to "extend" research-based knowledge to the rural sector to improve the lives of farmers' (Kapoor, 2010).

The ultimate objective of both research and extension systems is to increase agricultural production. Their roles in generating and transferring technology are complementary. Research institutions need to have information on the problems, technology requirements, socio-economic and ecological environment of producers to formulate research agendas, and to set priorities. Formulating a research agenda based on producers' requirements results in technology that will be more acceptable to users; this also leads to research institutions allocating their resources more efficiently. As the study is mainly focused on extension practices, it helps in understanding good practices in agricultural extension which can help the farmers in attaining better ideas or improved ways of understanding to increase their agricultural production.

What is extension?

In general perception among the stakeholders in India indicates that the agricultural extension is the application of scientific research and knowledge to agricultural practices through farmer education. Generally, Agricultural Extension can be defined as “The delivery of information inputs to farmers.” The role of extension services is invaluable in teaching farmers how to improve their productivity. An extension is also critical to move research from the lab to the field and to ensure a return on investment in research by translating new knowledge into innovative practices. However, current global understanding on Agricultural extension changed considerably and hence, the Global forum for Rural Advisory Services (GFRAS) in 2015 defines Agricultural extension and advisory services (AEAS) as systems and mechanisms designed to build and strengthen the capacity of rural farmers and other stakeholders. This is accomplished by providing access to information and technologies but also by enhancing agricultural skills and practices, capacity to innovate, and address varied rural development challenges through training programs, improved management and organizational techniques. Linkages with Research and other actors (POs, NGOs, Public-private etc) (www.gfras.org).

Extension services are classified into 3 types:

- Technology transfer – the traditional model of the transfer of advice, knowledge and information in a linear manner;
- Advisory – the use by farmers of a cadre of experts as a source of advice in relation to specific problems faced by them;
- Facilitation – this model aims to help farmers to define their problems and develop their own solutions.



Good practice

A good practice is not only a practice that is good, but a practice that has been proven to work well and produce good results, and is therefore recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, which has been repeated and deserves to be shared so that a greater number of people can adopt it.

Criteria of Good Practices

The following set of criteria will help to determine whether a practice is a good practice":

- **Effective and successful:** A "good practice has proven its strategic relevance as the most effective way in achieving a specific objective: it has been successfully adopted and has had a positive impact on individuals and/or communities
- **Environmentally, economically and socially sustainable:** A good practice meets current needs, in particular the essential needs of the world's poorest without compromising the ability to address future needs.
- **Gender sensitive:** A description of the practice must show how actors, men and women involved in the process, were able to improve their livelihoods.
- **Technically feasible:** Technical feasibility is the basis of a good practice. It is easy to learn and to implement.
- **Inherently participatory approaches are essential** as they support a joint sense of ownership of decisions and actions
- **Replicable and adaptable:** A "good practice" should have the potential for replication and should therefore be adaptable to similar objectives in varying situations.
- **Reducing disaster/crisis risks, if applicable:** A "good practice contributes to disaster/crisis risks reduction for resilience.

Methods of Extension

The extension-teaching methods are the tools and techniques used to create situations in which communication can take place between the rural people and the extension personnel. They are the methods of extending new knowledge and skills to the rural people by drawing their attention towards them, arousing their interest and helping them to have a successful experience of the new practice. A proper understanding of these methods and their selection for a particular type of work are necessary. As extension staff need to work closely with farmers and other actors in the Agricultural Innovation Systems (AIS), there is a need for both functional and technical capacities (Davis, 2015). Extension methods can be divided into individual approaches (one-on-one advisory services either face-to-face, by telephone, or via the internet) and group approaches. Group approaches, which include demonstrations and mass media, are used by methods such as Farmer Field School (FFS). They are more cost-effective than individual approaches. However, many farmers do need individual advice.

- **Mass media**

Mass media approaches include leaflets, pamphlets, posters, radio, television, websites, and text or audio messages via mobile phones. Mass media can reach many people at little cost. However, it is difficult to communicate complex information via mass media; they work better with simple messages. Also, some people (especially women) do not have access to mass media, or cannot read or speak the language used.

- **Demonstrations**

Crops and practices can be demonstrated in a farmer's field, on a research station, or at an agricultural show or fair. While demonstrations can be convincing, there are drawbacks. One is that people must be present to see them; another is that people may feel unable to follow suit because they don't have the resources. One way to deal with this is to hold demonstrations by farmers on their own fields. This is especially useful when trying to reach women and other marginalised groups.

- **Training-and-visit system (T&V)**

Under the transfer-of-technology approach, the T&V system was introduced to transfer the latest technologies and practices from research to farmers. The T&V system was used to address a lack of professionalism and improve the accountability of extension agents. Advantages include regular farm visits, continuous training for agents, and a more professional approach to extension.

- **Farmer Field Schools (FFS)**

Farmer field schools use an adult education, participatory, group-based approach. They are used in over 90 countries on many different topics, from integrated pest management to business management. Farmer field schools are especially good for teaching complex practices that must be experienced to be understood, and experiential learning and discovery learning are critical elements of this method. The approach can also be used for empowerment, and for building social capital. Farmer field schools do require a different mind-set than most extension agents have – facilitation rather than lecturing. They have been shown to be effective in reaching out to women and those with less education.

- **Theatre**

Theatre is a useful tool to put across key messages in a powerful, memorable way. While it has been used for some time for HIV/AIDS messages, it is now being used for climate change and other complex topics. Theatre is effective because it is entertaining and has an impact, but it is time and resource-intensive. Special skills are needed to put together good scripts, and unless local capacity is developed and used, sustainability is non-existent.

- **Videos and ICTs**

Videos, especially digital ones, are a relatively new technology. Videos may help to meet the challenges of disseminating information to farmers and reaching the poor, marginalised, women, and youth. Different types of video include documentary (describing events), institutional (promoting a project or organisation), instructional (developed by researchers with limited input from farmers), farmer-learning (made with farmers), and participatory (made by farmers). Videos have many benefits like entertainment value, the power of 'seeing is believing', clips can be readily available, and they can be easily made in many local languages. In terms

of sustainability, video can be made locally, and one DVD can be shown multiple times to thousands of people. Digital Green has shown, using a controlled evaluation, that video-enabled behaviour-change methods can bring a 10-fold increase in cost-effectiveness relative to a conventional extension system.

- **Innovation platforms**

Finally, innovation platforms can be a useful tool, especially for problem solving with relevant actors in value chains or innovation systems. This tool can be very empowering for farmers. However, it takes a lot of time and effort to coordinate, and the high number of stakeholders makes management a bottleneck, and sustainability an issue. Capacities needed by extension include facilitation and coordination.

- **Demand-driven approaches**

In this type of approach, farmers are given space to identify their needs and their requirements of extension programmes. Thus, they need sufficient capacity and organisation to aggregate their demands, which means strengthening the capacities of farmer groups to articulate their needs and monitor service provision. Participatory extension approaches ensure that services are relevant and responsive to local conditions, and meet actual user needs. Service providers are accountable to users, and ideally users should have a choice of service providers.

- **Market-oriented services**

Market-oriented extension often provides services focused on linking farmers to markets to improve their income. This type of extension may also involve providing services to other stakeholders in the value chain. Currently, there is an increasing demand for such market-oriented services.

Table 1 : Instruments of Extension

No.	Instrument	Brief Description
1.	Seminar	A seminar is an event that takes place in a classroom setting. It can include lecture, discussions and practical exercises.
2.	Training	Trainings are single or a sequence of learning events through which farmers gain the practical know how and the theory required to introduce good practices and other changes on their farms.
3.	Individual consultations	Single or sequence of talks between an individual farm and an extension agents. On the side of the farm one representative or several (e.g. family members) may take part.
4.	Group Consultations	Single or sequence of talks between a formal or informal group of farmers and an extension agent on issues of common concern.
5.	Farmer learning circle	Farmer circles are groups of farmers with an range of common interests meeting on a regular basis to discuss specific issues with facilitation by an extension agent.
6.	Demonstration fields and orchards	Demonstration of new practices and their results in the field during one or several cropping seasons, or in orchards, mostly over several years.

7.	Field Days	A field day is an event to share interesting new developments with a larger audience, for example to share results of demonstration fields, or to demonstrate new equipment and machinery with a wider range of people. They focus on awareness raising and provision of information; normally they will not provide the same in-depth learning effects as a practical training.
8.	Field demonstrations	In field demonstrations techniques for doing something (e.g. pruning, orchard planting), new machinery and equipment and their use are demonstrated.
9.	Learning visits	Learning visits - also called study or exchange visits - are travels of groups of farmers to farms or other places of interest, where they can see and discuss how others deal with certain problems or opportunities.
10.	Farmer Field Schools	Farmer Field Schools are season-long practical training programs suitable for assisting farmers in adopting complex changes such as the introduction of Integrated Pest Management or switching to organic practices on their farms.
11.	Participatory innovation Development (PID)	PID are innovations developed in collaborative experimentation between farmers, extension workers, and possibly researchers. Such innovations may be any new ways of doing things - in production practices, marketing channels, organisation of processes, form of collaboration.
12.	Campaign	Campaigns use a range of coordinated means to reach large numbers of people to raise awareness and provide knowledge on widespread and serious problems (e.g. crop pests or animal diseases whose control requires measures by large number of farmers, behaviour changes and other measures to reduce zoonotic diseases).
13.	Model Farms	Like demonstration fields and orchards, a model farm can show how better farming looks. These may be farms that advanced with support by an extension organisation or through their own initiative and abilities.
14.	Practical on advanced farms	Young farmers in particular can learn about advanced farm management practices and introduce them on their home farm if they get the opportunity to work for some time as trainees on a farm that operates on a more advanced level.

(Source: Guide for GAEP, KATZ et. al. 2012)

Extension Models and Evolving Needs

The T&V (Training and Visit system) of extension, promoted by the World Bank from the 1970s, focused on the state's role in development. Top-down, T&V merged existing efforts into a single national service to promote high-yielding (Green Revolution) technologies. The system experienced success in India and some other countries for a period. Its "campaign approach" to raising food production worked best where farmers' needs and the promoted technologies matched up. Overall, however, T&V failed to live up to the promises and expectations that came with the approach. As a supply-driven system, T&V promoted approaches developed by research scientists with little input from farmers, the actual users of technology. By the 1990s, T&V's time had passed.

Since then, agricultural extension has become “pluralistic” (Birner and Anderson, 2007; Neuchâtel Group, 2000). New thinking includes decentralization, outsourcing, cost-recovery, and involvement of the private sector and non-governmental organizations (NGOs).

Different extension models exist around the world; Birner et al. (2006) argue that there is no single best method. The “right” approach depends on the policy environment, infrastructure, the capacity of potential service providers, the farming systems and potential for market access, and on communities’ engagement. To fit a particular situation, agricultural extension needs to be flexible and able to accommodate local needs (Raabe, 2008).

In India, these local needs are closely linked to the widespread changes in agriculture underway. Market liberalization and gains in wealth are rapidly transforming old staple-based subsistence systems into a high-value, information-intensive commercial enterprise (Adhiguru et al., 2009). Farmers now work with various information sources to tap markets and provide consumers with good-quality commodities. As Adhiguru et al. (2009) note, the information requirement in this situation is demand driven, as different from the more supply-led approach practiced during the Green Revolution. The challenge now is (i) to improve access to suitable and timely information and (ii) to reach all farmers. Public and private systems both play a role, as Figure 1 outlines. In fact, public and private information systems should operate in partnership. Where private extension by for-profit and non-profit organizations is increasing, the public sector should focus on lagging areas and farming types, attract the private sector there, and ensure quality control. “Cyber extension” and cell phone-based applications support the process.

Indian farmers access to the available sources of extension for their information needs. Information access increases with farm size. Progressive farmers, input dealers, and mass media are the most important sources of information and extension advice. Public extension workers, cooperatives, and output buyers/processors play a smaller role. Government demonstrations, village fairs, farmers’ study tours, and KVKs (Krishi Vigyan Kendra or Farm science centers) are of minor importance, particularly for smallholders. The private sector (progressive farmers and input dealers) is a more important source than the public sector, for all farmers. NGOs’ reach is modest and displays somewhat of a bias towards larger farmers.

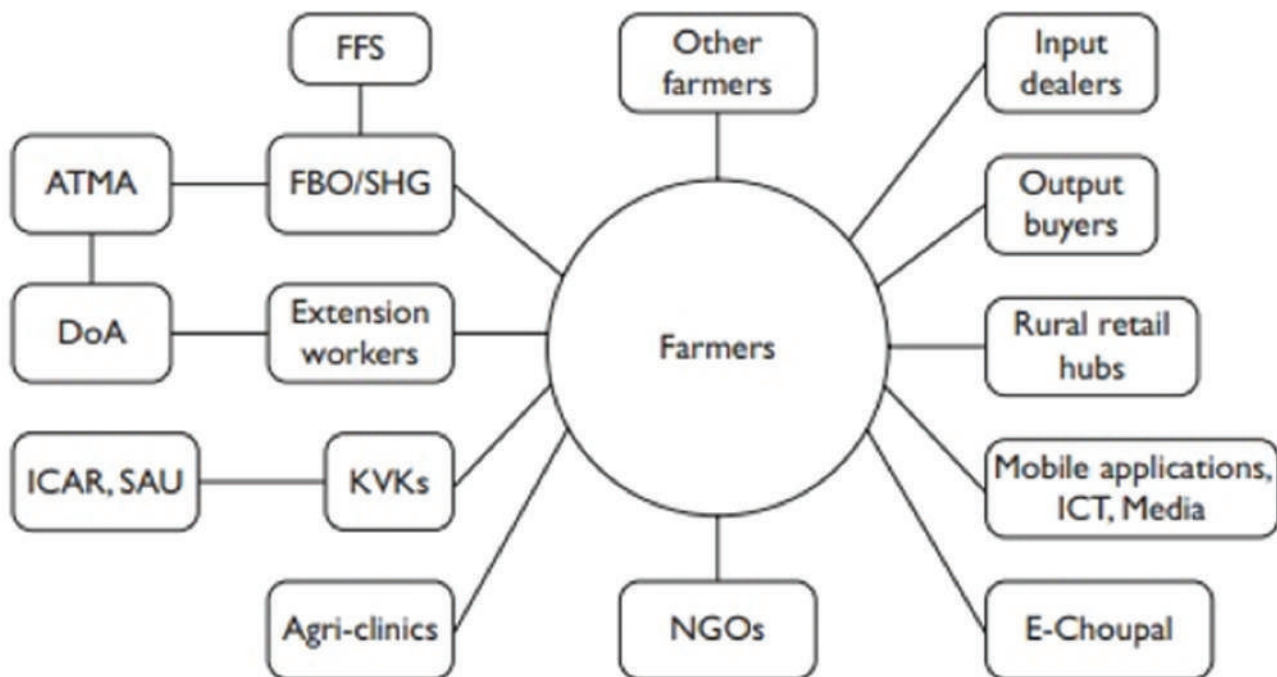


Fig 1: Information Exchange between Extension and Farmers in India

Source: Adapted from Glendenning et al. (2010)

The different sources' importance varies according to the information sought. For cultivation, farmers mainly want information on seed, fertilizer, crop protection, and harvesting/marketing. In animal husbandry, health and feeding top the list. Extension workers form a relatively important source of information on seed, as do progressive farmers, the media and input dealers. On fertilizer and animal feed, input dealers are consulted most frequently. Newspapers and radio are the important sources for obtaining information on crop protection. The main source of information on harvesting/marketing is newspapers, followed by progressive farmers. The data suggests some degree of pluralism in Indian extension. But worryingly, only about 40 percent of farmers have access to information on improved technology. Progressive farmers and input dealers stand out as sources, but the quality of their information may sometimes be doubtful. The public sector is present, but farmer access to its offer seems to be low. Due to the changing climate towards agriculture sector, extension needs to be strengthened and motivated so that it will help to develop the rural farmers towards sustainable agriculture.

Basic Features of the Extension Organizations

The number of extension organizations has been established in India; public extension system remains the largest in terms of the number of extension staff employed as well as its spread, being the national service provider. Some organizations have well-established structures that are evident throughout the country. It directly reaches farmers in their villages, unlike most NGOs, which go through the government staff to provide extension services. In addition, the public system has established coordination structures for extension provision. However, their effectiveness is not clearly known. NGOs are the largest group in the extension system. They vary widely in terms of geographical area of operation, from one or a few districts to regions and the nation. They also vary in terms of

their primary focus, but most of them concentrate on food security since they target smallholder farmers whose livelihoods depend on agriculture and whose incomes are below the poverty line. NGOs receive their mandate to operate in certain areas from the district assembly.

FPOs are a new group in the agricultural extension system. They appear to be small in number and size. However, their role in the system is critical if the demand-driven extension policy is to be operational and effective.

Private sector organizations are also new players in the system; most are interested in specific commodities and products. Their presence is a welcome development, as they can enhance marketing and value addition, which can have a positive impact on the farmers' livelihoods as some of them transition into small-scale commercialization. Multilateral organizations appear to be misplaced in the system. Actually, they are part of the government structure, funding projects and facilitating their implementation. The semi-autonomous organization is in fact a microfinance institution rather than an extension service provider; however, its role as a financier is critical in the agricultural innovation system.

Organizations involved in Good Practices

Farmers' Organization (FO)

As a part of the extension reforms, the National Agricultural Technology Project (NATP) project focused on group approach as a means to technological transfer in the villages to have better coverage. Farmers' groups are encouraged at village level and these groups in turn, evolve into Commodity Associations (CAs), Marketing Cooperatives and other types of FOs at the block and District level. Farmers belonging to farmers organizations are more aware of the constraints they face

MADAGASCAR – Best practices for improved soil

Farmer organisations are a key source of knowledge sharing and can play an important role in helping disseminate and scale-up the use of best practices. In Madagascar, la Coalition Paysanne de Madagascar (also known as FTM/ CPM) is one of many farmers' groups that encourage best practices such as crop rotation by training their members. They use crop rotation to improve soil nutrients, foster soil quality, minimise soil erosion, and increase water efficiency. Continuous replanting of one crop in a field depletes soil nutrients and the organic matter in the ground. National support programmes and international research and extension networks are critical to furthering these efforts. Co-operation with scientists and agricultural research centres, and conducting workshops with farmers to put practices into place locally, are both vital activities. In Madagascar, information campaigns on the radio and on key 'Action Days' have proven to be effective. They also hold forums to encourage farmers to share their experiences with each other. (http://www.farmingfirst.org/wordpress/wp-content/uploads/2012/06/Global-Forum-for-Rural-Advisory-Services_CaseStudies.pdf)

to improve their production than non-members. This may be due to the fact that most extension programmes were intended for farmers' organizations instead of individual farmers (OwonaNdongo et al., 2010). At the village level, Farmer Interest Groups (FIGs) and Women Interest Groups (WIGs) are effectively involved in the preparation of group action plans, which were later integrated into the block action plans.

Advisory and Consultative Team of Farmers

In some of the districts, few society-like institutions have come up at village and block levels after learning about the benefit of group approach. These societies have created their own infrastructure like small buildings, transportation facilities and guiding the farmers about the market demand and prices, and also collecting the produce from the farmers to sell them.

Innovations in extension through ATMA model

ATMAs began by working with the line departments and research centres within the district to carry out a PRA as part of developing a strategic research and extension plan for the district. An important part of the PRA is to identify success stories of entrepreneurial farmers who have supplied specific markets with higher-value products. These success stories are assessed in terms of their potential to involve significant numbers of small-scale farmers in these new enterprises (Singh, 2006).

Source: (Discussion Paper -International Conference on Innovative Approaches for Agricultural Knowledge Management: Global Experiences-2017)

Very poor tribal women produce tasar silkworms to increase household income, while conserving nearby forests, Dumka District | Jharkhand | India.

After discussions with tribal women in one village, they agreed to form a farmer interest group (FIG) to produce tasar (wild) silkworms. The Agricultural Technology Management Agency (ATMA) extension office arranged a training programme for the members and provided the FIG with 700 disease-free-laying. After the first crop, tribal women in surrounding villages began setting up their own FIGs, buying cocoons, and replicating this production model. Then, the ATMA trained the women on how to make silk threads from the wasted cocoons to generate more money. Next, the FIGs set up handlooms in their villages and began weaving the silk thread into fabric. Again, the ATMA arranged the necessary training. Each FIG member now earns about US\$25 per month from these silk production and value-added activities. (Dumka ATMA 2004).

Organizing Producer Groups

There is general consensus within the Government that small-scale and marginal farmers should be organized into community, farmer and/or producer groups (within and between local communities). The purpose of these groups is to help different groups of farmers to refocus on intensifying and

diversifying their respective farming systems by producing more high-value crops, livestock and fish products to increase farm income. In addition, if these groups can work together both for input supply and marketing purposes, they can also reduce the cost of these inputs, as well as to linking these producer groups to wholesale markets, so they will not be exploited by local “traders.” It should be noted that different approaches are being implemented across the different donor sponsored projects.

For example:

1. Common Interest Groups appear to be those farmers most closely connected with the extension staff at the Union and Upazila levels.
2. Integrated Pest Management (IPM) and Integrated Crop Management (ICM) Clubs (Generally 50% men and 50% women).
3. Village Groups being organized by KVK have monthly meetings to discuss and solve immediate technical, management, or marketing problems
4. Other donor projects seem to be focusing on organizing producer groups that are more specifically focused on particular crop, livestock, or fish systems (e.g. horticulture groups, prawn groups, etc).

There is broad agreement on the need to organize farmer or producer groups and that these groups are essential in successfully linking farmers to markets and in reducing the risk of poor farmers being exploited by local traders. Groups are being organized by different donors and NGOs, but most are using somewhat different methods of organizing these groups.

Role of Extension in Rural Development

Agricultural extension or agricultural advisory services play an important role in boosting agricultural productivity, escalating food security, improving rural livelihoods, and promoting agriculture as a heart

Engaging unemployed rural youth in poultry production Khurda District, Orissa, India

The chairman of the farmer advisory committee in one block of Khurda District was concerned about finding jobs for unemployed youth. The local block extension team organized a group of ten young men into a producer group. Initially, this group had tried producing vegetables on rented land, but the attempt was not successful. The group next decided to try producing broilers. The group leader was trained in all aspects of production, health care and marketing of broilers, and the group began by producing for festive occasions in the district. ATMA provided initial support of 200 chicks, and the group invested about US\$150 to build a poultry shed. By phasing the production and marketing of 300 birds every two weeks, the group was able to generate a profit of over US\$700 during the first year. Within two years, there were 58 similar poultry units in operation within the district. The hallmark of success is attributed to the strong commitment of the FAC members in identifying groups, building confidence and infusing a sense of pride within the community.

of pro-poor economic growth. Extension provides a significant support for rural producers and farmers for facing and dealing with the new challenges in agriculture for transformation in the global food and agricultural system, including the increasing importance of standards, labels, and food safety, growth in non-farm rural employment and agribusiness, constraints imposed by health challenges that influence rural livelihoods; and the deterioration of the natural resources and climate change.

Area focused by Extension

Extension can mainly contribute with two components namely Agrarian Transformation and Land improvement in terms of crop and livestock production. Extensionists can make some of major contribution in rural development provided as they are guided by particular policy. The study has found some important areas in which extension can play a role.

Food security

Food security is often defined in terms of food availability, food access and food utilization (USAID 1995) as cited by Rivera and Qamar (2003). Food availability is achieved when adequate quantities of food are constantly available to all individuals within a country. Such food can be supplied throughout domestic production, other household outputs, commercial imports or food assistance. Successful food security and poverty-leaning programmes not only help poor rural populations to produce more and diversified products, but also to generate a surplus that can be marketed and thereby make income for the purpose of improving quality of life through balanced diet and nutrition.

Conservation of Natural resource

Farmers and communities have modest support to conserve resources unless they are made mandatory by legislation. The beginning of land reform and soil nutrient management programme is the best example. A true extensionist does not use force but recognized strategies of persuasion to assist farmers and communities to conserve natural resources.

Dissemination of valuable Information

Extensionists usually influence farmers to adopt new practices mostly because they have access to research and its results. They have already received appropriate training that can be executed to help the farming communities. Extensionists should access diverse information needed by farmers in terms of production, good cultural practices, markets and marketing.

Empowerment of the farming groups

The professed objectives of rural development are as follows: a) development in local domestic output-income generation, (b) employment making, and (c) improvement in income distribution within a limited geographical region.

Extension support required by farmers

Agricultural Extension has to meet fluctuating demands of a dynamic agriculture system. As the majority of farmers have effectively shifted from subsistence to commercial agriculture, they now produce great marketable surplus. Thus, farmers progressively seek market related information such as market preference for crop and variety, market demand and prices on real time basis, details of buyers, availability of logistics (aggregation, transport, storage facility, etc.). These constitute business enabling information, which has not been traditionally addressed by public extension. The size of the land holdings is gradually reducing which can make production commercially unviable. The situation demands alternate ways to bring its scale of operation on contract farming and/or establishment of farmer producer organisations, either as companies/cooperatives. Whereas, small land holdings are agreeable to operate in a well-organized manner, the movement of produce to markets requires aggregation for logistical efficiency, besides cost effective purchase of inputs. Farmers, therefore, need details on agribusiness companies providing particular services and interested in contract farming, ways and means of establishment of farmer producer organisations and their linkage with the extension, credit institutions, common infrastructure, processing opportunities etc. This demands new set of information, knowledge and ability on the part of farmers, as also reoriented method to extension on the part of the extension system.

Table 2 : Characteristics of extension Indicators

Resource base	Water supply; soil quality and diversity: land size
Risk	Distribution: land unmanaged: population density
Resource base	Land tenure and size; financial capital; material equipment and machinery; animals: GDP per capita
Risk	Variability in production; variability in input and output prices
Financial resources	Access to formal and informal credit
Diversity	Diversity of the agricultural system (seeds available and used and number of crops planted): diversity income sources agriculture, livestock, off-farm and non-farm
Variability in the rural economy	Migration: land sales, land rental
Agricultural innovation and information dissemination	Public expenditure in agricultural research and extension/ population technological gap for agricultural production
Resource base	Population in the workforce: education: age: gender
Support programs	Technology transfer; technical assistance
Social programs	Emergency welfare programs: social services

REVIEW OF LITERATURE

Agricultural extension approaches in India

Public Extension in India

India's public extension began long before the Green Revolution, evolving with national priorities (Singh and Swanson, 2006). The food crises from the late 1950s prompted a focus on intensification. The Green Revolution in the late 1960s and T&V from the mid-1970s brought food self-sufficiency in the 1980s and beyond. Feder and Slade (1986) found that T&V greatly increased contacts between farmers and extension workers. In wheat and rice, they calculated, it raised yields by about 7 percent over three years.

T & V temporarily revitalized research and extension in the face of significant challenges just what is needed again today. Doubts, however, arose as implied above. T&V was less successful with poorer farmers. Malnutrition and poverty actually grew, prompting a search for new solutions in the 1990s. Sulaiman (2003) describes the innovations subsequently introduced. Five-Year Plan documents explored many aspects of extension (Academic Foundation, 2004). The early twenty-first century produced ATMA, the Agricultural Technology Management Agency. This emerged from the National Agricultural Technology Project (NATP, 1998–2005).

The new thrust emphasizes local solutions, diversification, market orientation, and farm income and employment growth. The one similarity with T&V is that ATMA is intended as an organizing and unifying framework, with incentives for institutional reform and improved performance (Singh and Swanson, 2006). ATMA is an autonomous organization with a wide range of powers. A Governing Board determines priorities and assesses impact. ATMA jurisdiction heads (Project Directors) report to the Board. These Project Directors chair Management Committees, which include the heads of all line departments and district research organizations.

The NATP piloted ATMA in 28 districts across seven states. By 2006, ATMA had extended to some 60 districts and was intended to function nationwide within five years (Singh & Swanson, 2006). However, bottlenecks began to emerge. Kapoor (2010) notes a lack of qualified local manpower, delivery mechanisms, technical and financial support, and a clear framework for partnerships. He also points to weak links between ATMA, ICAR, SAUs, and KVKs. In 2010, the government issued new guidelines on ATMA. These aim to strengthen specialist and "functionary" support at different levels; making sure that the "farmer friend" model (linking farmers and extension agents) works in practice, in particular by filling block-village gaps.

The new guidelines support convergence in four areas: extension under different programmes, public agricultural research and extension, between development departments, and with the non-governmental sector. The latter includes public-private partnerships. At least 10 percent of district allocation is meant to run outside the government sector, as well as, NGOs and farmer organizations;

this, for example, includes input suppliers (Government of India, 2010). The guidelines also attempt to increase responsiveness to farmers' needs. The quality of implementation varies by state, and will remain the central issue. Challenges include the sheer scale and complexity, instilling a culture of accountability to farmers in a multi-tier organization, alignment between knowledge generation and extension, and the dependence of extension's impact on the broader policy environment.

Private and voluntary sector initiatives

Many of these extension initiatives in India emerged without any active state support. Quite often they emerged in response to deficiency in public extension service provision.

These include the following:

- Input agencies (dealing with seeds, fertilisers, pesticides, equipments),
- Large agri-business firms (involved in manufacture and sale of inputs and purchase of farm produce).
- Farmer organisations and producer co-operatives,
- Non-Governmental Organisations (NGOs),
- Media (print, radio and television) and web based knowledge providers ,
- Financial agencies involved in rural credit delivery and consultancy services.

Pluralistic Agricultural Extension and Advisory System

Most rural communities have a broad combination of rural and farm families who are directly or indirectly involved in agricultural activities. During the second half of the 20th century, when the focus was on achieving national food security, most public agricultural extension systems disseminated or transferred a common package of production technology messages to all farmers who were growing specific food staple crops, such as high-yielding rice or wheat varieties, along with the concomitant production technologies.

During this period, everyone was aware that farm households had varying land, labour and other resources. But the focus of agricultural research and extension systems was primarily on increasing agricultural productivity to achieve national food security. However, the world food system is becoming increasingly integrated, and world food prices now reflect the changing supply and demand for all types of food and extension through Farmers' Organizations and Agripreneurs' agricultural products. Therefore, the price of different food products can change rapidly due to new factors, such as biofuel and climate change.

As a result, the focus of extension and advisory systems is now shifting towards improving rural livelihoods and achieving food security at the household level by strengthening farmers' ability to adapt more rapidly to changes in markets; therefore, it is now necessary to differentiate among these major clientele groups that can be served by a more pluralistic extension system. Because the technical, managerial and socio-economic skills and information needs of farm households differ

from country to country and from culture to culture, the following section will briefly describe the major characteristics of these different target groups:

1. Rural and Farm Women
2. Small and Marginal Subsistence Farmers
3. Medium-Scale Farmers
4. Commercial Farmers
5. Rural Youth

Role of social media in Agricultural Extension and Advisory System

In a quickly changing world, farmers require a package of innovations and facilities, in addition to continuous access to information and knowledge. Having all this under one roof and in a rural setting can greatly accelerate adoption of innovations and increase benefits to farmers. As the social media use for agriculture sector and extension has gained momentum in recent times, only popular platforms like Facebook, Twitter and YouTube are used for agriculture and extension related works. (Saravanan and Suchiradipta, 2017)

Extension Networks of Good Practices:

KVKs and State Agricultural Universities

Extension is executed at the state level, and it takes place through the state Department of Agriculture. Extension is structured differently in each state, with varied diversity in the number of staff and programme attention. But it is beyond the scope of this review to examine the precise operational characteristics of extension in each state, so only a broad overview is presented. The extension personnel of the Department of Agriculture operate at the district and block levels, which are administrative subdivisions. A block is a subdivision of a district. Senior and mid-level extension personnel are trained at the National Institute of Agricultural Extension Management (MANAGE), with four Extension Education Institutes (EIs) providing regional-level training to mid-level

Information flow in the extension activities of the state Departments of Agriculture

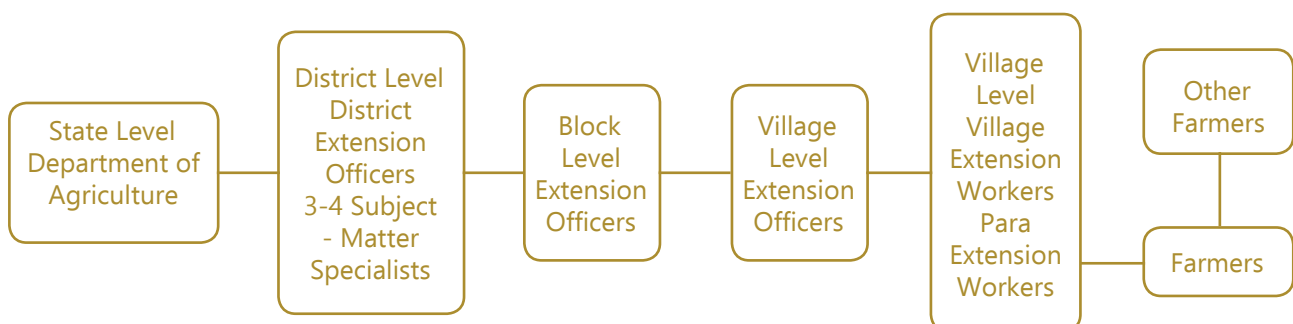


Fig 2: Flow of extension activities of SAU

(Source: IFPRI, December 2010)

functionaries working in the line departments (India, Department of Agriculture and Cooperation 2007b). Information is transmitted from the district and block extension staff to the village levels through contact farmers or para-extension workers.

The first KVK, on a pilot basis, was established in 1974 at Puducherry (Pondicherry) under the administrative control of the Tamil Nadu Agricultural University, Coimbatore. At present, there are 713 KVKs, out of which 498 are under State Agricultural Universities (SAU) and Central Agricultural University (CAU), 63 under ICAR Institutes, 101 under NGOs, 38 under State Governments, and the remaining under other educational institutions. They test and transfer technology to farmers.

The State Agricultural Universities are much larger, but still small compared with the farm population. In India, the first SAU was established in 1960 at Pantnagar in Uttar Pradesh. The SAUs were given autonomous status and directly funded by the state governments. They were autonomous organizations with state-wide responsibility for agricultural research, education and training or extension education. The establishment of the SAUs, based on a pattern similar to that of the land-grant universities in the United States, was a landmark in reorganizing and strengthening the agricultural education system in India. These universities became the branches of research under the ICAR and partners of the National Agricultural Research System (NARS).

The green revolution, with its impressive social and economic impact, witnessed significant contributions from the SAUs, both in terms of trained, scientific work force and the generation of new technologies. However, most of the agricultural universities in India continue to be dominated by top-down, monolithic structures that follow a limited extension mandate. None of the post-Training-and-Visit (T&V) system extension reforms could revitalize it to meet the demands of a changing agricultural context. SAU extension operates through state-level entities, but sometimes reaches out to farmers directly. KVKs and SAUs are important but under-resourced. Both tend to focus on primary production rather than post-harvest and marketing aspects.

Extension by Input and Technology Providers

Farmers frequently receive advice from input and technology providers. Agro dealers and input suppliers have a vested interest in providing advice. They essentially sell effects such as weed control that result from applying both a product and knowledge about its best use. The quality and relevance of their advisory services are major determinants of brand reputation and market share. The industry's issue is cost: how can it most efficiently inform a large number of farmers who each only buy small amounts? The challenge for regulators and the public, on the other hand, is reliability—both of the information and of the products. In the agrochemical market, for example, useless or even dangerous counterfeits abound.

There are an estimated 2, 82,000 input dealers in India. They are pillars of their communities, and have every interest to offer quality services; however, this requires training. MANAGE, the National Institute of Agricultural Extension Management, offers a Diploma in Agricultural Extension Services for Input

Dealers (DAESI). So far, however, only a minute fraction of all input dealers have signed up. DAESI covers agronomy, extension and communication methods, individual and business development, and legislation.

A number of other training sources also exist for input dealers. The Mahindra Krishi Vihar (MKV) "one-stop farm solution centre" by the Mahindra & Mahindra Ltd. tractor and utility vehicle company is one example. Started in 2000, Mahindra ShubhLabh Services aims to "tackle deficiencies in the farm sector, including low consumption of quality inputs, lack of mechanization, scarcity of farm finances and low awareness of scientific farm practices." MKV centres operate on a franchise basis. They provide farmers with quality inputs, rental equipment, credit (in partnership with banks), farm advice by trained field visitors, and crop contracts with processors.

A study of MKV results based on primary field data suggests that: (i) farmers are willing to pay for integrated services; (ii) a private extension provider can help substantially increase yields and farm income; (iii) the increases stem from field-specific advice on input application; (iv) MKV has developed a sustainable and profitable extension business; (v) MKV's flexible "learning by doing" approach contributes to success; and (vi) this type of approach focuses on medium and larger scale farmers.

Hariyali Kisaan Bazaar (HKB), run by the DCM Shriram fertilizer, seed and sugar conglomerate, provides "end-to-end agri-solutions." The offer is built around agri-inputs, extension, credit, and produce marketing. HKB operates over 300 rural stores across eight states; each serves at least 15,000 farmers. HKB have evolved into a "super bazaar" which as along with inputs provides fuel, credit, insurance, and mobile phones. Other examples of extension by input suppliers include:

- Tata Kisan Sansar (TKS) by Tata Chemicals Ltd. These "one-stop farmer solution shops" provide operational and advisory support, mainly in Uttar Pradesh, Haryana, and Punjab. Services include soil testing, remote diagnostics and house brands for seeds, cattle feed, pesticides and sprayers. Some 681 TKS serve 2.7 million farmers in about 22,000 villages.
- Godrej Agrovet is a chain of rural outlets, each serving some 20,000 farmers. GA offers agricultural equipment, consumer goods, technical services, soil and water testing, veterinary, financial and post office services, and pharmaceuticals. Started in 2003 near Pune, it now has over 60 centers across the country. The company aims to open at least 1,000 stores.
- Jain Irrigation provides education on micro-irrigation at its High-Tech Agriculture Training Institute. Farmers, students, government officers, and NGO staff learn about water resources, watershed and irrigation management, fertigation, and modern cultivation. Jain Irrigation agronomy and engineering experts also mentor client farmers.

These approaches impact on smallholders is yet to be evaluated, but they may provide better-quality inputs and technical services than local suppliers upon which most farmers currently rely.

The Private Sector: Commercial Providers

How good is the information that agro dealers and input suppliers provide? Critics accuse suppliers of promoting their own brands, and agro dealers of pushing sales regardless of farmers' real interests and needs. The criticism still awaits neutral and robust study.

The study would also test the opposite hypothesis: that solutions from private players naturally respond to farmers' needs. Input dealers' reputation and business depend on providing good services and advice. Seed and technology sales forces know that honest advice on products creates a competitive edge. Buyers of produce advise farmers as part of their procurement drive. Commercial extension is also likely to be best at delivering private sector R&D results that truly meet farmers' needs. Partnership with non-profits can help reach smaller and poorer farmers.

Agricultural extension by commercial companies is advancing rapidly in India. Those involved include seed and input companies, distributors and dealers, service providers, food processors and retailers, and mobile operators and their business partners. Contract farming is an increasingly important vehicle for "embedded services," information tied to input sales or marketed produce (Feder et al., 2011). Input suppliers and produce aggregators provide information services to foster products' safe and effective use, expand market share, and ensure the necessary supply of commodities. Companies may work independently or in partnership with other organizations across all sectors.

A variety of models currently exist for delivering and financing extension by private providers. Commercial providers may offer information services as part of contract farming or "outgrower" schemes. They may send their own agronomists into farmers' fields or engage third parties. Possible partners include NGOs, consultants, research institutes or universities, and public providers. The sources of funding include direct farmer fees as well as public or donor payments. A further model links commodity-specific extension to production contracts: farmers' produce prices reflect the extension costs.

Extension by NGOs

NGOs provide very important support to Indian small holders. Like government organizations, however, they cannot cover all those seeking advice. NGOs range considerably in size. Their professionalism and knowledge of agriculture vary, but their social commitment is typically high. Many dedicate themselves to forming self-help groups or farmer-based organizations as focal points for demand driven agricultural extension. Outside sponsors or donors often help. Community organization and social programs had already progressed well when they teamed up to address agriculture.

AGROVISION – Jingle based advisory creating awareness among the farmers

AGROVISION Foundation, is an NGO working in Nagpur (Vidharbha) in conjunction with the government's Agriculture Departments and other stakeholders. Its aim is to teach and train the farmers about the new technologies, innovative methods to increase the farm yield. The NGO, established in 2015, has an outreach of about 3 to 4 lakh farmers and is working in different villages of Vidharbha, Maharashtra state. They organize events for the farmers including exhibitions, workshops, conferences, trainings, etc. As the majority of the traditional farmers are illiterate and lack knowledge of modern farming, every year agrovision organizes farmers' exhibitions which cover AgriTechs like Farm mechanization, Agri inputs, Agrochemicals, irrigation and water management, Agri infrastructure, and Marketing and Trade promotion. However, they developed a jingle based advisory system for creating awareness about different agriculture consequences. They have experienced, as most of the farmers don't want to spend their time in reading after returning from the farm every day. So, they have started making jingles (songs) for delivering important agriculture news to the farmers.



A study in Maharashtra by Bachhav (2012) concluded that the majority of farmers seek information on availability of seeds (74 per cent), crop production (71 per cent), fertilizer (65 per cent) and insecticide availability (62 per cent). Other areas mentioned by farmers were water management (34 per cent), weather information (23 per cent), and agricultural equipment (18 per cent). Similar findings were observed by Meitei and Devi (2009), who concluded from a study in Manipur State that most farmers seek information on crop production and availability of seeds and fertilizers. Babu et al. (2012) observed that the most important information needs for rice farmers in Tamil Nadu related to disease and pest management, and pesticide and fertilizer application. The most important information need of tribal farmers, as identified by Saravanan (2007) include disease and pest management, followed by information related to suitable crop varieties, packages of practices, farmers' training programmes, irrigation, and farm credit.

A study by Reardon et al. (2011) in Uttar Pradesh showed that public sector extension sources (State extension staff, KVKs, All-India Radio, university extension, and plant protection units) were collectively a source of information for only 25 per cent of farmers. In Madhya Pradesh, 37 per cent of the farmers had contacted State extension staff (Reardon et al. 2011) for services. Other major sources of extension services for farmers in Madhya Pradesh were All-India Radio and television (21 per cent), and KVKs (12 per cent). Private sector sources accounted for 25 per cent of all information sources.

Glendenning *et al.* (2010) concluded from a review of agricultural extension in India that despite the variety of agricultural extension approaches that operate in parallel and sometimes duplicate one another, the majority of farmers in India do not have access to any source of information; this lack of access severely limited their ability to increase productivity and income, and reduce vulnerability.

Use of ICTs to reach rural women: MSSRF's initiatives in Puducherry, India

The M.S. Swaminathan Research Foundation (MSSRF) is an NGO established in 1989 with an aim of technology development and dissemination. It focuses on pro-nature, pro-poor, pro-women and pro-sustainable livelihoods. They operate on six themes: Coastal Systems Research, Bio-diversity, Biotechnology, Eco-technology, Food security and Information, Education, and Communication. MSSRF has been using a combination of various ICT tools to reach rural farmers/women. These include text and voice messages to mobiles, mobile phone-based interactive sessions, village knowledge centres (information kiosks) managed by women knowledge workers, community radio, and newsletters.

(<https://www.mssrf.org/mssrfoldsite/sites/default/files/VKC-Report.pdf>)

Extension by Aggregators and Processors

Extension by aggregators and processors of produce mainly operates via contract farming, the role of which is growing in Indian agriculture. Gulati *et al.* (2008) make the point that while "front-end" activities such as wholesaling, processing, logistics, and retailing are rapidly expanding and consolidating, "back-end" activities of primary production have been fragmenting. Contract farming, the authors believe, can link both ends and create business opportunities for all concerned.

The literature on contract farming is not universally positive. However, an IFPRI study of Andhra Pradesh poultry farming states that "contract production is more efficient than non-contract." Although the processor benefits most from the efficiency surplus, farmers "gain appreciably" through lower risk and (expected) higher returns. Improved technology and production practices help make these outcomes possible (Ramaswami *et al.*, 2006). For Gahukar (2007), the advantages of contract organic farming include organized sales and the training on production protocols they need to follow. A Punjab study also finds merit in contract farming, and stresses the need for extension related to both production and marketing of crops (Singh, 2005).

Examples of contract farming and "value chain integration" include:

- Contract wheat farming practiced in Madhya Pradesh by Hindustan Lever Ltd. (HLL), Rallis and ICICI (MANAGE, 2003). Rallis supplies agri-inputs and know-how, ICICI provides credit, and the processors HLL offer a buyback arrangement. Farmers have an assured market and floor price, quality inputs, and free technical advice. HLL's supply chain is more efficient, and Rallis and ICICI have an assured clientele.

- Adani Agrifresh apple production for New Delhi in Himachal Pradesh. The extension focuses on post-harvest practices, because apples must be in the cold chain within 24 hours. AA announces assured prices weekly, above the market (FICCI, 2010).

Extension Advisory Services provide by Various Organizations

1. Farm Advisory Service

- Diagnostic Team Visits
- Field Demonstrations
- On-Farm Trials
- Organization of Kisan Melas, Kisan Divas, Field Days
- Field Visits
- Village Adoption
- Veterinary Clinical Camps
- Farm & Home Visits
- Celebration of Important Days
- Education and Trainings
- On-campus trainings

2. Training programmes of short duration (one day to one month) are organized on various aspects of agriculture and allied fields viz.:

1. Watershed management
2. Improved agricultural technology
3. Vegetable growing
4. Bee-keeping
5. Mushroom cultivation
6. Vermicomposting
7. Dairy management
8. Fish farming
9. Fodder and pasture management
10. Integrated pest management
11. Home Science

These trainings are organized for the benefit of farmers, women-groups, Mahila Mandals, unemployed youths, Self Help Groups, Entrepreneurs, Officers of different government departments as well as to NGOs.

- **Off-campus trainings:** One day off-campus training programmes are also organized under different projects in the project areas.
- **Organization of Workshops and Seminars:** To provide a common platform for interaction

among university scientists, officers of the agriculture departments, other extension workers and progressive farmers Rabi Workshop and Kharif Workshop are organized every year before the commencement of Rabi and Kharif seasons, respectively.

- In these workshops, new recommendations of the University for improving agricultural production as well as emerging problems and issues are discussed and packages of practices for cereal crops are finalized.

3. Farm Information and Communication

- Publications
- Museum
- Use of Electronic media :
- Radio Talks
- Radio Pathshala on different aspects
- Bee keeping
- Pulse cultivation
- Agricultural Engineering
- Live Phone-In programme from Doordarshan

4. Use of Print Media:

- Fortnightly information on important activities in agriculture and animal husbandry published in local newspapers in Hindi and English.

Methodology

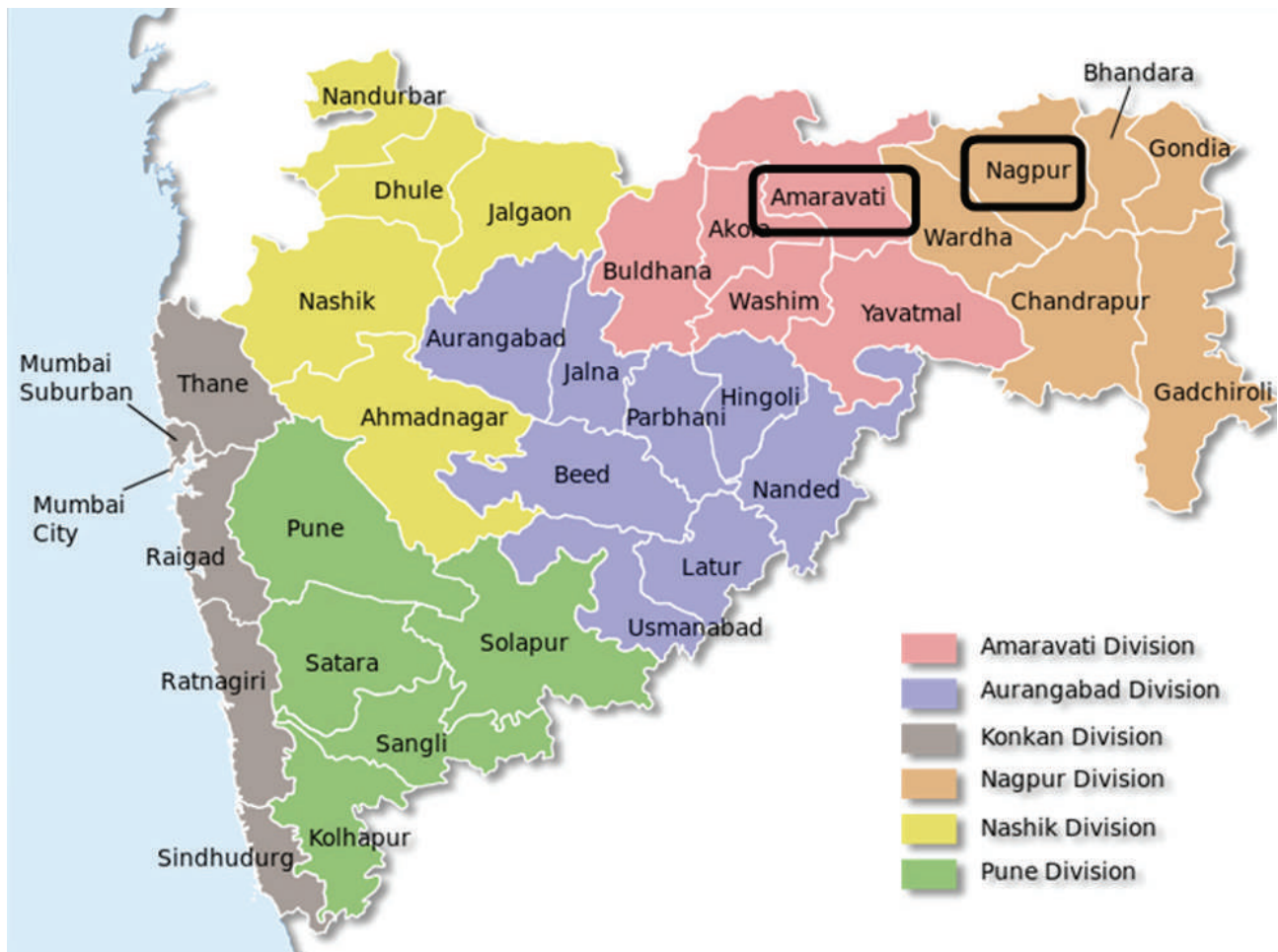


Fig 3: Selected districts of Maharashtra state

Description of the Study Area

Profile of the State – Maharashtra

Geography

Maharashtra is the third largest in area and second most populous state of India. It has an area of 307,713 sq. km. with 35 districts, 358 blocks and 43711 villages and a population of 112,372,972. The 45% population of the state is urban. All the districts of Maharashtra are grouped into six divisions: Aurangabad Division, Amravati Division, Konkan Division, Nagpur Division, Nashik Division, and Pune Division. Maharashtra occupies the western & central part of the India and has about 720 km long coastline along the Arabian Sea and is also fortified naturally by Sahyadri and Satpuda mountain ranges. The State is surrounded by Gujarat to the North West, Madhya Pradesh to the north, Chhattisgarh to the east, Telangana to the south east, Karnataka to the south and Goa to

the south west. For administrative convenience, the State has been divided into 36 districts and six revenue divisions (viz. Konkan, Pune, Nashik, Aurangabad, Amravati and Nagpur). With a population of 11.24 crore, as per Population Census 2011 and with geographical area of about 3.08 lakh sq. km, the State ranks 2nd by population and 3rd in terms of geographical area. The State is highly urbanised with 45.2 per cent of the population resides in towns.

The state enjoys tropical monsoon climate. The hot scorching summer from March onwards is followed by monsoon in early June. Maharashtra has also got blessings of nature as seen in its dense and rich forests and it boasts of six Prime Tiger reserves and six National Parks. Maharashtra is an agricultural state. Almost 82% of the rural population depends on agriculture for livelihood. Both food crops and cash crops are grown in the state.

Selection of District

Of the 36 districts in Maharashtra, Nagpur and Amravati were selected on the basis of the number of successful agripreneurs and public, private and civil society organizations (CSOs), including non-governmental organizations (NGOs), and farmer-based organizations (FBOs) are maximum in this area. Some major agripreneurs and Master or Leader Farmers, FOs of the two districts were selected and visited for the examination of good practices in agricultural extension for the farmers. Qualitative and quantitative data were collected from an interview schedule.

Selection of respondents

For the current study, all the services provided in the field of Agriculture by the public sector, private sector, NGOs, Public-Private sectors formed the respondents. Thirty (30) farmers from each district.-15 beneficiaries as well as 15 non-beneficiaries - were selected using Snow Ball sampling for the study.



Variables

Impact of good extension practices

Impact Evaluation: Impact evaluation seeks to measure lasting impacts of programmes or projects on important indicators such as crop yields, farm profitability, family income, or livelihood improvement. Such assessments may also focus on broad and long-term programme effects, such as changes in ecology, social, economic, or community conditions.

Impact evaluation attempts to assess the changes that can be attributed to a particular intervention, such as a project, programme or policy. These changes can be those intended or expected and also the unintended ones. In contrast to outcome monitoring, which examines whether targets have been achieved, impact evaluation is structured to answer the bigger question: has there been any change in the situation which the intervention was planned to correct, and how has the intervention impacted the lives of the intended beneficiaries? This involves counterfactual analysis, that is, a comparison between what actually happened and what would have happened in the absence of the intervention. The key challenge in impact evaluation is that the counterfactual cannot be directly observed and must be approximated with reference to a comparison group. Impact evaluations seek to answer cause-and-effect questions.

In other words, they look for the changes in outcome(s) that are directly attributable to a program. Such analysis helps in evidence-based policy decisions and understanding what works, what doesn't, where, why and at how much cost? The impact evaluations go for in-depth analysis of the process of impacting as well. This has received increasing attention as aids to policy making in recent years in both developed and developing country contexts. It is an important component of the armory of evaluation tools and approaches and integral to global efforts to improve the effectiveness of aid delivery and public spending more generally in improving living standards.

Study applies 'Bennett's hierarchy' (Bennett, 1976;), which describes evidence of extension activity impacts, to the data collected through individual surveys of the participants, beginning at the bottom step with inputs, and progressing to the top – end results. While this model is useful for assessing inputs, activities, outputs, reactions, knowledge, opinions, skills and attitude changes (levels 1–5), it is not rigorous enough to assess practice change and end results at levels 6–7 (Morfordet al, 2006). Second, in order to address the above deficiency, the study employs a different case study of stakeholders.

Impact Indicators:

1. Knowledge
2. Attitude
3. Skills
4. Adoption

5. Reactions
6. Practice Change
7. Perception
8. Participation.

Research Design

Descriptive research is used to describe characteristics of a population or phenomenon being studied. It addresses the questions 'what' and 'how' (what are the characteristics of extension practices?) but cannot describe why a situation is caused. Descriptive research generally precedes explanatory research i.e. findings of a descriptive research leads to explanation of many situations and predictions, and before writing descriptive research survey, an investigation is conducted. In this study, detailed investigation of different extension practices of selected enterprises is done and then findings are described. Therefore, descriptive research design befits this study.



Data Collection



The study included both primary and secondary data.

Primary data collection

A structured questionnaire and an interview schedule was used as instrument to collect primary data from extension agents and smallholder farmers, respectively. Another method used for primary data collection was key informant interviews, using an interview checklist. A questionnaire and checklist were prepared in such a way as to capture important primary information for the study. The question wording was made as simple as possible and sensitive questions were simplified. The questionnaire was designed in English, but questions were translated in Local Language for easy understanding. This was followed by a face-to-face interview with a representative of each organization, using an interview guide that collected qualitative data focusing on the status quo of the organization in terms of its primary goals, functions, and extension approach. Linkages between research and extension systems, coordination of agricultural service delivery, extension dissemination methods, and key institutional constraints experienced were also featured. The interviews of all the respondents were done in order to avoid language constraints and misinterpretation. Interview with each respondent took approximately 25 to 30 minutes, and in order to ensure clarity on some issues some key informants were visited more than once.

In-depth information and underlying reasons like, what are some good practices used as extension methods were documented and prepared as models. Also, random interviews and group discussions of many farmers, Agripreneurs, FOs were taken. All the practices were documented in order to make

the study more effective and comprehensive. Likewise, successful case studies were recorded and analysed noting the good practices.



Secondary data collection

Secondary data such as extension staff' records, monthly work reports, production statistics of major crops of previous two years, learning materials, annual work plan, demonstration plot records, supervision reports, agents and farmers training schedules, were collected from libraries, extension staff offices, District offices and the internet. Document review was also made.

Agriculture & allied activities:

In Maharashtra, in agriculture net sown area is 17,345000 ha. Gross cropped area is 23,474000 ha. Also, area under principal crops are like Rice 1,530 000 ha, Wheat 1083000 ha., Jowar 3,186000 ha, Bajra 834000 ha, all cereals 7,909000 ha., All food grains (cereals and pulses) 11,680000 ha., harvested area of sugarcane is 883000 ha., cotton 4,066000 ha., 330000 ha. Livestock census of Maharashtra is total livestock (2012) 32,489000, total forest area (2017) is 61,724 sq. km. Per capita State Income of Maharashtra is Rs. 1,91,827, Gross product growth rate 7.5 per cent. (Advance estimates as per Directorate of Economics and Statistics, GoM 2018-19)

The state received only 73.6 per cent of the normal rainfall during monsoon 2018. Out of 355 talukas (excluding talukas in Mumbai City & Mumbai suburban districts) in the State, 192 received deficient, 138 received normal and 25 received excess rainfall.

The state ranks 11th in average size of operational holding (1.34 ha) amongst all states, as per Agriculture Census 2015-16. The total area of small & marginal (up to 2.0 ha) operational holding was 92.20 lakh ha constituting 45.0 per cent of the total area whereas number of small and marginal operational holdings was 121.55 lakh which is 79.5 per cent of the total number of operational holdings.

During kharif season of 2018, sowing was completed on 151.03 lakh ha area. The production of cereals & pulses is expected to decrease by six per cent and 35 per cent, respectively, while the production of oilseeds, cotton and sugarcane is expected to increase by 16 per cent, 17 per cent and 10 per cent respectively over the previous year.

During 2018-19, area under rabi crops is 33.83 lakh ha which is 50 per cent compared to the previous year mainly due to deficit rainfall in September and October, 2018. 1.18 During 2018-19, the area under horticulture crops is 16.43 lakh ha and production is expected to be 224.17 lakh MT as against area of 17.22 lakh ha and production of 248.53 lakh MT during 2017-18.

During 2018-19, the area under horticulture crops is 16.43 lakh ha and production is expected to be 224.17 lakh MT as against area of 17.22 lakh ha and production of 248.53 lakh MT during 2017-18.

Table 3: Rainfall and Crop production in the State

Particulars	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rainfall (Percentage to Normal)	102.3	90.3	124.6	70.2	59.4	94.9	0
Crop	Production						
Cereals	10,276	8,667	10,677	9,259	7,210	12,646	10,944
Pulses	2,225	2,262	3,114	9,259	2,019	4,584	3,684
Total Foodgrains	12,501	10,929	13,791	9,259	11,278	17,230	14,628
Oilseeds	4,485	5,087	5,294	9,259	2,850	5,113	4,208
Sugarcane	86,733	69,648	76,901	9,259	84,699	54,237	83,138
Cotton (Lint)	7,200	7,655	8,834	9,259	7,000	10,755	6,094
Fruits	10,538	9,785	13,458	9,259	11,090	10,630	11,729
Vegetables	8,778	8,008	10,162	9,259	8,783	10,520	12,307

Includes Kharip, Rabi and Summer @Production of Cotton in 000 bales of 170 kg each #Final Estimates

Major developments in Agriculture in Maharashtra

The major developments of Agriculture in Maharashtra are:

- First State to adopt Dry Land Farming Technology
- Emphasis on the development of horticulture along with Agriculture
- State Seed Corporation – First Farmers Company in seed sector
- Pioneers in Co-operative network - Sugar factories, Dairies, Water user associations
- Four State Agricultural Universities
- Presence of very effective and research based Farmers Organisations
- Acceptance of latest technology by Grape farmers like Eurepgap, Agmark, Bar-coding & Residue Monitoring system etc.
- Concept of contract farming & corporate farming is in the way of promotion
- An area of 13.66 lakh hectares under horticultural and 4 lakh ha under vegetables
- Largest producer of seedless Grapes (78%) banana (75%) Mandarin oranges (75%) Onion (63%), Tomatoes (42%) of the total production in India. Alphanso Mangoes accounts for 90% of India's export in mangoes.
- The highest number of poly houses (1271) owned by small farmers for cultivation of flowers
- Leads the sugar industry sector with 200 sanctioned and 150 productive cooperative sugar mills
- 40% turnover of the seed industry in the country
- More than 60% of the area under drip irrigation thus stands first in the country
- Implementation of Agriculture Export Zones

Location

Nagpur district is in the Vidarbha region of Maharashtra state in central India. The city of Nagpur is the district administrative centre. Nagpur (formerly Nagpore) is the third largest city and winter capital of the Indian state of Maharashtra. It is the 13th largest Indian city by population. Like most of the places in India, agriculture in Nagpur also contributes significantly to the economy of the city. The principal crops that are abundantly grown in the city of Nagpur include sugarcane, wheat, soya bean, pulses, mung, wheat, gram, jowar, bajra, linseed, cotton, groundnut, sunflower, tur and others. Amravati District is a District of Maharashtra state in central India. The district occupies an area of 12,235 km². Amravati is located at 20.32 N to 21.46 N latitude and longitude of 76.37 E to 78.27 E with altitude of 300 to 900 mt. above Mean Sea Level (MSL). The total geographical area of the district is 12212 sq. km. which is 3.96% of the total area of the state. The district is divided into 14 tehsils (blocks). The district has two tribal blocks (1) Dharani and (2) Chikhaldara.

Demographic characteristics

Nagpur: According to the 2011 census, Nagpur district had a population of 4,653,171, roughly equal to the nation of Ireland or the US state of South Carolina. This gives it a ranking of 29th in India (out of a total of 640). The district has a population density of 470 inhabitants per square kilometre (1,200/sq. mi). Its population growth rate over the decade 2001–2011 was 14.39%. Nagpur has a sex ratio of 948 females for every 1000 males, and a literacy rate of 89.52%. The district had a population of 4,653,171 of which 64.26% were urban as of 2011.

Amravati: According to the 2011 census Amravati district has a population of 2,887,826 roughly equal to the nation of Jamaica or the US state of Arkansas. This gives it a ranking of 131st in India (out of a total of 640). The district has a population density of 237 inhabitants per square kilometre (610/sq. mi). Its population growth rate over the decade 2001-2011 was 10.77%. Amravati has a sex ratio of 947 females for every 1000 males, and a literacy rate of 88.23%.

Agro ecological characteristics

Nagpur: Agriculture in Nagpur received a much-needed lift when there was an increase in the cropped area. This was the result of a decrease in the number of fallow land. Another reason was the increase in the portion of the cultivable land. The major plantations of Nagpur include the extremely tasty and luscious citrus fruit, orange. Soya bean is considered to be the chief cash crop of Nagpur. Amravati: In the district, 91.50% area is exclusively under rainfed cropping. The total area under kharif crops is 683700 ha while 106200 ha is under rabbi crops. The area under irrigation is 80543 ha in the district, which is 8.5% of the total cultivated area. Cotton is the main cash crop of the district; occupying an area of 327901 ha (34.60% of total cropped area). The district economy is predominantly agro based. A number of ginning and pressing units for cotton, oil mills, and dal mills are working in the district. Under ATMA, 950 nos. of producer groups are registered and are undertaking production activity of major crops in the district e.g. soyabean. There are 08 nos. of

warehouses of MSWC at various locations in the district of which 02 are in the vicinity of APMCs. MSWC has initiated e-warehouse receipts system in some of the warehouses viz., Chandur bazaar and Achalpur. There are 12 APMCs, 11 LSMs, 13 RHs (in GPs above 7500 population) in the district. Of these, 05 APMCs, 01 LSMs, 13 RHs have participated in MACP. As per the provisions of the model act, 01 Private market has been established in the district, which mainly undertakes sale & purchase of raw cotton (MTR, 2013).

Of the 36 districts in Maharashtra, India, two districts namely, Nagpur and Amravati were selected. Major agripreneurs, FPOs, NGOs, consultancies and Master or Leader Farmers of the three districts were selected and surveys were made for the examination of good extension practices in agricultural among the farmers and different agriculture institutions. Qualitative and quantitative data were collected from an interview schedule.

Different agriculture extension organizations/ Services in Maharashtra

A) Government organization:

1. National Mission on Agriculture Extension and Technology (NMAET)

The National Mission on Agriculture Extension and Technology (NMAET) was launched by the Department of Agriculture and Farmers' Welfare (DACFW) in 2014-15 and takes a holistic view of extension by embedding components for technical support and training. It aims to make the system farmer-driven and accountable by restructuring and strengthening existing agriculture extension programmes to enable the delivery of technology and to improve the current agronomic practices of farmers.

In the central level, different programmes were introduced with the objective of strengthening the extension machinery and utilizing it for synergizing the interventions under the ATMA. The programmes include - support to state extension programme for extension reforms (ATMA), sub-mission on seed and planting material (SMSP), sub-mission on agricultural mechanization (SMAM), sub-mission on plant protection and plant quarantine (SMPP).

2. KVK:

The first KVK, on a pilot basis, was established in 1974 at Puducherry (Pondicherry) under the administrative control of the Tamil Nadu Agricultural University, Coimbatore. At present, there are 706 KVKs, out of which 47 KVKs are in Maharashtra. The following are the KVKs in Pune district. KVK in Nagpur district:

i) KRISHI VIGYAN KENDRA

CICR-Central Institute for Cotton Research, Panjri Farm, Wardha Road, Nagpur.

Indian Council of Agriculture Research has sanctioned Krishi Vigyan Kendra (KVK) for Nagpur district in 1994 and is located at the premises of CICR, Nagpur. It is functioning under the control of Director CICR, Nagpur. KVK, CICR, Nagpur comes under Zonal Project Directorate, Zone-V, Hyderabad. KVK,

Nagpur is a grass root level organization meant for application of technology through assessment, refinement, and demonstration of proven technologies and training of same under different 'micro farming' situations in Nagpur district.

ii) CICR-Central Institute for Cotton Research

Central Institute for Cotton Research (CICR) is a central research institute established (in 1976) by the Indian Council of Agricultural Research (ICAR) to promote long term research efforts in cotton production, and to provide support and conduct applied research on cotton with the active participation of State Universities. The research efforts of CICR fall under the All India Coordinated Cotton Improvement Project (AICCIP), initiated by the Council in 1967. Its headquarters are located in Nagpur and the other two regional units are located at Coimbatore, Tamil Nadu, and Sirsa, Haryana. The Govt. of Maharashtra in collaboration with the CICR, Nagpur implemented a pilot project in the Vidarbha region (highly prone to farmer suicides), based on a Brazilian model to enhance the per-acre yield of cotton while reducing its per-acre cultivation cost.

iii) CCRI- National Research Centre for Citrus

The National Research Centre for Citrus is an institute for research in citrus fruits and horticulture in India. It is situated at Nagpur in the state of Maharashtra which is famous for the Nagpur Mandarin oranges. The centre, under the autonomous Indian Council of Agricultural Research (ICAR), conducts research in the field of citrus agriculture; it also provides consultancy in the same field.



KVK in Amravati District:

1) KRISHI VIGYAN KENDRA Ghatkhed

Address: Chandur Rly Road, Bodana Fata, Near Tapowaneshwar Temple, Ghatkhed, Amravati Phone: 0721-2950342, 9890069568 Email: kvkgamravati@rediffmail.com, kvkgamravati@gmail.com

2) KRISHI VIGYAN KENDRA, Durgapur

Address: Durgapur (Badnera), Dist. Amravati, Ph. No. 07212580606, 07212580174

E-mail: pckvkda2015@gmail.com, www.kvkdurgapur.in

Information Officer: Mr. P. S. Jayale, Cell No. 9921333611



The farmers or any person or organization can avail the following services provided by the Krishi Vigyan Kendra:

Participation in the Trainings: Interested farmers may register their names with the Krishi Vigyan Kendra either personally or through Phone or E-Mail for the training he/she wishes to attend. The Krishi Vigyan Kendra can also arrange off-campus training on desired topics in the farmers' village. For such trainings, a minimum of 25 farmers from the same village need to participate. Special trainings can also be arranged on topics of their choice.

Participate in Extension Activities: Farmers can participate in extension activities such as kisan melas, study tours, field days by prior registration.

Consultancy: Farmers may interact with the scientists at the Krishi Vigyan Kendra & get consultancy on issues related to agriculture, allied fields & information on advanced agricultural technologies.

Demonstrations and On Farm Trials: Farmers can participate in conducting demonstrations & trials on their fields, which is arranged by Krishi Vigyan Kendra every year.

Weather Information: Farmers can get information on weather in the form of mobile SMS from the KVK about rainfall and disease predictions. Accordingly, they can decide the water requirement and spraying schedule for the crops.

Study Tours to KVK: Farmers on study tour can see farm & demonstration units on greenhouses, nursery, dairy & the museum of agri implements. Farmers can stay in the designated hostels after paying nominal charges.

Soil and Water Testing: Farmers, institutions, and organizations can get their soil, water samples, fertilizers/ manure and leaf samples tested for various parameters of their choice at reasonable rates in the soil testing laboratory. Farmers may also invite the mobile soil testing laboratory of the KVK to visit their village to get their samples tested.

Diagnostic Services: Farmers can request Krishi Vigyan Kendra scientists to visit their problematic fields for getting curative & diagnostic recommendations. Hiring Agricultural Implements: Farmers can hire the various agricultural implements from the Krishi Vigyan Kendra.

Interactive Voice Response: Farmers can access information about market rates for agricultural commodities, weather through interactive voice response facility.

Activities of KVK:

- On-farm testing to assess the location specificity of agricultural technologies under various farming systems.
- Organize Frontline Demonstrations to establish production potential of technologies on the farmers' fields.
- Capacity development of farmers and extension personnel to update their knowledge and skills on modern agricultural technologies.
- To work as knowledge and resource centre of agricultural technologies for supporting initiatives of public, private and voluntary sector in improving the agricultural economy of the district.
- Provide farm advisories using ICT and other media on varied subjects of interest of farmers.

ATMA:

The Indian Government (1998), with the help of World Bank, introduced the Agriculture Technology Management Agency (ATMA) under the Innovation in Technology Dissemination (ITD) component of the National Agricultural Technology Project (NATP). Firstly, it was introduced in 28 districts in seven states from 1998 to 2003 under the guidance of MANAGE (National Institute of Agricultural Extension Management), an institution promoted by Ministry of Agriculture, Government of India. It was later expanded throughout the country in 2005 (Babu *et al*, 2013).

ATMA created a platform for convergence of human and financial resources available in the government, civil society, farm community, and private sector. ATMA Governing board at the state level set out the priorities for research and extension which is to be implemented in each district.

After the Strategic Research Extension Plan (SREP) was approved, the Farm Information and Advisory Centres (FIAC) at the district level, the block level teams (BTT) and the Farmer Advisory Committee (FAC) were responsible for the extension activities in the district. Existing extension staff still formed the backbone of the ATMA approach. Some additional resources were made available to support innovative approaches, pilots by NGOs, private sector, etc. At the state level, an apex planning and training body, the State Agricultural Management and Extension Training Institute (SAMETI) was established, with the aim of training various levels of extension staff in the convergence-led approach of ATMA.

Support to State Extension Programmes For Extension Reforms (ATMA Scheme):

The scheme "Support to State Extension Programmes for Extension Reforms" aims at making extension system farmer driven and farmer accountable by disseminating technology to farmers through new institutional arrangements viz. Agricultural Technology Management Agency (ATMA) at district level to operationalize the extension reforms on a participatory mode.

This Scheme shall focus on the following key extension reforms:

- Encouraging multi-agency extension strategies involving Public/ Private Extension Service Providers.
- Ensuring an integrated, broad-based extension delivery mechanism consistent with farming system approach with a focus on bottom up planning process.
- Adopting group approach to extension in line with the identified needs and requirements of the farmers in the form of CIGs & FIGs and consolidate them as Farmers Producer Organisations;
- Facilitating convergence of farmer centric programmes in planning, execution and implementation.
- Addressing gender concerns by mobilizing farm women into groups and providing training to them.

i) ATMA in Nagpur district

The activities of ATMA in the district include:

- To support their efforts of revitalization of the extension system and making available the latest agricultural technologies in different thematic areas
- To increase agricultural production through extension activities, viz., Farmers Training, Demonstrations, Exposure Visits, KisanMela, Mobilization of Farmers Groups and Setting up of Farm Schools.

Through these activities, latest agriculture technologies are disseminated to farmers of the country.

State Agricultural Universities

While the main mandate is to impart formal degree programmes in major agricultural disciplines, they provide extension and training support through the directorate of extension and education. The information flow is mainly from the universities to the KVKs which are responsible for training farmers.

In Maharashtra, there are four agricultural universities namely, Mahatma Phule Krushi Vidyapeeth, Rahuri; VNMKV, Parbhani; PDKV, Akola; and DBSKKV, Dapoli which were established to provide extension and training support. The Nagpur district KVK comes under Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

i. Dr.PanjabraoDeshmukhKrishiVidyapeeth, Akola

- RKVY scheme:

The Rashtriya Krishi Vikas Yojana (RKVY) scheme was initiated in 2007 as an umbrella scheme for ensuring holistic development of agriculture and allied sectors by allowing states to choose their own agriculture and allied sector development activities as per the district/state agriculture plan.

ICT (Information and Communication Technology) led Extension

ICT has significant potential to reach large numbers of farmers in a cost-effective manner and facilitate two-way information flow between farmers and the extension agencies. Schemes launched under

ICTs include farmers' portal, mKishan, Kisan Call Centre, Kisan TV Channel, mobile agro advisory services etc.

In Maharashtra, Doordarshan is telecasting Amchi Mati Amchi Manas programme. Other local T.V. channels also telecast different programmes like annadata, shetkari, etc.

Agriculture Clinic and Agriculture Business Centres (ACABC)

The ACABC scheme was launched in 2002 and was targeted at young rural agriculture graduates who wanted to turn entrepreneurs seeking to provide fee-based agriculture services to farmers. A mandatory two-month training at the National Institute of Agricultural Extension Management (MANAGE), at Hyderabad was designed to know the basis of business management among aspiring agriculture entrepreneurs. (MANAGE <http://www.manage.gov.in/>).

B) Private Agriculture Extension System

Some private sector agribusiness and input manufacturing companies undertake direct extension activities which help the farmers to realize higher production (and thus returns) through necessary pre-sowing preparation, optimum seed rate, correct agronomic practices, application of nutrients, and harvesting techniques.

In the case of different fertiliser companies, different extension activities include a wider range of interventions, such as conducting farmer meetings, organizing crop seminars, arranging for soil testing facilities, adopting villages, etc. There is a growing importance of the private sector in both research and extension in India.

C) Agriculture Extension System through Farmer Interest Groups/ Farmer producer Groups/ Women farmer Groups etc.

Organized user groups such as commodity groups, farmer interest groups, farmer clubs, women farmer groups, special interest groups, etc., also play small but important roles in extension in niche regions and areas.

Extension activities they are taking are as follows:

1. SMS group
2. Trainings
3. Field visits
4. Mobile advisory
5. Group discussion
6. Demonstration
7. Workshops, etc.

D) Agriculture Extension System by NGOs

In India, thousands of NGOs are actively involved in development of rural areas. Their grassroots orientation and proclivity to work in rain-fed and tribal regions has naturally oriented them towards land-based livelihood. These organisations, which specialise in the field of agriculture, work across different places and mainly specialize in the field of agriculture, watershed development, natural resource management, livelihood improvement, women empowerment, institutional development, etc. (Sulaiman, 2012).

Results and Discussion

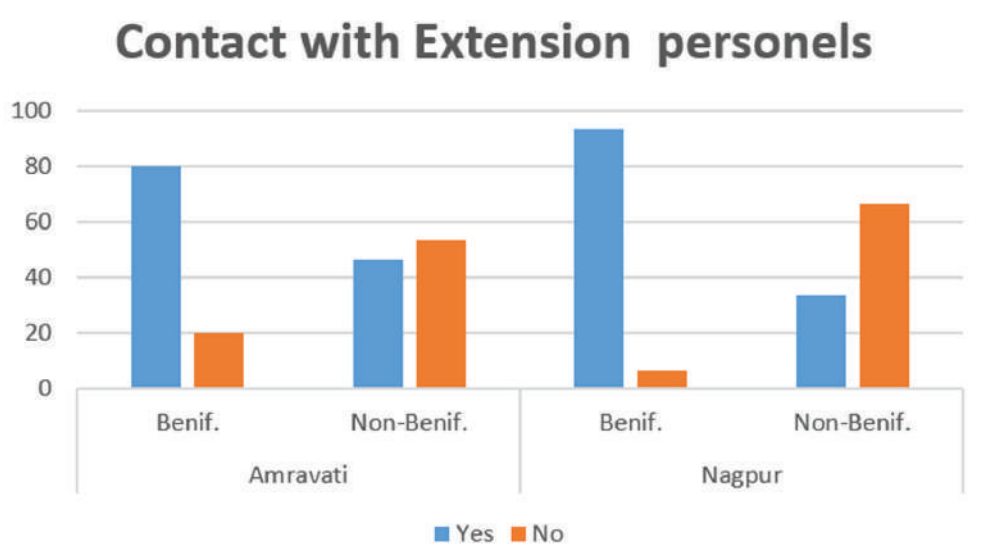


Figure 1.1 District-wise contact of respondents with Extension personnel

Figure 1.1 shows that in Amravati district, 80 percent of the beneficiaries have contact with extension agent and 20 percent do not, whereas, in case of non-beneficiaries, 45 percent are in contact and rest 55 are not. In Nagpur district, more than 90 percent of the beneficiaries are in contact with the extension personnel, while in case of non-beneficiaries, 33 percent respondents are in contact with the extension agents and rest 67 percent are not in contact.

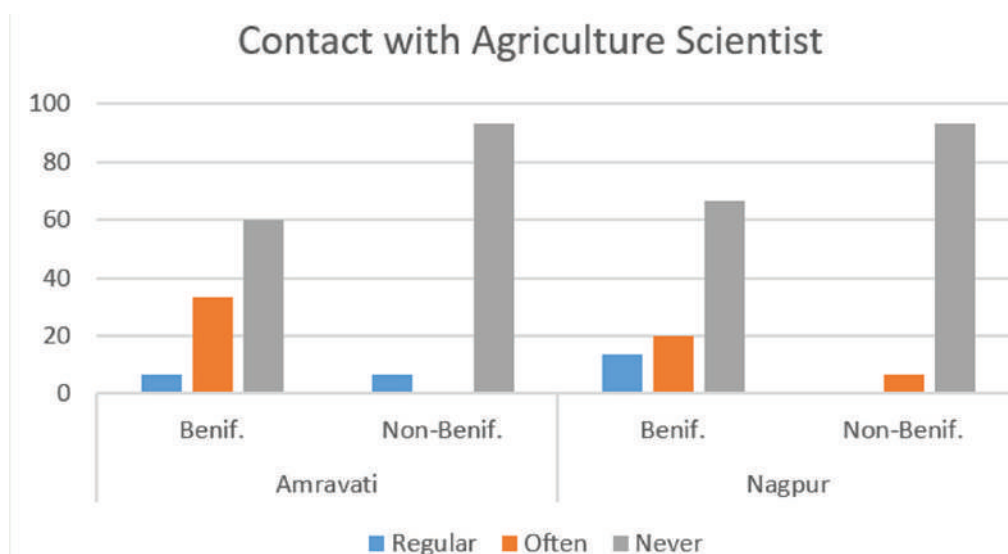


Figure 1.2 Contact of respondents with Agriculture Scientist from selected districts

Figure 1.2 shows that very few percent of respondents from both the districts are in contact with the agriculture scientists while most of the respondents from both the districts never contacted any Agriculture Scientist.

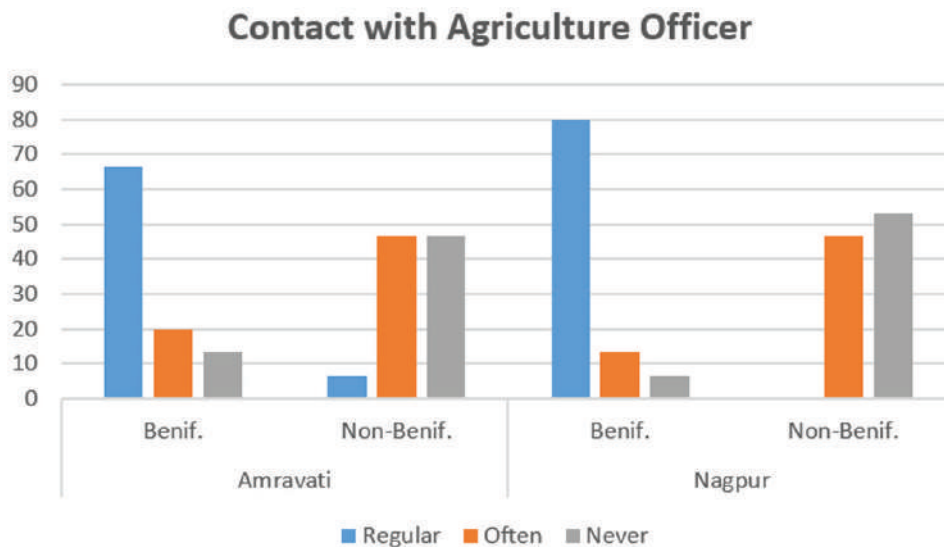


Figure 1.3 Contact of the respondents with Agriculture Officer from selected districts

Figure 1.3 indicates that in Amravati district, more than 65% of the beneficiaries are in contact with Agriculture Officer, while 13% & 17% are often & never in contact, respectively. Among the Non-beneficiaries 6% are in regular contact, 47% often, and 47% never contact any Agriculture officer. In Nagpur district, 80% beneficiaries are in contact with Agriculture Officer while 13% contact often, & 17% never contact. Non-beneficiary who contact regularly are none, 47% often and 53% never contact Agriculture officer.

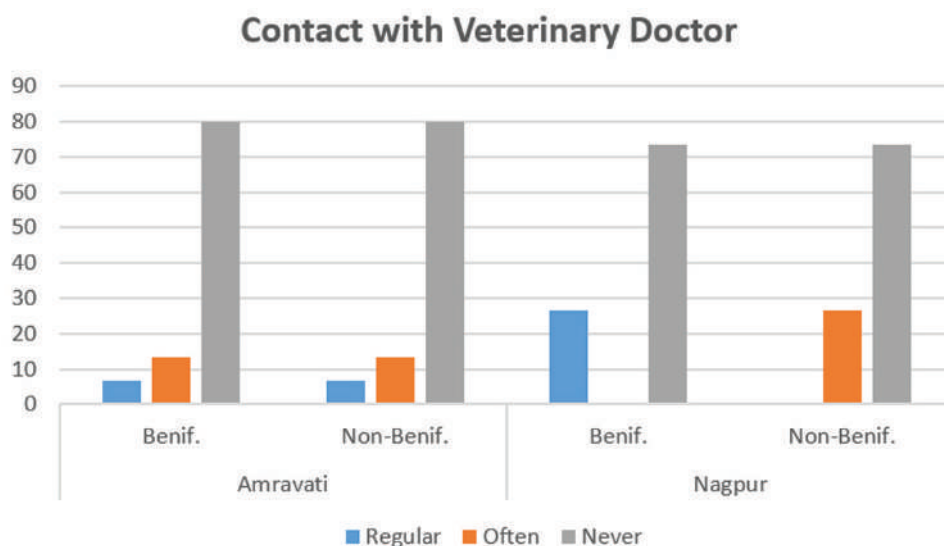


Figure 1.4 Contact of the respondents from selective districts with veterinary doctor

From figure 1.4 it is observed that only few beneficiaries and non-beneficiaries from both the districts are in contact with the veterinary doctor. However, more than 70% of the respondents including beneficiaries and non-beneficiaries are not in contact with the veterinary doctor.

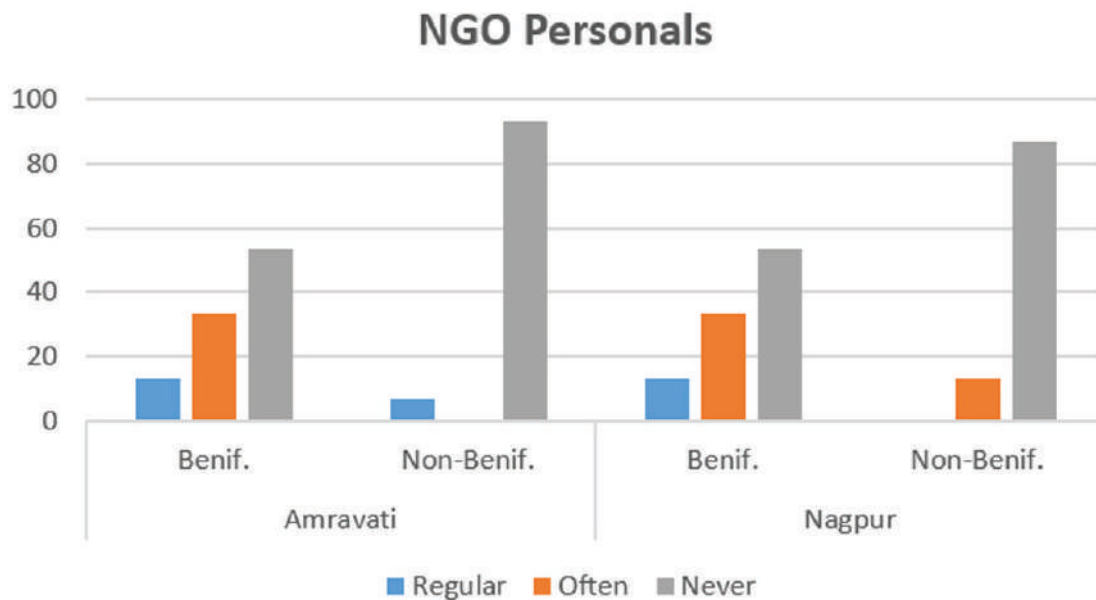


Figure 1.5 Amravati and Nagpur district Respondents contact with NGO personnel

Figure 1.5 Elucidates that in Amravati district only 13.33 per cent of the beneficiaries contact NGO personnel regularly for taking information; while in case of non-beneficiaries only 6.66 per cent of the respondents contact the NGOs. In case of Nagpur district, only 13.33 per cent of the beneficiaries contact NGO personnel regularly for taking information while 13.33% of the non-beneficiaries contact the NGO personnel.

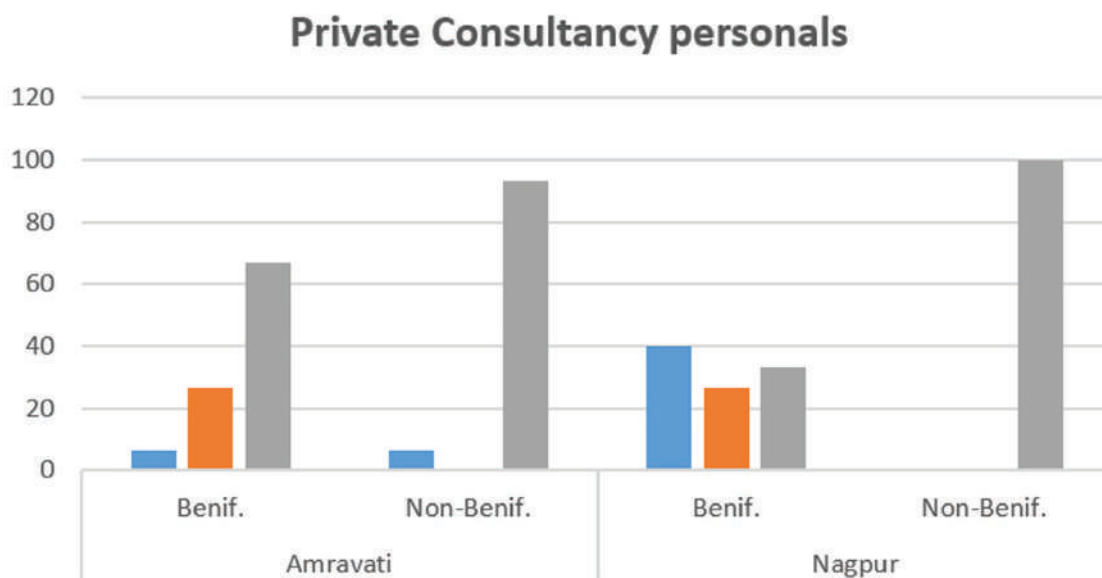


Figure 1.6 Amravati & Nagpur district Respondents contact with Private Consultancy personals

Figure 1.6 elucidates that in Amravati district, only 13.33 per cent of the beneficiaries contact NGO personnel regularly for taking information. In case of non-beneficiaries, only 6.66 per cent of the respondents contact the NGOs. In case of Nagpur district, only 13.33 per cent of the beneficiaries contact the NGO personnel regularly for taking information while in non-beneficiaries 13.33% respondents often contact the NGO personnel.

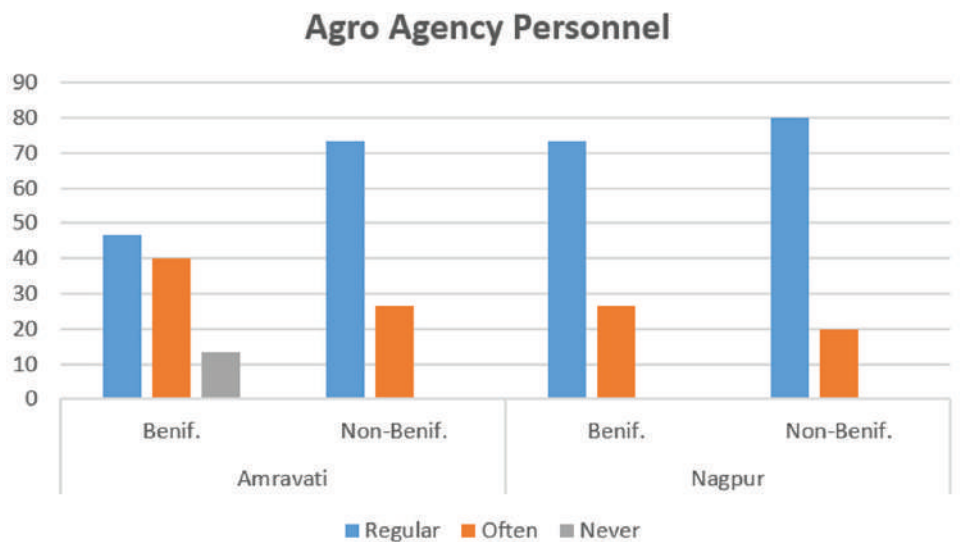


Figure 1.7 Amravati & Nagpur district Respondents contact with Agro Agency Personnel

Figure 1.7 explains that in Amravati district, only 46.66% & 40% of the beneficiaries contact Agro Agency Personnel regularly & often for taking information while in case of non-beneficiaries, 73.33% respondents contact regularly. In case of Nagpur district, 73.33 per cent of the beneficiaries contacting Agro Agency Personnel regularly for taking information while in non-beneficiaries 80% respondents contacts Agro Agency Personnel regularly.

Extension methods

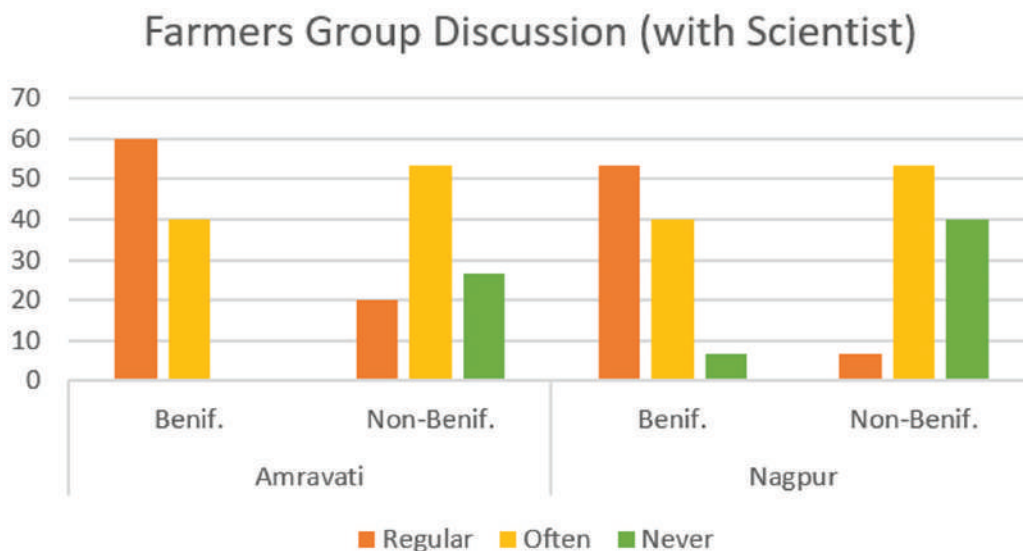


Figure 2.1 Participation of selective district respondents in Group Discussion

Figure 2.1 shows that in Amravati district maximum (60.00%) of the beneficiaries regularly participate in group discussion while 40% are participated sometimes for taking information while in case of non-beneficiaries 53.33% of the respondents are participate very few times in group discussion. In case of Nagpur district, more than fifty i.e., 53.33 per cent of the beneficiaries participate in group discussion for taking information while non-beneficiaries 53.33% respondents often and 40% respondents never participate in group discussion.

Weekly Farmers Meetings (Kisan Goshties)

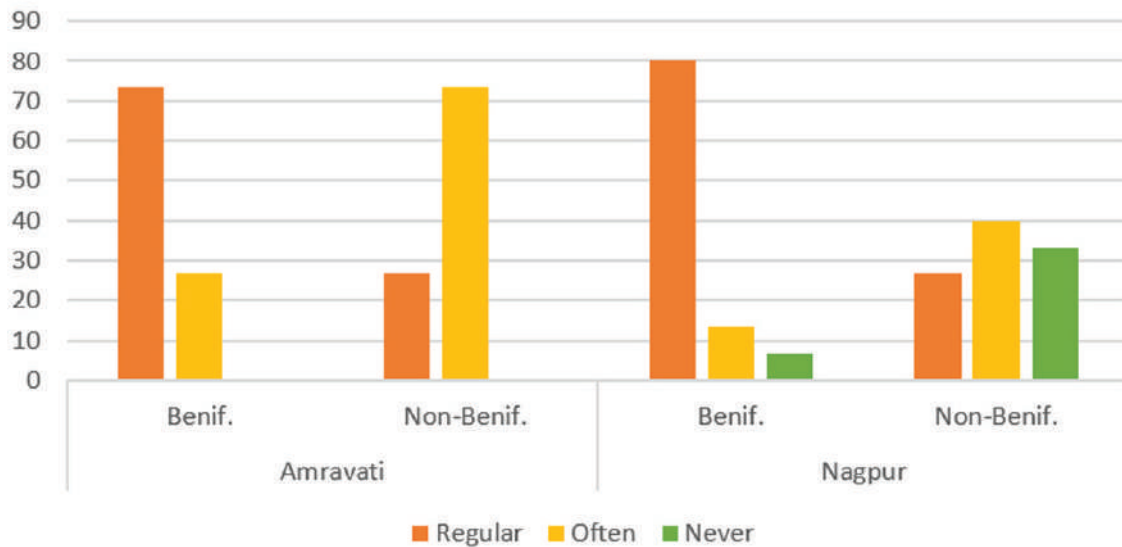


Figure 2.2 Participation of selective district respondents in weekly farmers meeting.

Figure 2.2 depicts that in Amravati district, more than 70% of the beneficiaries regularly attend weekly farmers' meeting for taking information while in case of non-beneficiaries only 26.66%. In case of Nagpur district, 80% of the beneficiaries regularly attending weekly farmers' meeting for taking information while non-beneficiaries' 26.66%. The rest 40% said often & 33.33% never attending weekly farmers' meeting for taking information.

Discussion with fellow Farmers (progressive farmers)

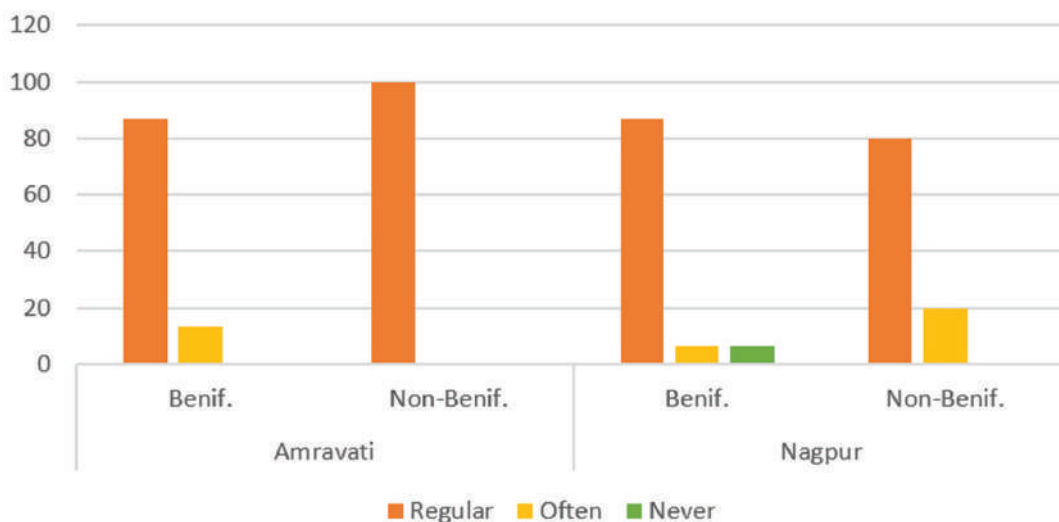


Figure 2.3 Participation of selective district respondents in discussion with fellow farmers.

Figure 2.3 elucidates that in Amravati district, more than 85% of the both beneficiaries as well as non-beneficiaries discuss with fellow farmers for seeking information. In case of Nagpur district, more than 80% of the respondents both beneficiaries as well as non-beneficiaries discuss with fellow farmers for seeking information.

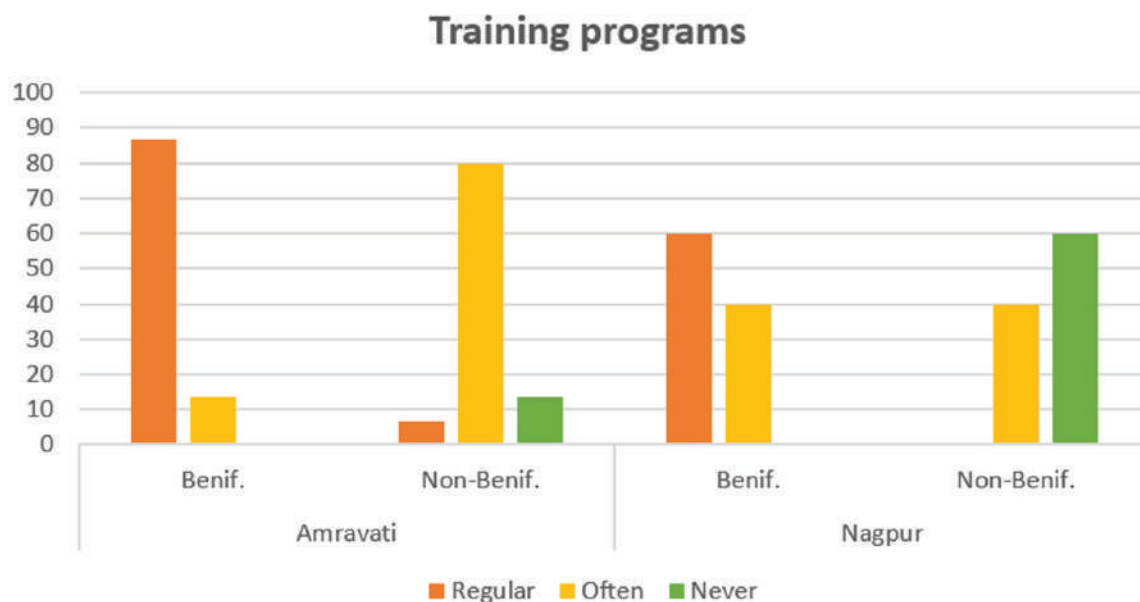


Figure 2.4 Participation of selected district respondents in training programs.

Figure 2.4 shows that in Amravati district more than 80% of the beneficiaries regularly participate in training programmes for taking information, while in case of non-beneficiaries 80.00 per cent of the respondents often participate in training programmes for taking information. In case of Nagpur district, 60% of the beneficiaries participate in training programmes for taking information while more than 60% non-beneficiaries never participate in training programmes for taking information.

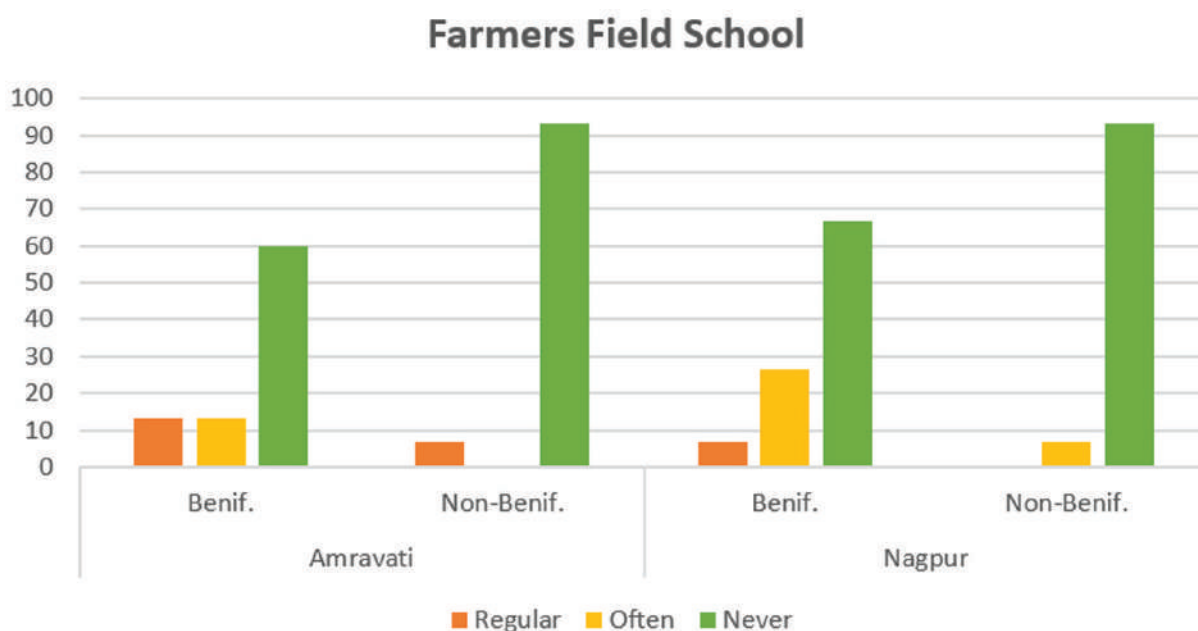


Figure 2.5 Participation of selected district respondents in farmers' field school.

Figure 2.5 elucidates that in Amravati district, 60% of the beneficiaries and more than 70% of non-beneficiaries never attend farmers' field school for seeking information. In case of Nagpur district, more than 60% of beneficiaries and 90% of the non-beneficiaries never attend farmers' field school for seeking information.

Field days- Lectures and Trials

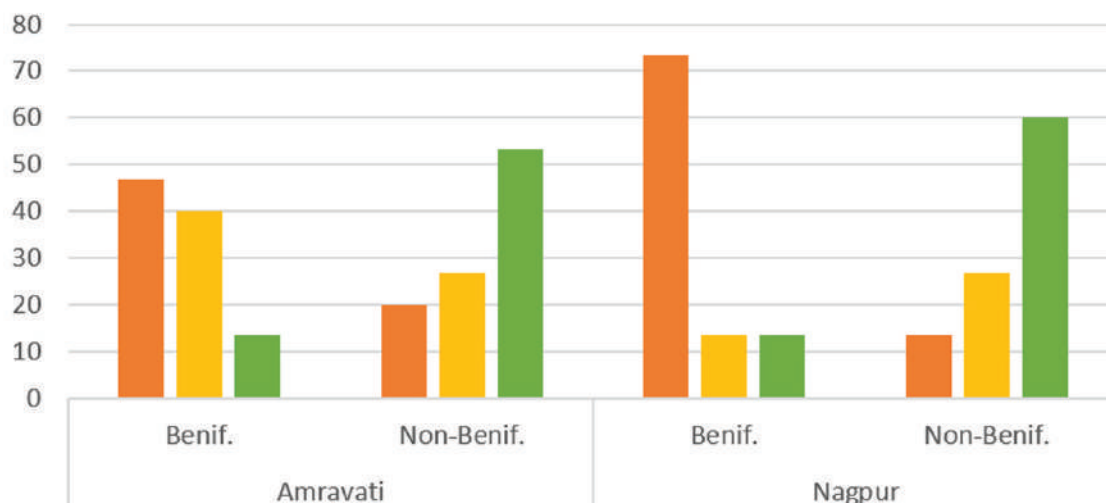


Figure 2.6 Participation of selected district respondents in field days.

Figure 2.6 shows that in Amravati district, a maximum of 46.66% of the beneficiaries regularly participate in Field days - Lectures and Trials - while 40% participate often for taking information. In case of non-beneficiaries, 20% of the respondents regularly participate, and 53.33% of respondents never participate in Field days - Lectures and Trials. In case of Nagpur district, more than 73% per cent of the beneficiaries participate in Field days - Lectures and Trials for taking information while for non-beneficiaries 60% respondents never participate.

Field Tours

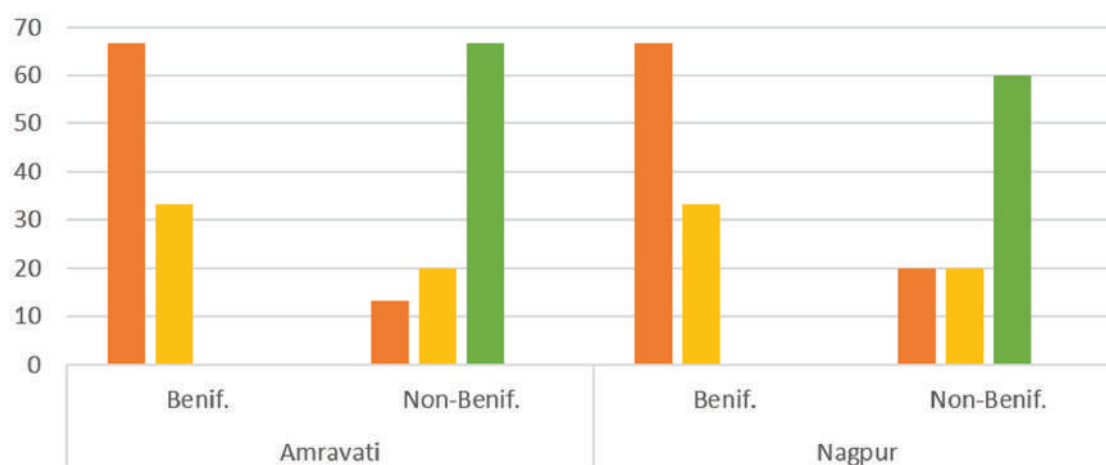


Figure 2.7 Participation of selected district respondents in field tours.

Figure 2.7 indicates that in Amravati district, more than sixty percent i.e. 66.66% of the beneficiaries regularly went to field tours, while 33.33% went sometimes for seeking new information. While in case of non-beneficiaries, more than 60% of the respondents never went to field tour. In case of Nagpur district, more than 65% of the beneficiaries went regularly to tour while non-beneficiaries 20% regular, 20% often, and 40% respondents never went to field tour.

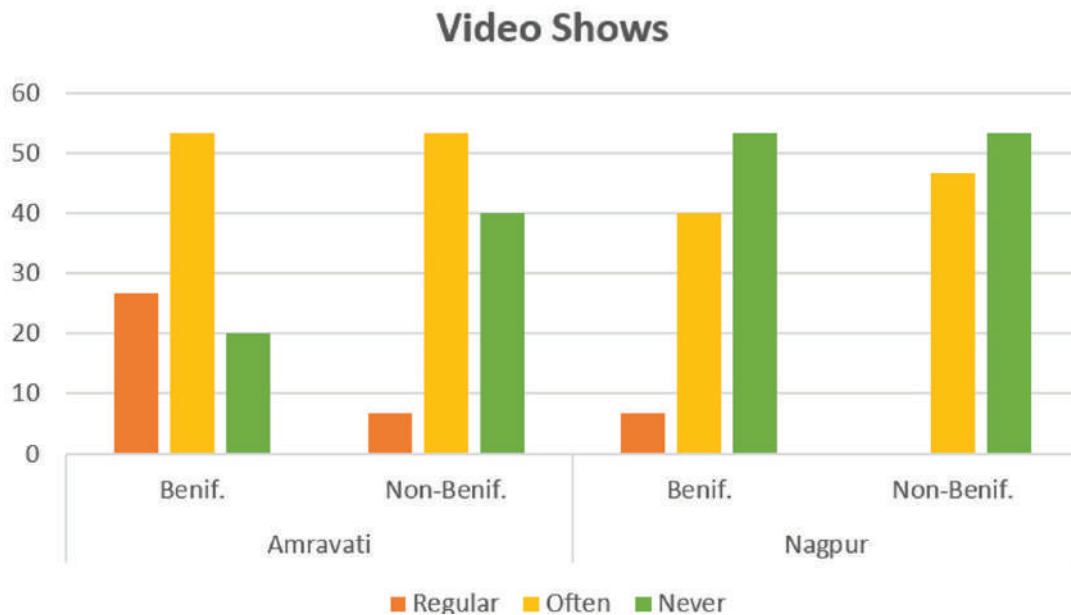


Figure 2.8 Participation of selected district respondents in video shows.

Figure 2.8 elucidates that in Amravati district, more than 50% of the both beneficiaries, as well as, non-beneficiaries using Video shows irregularly; while 20% of the beneficiaries and 40% of non-beneficiaries never use video shows for taking information. In case of Nagpur district, more than 40% of beneficiaries watches video shows irregularly, and more than 50% of the beneficiaries as well as non-beneficiaries watches Video shows for learning new things.

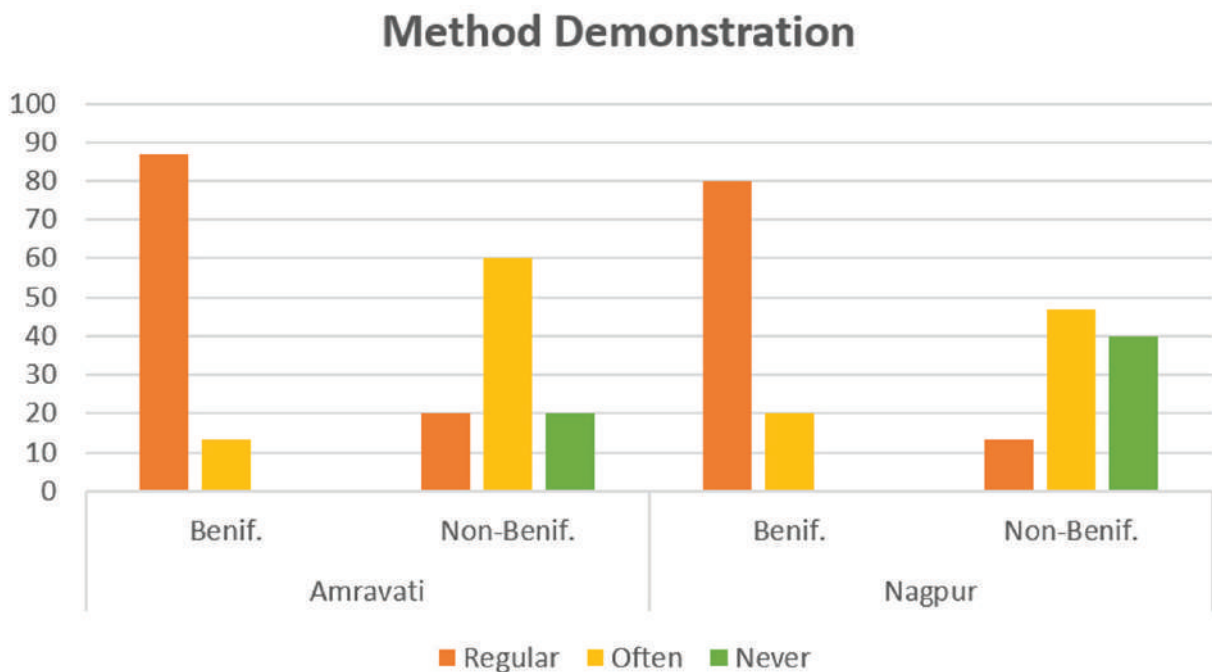


Figure 2.9 Participation of selected district respondents in method demonstration.

From figure 2.9 it is observed that 86.66% of the beneficiaries learn from method demonstration, whereas, 60% non-beneficiaries often learn from method demos. In Nagpur district, 80% of beneficiary regularly learn from method demonstration, whereas, 13.33 % non-beneficiary regular in method demonstration.

Agri Exhibition/ Mela

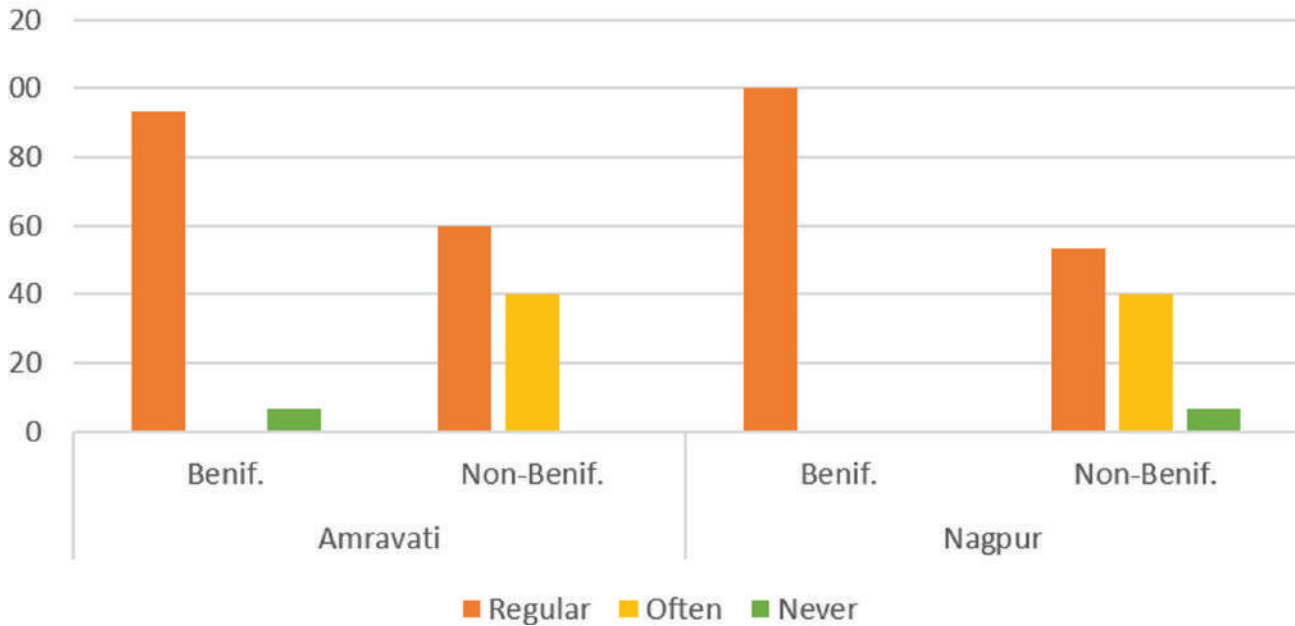


Figure 2.10 Participation of selected district respondents in Agri Exhibitions.

Figure 2.10 shows that in Amravati district, more than 90% of the beneficiaries and 60 % of non-beneficiaries are obtaining the information from Agro Exhibition. In case of Nagpur district, 100% per cent of the beneficiaries and 53.33 percent of non-beneficiaries attend agro exhibition for information.

Need based weekly mobile advisory

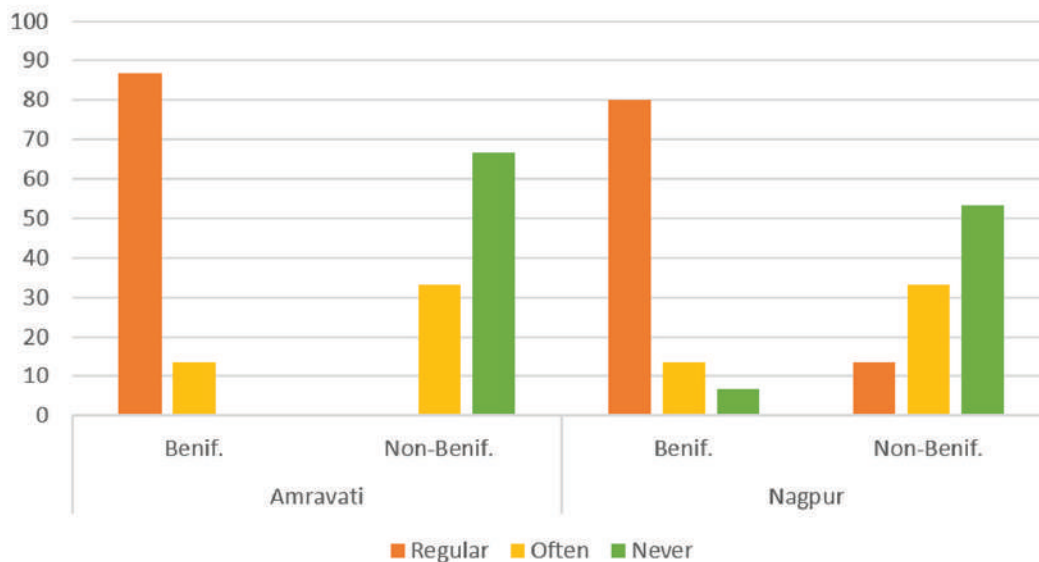


Figure 2.11 Participation of selected district respondents in obtaining Need based weekly mobile advisory.

From figure 2.11 it is elucidated that In Amravati district, 86.66% of the beneficiaries regularly, and 66.66% of non-beneficiaries never take information from need-based weekly mobile advisory. While 80% of beneficiaries regularly receive information, and more than 50% of the non-beneficiaries never do so from need-based weekly mobile advisory.

Fortnight Scientific Diagnostic Surveys and Solutions

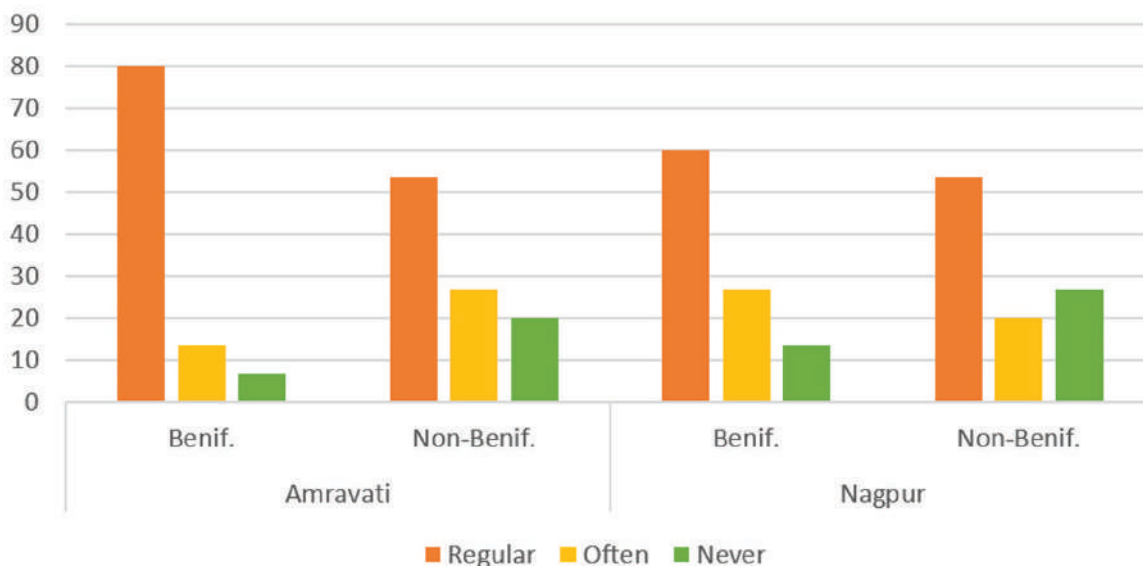


Figure 2.12 Participation of selected district respondents in obtaining solutions from Fortnight Scientific Diagnostic Surveys.

Figure 2.12 shows that in Amravati district, 80% beneficiaries and 53.33% non-beneficiaries regularly receive solution from Fortnight Scientific Diagnostic Surveys, while in Nagpur, 60% beneficiaries and 53.33% non-beneficiaries regularly receive solution from Fortnight Scientific Diagnostic Surveys.

PPT presentation Advisory Lectures

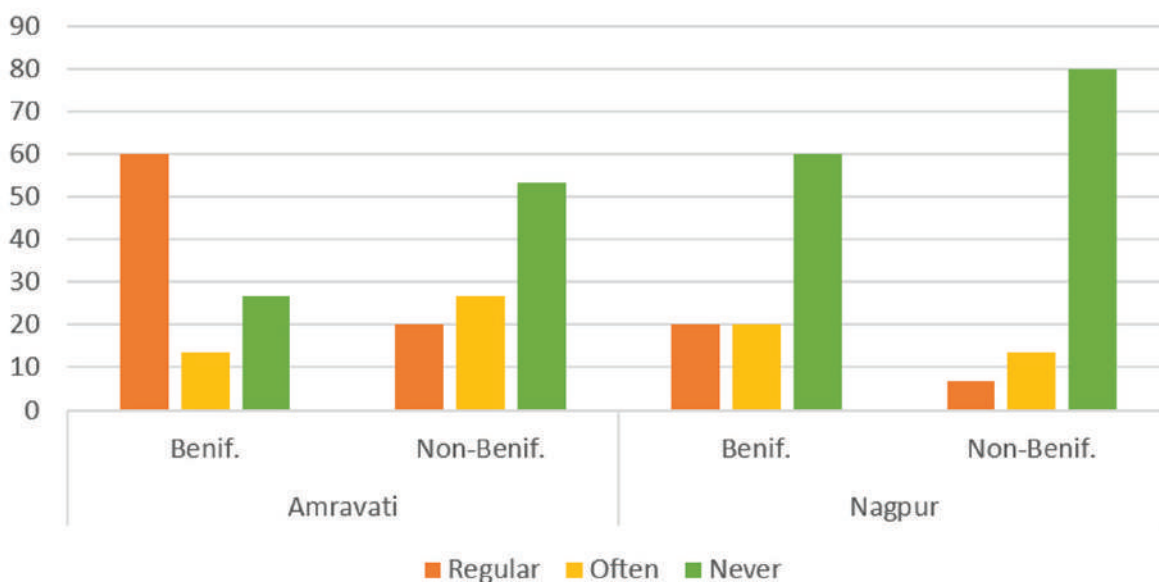


Figure 2.13 Participation of selected district respondents in PPT presentation Advisory Lectures.

Figure 2.13 shows that in Amravati district, 60% beneficiaries regularly & 26.66% never attend PPT presentation Advisory Lectures, whereas, more than 50% of the non-beneficiaries never attend PPT presentation Advisory Lectures. In Nagpur, 60% beneficiaries and 80% non-beneficiaries never attend PPT presentation Advisory Lectures for seeking information.

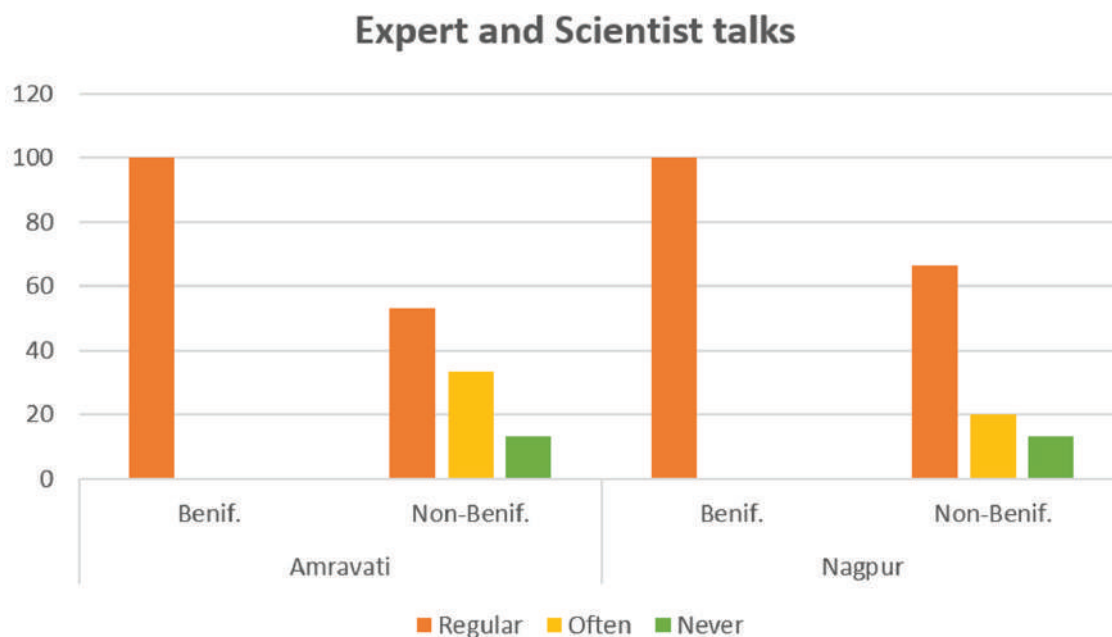


Figure 2.14 Participation of selected district respondents in Expert and Scientist talks.

Figure 2.14 shows that in Amravati district, 100% beneficiaries and 53.33% non-beneficiaries regularly attend Expert and Scientist talks, while in Nagpur, 100% beneficiaries and more than 60% of non-beneficiaries regularly attend Expert and Scientist talks.

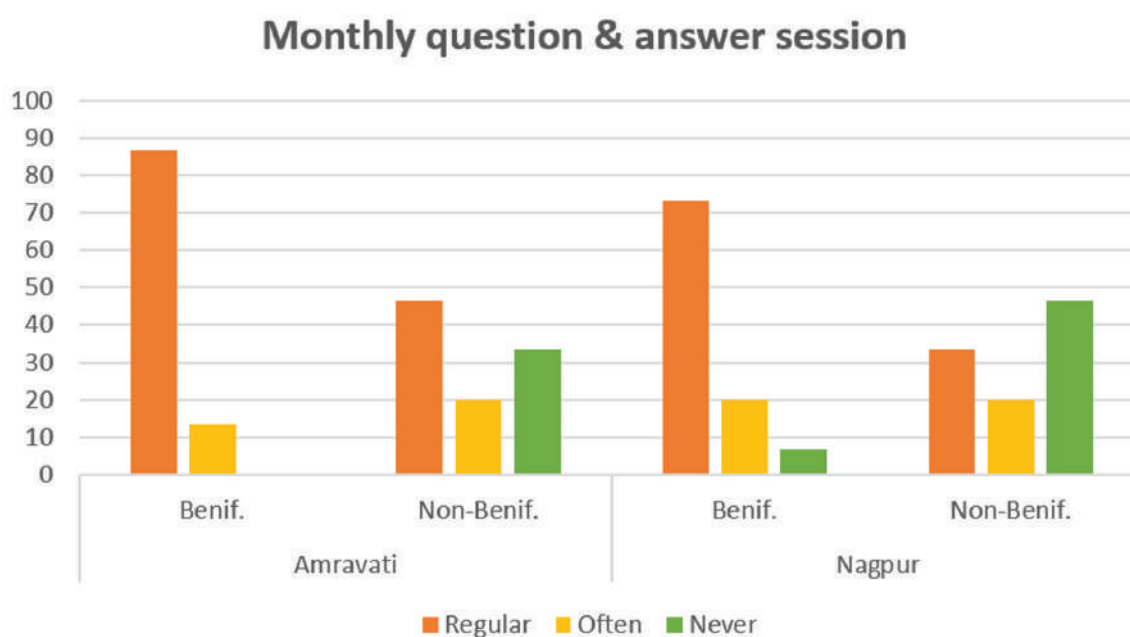


Figure 2.15 Participation of selected district respondents in Monthly question & answer session.

From fig. 2.15, it is elucidated that in Amravati district, more than 86.66% beneficiaries and 46.66% non-beneficiaries regularly attend Monthly Question and Answer Session; more than 30% of non-beneficiaries never attend the same. In Nagpur, 73.33% beneficiaries and more than 30% of non-beneficiaries regularly attend monthly question & answer session; whereas, 46.66% of non-beneficiaries never attend Monthly question and answer session.

Mass Media Extension

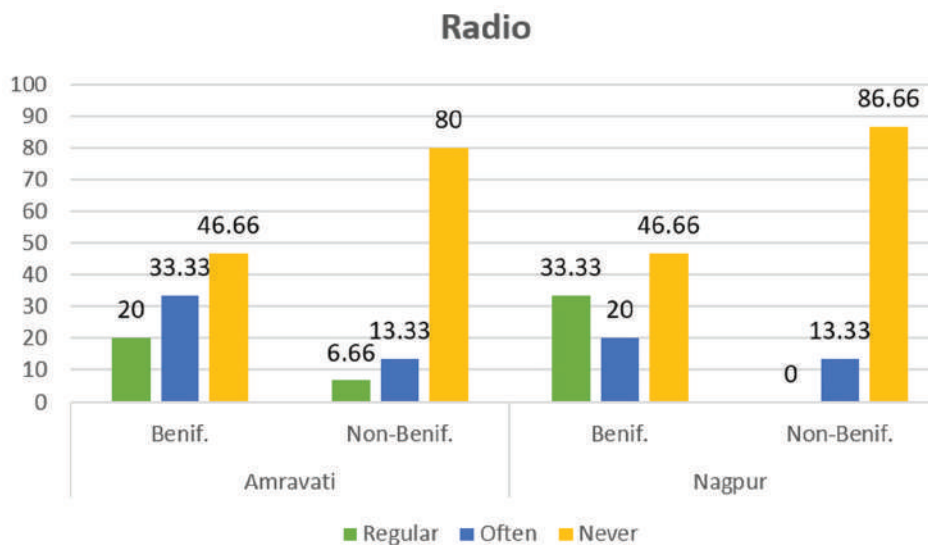


Figure 3.1 Involvement of selected district respondents in Radio as mass media extension.

Figure 3.1 elucidates that in Amravati district, only 20.00 per cent of the beneficiaries use radio regularly for taking information while in case of non-beneficiaries, only 6.66 per cent of the respondents use radio. In case of Nagpur district, only 33.33 per cent of the beneficiaries use radio for taking information, while non-beneficiaries are not at all using radio for mass media exposure.

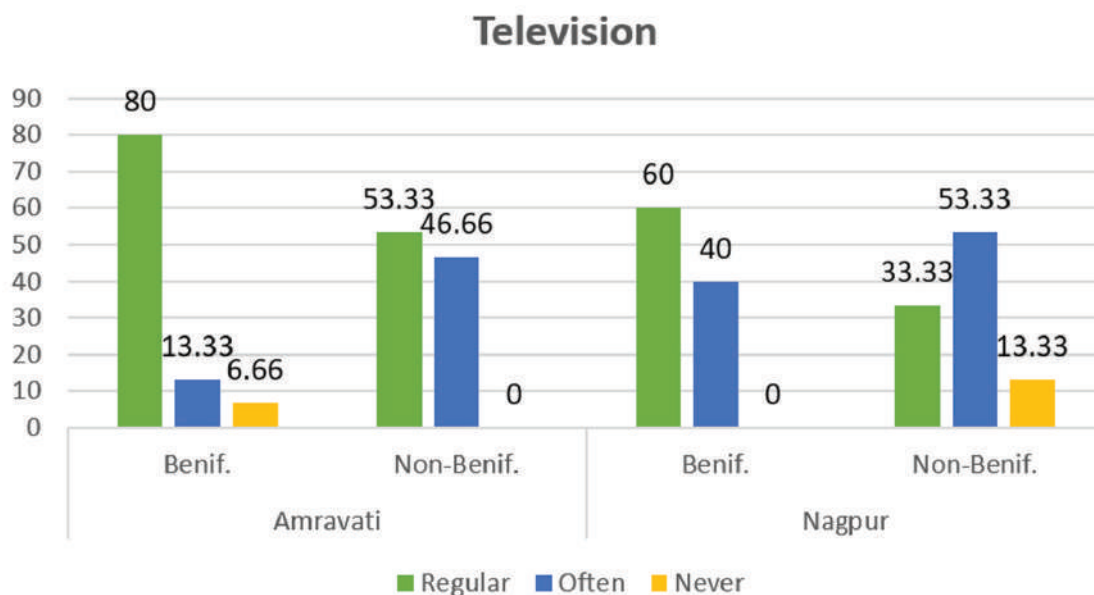


Figure 3.2 Involvement of selected district respondents in television as mass media extension.

Figure 3.2 shows that in Amravati district, maximum (80.00%) of the beneficiaries use television regularly for taking information, while in case of non-beneficiaries, 53.33 per cent of the respondents use it. In case of Nagpur district, more than fifty i.e., 60.00 per cent of the beneficiaries use television for taking information. However, only 33.33 per cent among the non-beneficiaries use television for mass media exposure.

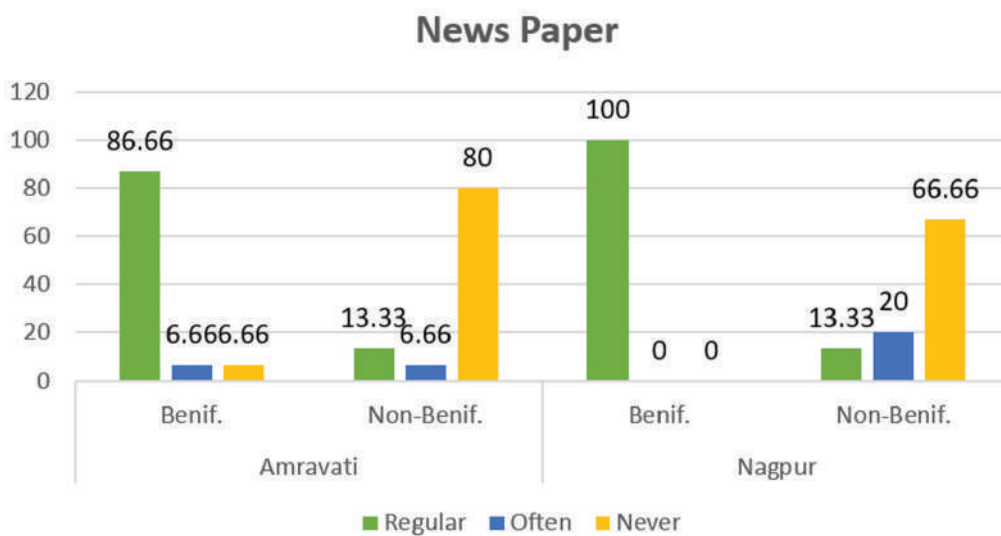


Figure 3.3 Involvement of selected district respondents in newspaper as mass media extension.

Figure 3.3 reveals that in Amravati district, maximum (86.66%) of the beneficiaries use newspaper regularly for taking information, while in case of non-beneficiaries only 13.33 per cent of the respondents are using newspaper. In case of Nagpur district, cent per cent of the beneficiaries use newspaper for taking information, while in case of non-beneficiaries, only 13.33 per cent of the respondents are using newspaper for mass media exposure.

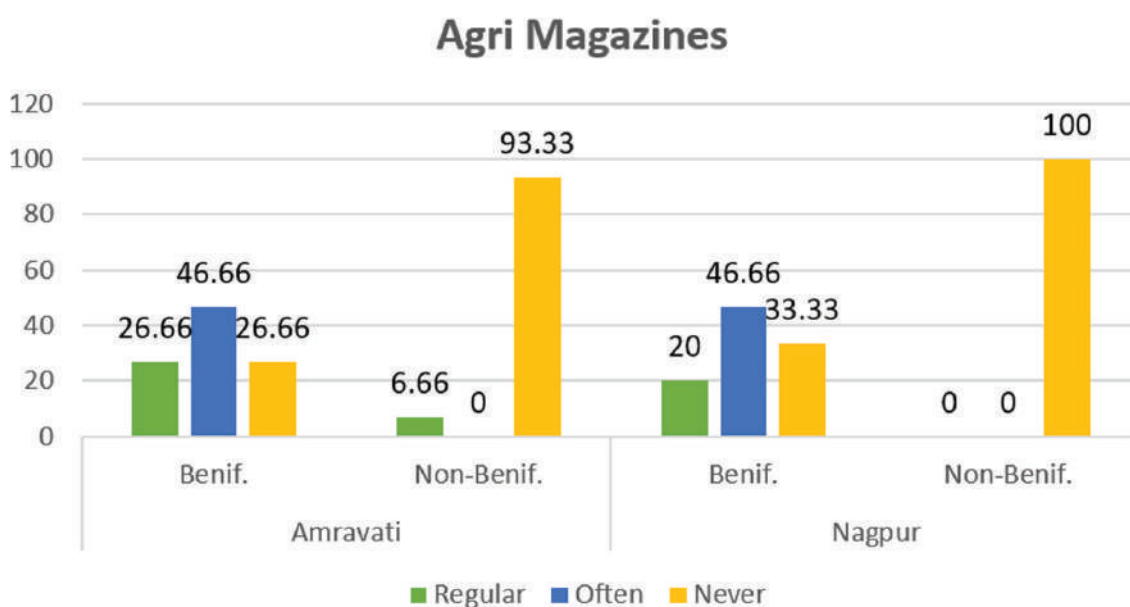


Figure 3.4 Involvement of selected district respondents in agri Magazines as mass media extension.

Figure 3.4 shows that in Amravati district, more number i.e., 46.66 per cent of the beneficiaries are using agro magazines often for taking information, while in case of non-beneficiaries, 46.66 per cent of the respondents are using agro magazines. In case of Nagpur district, maximum i.e., 46.66 per cent of the beneficiaries use agro magazines for taking information, while none of the non-beneficiaries use agro magazines for mass media exposure.

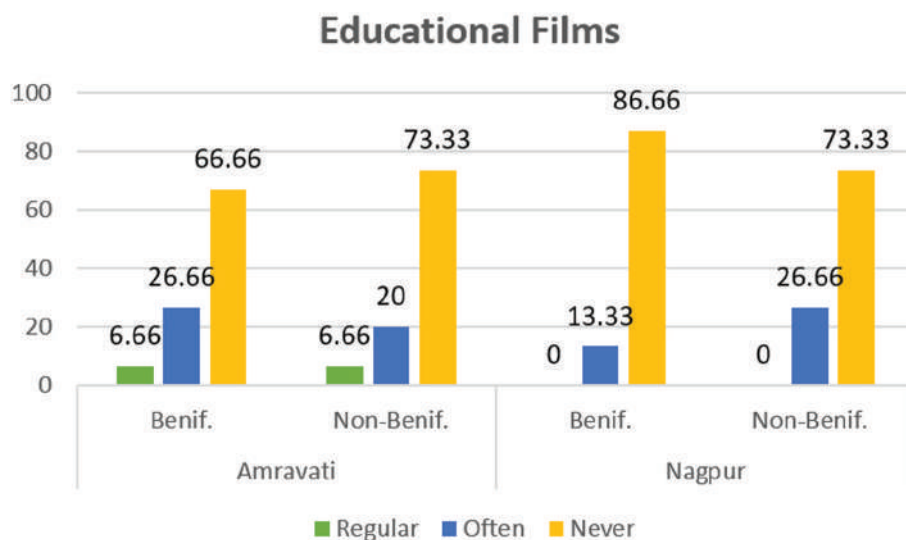


Figure 3.5 Involvement of selected district respondents in Educational films as mass media extension.

Figure 3.5 elucidates that in Amravati district, very less (6.66%) of the both beneficiaries as well as non-beneficiaries use educational films regularly, while 66.66 per cent of the beneficiaries never use educational films for taking information. In the case of non-beneficiaries, 73.33 per cent of the respondents never use educational films. In case of Nagpur district, none of the respondents, both beneficiaries as well as non-beneficiaries, use educational films for taking information.

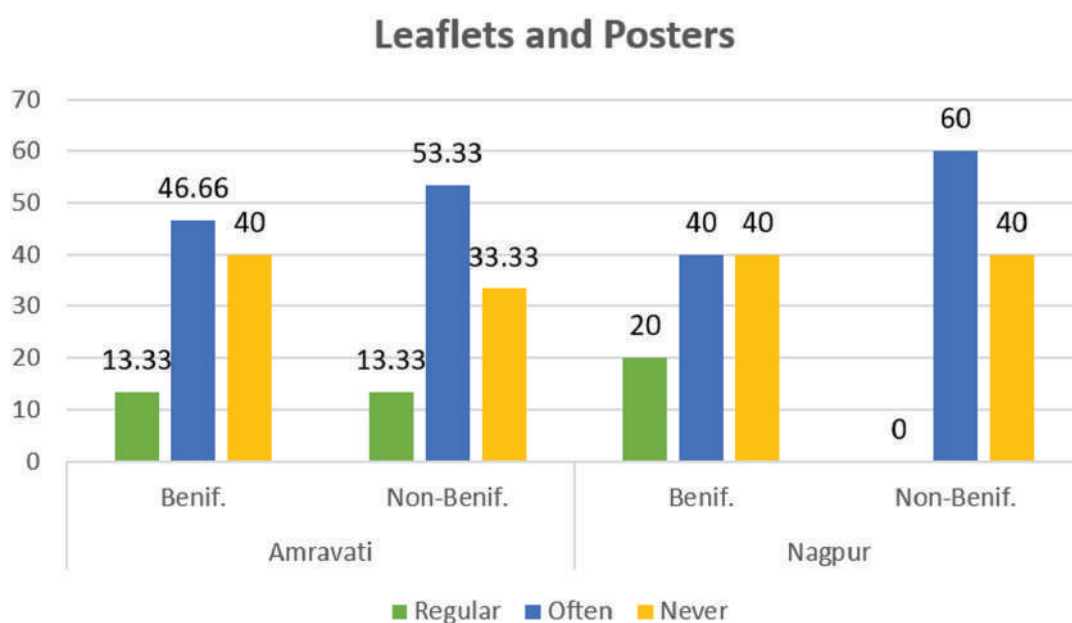


Figure 3.6 Involvement of selected district respondents in Leaflets and Posters as mass media extension.

Figure 3.6 shows that in Amravati district, maximum (46.66%) of the beneficiaries use leaflets and posters for taking information; while in case of non-beneficiaries, 53.33 per cent of the respondents use leaflets and posters often. In case of Nagpur district, only 20.00 per cent of the beneficiaries use leaflets and posters for taking information, while non-beneficiaries use 60.00 per cent leaflets and posters for taking information.

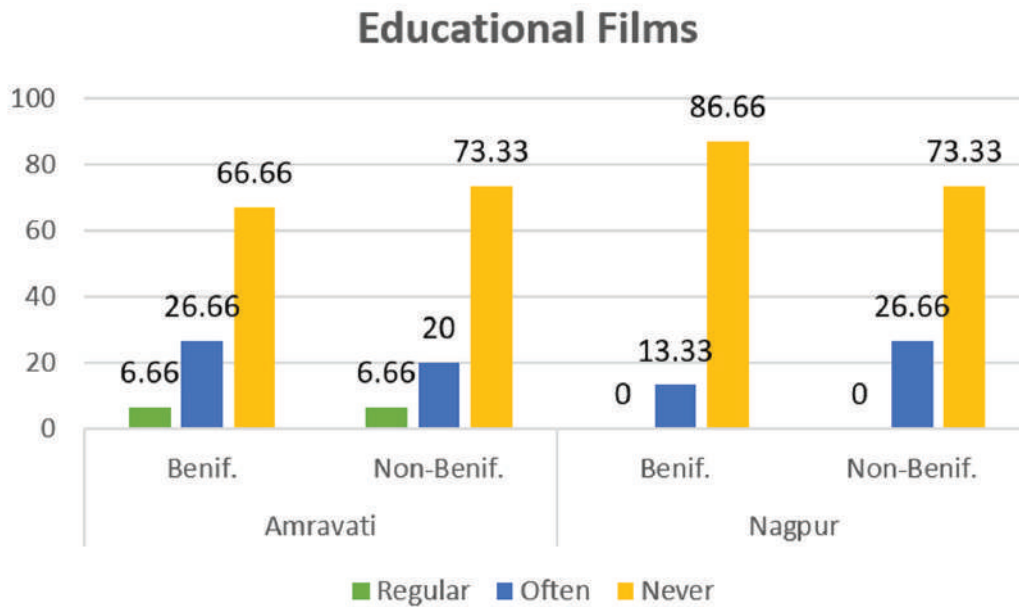


Figure 3.7 Advisory obtained from Vehicle Canvas Awareness Rally.

Figure 3.7 shows that in Amravati district 73.33% beneficiaries and 53.33% non-beneficiaries regularly obtain information from vehicle canvas awareness rally. However, in Nagpur district, 80% beneficiaries and 40% non-beneficiaries are regularly obtaining information from vehicle canvas awareness rally.

ICT based Extension

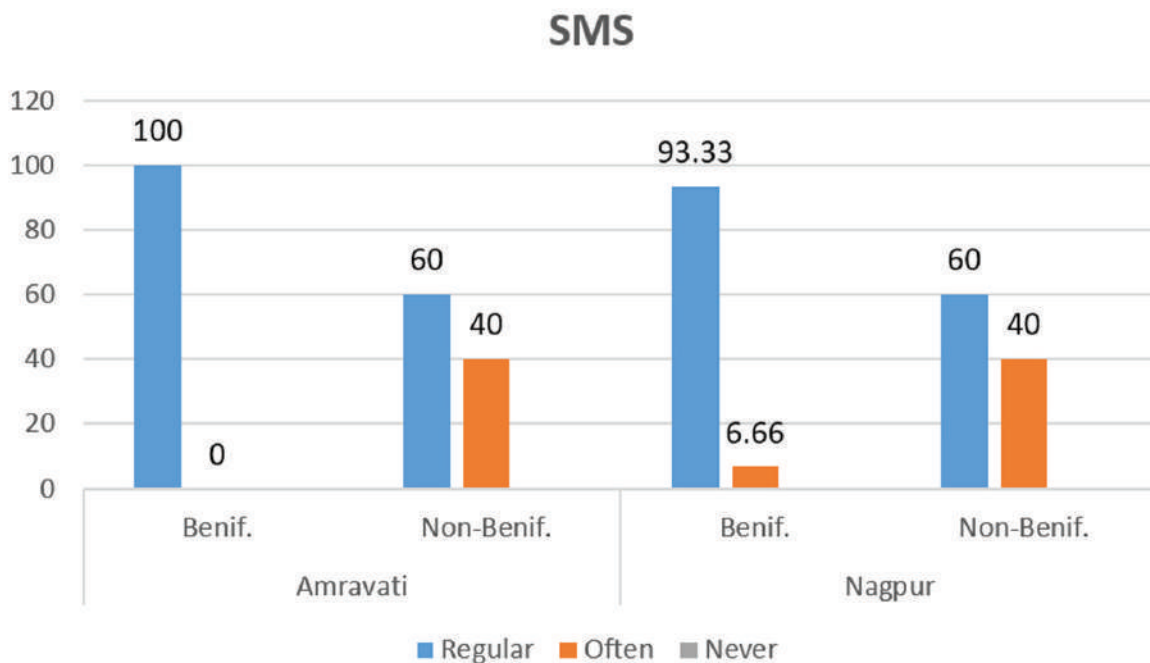


Figure 4.1 Engagement of selected district respondents in SMS as ICT extension.

Figure 4.1 shows that in Amravati district, cent per cent of the beneficiaries use SMS regularly for taking information, while in case of non-beneficiaries, 60.00 per cent of the respondents use SMS. In case of Nagpur district, more than ninety i.e., 93.33 per cent of the beneficiaries use SMS for obtaining information, while among the non-beneficiaries 60.00 per cent use SMS for mass media exposure.

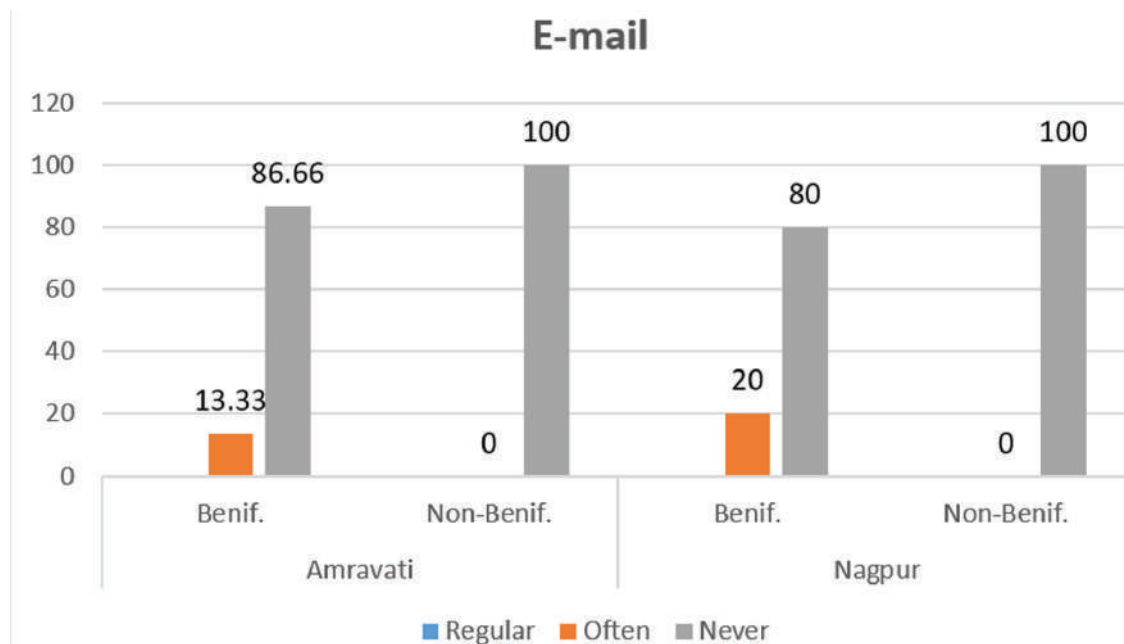


Figure 4.2 Engagement of selected district respondents in E-mail as ICT extension.

From figure 4.2, it is observed that in Amravati district, maximum (86.66%) of the beneficiaries are not using E-mail for taking information, while in case of non-beneficiaries, respondents are not at all using E-mail. In case of Nagpur district, maximum i.e., 80.00 per cent of the beneficiaries are not using E-mail for taking information while non-beneficiaries are not at all using E-mail for mass media exposure.

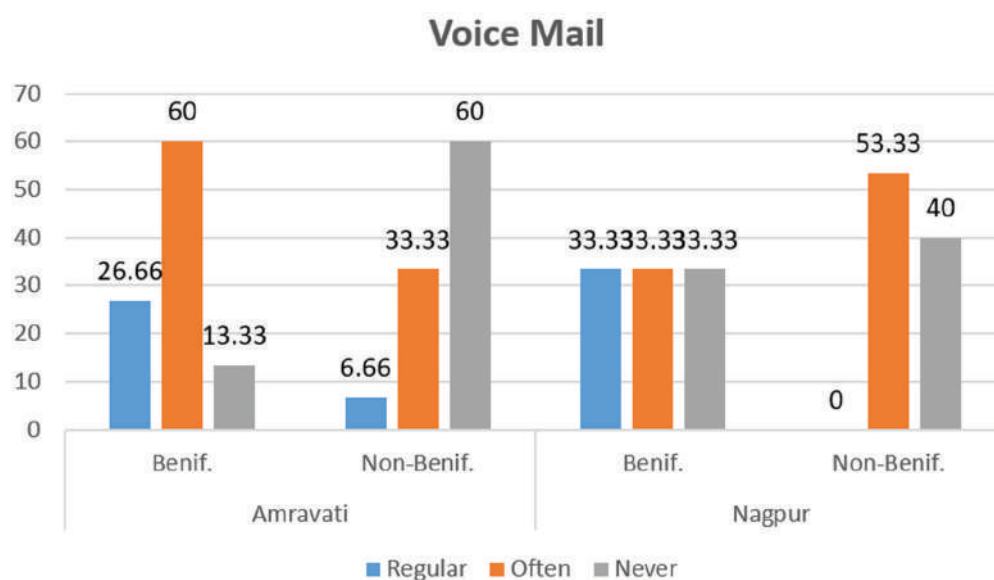


Figure 4.3 Engagement of selected district respondents in Voice mail as ICT extension.

Figure 4.3 shows that in Amravati district, more number (60.00%) of the beneficiaries use voice mail often for taking information, while in case of non-beneficiaries, maximum i.e., 60.00 per cent of the respondents are not at all using voice mail. In case of Nagpur district, only 33.33 per cent of the beneficiaries use voice mail regularly for taking information, while among non-beneficiaries more than fifty i.e., 53.33 per cent use voice mail for mass media exposure.

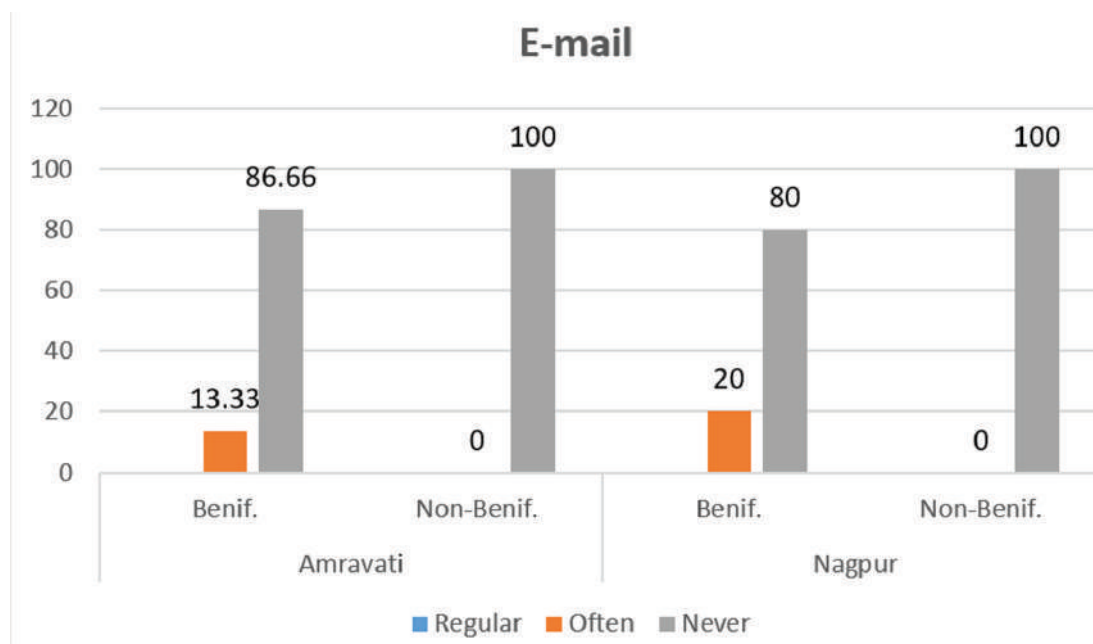


Figure 4.4 Engagement of selected district respondents in Kisan Call Centres as ICT extension.

Figure 4.4 observed that in Amravati district, maximum (86.66%) of the beneficiaries as well as non-beneficiaries are never using kisan call centres for taking information. In case of Nagpur district, cent per cent of the beneficiaries never use kisan call centres for taking information while non-beneficiaries using only 6.66 per cent kisan call centres often for mass media exposure.

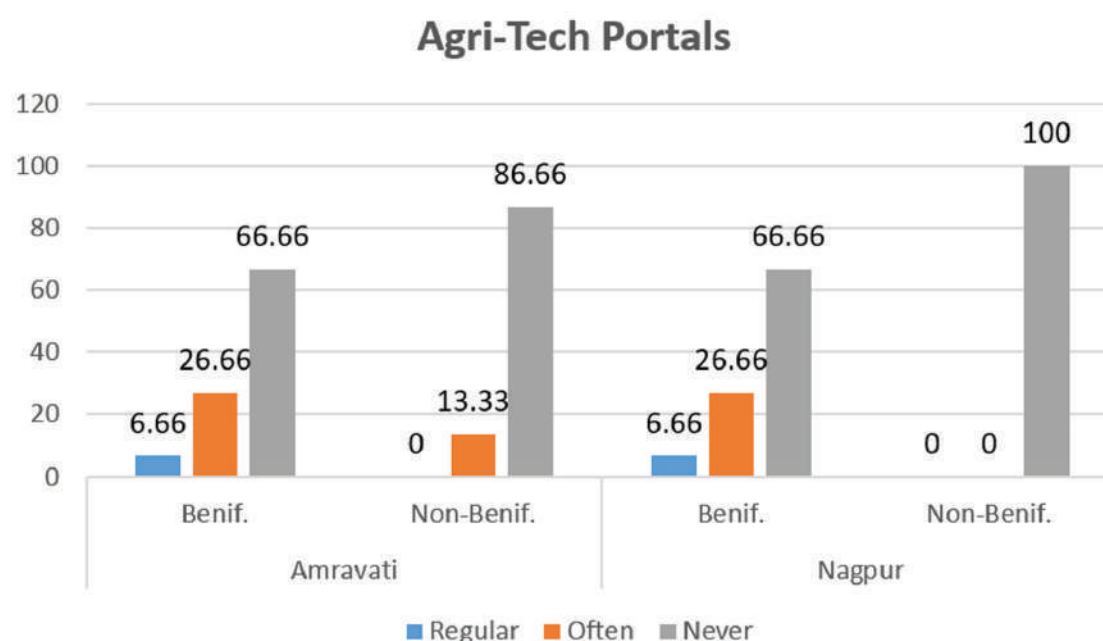


Figure 4.5 Engagement of selected district respondents in AgriTech portals as ICT extension.

Figure 4.5 shows that in Amravati district, only 6.66 per cent of the beneficiaries using agri tech portals regularly for taking information, while in case of non-beneficiaries, none of the respondents are using agri tech portals. In case of Nagpur district, 6.66 per cent of the beneficiaries use agri tech portals regularly for taking information while non-beneficiaries not at all using agri tech portals for taking information.

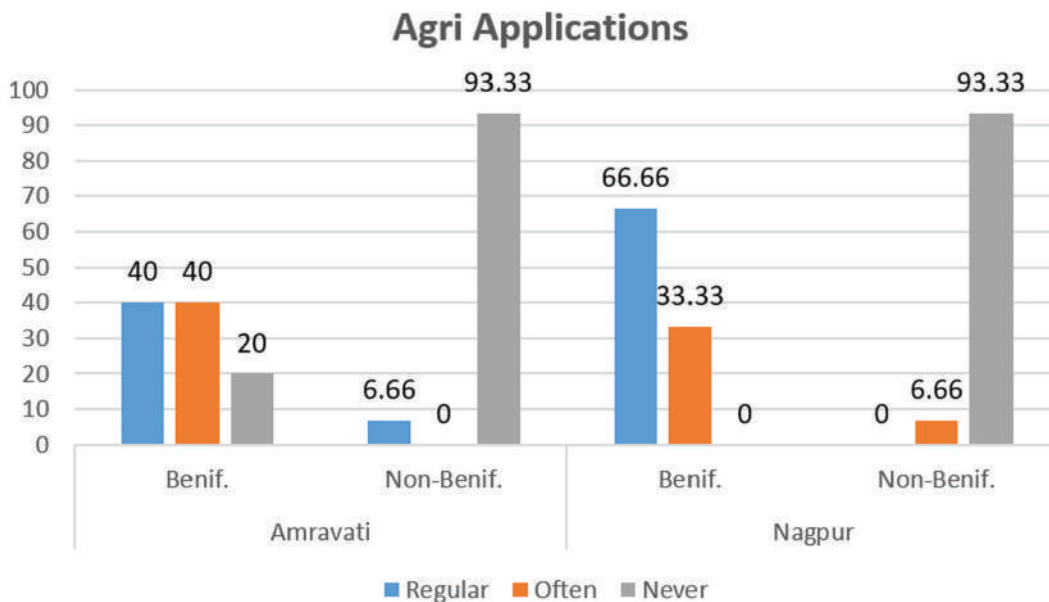


Figure 4.6 Engagement of selected district respondents in agro-applications as ICT extension.

Figure 4.6 depicts that in Amravati district, equal number (40.00%) of the beneficiaries using agri applications regularly, and often for taking information; while in case of non-beneficiaries only 6.66 per cent of the respondents are using agri applications. In case of Nagpur district, more than sixty i.e., 66.66 per cent of the beneficiaries use agri-applications for taking information, while non-beneficiaries are not at all using agri-applications for mass media exposure.

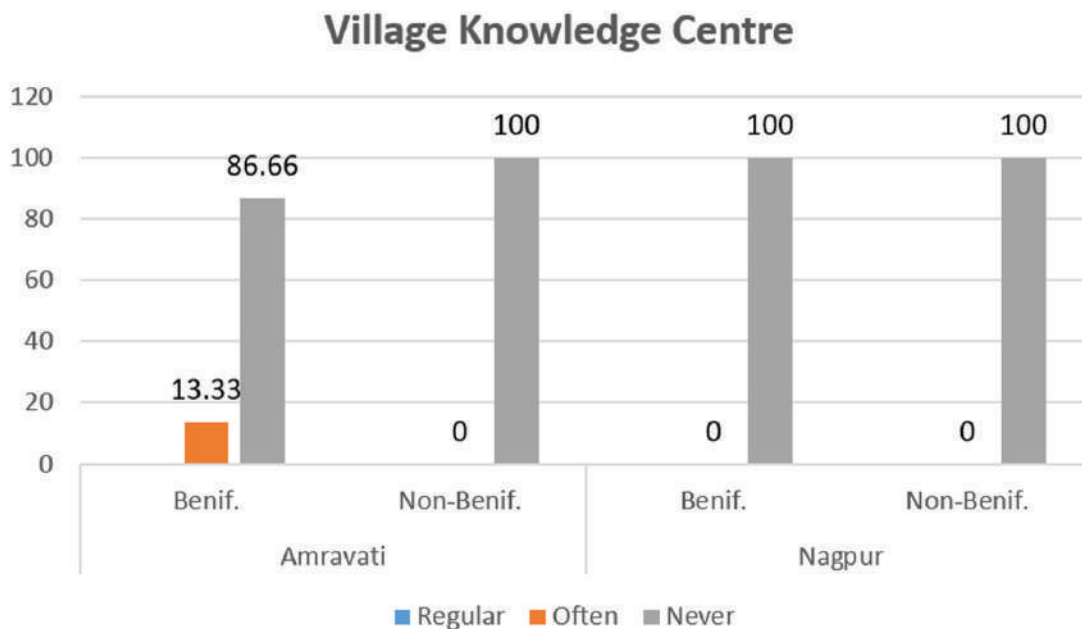


Figure 4.7 Engagement of selected district respondents in village knowledge centre as ICT extension.

Figure 4.7 shows that in Amravati district, a minimum number of the beneficiaries i.e., 13.33 using village knowledge centre often for taking information; while in case of non-beneficiaries, no one is using the village knowledge centre. In case of Nagpur district, nobody uses village knowledge centre for taking information.

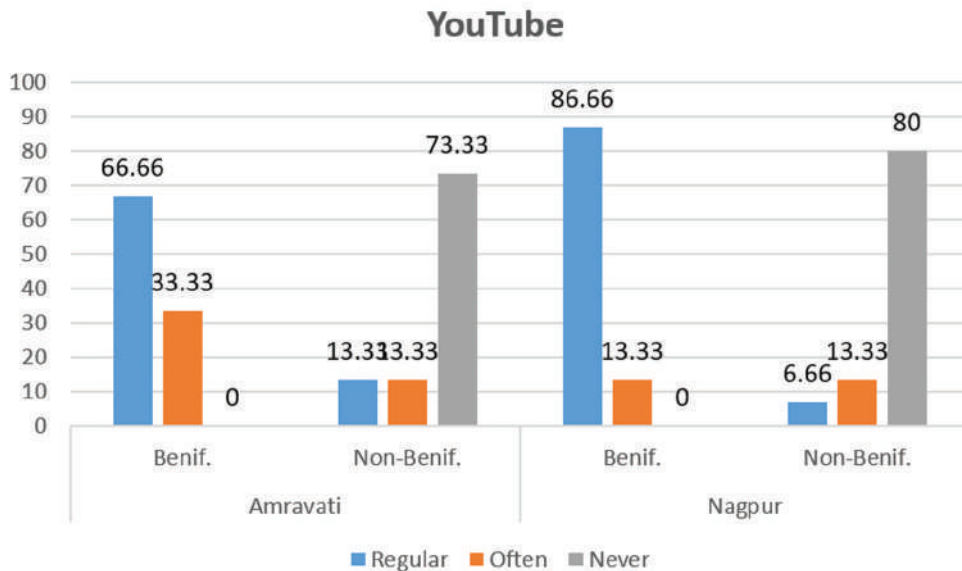


Figure 4.8 Engagement of selected district respondents in YouTube as Social Media extension.

Figure 4.8 elucidates that in Amravati district, maximum (66.66%) of the beneficiaries using YouTube regularly for taking information, while in case of non-beneficiaries only 13.33 per cent of the respondents are using YouTube. In case of Nagpur district, more than eighty i.e., 86.66 per cent of the beneficiaries use YouTube for taking information while non-beneficiaries use only 6.66 per cent YouTube for mass media exposure.

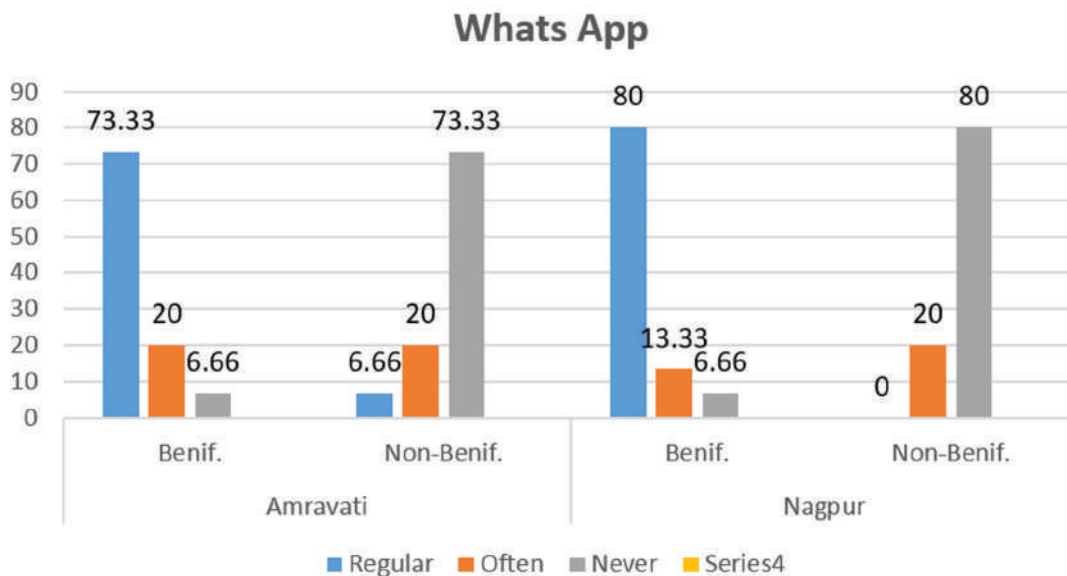


Figure 4.9 Engagement of selected district respondents in WhatsApp as Social Media extension.

Figure 4.9 shows that in Amravati district more than seventy (73.33%) of the beneficiaries use WhatsApp regularly for taking information, while in case of non-beneficiaries, only 6.66 per cent of the respondents use WhatsApp. In case of Nagpur district, 80.00 per cent of the beneficiaries use WhatsApp for taking information, while among non-beneficiaries only 20.00 per cent use WhatsApp often for mass media exposure.

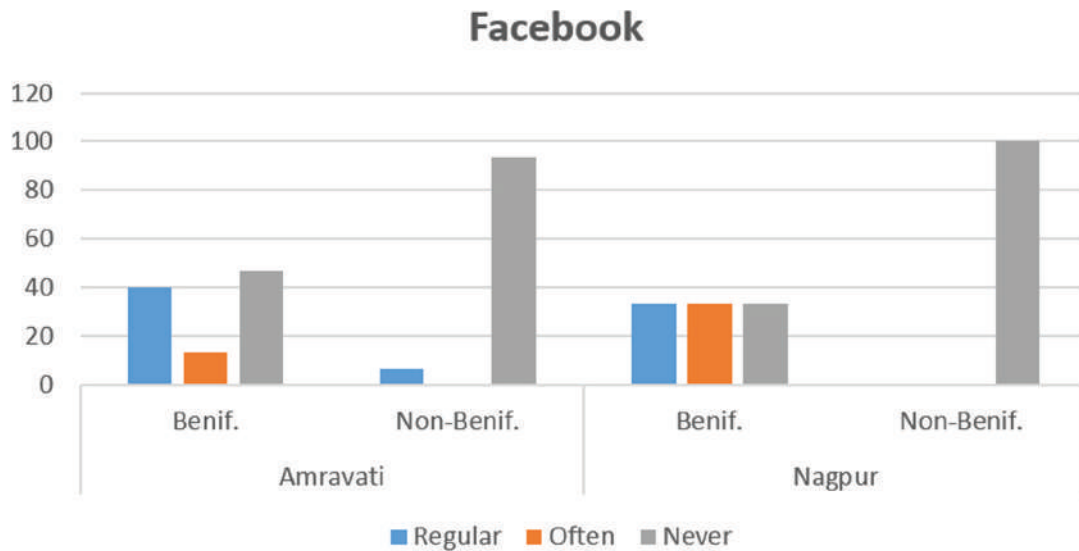


Figure 4.10 Engagement of selected district respondents in Facebook as Social Media extension.

Figure 4.10 shows that in Amravati district, maximum (80.00%) of the beneficiaries use television regularly for taking information, while in case of non-beneficiaries, 53.33 per cent of the respondents use television. In case of Nagpur district, more than fifty i.e., 60.00 per cent of the beneficiaries use television for taking information, while non beneficiaries use only 33.33 per cent television for mass media exposure.



Table 4: Good agriculture extension practices found in Amravati and Nagpur districts

Sr. No.	Good Extension Practices	Descriptions
1.	Farmers' Group Discussion with Scientist	Farmers from nearby villages come together in a group for a long duration discussion on how the scientist-farmer interface could be strengthened.
2.	Voice mail	Short voice messages on different crops updated information given to farmers mobile.
3.	News Paper (Agrown, Krishak-Kosh)	Latest technology and all the agricultural information countrywide, as well as, worldwide obtained by farmers in local language newspaper.
4	WhatsApp	Latest innovations & ideas in agriculture, as well as, problems of farmers are solved by experts, scientists, and progressive farmers instantly with the use of social media extension whats app.
5	SMS	SMS advisory service used by different public, private, as well as, public-private sectors to share the knowledge of agricultural farm practices.
6	Fortnight Scientific Diagnostic Surveys and Solutions	Fortnightly diagnostic surveys made by the agri Scientist to different farmers' field to find the problems and the solutions provided to them.
7	YouTube	It is the most valuable video based social media platform used by farmers which improves farmers' knowledge on farming.
8	Monthly Question and Answer session	A group of farmers' session arranged monthly where farmers from different villages solve each other's problems.
9	Experts and Scientist Talks	Agriculture Scientists and experts from different sectors are invited to share knowledge with farmers for their capacity development.
11	Television (aamchimaati-aamchi manse)	It is the visual mass advisory platform by which farmers come to know about different agricultural and farm-related information.
12	Discussion with progressive farmers	Progressive farmers or successive farmers playing an important role for rural development by sharing their personal farming experiences.
13	Weekly farmers' meeting (Kisan Goshti)	Weekly farmers meeting undertaken by the extension personal to give information on latest technology, Schemes, good practices with the help of power point presentation and educational videos. Also check crop status of farmers.
14	Vehicle canvass awareness rally	Information, Scheme or new updated agricultural knowledge, as well as, farming advisory given to farmers with the help of advertisement hoardings and posters mounted on a vehicle, and at the same time audio mic used for giving information by audio messages, and sometimes leaflets are also distributed to farmers.

Explanation: From the result and discussion, these are the good agricultural extension practices found in both the districts of Maharashtra.

Table 5: Major problems and thrust areas identified in selected districts

Taluka	Major Crops & Enterprises	Major Problems Identified	Identified Thrust Areas
1. Nagpur	Orange, Cotton, sugarcane, wheat, soya bean, pulses, mung, gram, Maize, linseed, paddy, tur, Papaya, tomato, Vegetables, Cattle, poultry, green chilly	<ul style="list-style-type: none"> • Plant diseases such as citrus canker have had a negative effect on citrus production and economics. • Non Availability of Orange saplings • Fluctuating market prices for cotton • Absence of modern technology in cultivation as well as ginning • Decreasing and stagnant yields with deteriorating quality and productivity of soil due to incessant use of pesticides and pests that are becoming increasingly resistant to chemical dosage. • Inadequate training to citrus growers • Unavailability of varieties • Rising cost of production of seeds, fertilizers, and labour, i.e. input costs is an issue. • Bollworm disease is uncontrollable decreases the quality of cotton. • Climate change shifts paddy farming to cotton farming. • Temperature change reduces the quality of orange. • Powdery mildew disease affects chilli plant leaves, typically in the flowering and fruiting stage. 	<ul style="list-style-type: none"> • Improving Productivity of cotton • Demonstration on improved varieties • Knowledge about improved agricultural technology • Integrated nutrient management • Mechanization • Introduction of high yielding variety • Livestock management • Integrated pest disease management • Mechanization varieties • Introduction of high yielding Crops • Livestock management • Increasing the productivity and quality of vegetable crop.
2. Amravati	Groundnut, Orange banana, tur, cotton, Papaya, wheat, soya bean, cattle's, goats, pulses, mung, gram, maize, tomato, soybean, vegetables,	<ul style="list-style-type: none"> • Low quality planting materials. • Water scarcity makes slow growth of plant. • Nutrient Deficiency in Groundnut. • Lack of interaction with the technology generators or researchers • Chilli plant leaf burn due to high temperature and water scarcity • Poor irrigation facilities, exposing production to monsoon fluctuations. • Weak extension support • Due to deterioration in genetic purity of cotton varieties and hybrid seeds it becomes difficult to assess the quality of cotton • Water management • Lack of soil nutrient management 	<ul style="list-style-type: none"> • Management and formation of groups • Nutritive requirements of dairy cattle for management • Varietal introduction • Integrated nutrient management

- Labour unavailability
- Lack of awareness in modern farming technology.
- Weed management and marketing of soybean
- Integrated Pest and Disease Management
- Value addition
- Improving the productivity and quality of orange.
- Resource conservation
- Feed and fodder technology
- Infestation of Stem borer
- Feed enrichment
- Nutritional Gardening

Table 6: Advisory Services in Nagpur and Amravati Districts

S. No.	Technology disseminated	Method / Good Practices	Accepted
1	Central Institute of Cotton Research (CICR), Nagpur (Public Sector) <ul style="list-style-type: none"> • Cotton production technology • Water management for rain fed cotton • Water management for irrigated cotton • Chemical Insecticides and their doses recommendation • Biological Agents Recommended • Botanicals Recommended • Sustainable pest management • Soil Analysis • Weather Data • Simulation models/ sensor-based gadgets for cotton • Protection and production • Pest Scouting gadgets • Intercropping in cotton • Integrated Cotton Management 	<ol style="list-style-type: none"> 1. Training 2. KisanGoshties (Discussion) 3. Cotton Fair 4. Vigilance Awareness week 5. Children's Education 6. Farmers' Group Discussion with cotton Scientist 7. e-Communication 8. Field crop Demonstration on Farmers' field 9. Need based weekly mobile advisory 10. Cotton Literature to farmers 11. Soil health card 12. Front Line Demonstration 13. Lectures on farmers field 14. CICR Cotton app 15. Voice mails 16. SMS 17. Kisanmelas 18. Cotton Museum 19. Television 	17

2	KVK Nagpur (Public Sector)	<ul style="list-style-type: none"> • Soil Testing • Weather Forecasting • Citrus production technology • Paste application • Nutrient application • Cultivation of crops and flowers • Disease Management • Nutrition Management • Supplementation of mineral lick block • Feed and camp • Fodder Management • Recycling of agro waste • Fruits and Vegetable processing • Lab Soil Testing • On the spot Soil Testing • Pink bollworm Management 	<ol style="list-style-type: none"> 1. On farm trail 2. On Campus and off campus Trainings 3. Cluster Frontline Demonstration 4. Frontline Demonstration 5. Diagnostic Surveys 6. Awareness campaigns 7. Kapas Mela 8. Special Day Celebration 9. Kisan Goshti 10. Telephonic Calls 11. SMS advisory 12. Exhibitions 13. Radio Talks in Local Language 	27
3.	Central Citrus Research Institute, (CCRI), Nagpur. (Public Sector)	<ul style="list-style-type: none"> • Weather Forecasting • Mulching advisory • Soil and Water management in Citrus • Grass/straw or plastic mulching • Bed preparations • Management of Mrig crop (Monsoon blossom) flowering and fruiting • Management of Ambia crop (Spring blossom) of citrus fruits • Plant protection • WEED MANAGEMENT IN CITRUS ORCHARDS • Intercropping in Citrus Orchards • Integrated management of Citrus nematode • Insect Pests Management • On-farm Rain water harvesting • Soil moisture conservation 	<ol style="list-style-type: none"> 1. Training Programs 2. One day awareness creation 3. Group Discussion 4. Field Tours 5. Radio Talks 6. Agrowon News Papers information posts 7. Agri Magazines 8. Orange Festival 9. On farm Trails 10. On Campus demonstration 11. Citrus app 12. Leaflets 13. SMS 14. Citrus Helpline 15. Seminars 16. World Orange Festival and Award function to motivate farmers 	14

		<ul style="list-style-type: none"> • Quality fruit production through scientific method of management • Rejuvenation of declining citrus orchards • Importance and Overview of citrus Industries • Soil Solarization and fumigation techniques 		
4.	KVK Durgapur, Amravati (Public Sector)	<ul style="list-style-type: none"> • Integrated Nutrient Management in Orange • Varietal Evaluation • Management of Pink Bollworm of Bt Cotton • Management of Pod Borer complex in Pigeon Pea • Management of Stem Fly and girdle beetle in Soybean • Management of Pod Borer complex in Chickpea • Value Addition and Processing practices • Krishi Vigyanmanch • New tech and Equipment's • Krishidoot training • Capacity Development of farmers • Soil Analysis • Plant Health Analysis • Women empowerment • Bio pesticide production • Marketing Techniques • Nursery Management • AC&ABC Training • Livestock farming • Irrigation Scheduling and Management 	<ol style="list-style-type: none"> 1. Hello kastakar 2. Field Day 3. Exhibition 4. Workshops 5. Exposure Visit 6. Pre-monsoon and post-Monsoon KrishiMela 7. Krishi Din 8. Shivar pheri (a field trip) 9. Women Empowerment workshops 10. Voice Message service 11. Training and Visit system 12. Sadhna Radio 13. Mahilashetkari Medawa 14. Plant health clinic 15. T.V. 16. Field Days 17. Ex-trainees Sammelan 18. Classroom Lectures 19. PPT presentation 20. Question Answer session 	42

5	KVK Ghatkhed Amravati (Public Sector)	<ul style="list-style-type: none"> • Integrated crop management • IPM • Farm Tech Equipment • Motivation and capacity building • Varietal Evaluation • Seed / Plant production • Weed Management • Integrated Nutrient Management • Integrated Farming System • Mushroom cultivation • Drudgery reduction • Farm machineries • Value-addition • Integrated Pest Management • Integrated Disease Management • Resource conservation technology • Small Scale income-generating enterprises 	<ol style="list-style-type: none"> 1. Varietal Demonstration 2. On Campus and off campus Trainings 3. On farm soil testing 4. Field Days 5. Frontline Demonstration 6. Exposure Visits 7. SMS advisory 8. Kissan Medawa 9. Leaflets 10. Radio Talks 11. Farmers' group 12. On Farm Trial 13. Scientists' visit to farmers field 14. News Paper Coverage 15. Plant/Animal Health Camp 16. Kisan Mela 17. Method demonstration 18. Special day celebration 	13
6	Agro vision Foundation (Private Sector)	<ul style="list-style-type: none"> • Agribusiness • Terrace gardening • Farmers Encouragement • Women Empowerment • Irradiation Technology • Dairy Management • Multi Crop Farming • Bamboo Cultivation and Opportunities • Irrigation Technologies and Methods • Bio-Technology • Micro-Irrigation • Shade net • Cold Storage • Earthmover • Tractors • Power Tiller • Automatic Equipment, Solar Equipment • Growth Regulators • Pink Bollworm Control Programme 	<ol style="list-style-type: none"> 1. Conferences 2. Workshops 3. Trainings 4. Agrovision Agriculture Exhibition 5. Newspapers 6. Jingle 7. Radio talks 8. Farmers Agri Tours 9. Group Discussion 10. Vehicle rally 11. Advertisement boards 12. Leaflets 13. Meetings 14. SMSs 15. Press note 16. National Expo 17. Guidance from experts 18. Audio/Video Presentation 19. Distribution of printed Materials 	

			20. Live demonstrations	
			21. Answer and Question session	
7	Sahayadri Foundation (Private Sector)	<ul style="list-style-type: none"> • Revised National Tuberculosis Control Programme (RNTCP) • Strengthening HIV-TB Co-ordination • HIV/AIDS, TB & Cancer Detection and Awareness Programmes • Starts HIV/AIDS Awareness Drive & Control Programme • Life Skill Education Programme • Free Cancer Detection Camp • Farmers health Education and Training Program • Yoga and Meditation for Farmers • Women's personal health check-up and Training 	<ol style="list-style-type: none"> 1. SMS 2. Lectures 3. Short sessions with Doctors 4. Meetings 5. PPT presentation 6. Leaflets 7. Magazines 8. Street Play 9. Movie Shows 10. Children's Movie Screenings 	21

Conclusion and Recommendations

The large farms seem to be best served by producer groups and the private sector through a coordinated, collaborative approach. Medium-sized farms appear to work best when government, producer organizations, and the private sector cooperate. Small farms largely depend upon government and NGO services, including KVKs, universities and volunteer programmes such as farmer-to-farmer extension.

Extension personnel have a reservoir of knowledge and information on rural development because they already developed a habit of working in close contact with local traditional leadership to solve community problems to develop and conduct educational programmes to meet the local demands. The present study found that extension systems in agriculture and allied sector needs to be motivated and strengthened in selected districts of Maharashtra state for agricultural development. As an agrarian economy, capacity development of the extension personnel is required to help the farmers in a better way. Convergence between line departments is required to provide a platform for technology dissemination and sharing of good practices that occur within sectors but are not being replicated as they are not getting highlighted. Progress of the states has become important in the recent past and considering their dependency on agriculture, extension is going to be the driving force behind this transformation.

Based on the findings of the study, one can conclude that definitely extension has an important role to play in rural development. However, the recommendations are wide-ranging, and there is a need to accelerate the extension study to establish the depth of the impact of extension practices in terms of, for example, doubling farmers' income, advance technological information, and awareness on sustainable agriculture for making a positive perception among the farming community.

The following recommendations, given by farmers and researchers themselves, are as follows:

- **Improvement in traditional extension Methods**

From the results and discussion, the researcher found that some traditional extension methods for example Radio, Kisan call centers, and farmers' field school are currently not working efficiently as more than 50% of the respondents are not using the extension sources. So, these should be improved or altered by some good extension methods.

- **Training of extension worker for skill up-gradation in extension worker in the field of agricultural marketing.**

Apart from the improvement in traditional extension methods, strong network of marketing extension is greatly needed at District/block/Village level to effectively advise farmers on various aspects of marketing. Advice is also required on product planning, marketing information, securing market for farmers, advice on upgraded market practices and advice on post-harvest management practices. Marketing Extension Linkage is essential to be formed by integrating the extension network already available with Agriculture Department. Officers

of Agriculture, Horticulture and Agricultural Marketing departments should be given training on various aspects of Agricultural Marketing for the purpose of carrying out extension work effectively and efficiently. This will help in minimizing the post-harvest losses to a significant extent.

- **Enhancement in farmers' communication skills**

Enhancing the interactive and communication skills of the farmers to exchange their opinions with customers and other market services (middlemen) for getting response and gain the bargaining during direct marketing is required.

- **Implementation of Social media platform for extension**

Social media provides a new tool to extension professional for sharing different knowledgeable information, and to be a part of discussion and conversations on extension. It also helps them to be aware of the current improvements in the agriculture sector and stay updated. Also, they can reach to more and more farmers with the help of platforms like WhatsApp, Facebook and YouTube.



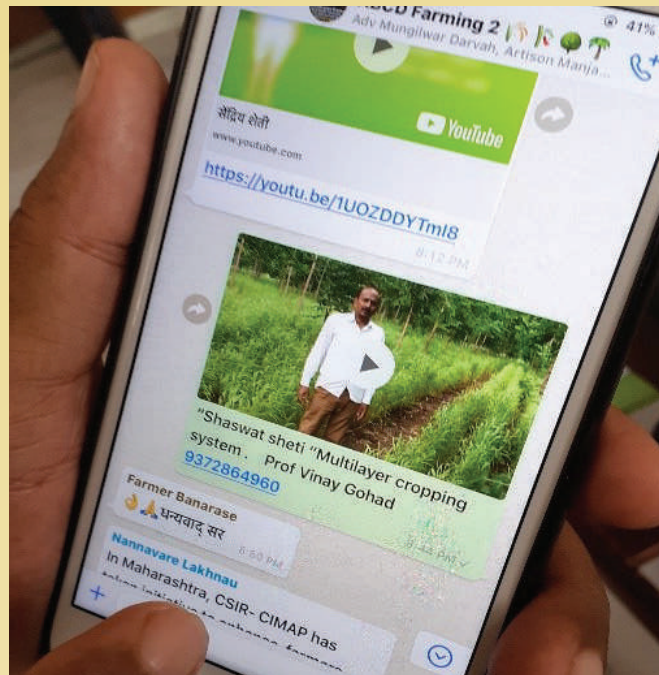
Nursery rising for all type of plant sapling and marketing

Taj Nursery is a one-stop for all types of vegetable, fruits and flowers sapling sold primarily to farmers. Besides ornamental landscaping, Nature Park, avenue hedge, lawn making are the major activities for urban agriculture development. Mr. Hussain is also arranging demonstration and training programmes for the workers, housewives in urban agriculture. The topics included seed management, soil nutrients, organic farming, nursery, vegetable nursery, vertical gardening, water and compost management, etc. Mr. Attar Hussain (35) is a resident of Kalmehwar, Nagpur. As he belongs to a joint family, pressure for earning money at an early age made him discontinue his formal education. During this period, he came to know about the 3-day nursery plant-management training programme from an agriculture officer in KVK Nagpur. After taking the training from KVK, he invested his 11 Acre family farm into the nursery raising. In his free time he discusses about the new technologies with agriculture officers, collects information from the internet about the new varieties of plant saplings and seeds, and also visits different states every year in search of new varieties of seeds, soil, etc. At present, Mr. Hussain owns 6 (six) new nurseries that generate an income of 1 lakh per month, and also gives employment to 20 of his family members and relatives including 8 women.



ICT- Video advisory services to motivate farmers for multilayer cropping system

60 year old Mr. Vinay Gohad is a successful farmer who lives in Amravati district of Maharashtra State. After completing his M.Sc. in Agriculture, Vinay started doing traditional farming like other farmers in the village. But even after doing a lot of hardwork in the farm, he did not benefit much in the post-harvest period. Once he came to know about a one-day seminar organised by the Central Institute of Medicinal and Aromatic Plants at Agriculture College in Amravati. He attended that seminar and learnt different cropping systems. Primarily, he experimented new varieties of medicinal and aromatic plants in some half-acre of his farm land to check the result, and found it to be very fruitful. In 2016, he skipped traditional farming and started doing medicinal and aromatic plant farming in his entire 21 Acre farm. In his free time he searched for new farming technology and modern agriculture related videos in Youtube. The motivation from youtube videos took him to different farmers' fields across the country. He found that the information that he acquired from different farmers was very beneficial for all the farmers of his region. Hence, he made whats app groups and also a Youtube channel to provide advisory on different multilayer agriculture cropping system.



Educating farmers and children for HIV and Cancer

Sahyadri Foundation (NGO) was established in Nagpur in 2002 by a group of professionals who shared a common dream and had come jointly to work on a people for the improvement in areas such as health, education for economically poor rural children, livelihood, community development and social and farmers welfare. Illiteracy and lack of resources make a direct impact on rural health and agriculture as the farmers lag in the area of technology, which in turn results in low productivity from rural side of the country.



Foundation is currently focusing on diseases like HIV and Cancers within children's as well as in farmers of Vidharbha region. NGO also working constantly to develop rural areas in nearby the blocks of Nagpur and currently heading 5 projects which aims at improving rural people's livelihoods in an equitable and sustainable manner, both socially and environmentally, through better access to assets (natural, physical, human, technological), and services that enable them to improve their livelihoods on a sustainable and equitable basis. The basic objectives of Rural Development Programmes have been an alleviation of poverty and unemployment by helping them to create basic social and economic infrastructure.



Broiler Poultry farming

Name and Age	Address	Employment	Annual turnover	Dealers Covered
Ritesh Kale 35	Vill-Patan sawangi, Tal-Saoner, Dis- Nagpur Maharashtra 9767225027	1 person	Rs. 4.2 Lakh	10

Mr. Ritesh Kale, 35, is basically from an agriculture family. Earlier Mr. Ritesh Kale was into cotton farming as his father used to do the same. Due to the low productivity of his father from cotton farming, he went to search for a job in poultry farm 40 km far from his village. During his job, he learned all the skills of poultry farming, as well as, marketing skills. After coming home, he prepared detailed poultry project report of Rs. 3 Lakh and got a sanction from Union Bank Saoner NABARD also provided 36 % subsidy. Mr. Nitesh registered MK poultry and constructed a poultry shed on a 3000 sq. ft. area. He purchased 3000 chicks from an Indian Broiler Company, and also regular supply of chick, feed, medicine facilities given by Indian Broiler. Marketing is the tough work after the production of the birds. Earlier, Mr. Ritesh used to take his bike to visit the city area for marketing his birds. Now, he has more than 10 dealers to whom he supplied his birds. He takes online orders from dealers through Whatsapp. Mr. Ritesh is taking 6 batches of poultry per year. He also gives advice to his close farmer friends and youths of his village.



Cultivation, seed production and Marketing of Vegetable and Cotton

Name and Age	Address	Employment	Annual turnover	Dealers Covered
Shravan Sadhu Gorle 44	Vill-Gunthoda, Tal-Saoner, Dis- Nagpur Maharashtra. 9536383738	100+ persons (50 men + 50 women)	Rs. 25 Lakh	250 farmers from 14 villages

Mr. Shravan lives in Urban Nagpur but every day he manages his farm which is 50 km away from his residence. Mr. Shravan initially has a 20 Acre farm in which he grows a variety of crops. Once Krishi Adikari visited his farm and asked him to join a 4-day programme in cotton production and seed processing. After joining the training programme, Mr. Shravan started growing cotton in his whole farm instead of earlier crops like soybean, pigeon pea, maize, etc. In the first phase, he harvested the cotton, processed the seeds, and sold the cotton separately to the nearby textile mill. The processed seeds sealed by him were sold to the nearby farmers. In the following year, farmers saw that the quality of the cotton is very rich. So farmers demanded more seeds for their next crop. After a few years Mr. Shravan started packaging of cotton seeds and sold them to the local agencies. Currently, he owns a farm that measured more than 20-acres dedicated solely to cotton seed processing. He currently supplies his cotton seeds to more than 15 villages and 400 farmers.



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