

IMPROVING CLIMATE RESILIENT AGRICULTURE THROUGH FARMERS FEEDBACK INTO e-AGROMET ADVISORIES, MAHARASHTRA



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Abbreviation

AAS	:	Agro Advisory Services
app	:	Application
CRA	:	Climate Resilient Agriculture
DSES	:	District Socio Economic Survey
FFS	:	Farmers Field School
FYM	:	Farmyard Manure
GoI	:	Government of India
GoM	:	Government of Maharashtra
IMD	:	India Meteorological Department
IPCC	:	Intergovernmental Panel on Climate Change
mha	:	Million hectares
NUE	:	Nutrient Use Efficiency
NGOs	:	Non-Governmental Organizations
ODK	:	Open Data Kit
UN	:	United Nations
UNFCCC	:	United Nations Framework Convention on Climate Change
W-CReS	:	WOTR Centre for Resilience Studies
WOTR	:	Watershed Organisation Trust

Executive Summary

It has been documented with a fair degree of accuracy that climate is changing and rise in temperature will be posing various challenges all across the world. Indian region is likely to bear the worst of warming planet due to its tropical location. Agriculture and food production are likely to be significantly affected by climate change. In addition to this, climatic variability leading to extreme events like drought, flood, occurrence heavy rainfall, etc. is increasing during the last one and half decades. Thus, both climate change and climate variability are causing concern on the agriculture and ultimately agro eco-system in different parts of the country. Besides, in India, much of the soil degradation in the cultivable land is caused by faulty agricultural methods, inappropriate land management practices, excess use of chemical fertilizers and pesticides, and injudicious use of irrigation. India's total consumption of chemical fertilizers has been increased by manifold in past few decades and many studies have reported that the extensive use of chemical fertilizers and irrigation leads to soil degradation. Also, in total chemical pesticides consumption, India is 3rd in Asia after China and Turkey and, the uncontrolled and haphazard pesticide usage is responsible for the presence of high pesticide residues in both natural and physical environment. Given the multidimensional impacts of climate change and climate variability, and faulty agricultural practices, there exist considerable knowledge gaps in understanding climate vulnerability, sustainable agriculture practices, socio-economic impacts, and suitable ways to build resilience. Evidently, there is a need for a transition of current agricultural systems into highly resource-use efficient systems that are profitable, but at the same time ecologically safe and socially acceptable that cover the nature-based solutions derived from locally available natural inputs which will help to revive the agro-ecosystem, rebuild the resilient to changing climate and achieve sustainable agricultural production. Agro advisories are one of the best and effective means to decimate and build capacities of farmers in this regard.

The India Meteorological Department (IMD), Ministry of Earth Sciences is providing district level Agromet Advisory Services (AAS) in the country. However, at times, these district level crop weather advisories became redundant in changing climate and diverse crop and geographical situations. On the other hand, farmers need a dynamic decision support system that is tailored to their specific farms and provides them weather-responsive advisories across key aspects of agricultural operations. In this regard, Watershed Organisation Trust (WOTR) has developed "FarmPrecise"- an android based mobile application available on "Google Play Store" that provides crop-specific weather based information on up-to-date farming techniques, fertilizer and nutrient management, integrated pest, and disease management, irrigation water management, and market prices of different crops in nearby markets.

The farmer's feedback as shown that this mobile application is a boon for profitable farming. However, WOTR is working tirelessly on how the "FarmPrecise" mobile application can help to accelerate agricultural development and alleviate the technological and knowledge gap of farmers. In this view, to assess the appropriateness and ground feedback on agromet advisories, there is a need to study the status of the adaptation of agromet advisories, their usefulness, improvements needed in agromet advisories, and any modification required in the design of the FarmPrecise app. Therefore the current study was aimed for improving climate-resilient agriculture through farmer feedback into e-agromet advisories provided through FarmPrecise app.

Both qualitative and quantitative data for Kharif and Rabi season of the year 2020-21 was collected from selected 68 villages of 08 blocks of 04 districts of Maharashtra state. The farmers feedback on 11 major crops cultivated in the region were assessed in the present study.

The study revealed that the FarmPrecise mobile App is effective way to disseminate agromet advisories and build resilience to climate change. The crop weather advisories helped farmers to increase their knowledge about climate resilient agricultural practices including modern technologies and eco-friendly nature-based solutions. They are able to reduce the input cost and increase the net profit for the paddy crop. However, the community level capacity building is required to increase the adaptability of appropriate nature-friendly solutions and dissemination with small videos on the good practices will greatly benefit the users of FarmPrecise. Also village/community level hands-on trainings of how to use the mobile app will be helpful to farmers, and communicating the messages in colloquial language will have a greater uptake. If the mobile app can be operated in low network connectivity as well as in offline mode with a simple user interface, it will benefit many users. To enable farmers to adopt climate-resilient agriculture technologies, the very important step required is to make them aware of future risks of climate change, it will help them prepare their mind-set to deal with climate change and respond in adverse situations. Ultimately uptake of the FarmPrecise mobile application will improve.

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We are specifically thankful that the study team had extensive discussions on the Generating Knowledge to Build Drought Resilient in a Climate Change and also the modalities of the study on 'Improving climate-resilient agriculture through farmer feedback into e-agromet advisories'. We thank them all for their cooperation and assistance.

We received very useful and valuable support from both Agriculture and Social team of the WOTR Centre for Resilience Studies (W-CReS) for the preparation of questionnaires and online data collection tools. We extend our thanks to them.

We are grateful to the team of field staff numbering about forty-five male/female investigators eight field supervisors who had worked tirelessly for more than 3-4 months in the field under odd conditions but not compromising on the quality of data.

Last but not least, the research team is grateful to the respondents to our questionnaire, participants in the discussion and in the whole process of data collection, who had patiently spent more than two hours per season of their time with our investigators and responded to the questions on various aspects of the study with all sincerity.

Study Team,

W-CReS and WOTR

1. Introduction

The United Nations (UN) estimates that during the period 1998-2017, climate-induced extreme events (droughts, floods, cyclones) caused India an estimated loss of nearly \$80 billion, and the costs are expected to increase (Pascaline and Rowena, 2019). In India, around 36 million hectares (mha) agricultural area was affected due to hydro-meteorological calamities, including heavy rain and floods since 2016- 6.65 mha in 2016, 5.08 mha in 2017, 1.70 mha in 2018, 11.42 mha in 2019, 6.65 mha in 2020 and 5.04 mha in 2021 (downtoearth news, 2021). A [report released by the Intergovernmental Panel on Climate Change \(IPCC\)](#) in 2014, India will suffer more frequent and intense heatwaves, extreme rainfall events, and erratic monsoons, as well as more cyclonic activity, among other weather-related calamities, in the coming decades (Braun, 2021). Additionally, India is facing a double challenge of sustaining food security and rapid economic growth while combating the threat of climate change especially regarding its impacts on land, water, and agriculture which provide sustenance and livelihoods for nearly 60% of Indians, most of whom live in rainfed, dryland semi-arid regions (Gupta and Pathak, 2016). It has been documented with a fair degree of accuracy that overall climate is changing particularly in respect of temperature over the Indian region and India is among the countries which are likely to bear the worst of a warming planet due to its tropical location. Agriculture and food production are likely to be significantly affected by climate change (Chattopadhyay and Chandras, 2018). Besides, climatic variability leading to extreme events like drought, flood, occurrence heavy rainfall, etc. is increasing during the last one and half decades (Chattopadhyay and Rathore, 2013). Thus, both climate change and climate variability are causing concern on the agriculture and ultimately eco-system in different parts of the country (Gupta and Pathak, 2016; Rathore et al., 2013). Given the multidimensional impacts of climate change and climate variability, there exist considerable knowledge gaps in understanding climate vulnerability, socio-economic impacts, and suitable ways to build resilience (Joern Birkmann et al., 2012). This view is strongly underscored by both the IPCC and India's Second National Communication to United Nations Framework Convention on Climate Change (UNFCCC) which recommended integrated research on operational strategies and approaches for adaptation of region and sector specific policy interventions that build resilience and adaptive capacities of communities (Raghunandan, 2020).

In India and across the world, one of the major challenges faced in the recent decade is anomalous weather which drastically affects agricultural production at the local level. Under increasing climate threats, it is becoming increasingly important for farmers to proactively manage the weather and climate risks to agriculture to protect their livelihoods (Chaubey et al., 2018). Therefore farmers, especially smallholder farmers, need advance decision support system which facilitates them to take appropriate actions under emergent weather conditions at a local level (Lobo et al., 2017). To address this issue and others, the India Meteorological Department (IMD), Ministry of Earth Sciences is providing district level Agromet Advisory Services (AAS) in the country. Crop weather advisories are helpful to farmers to get information of weather and crop specific management practices in a given weather condition. Agro-meteorological service rendered by India Meteorological Department is a step to contribute to weather information-based crop/ livestock management strategies and operations dedicated to sustainably enhancing crop production (Chattopadhyay and Chandras, 2018; Chaubey et al., 2018). However, at times, these district

level crop weather advisories became redundant in changing climate and diverse crop and geographical situations.

Additionally, with the advent of green revolution, Indian farming has become more and more dependent on external inputs, most of those are synthetic and chemical products. Excessive use of synthetic fertilizers and agro-chemicals for plant nutrition and protection measures not only increasing the cost of cultivation but also degrading the natural resource base of soil and water. There is an urgent need to provide appropriate eco-friendly, non-chemical and integrated options for crop cultivation which will help farmers to reduce their input cost, maintain the production levels and reduce the environmental damages caused by conventional agricultural practices. The eco-friendly measures cover the nature-based solutions derived from locally available natural inputs which will help to revive the agro-ecosystem, rebuild the resilient to changing climate and achieve sustainable agricultural production. Agro advisories are one of the best and effective means to decimate and build capacities of farmers in this regard.

In India, most of the smallholder farmers are often have limited access to the technologies and resources. Therefore there is a great need to convert the climate information into actionable information for farmers by linking the climatic information with the available technologies and best farming practices (Kenneth, 2021). Effective climate information and advisory services have great potential to facilitate farmers' in their decision-making process, improve management of climate-related agricultural risk, and help farmers adapt to change. However, many challenges confront efforts to use climate-related information to improve the lives of smallholder farmers (Philip and Lindsay. 2021).

In this view, farmers need a dynamic decision support system that is tailored to their specific farms and provides them weather-responsive advisories across key aspects of agricultural operations. This will help them mitigate weather-induced risks, reduce losses and costs of production, increase productivity and improve incomes (Lobo, 2017).

A mobile or smartphone application (app) is one such platform through which farmers can avail all such information. Smartphones have revolutionized connectivity and mobile apps are being used to transfer agricultural information to farmers (Barh and Balakrishnan, 2018). According to global statistics, India is the third-largest user of smartphones after China and the United States (EMarketer, 2016). Mobile telecommunication systems are increasingly cost-effective and an efficient way of delivering weather-based agro-advisories to farmers at a large scale (Lobo et al., 2017). In this regard, Watershed Organisation Trust (WOTR) has developed "FarmPrecise"- an android based mobile application that provides crop-specific information on up-to-date farming techniques and methods used, real-time weather data, 5-day weather forecast, weather alerts, fertilizer requirement for crops its planning and application, crop-specific irrigation needs and their application, nutrient management, integrated pest, and disease management, and market prices of different crops in nearby markets (Bhagat and Gholkar, 2021). As of now, FarmPrecise mobile application provides locale specific crop weather advisories to farmers in English, Hindi, Marathi, and Telugu languages and soon it will be available in other Indian languages. It is available for free and can be downloaded from the "Google Play Store". Presently more than 45000 farmers have downloaded this mobile application (WOTR, 2021).

FarmPrecise mobile application has a simple interface and an additional tab connects the farmers directly to the experts of WOTR to answer the farmer's questions. In addition to this farmer's feedback has shown that this mobile application is a boon for profitable farming (Joshi, 2020). However, WOTR is working tirelessly on how the "FarmPrecise" mobile application can help to accelerate agricultural development and alleviate the technological and knowledge gap of farmers.

In this view, to assess the appropriateness and ground feedback on agromet advisories, there is a need to assess the status of the adaptation of agromet advisories, their usefulness, improvements needed in agromet advisories, and any modification required in the design of the FarmPrecise app. Therefore the study was aimed to get the farmers' feedbacks on climate-resilient agriculture on e-agromet advisories provided through FarmPrecise. The data on both qualitative and quantitative feedbacks of 2000 farmers were collected from selected villages of different blocks of Maharashtra state. Maharashtra state is a leading State in agriculture (Udmale et. al., 2014). The principal crops grown in the state are Paddy, Sorghum, Pearl millet, Wheat, Pigeon pea, Green gram, Black gram, Gram and other pulses. The major oil seed crops grown in state are Groundnut, sunflower, and Soyabean and, the important cash crops are cotton, sugarcane, turmeric and vegetables (Hazari, 2015; Gol, 2019). State is pioneer in onion production in the country (Gadge and Lawande, 2012). But currently Maharashtra faces an increasing risk from climate change which is likely to impact the production of major crops (Sen et al., 2021). Therefore for the study 11 major crops (Kharif: Paddy, Maize, Pearl millet, Green gram, Groundnut, Soybean and Cotton; Rabi: Wheat, Sorghum, Chickpea, and Onion) grown in the 08 different blocks of 04 districts of Maharashtra selected where WOTR is being actively engaged through its various project activities. The data collection was done for both the seasons (Kharif and Rabi) of the year 2020-21.

2. Objectives of Study

The broad objective of the study is to improve climate-resilient agriculture through farmer feedback into e-agromet advisories. The detailed objectives are as follows.

1. To study the impact of e-agro advisories through farmer's feedback
2. To study the barriers and enablers of adapting the crop specific climate resilient agricultural practices
3. To improve e-agro advisories and means of dissemination (FarmPrecise App) through farmer's feedback
4. To provide policy recommendations and programmatic interventions to improve the adoption of climate-resilient agriculture

3. Description of the Study Area

The data collection for the study is done in five districts of two states Maharashtra and Telangana for the Kharif and Rabi season of the year 2020-21. In Maharashtra: data collection was done in 68 villages of 08 blocks of 04 districts, and in Telangana: data collection was done 05 villages of Narayanpeth block of Narayanpeth district. This report is

pecially prepared for the Maharashtra state only and the location map of the study area is shown in Figure 1. The block-wise details of study villages are given below.

Name of State	Name of district	Name of block	Name of Village
01 State	04 Districts	08 Blocks	68 Villages
Maharashtra	Ahmednagar	1. Akole,	1. Devgaon 2. Shenit 3. Waranghushi 4. Wanjulshet 5. Selvirhe
		2. Sangamner	1. Karule 2. Kasare 3. Shivapur 4. Darewadi 5. Satichiwadi 6. Dolasne 7. Gunjalwadi 8. Sarole Pather 9. Mandhwan 10. Vankute 11. Bhojdari 12. Shelkewadi
		3. Parner	1. Bhangadewadi 2. Ranmla 3. Hanumanwadi 4. Gawadewadi 5. Sutarwadi 6. Kutewadi
	Jalna	4. Ambad	1. Dadesavagi 2. Sadesavagi 3. Mathpimpalgaon 4. Bhivandi Bodakha 5. Chambharwadi 6. Godri
		5. Bokhardan	1. Kasgaon 2. Vadad Tanga 3. Vadona 4. Khaprkhedda 5. Tingalkhedda 6. Dond kheda 7. Songiri 8. Sirasgaon 9. Sipora 10. Chincholi 11. Adha 12. Arankhedda 13. banegaon 14. Baradkheda

Name of State	Name of district	Name of block	Name of Village
01 State	04 Districts	08 Blocks	68 Villages
			15. Palaskheda 16. Chandai Tepale
		6. Jafrabad	1. Wankheda 2. Vadala 3. Sonkheda 4. Janepal 5. Borgaon Math 6. Chinckkheda 7. Javkheda 8. Shindi 9. Pasodi 10. Gopi 11. Boari
	Osmanabad	7. Bhoom	1. Walwad 2. Umachiwadi 3. Narkewadi 4. Nagewadi 5. Chumbli 6. Eida 7. Nagalwadi
	Dhule	8. Sakri	1. Manjari Mapalgoan 2. Shendvad 3. Mohgaon 4. Pimpalpada 5. Chorwad

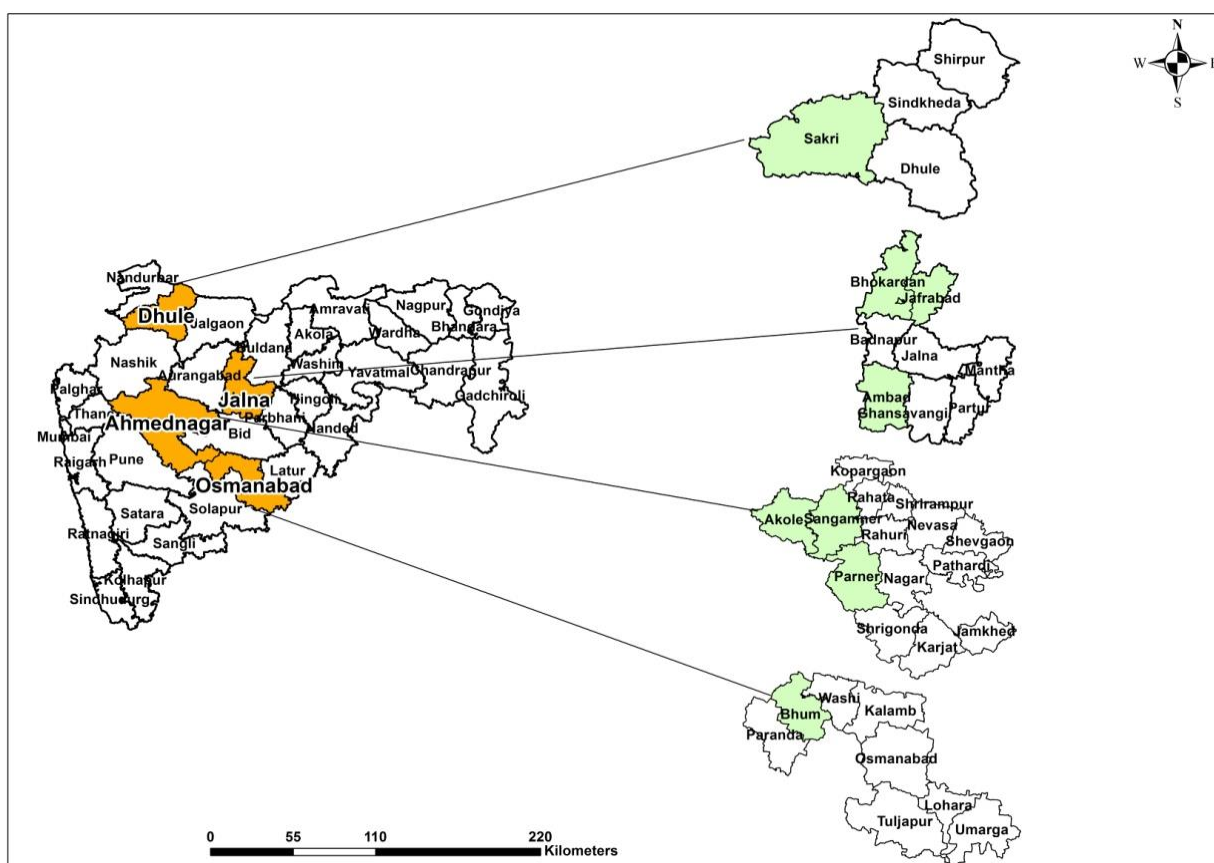


Figure 1 Location map of the study area

4. Sample Selection

The major crops/ most grown crops in the different blocks of Maharashtra for Kharif and Rabi season were selected for the data collection. The study was conducted in 68 villages of 08 blocks of 04 districts of Maharashtra. A questionnaire based tool was designed to collect the data from selected farmers. The sample size was determined at 95% confidence level and 10% confidence interval which come about 96. So, equal numbers of farmers who are recipient of agro-advisories through FarmPrecise app were selected from each of the study village. In total, 2000 farmers (100 farmers per crop) were interviewed to collect the feedback on e-agro-advisory services provided through the FarmPrecise. The block-wise details of major crops selected for the Kharif and Rabi seasons (2020-21) are given below.

Name of Block	Name of Crop	
	Kharif season	Rabi season
Parner	Pearl millet, Green gram	Onion
Sangamner	Groundnut, Maize	Onion
Akole	Paddy	Chickpea
Jaffrabad	Maize, Cotton	Chickpea
Bhokardan	Soybean, Cotton	Wheat
Ambad	Cotton	Chickpea
Bhoom	Soybean	Sorghum
Sakri	Paddy	Wheat

5. Information Collected in Survey

During the survey, following information was collected from selected farmers.

➤ Household Profile

- Type of family, number of male and female members, education of family holder, and household size.
- Income generated through primary and secondary occupation.

➤ Agriculture Information

- Total land, cultivated and uncultivated land, seasonal and perennial irrigation land, land for which e-agro advisories followed.
- Major crops cultivated in Kharif and Rabi seasons (the year 2020-21)

➤ Adaptability Status of e-Agro Advisories

- Advisories of land preparation before sowing
- Advisories of application of organic manures
- Advisories of seed treatment at the time of sowing and related activities after sowing
- Advisories of trap crops and various traps to control pest attack
- Advisories of application of Amrutpani, Jeevamruit, and Vermi-wash spraying
- Advisories of application of bio-pesticides (Dashparni ark/NSKE/Neemark)
- Advisories of application of irrigation
- Advisories of application of a recommended dose of chemical fertilizer
- Advisories of daily weather and weather alerts
- Crop-specific e-agro advisories
- Impact of selective e-agro advisories
- Scaling of the usefulness of e-agro advisories

6. Preparation of Questionnaires

Questionnaires were developed in Marathi and English languages to collect the farmer's feedbacks on agro-advisories disseminated through the FarmPrecise mobile application during the Kharif and Rabi crop seasons of the year 2020-21. The questionnaires were then converted in Open Data Kit (ODK) format so that it can be assessed online and digital data collection is possible using a mobile or a tab.

8. Data Collection

The field coordinators and survey teams were trained for the data collection using ODK Application. The online training of survey team was conducted before the data collection during Kharif and Rabi seasons. All the queries of data collectors regarding questionnaires were resolved during the training program. The data collection was divided into three stages during the cropping cycle - the early stage, mid-stage, and end/ harvesting stage of the crop.

Data collectors were closely monitored during the data collection process and required inputs and clarification was given to them to avoid gaps and errors in the data.



Photo 1 Field investigators during data collection (Photo Credit- WOTR)

Farmers' Feedback on Various CRA Advisories

13. Advisories of Land Preparation before Sowing

The main objective of land preparation is to create a favourable environment for the seed/plants to germinate and grow. Adequate land preparation will help to improve soil structure for better soil aeration, permeability, and loosening of the root zone to make root penetration easier.

- **Kharif Season**

Figure 2 revealed that the advisory of ploughing and harrowing followed by more than 90% and 75% farmers respectively, except for the Akole block where the adaptability of advisories of ploughing and harrowing is 66% and 68% farmers respectively.

- **Rabi Season**

Figure 3 revealed that the advisory of ploughing followed by more than 90% of farmers except for the Ambad, Bhokardan, and Bhoom blocks where the adaptability of advisories of ploughing is 76%, 58%, and 69% respectively. Similarly, the advisory of harrowing followed by more than 95% of farmers except for the Bhokardan and Bhoom blocks where adaptability of advisories of harrowing is 55% and 73% farmers respectively. There were very high variations in crop-wise and block-wise adaptability of advisories of land preparation.

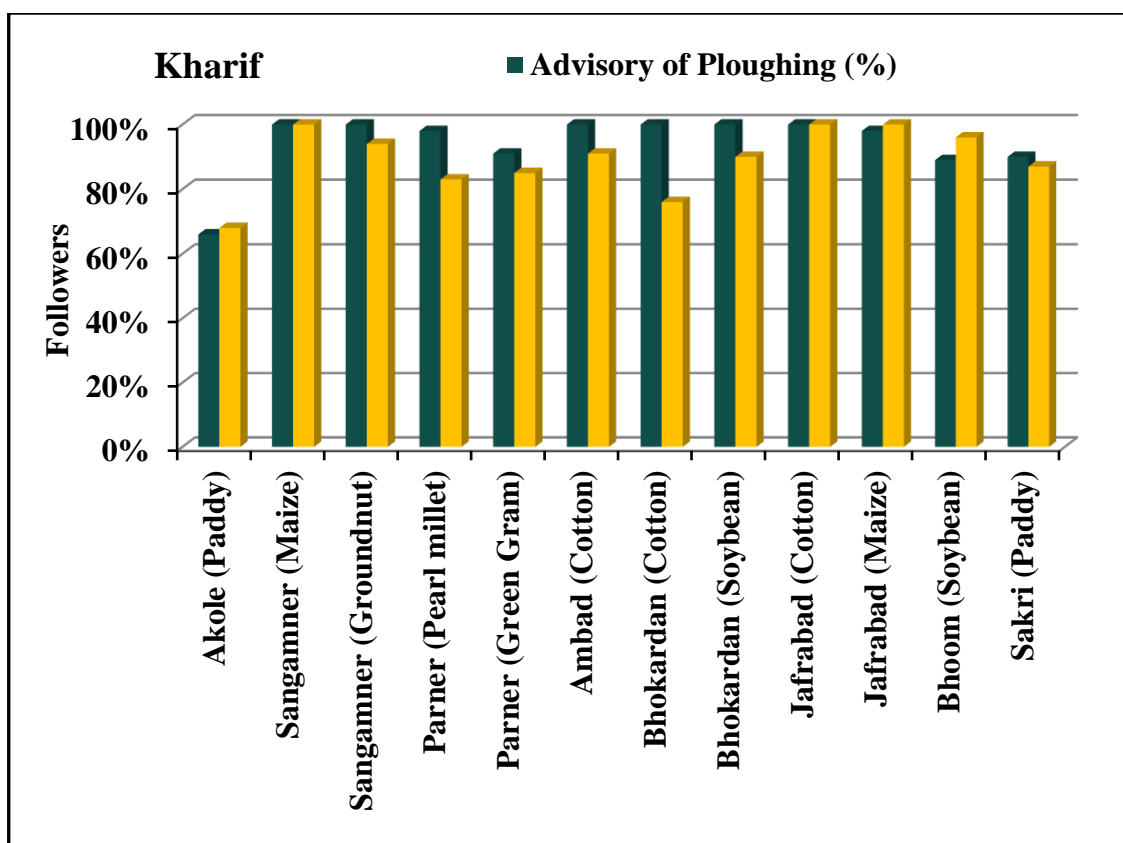


Figure 2 Status of farmer's adaptability for advisories of ploughing and harrowing for Kharif season crops in the different blocks

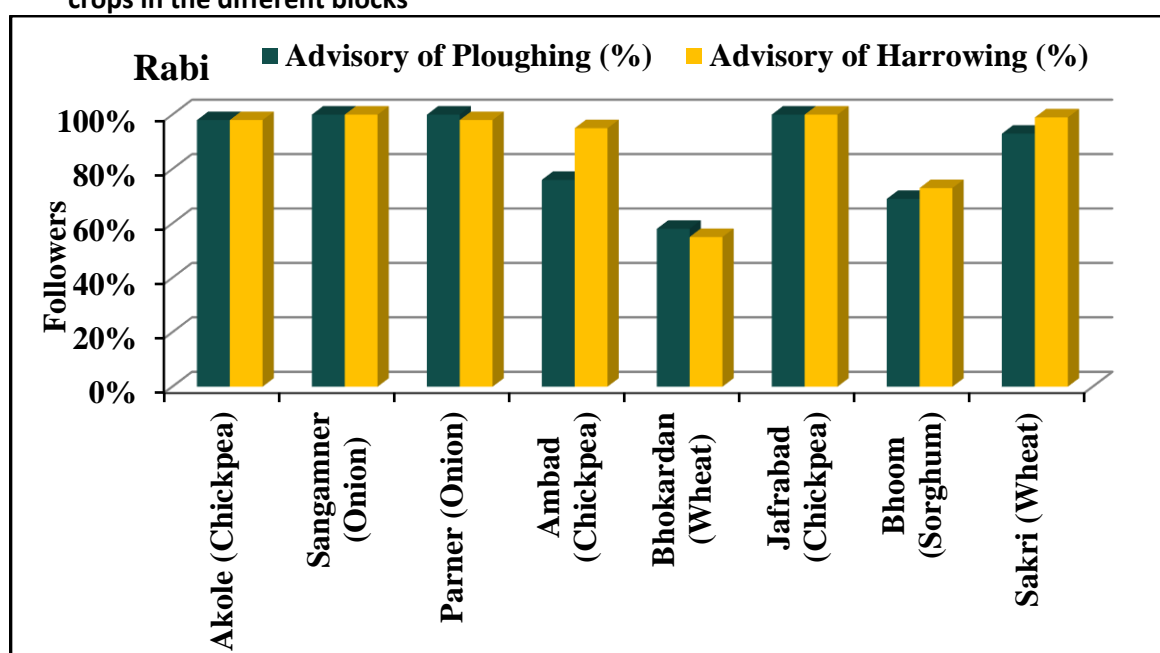


Figure 3 Status of farmer's adaptability for advisories of ploughing and harrowing for Kharif season crops in the different blocks

14. Advisories of Application of Organic Manures

Use of organic manures will help farmers to reduce their dependency on synthetic fertilizers which are not only costly but cause soil degradation and emission of greenhouse gases. On the other hand, application of organic manure increases the soil organic matter, thereby

improving the, soil water holding capacity and nutrient availability for crops, which helps to mitigate adverse effects of climate change on crop production and attain sustainable crop yield. The application of organic manure has a significant positive effect on plant growth parameters such as plant height, length, number of fruit branches, and stem diameter (Botir et al., 2019). Use of organic manures like vermi-compost, decomposed compost, green manuring are some of the key nature-based solutions which enhances crop productivity and also protect agro-ecosystems.

- **Kharif Season**

Figure 4 revealed that the advisory of application of organic manures (FYM, Vermicompost, and Compost) during land preparation was highest followed by 93% of farmers in Sangamner block and lowest followed by 53% of farmers in Akole and Bhoom blocks.

- **Rabi Season**

Figure 5 revealed that the advisory of application of organic manures (FYM, Vermicompost, and Compost) during land preparation was highest followed by all the farmers (100%) in Sangamner block and lowest followed by 40% of farmers in Jafrabad block.

For both seasons, the adaptability was varying both crop-wise and block-wise. There is a great scope to increase the adaptability by course of activities.

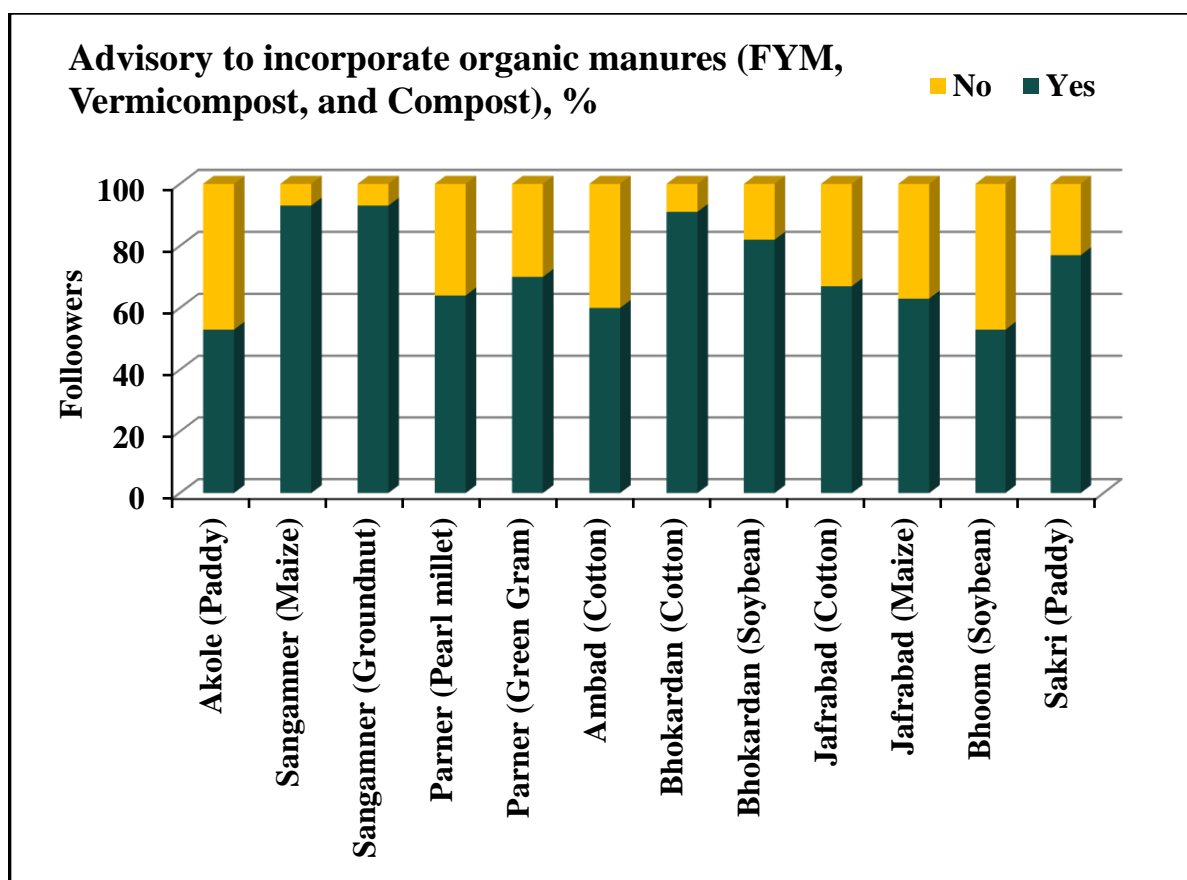


Figure 4 Status of farmer's adaptability of advisory to incorporate organic manures in the soil for Kharif season crops in the different blocks

Report on Farmers Feedback into e-agromet Advisories- Selected Blocks of Maharashtra State

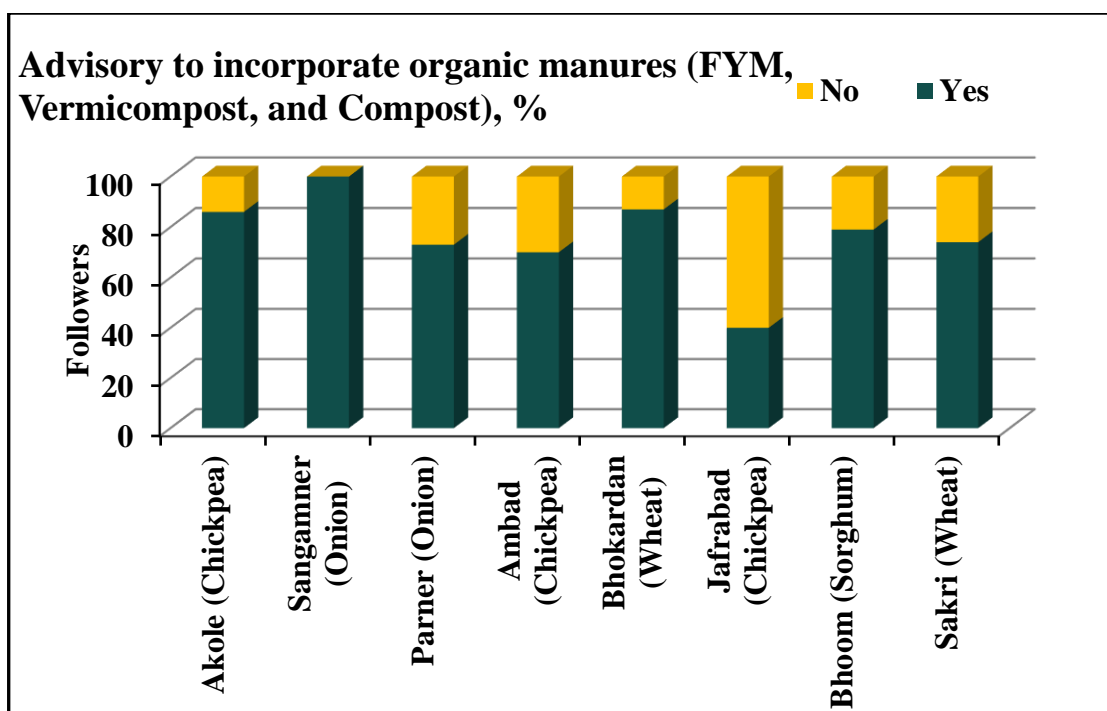


Figure 5 Status of farmers' adaptability of advisory to incorporate organic manures in the soil for Rabi season crops in the different blocks

15. Advisories of Seed Preparation (treatment) before Sowing and Related Activities after Sowing

Seed treatment means treating seeds with various chemical and/or biological inoculants to reduce, control, and repels the attack of pest, disease, insects which attack the seed or seedlings. Seed quality and its germination depend on many environmental factors, like soil moisture and temperature. Treating seed with one or more inoculants is the most economical and efficient way to protect seed from soil borne pests and diseases which improve seed germination. Along with seed treatment, Optimum plant population per unit area is also important for crop growth and ultimate yield.

Kharif Season

From Figure 6, it is clear that almost all the farmers follow the advisory of seed treatment except the 55%, 79%, 27%, and 79% farmers of Akole, Ambad, Bhoom, and Sakri blocks respectively. The lowest followers 27% of farmers for Soybean crops in the Bhoom block. The percentage of farmers who follow the gap-filling was very low except 23% farmers' of cotton crop in the Bhokardan and Jafrabad blocks while re-sowing was done by less than 10% farmers of all the blocks except 24% farmers in the Bhoom block. The advisory of the weeding/hoeing was followed by more than 90% of farmers in all blocks except 79% farmers in the Sakri block for paddy. Figure 6 also revealed that there was a very high variation in the followers of advisory of crop geometry block-wise and crop-wise. About 92-96% farmers in the Jafrabad block follow the advisory of crop geometry for Cotton and Maize crops which was highest among the blocks and 1% farmers in the Boom block follow the advisory of crop geometry for Soybean crop which was lowest among the block. The overall adaptability of advisory of crop geometry is average.

From Figure 8 revealed that about less than 40% farmers were doing proper seed treatment with organic and inorganic ingredients. The details of the organic and inorganic ingredients used for the advisory of seed treatment for the Kharif season crops in the different blocks are shown in Figure 8.

- **Rabi Season**

From Figure 7 revealed that more than 90% farmers follow the advisory of seed treatment except 2%, 5%, and 64% farmers of Sangamner, Bhokardan, and Bhoom blocks respectively. The percentage of farmers who follow the gap-filling was very low except 50% and 15% farmers of Chickpea in the Akole and Ambad blocks. Few farmers of all the blocks required re-sowing except 12% farmers in the Akole (Chickpea) and Bhoom (Sorghum) blocks. The advisory of the weeding/hoeing were followed by more than 80-90% of farmers in all blocks. The followers of the advisory of crop geometry were varying block-wise and crop-wise. The overall adaptability of advisory of crop geometry in the Rabi season was average like Kharif season.

From Figure 9 revealed that about less than 50% farmers was doing proper seed treatment with organic and inorganic ingredients. The details of the organic and inorganic ingredients used for the advisory of seed treatment for Kharif season crops in the different blocks are shown in Figure 9.

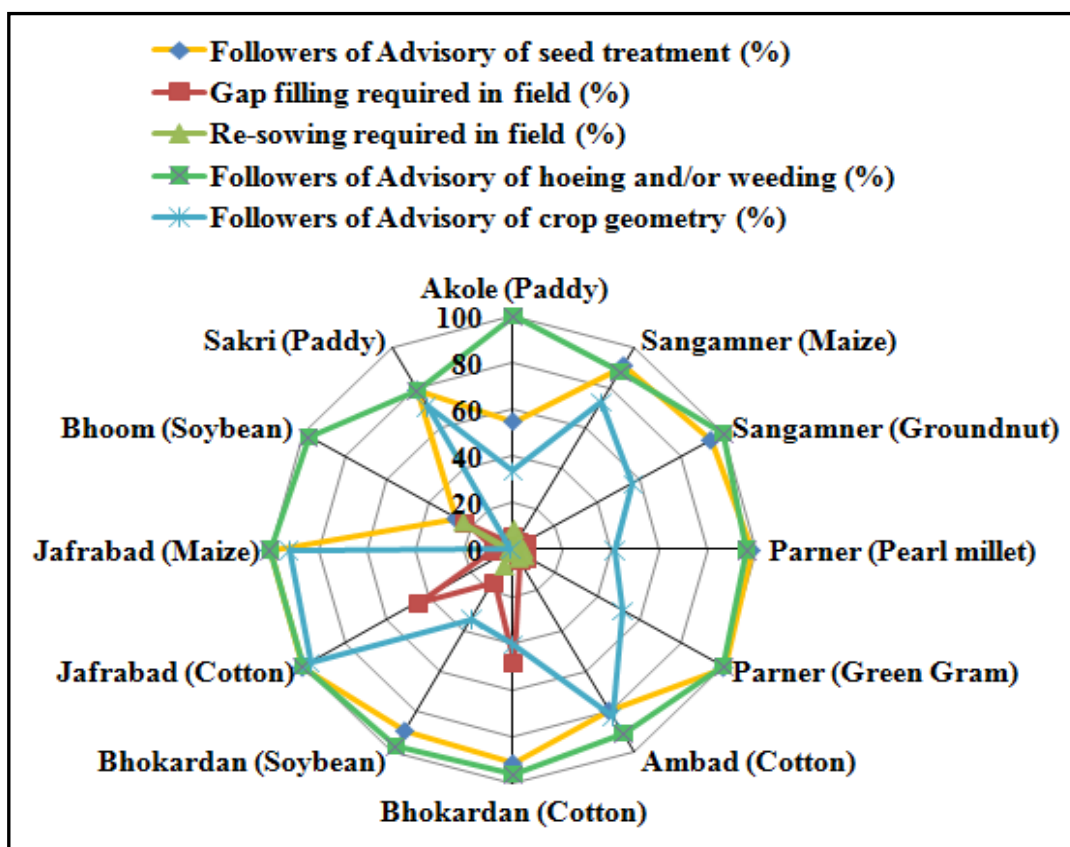


Figure 6 Status of farmer's adaptability for advisories of seed treatment, crop geometry, and weeding for Kharif season crops in the different blocks

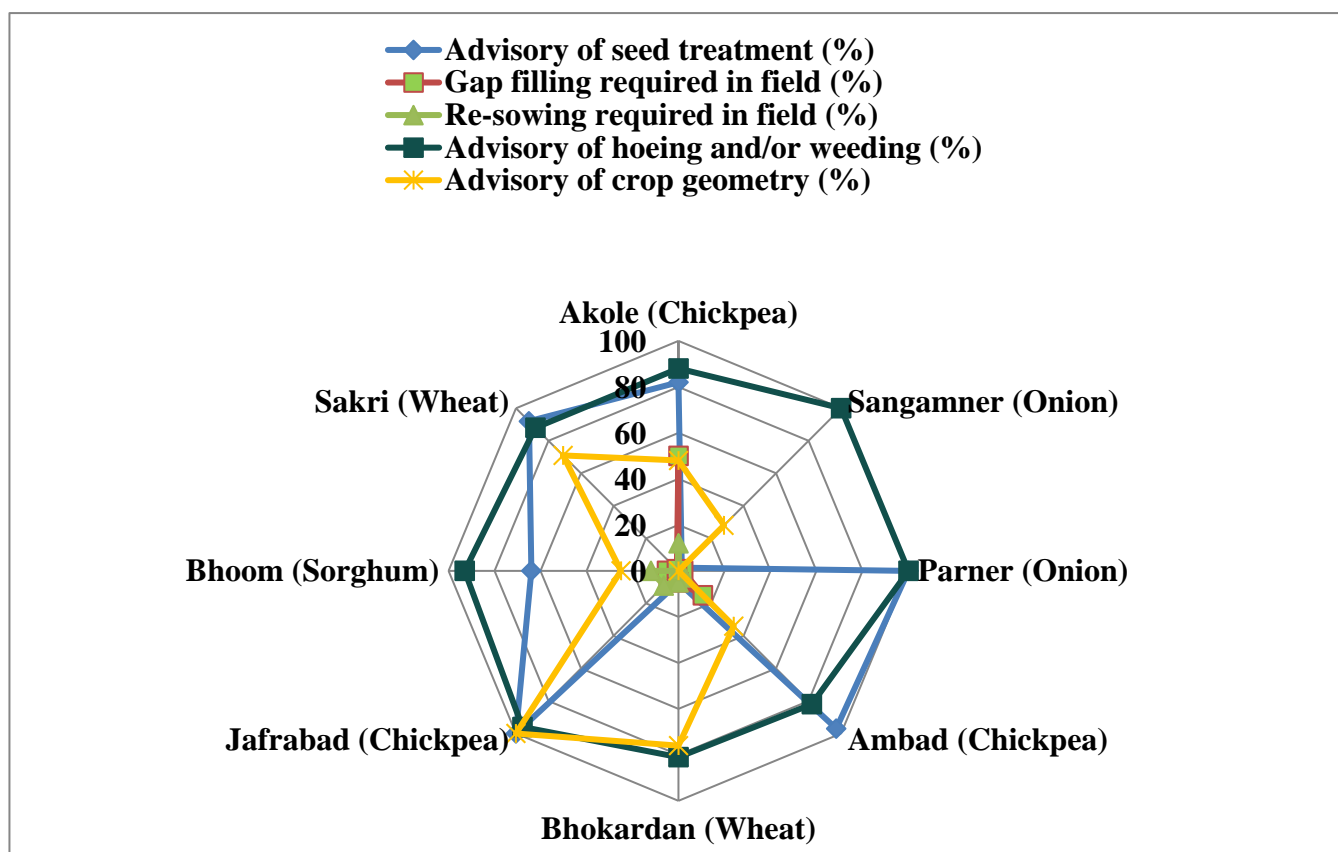


Figure 7 Status of farmers' adaptability for advisories of seed treatment, crop geometry, and weeding for Rabi season crops in the different blocks

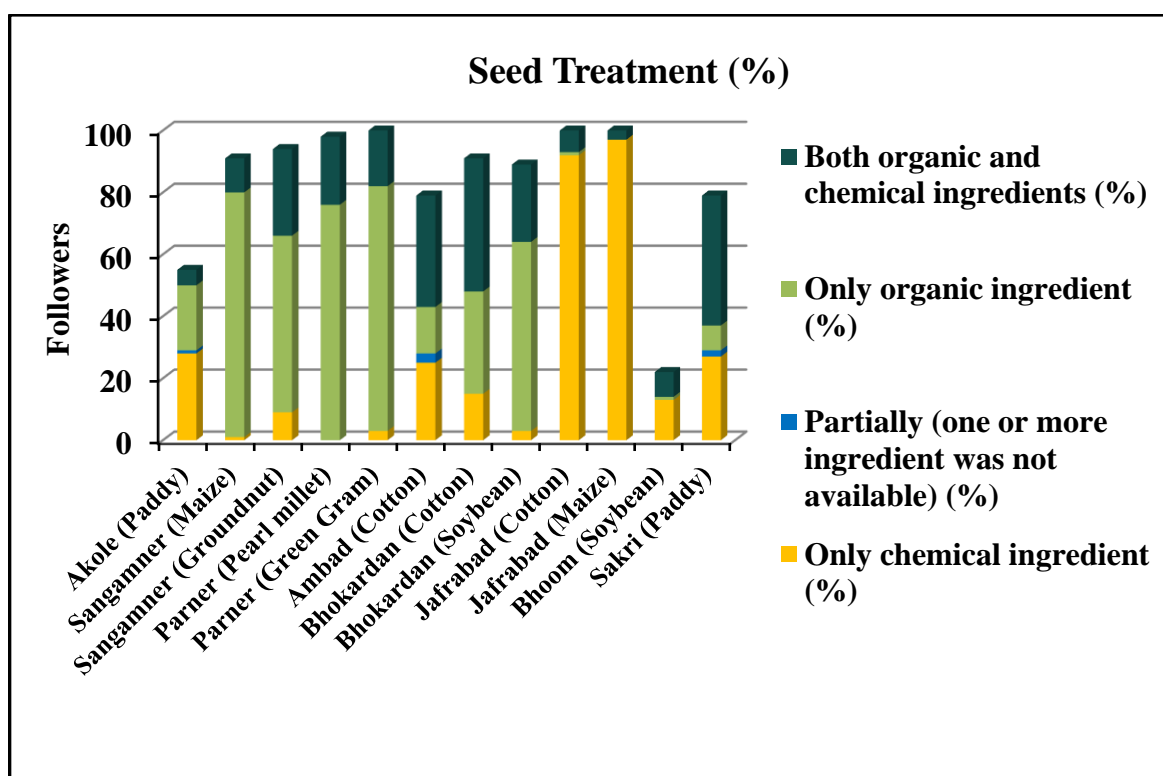


Figure 8 Details of advisory of seed treatment for the Kharif season crops in the different blocks

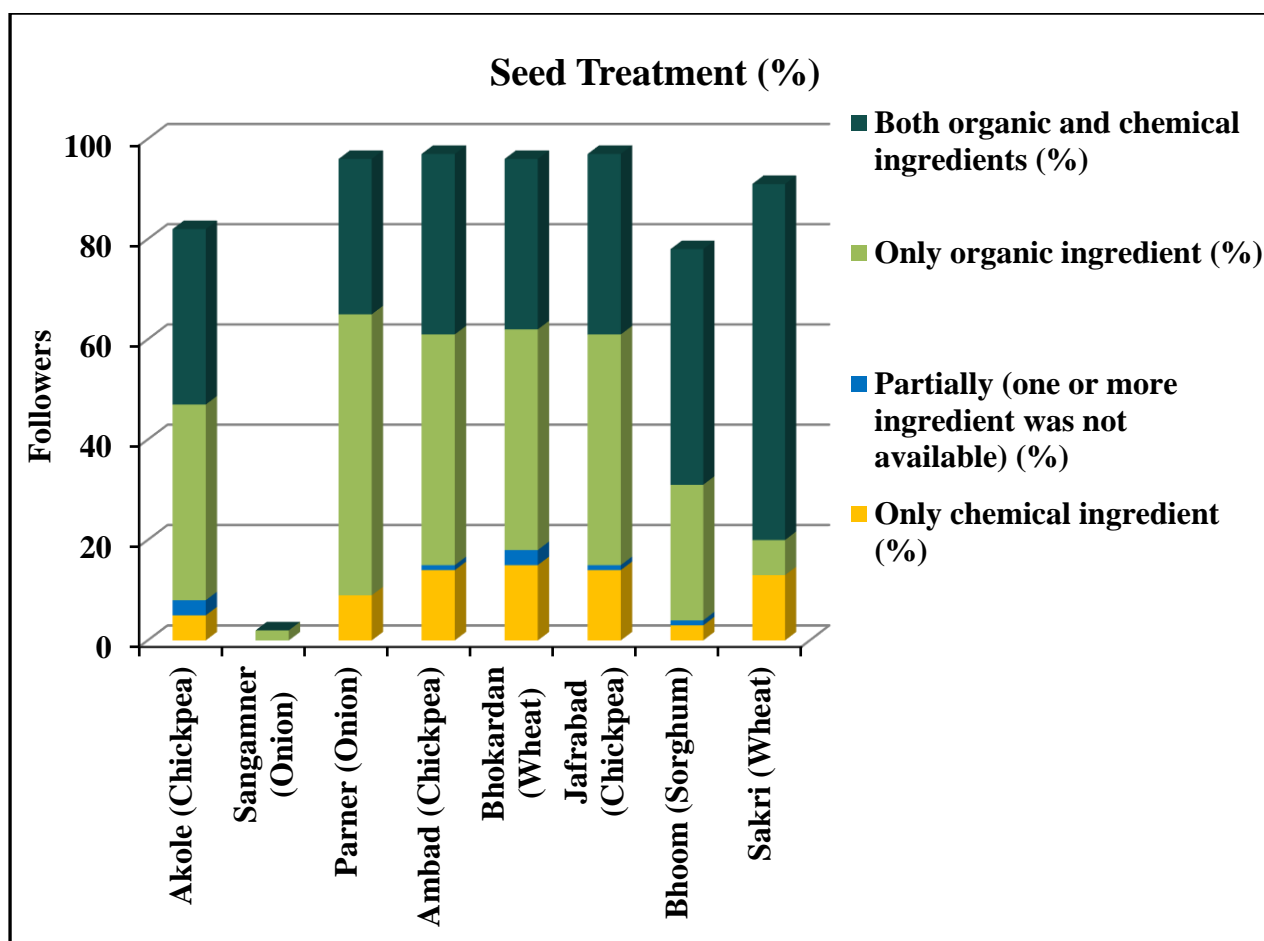


Figure 9 Details of advisory of seed treatment for the Rabi season crops in the different blocks

16. Advisories of Trap Crop and Intercropping

Trap crops are grown to attract insects or other organisms like nematodes to protect main crops from pest attacks. Protection may be achieved either by preventing the pests from reaching the crop or by concentrating them in a certain part of the field where they can be economically destroyed. This form of companion planting can save the main crop from decimation by pests without the use of pesticides.

Also, intercropping is the cultivation of two or more crops simultaneously in the same field. The major benefits of intercropping are increase in the rate of crop production, decrease in the risk of total crop loss, and effective control over weed infestations. Intercropping makes sure that nutrients from different soil layers are available to the crops. It also averts runoff and can prevent the loss of top fertile soil.

• Kharif Season

Figure 10 shows that the advisory of trap crop was followed by 34% to 90% of farmers in the different blocks. The block-wise and crop-wise adaptability were varying very erratically. As an example, the advisory of trap crop for was cotton followed by 87% of farmers in Jafrabad block and only 13% farmers in the Bhokardan block, similarly for Soybean crop followed by 93% of farmers in the Bhokardan block and about 42% farmers in the Bhoom block. Figure 10 also revealed that the advisory of intercrop was followed by 23% to 98% of farmers for different crops in the blocks. The adaptability of advisory of

intercropping was highest in Akole and Jafrabad blocks, and lowest in the Parner block. The adaptability of the advisory of intercropping was varying very differently crop-wise and block-wise.

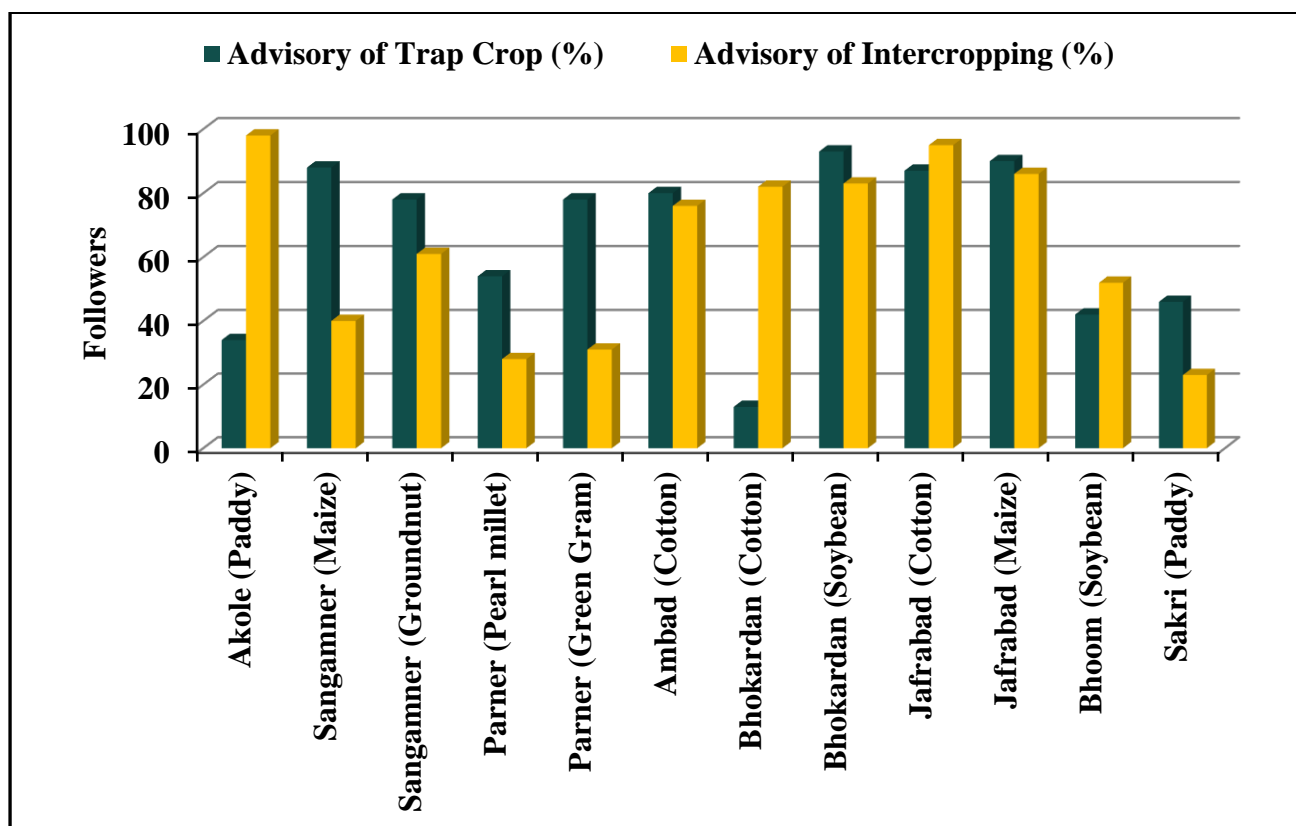


Figure 10 Status of farmer's adaptability for advisories of trap crop and intercropping for the Kharif season crops in the different blocks

- **Rabi Season**

Figure 11 shows that the advisory of trap crop was followed by 10% to 92% of farmers in the different blocks. The adaptability of advisory of intercropping was highest in Sangamner, Ambad, and Jafrabad blocks and lowest in the Bhoom block. The block-wise and crop-wise adaptability were varying very differently. Figure 11 also revealed that the advisory of intercrop followed by 3% to 84% of farmers for different crops in the blocks. The adaptability of advisory of intercropping was highest in Ambad, Bhokardan, and Jafrabad blocks, and lowest in the Sangamner block. The adaptability of the advisory of intercropping was varying very differently block-wise and crop-wise.

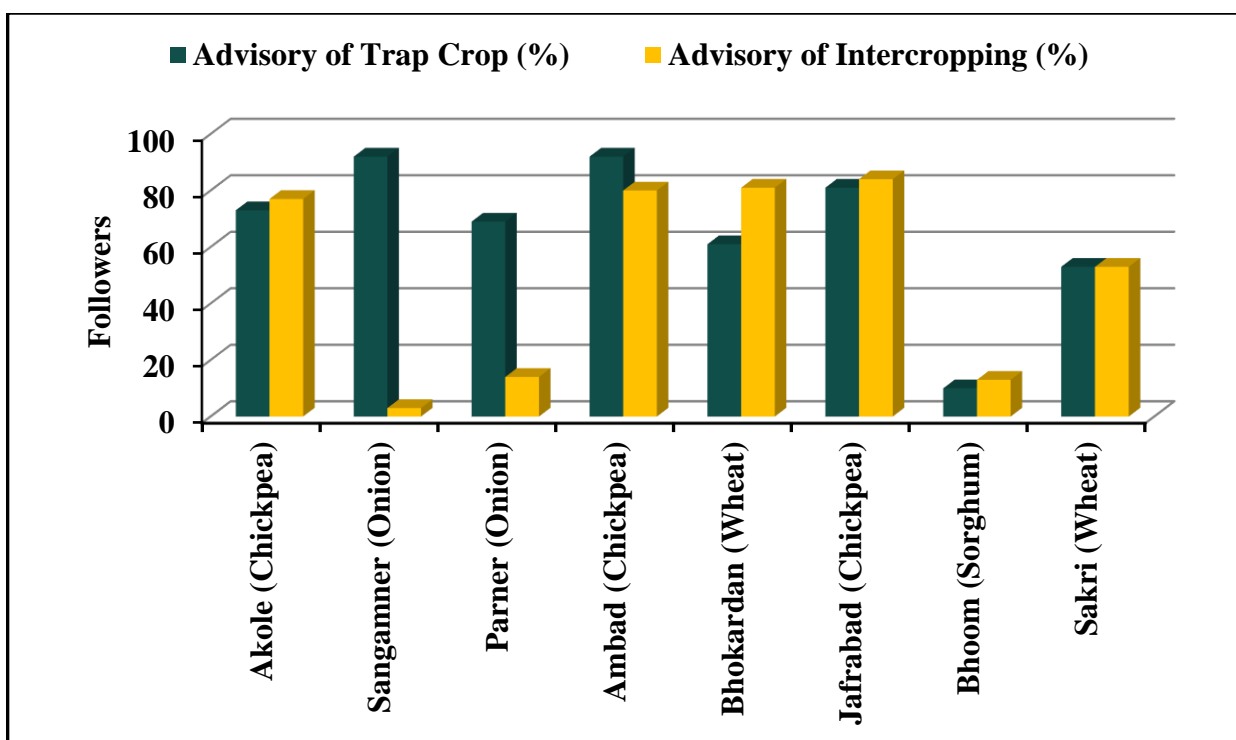


Figure 11 Status of farmer's adaptability for advisories of trap crop and intercropping for the Rabi season crops in the different blocks

17. Advisories of Use of Various Traps to Control Pest Attack

Insect pests are the main sources of biotic stress on crops. There are hundreds of insects that can cause serious damage to crops and are controlled by chemical pesticides, which are one of the main sources of pollution and cause the development and progression of several health problems in humans and animals. To avoid the excessive use of chemical pesticides, light traps and pheromone traps play a great role as control measures. Insect traps are used to monitor or directly reduce populations of insects or other arthropods, by trapping individuals and killing them. Pheromones are chemicals used by insects and other animals to communicate with each other. Insects send these chemical signals to help attract mates, warn others of predators, or find food. Using specific pheromones, traps can be used to monitor target pests in agriculture or residential areas. Mating disruption, mass trapping, attract-and-kill, and push-pull are some of the direct pest control strategies that depend on the use of pheromones. The insect light trap is one of the very effective ways of insect pest management in organic agriculture as it mass-traps both the sexes of insect pests and substantially reduces the carryover pest population. The light-trap attracts several kinds of insects i.e. rice moth, flour beetle, rusty grain beetle, foreign grain beetle, saw-toothed grain beetle, rice weevil, and lesser grain borer. Light traps could therefore be effectively used to monitor infestation.

- **Kharif Season**

Figure 12 revealed that the advisory of installation of pheromone trap was followed by 14% to 89% of farmers. The advisory followers were highest in the Bhokardan, Jafrabad, and Ambad blocks and lowest in the Sakri, Parner, Akole, and Bhoom blocks.

Figure 12 also revealed that the advisory of installation of light trap was followed by 6% to 100% of farmers. The advisory followers were highest in the Akole, Jafrabad, Ambad, and Bhokardan blocks and lowest in the Parner, Bhoom, Sakri, and Sangamner blocks.

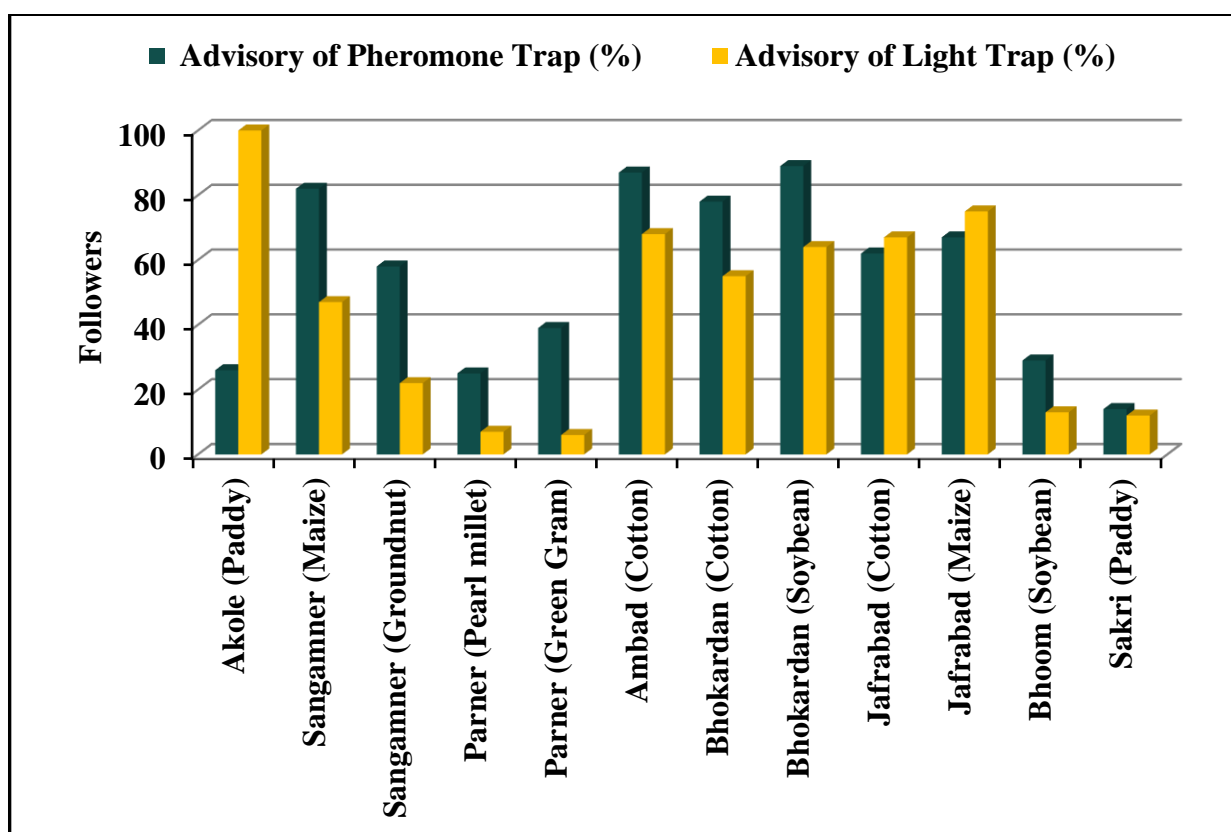


Figure 12 Status of farmer's adaptability for advisories of Pheromone trap and Light trap for the Kharif season crops in the different blocks

- **Rabi Season**

Figure 13 revealed that the advisory of installation of pheromone trap was followed by 5% to 100% of farmers. The advisory followers were highest in the Sangamner, Akole, Ambad, and Sakri blocks and lowest in the Parner, Bhoom, Jafrabad, and Bhokardan blocks.

Figure 13 also revealed that the advisory of installation of light trap was followed by 0% to 65% of farmers. The advisory followers were highest in the Bhokardan, Ambad, and Akole blocks and lowest in the Sangamner, Parner, Sakri, Bhoom, and Jafrabad blocks.

There is wide scope to increase the adaptability through the appropriate use of Pheromone and Light traps technologies in the field.

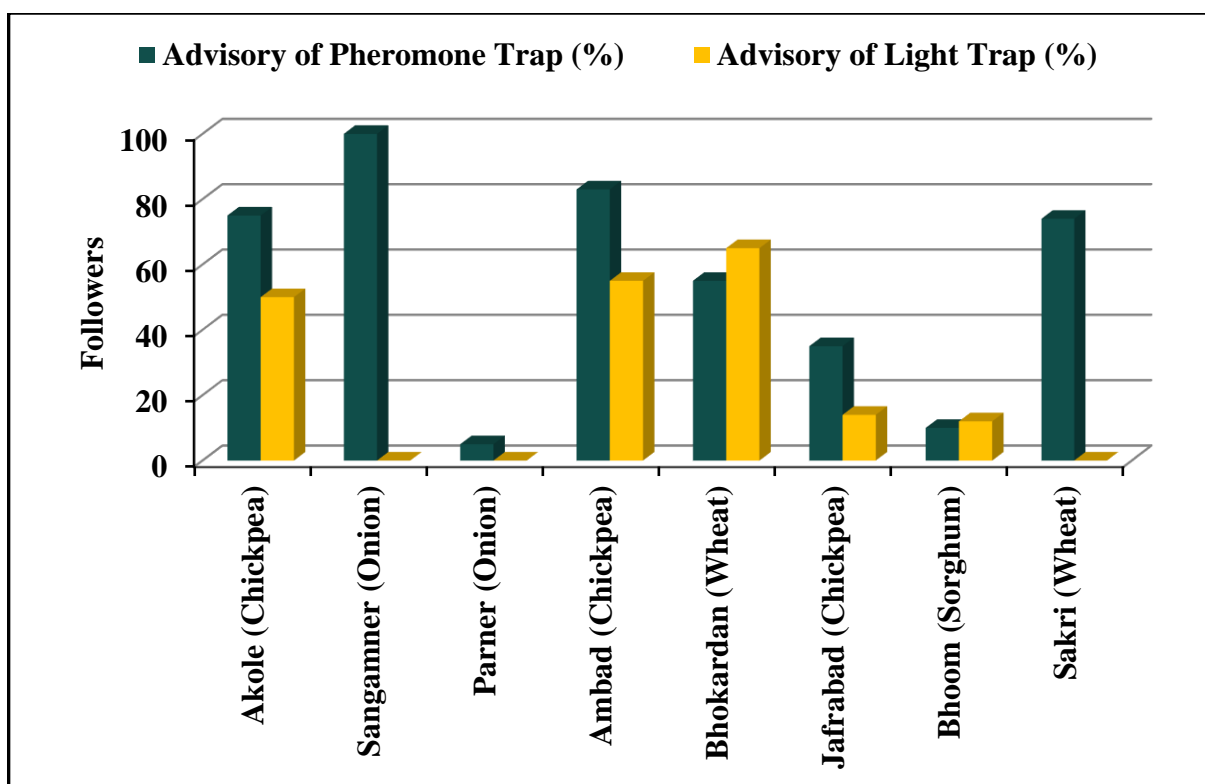


Figure 13 Status of farmer's adaptability for advisories of Pheromone trap and Light trap for the Rabi season crops in the different blocks

18. Advisories of Application of Amrutpani, Jeevamruit, and Vermiwash

Amrutpani is a bio-inoculants and acts like a tonic that influences the growth, quality and yield, and attributes of various crops and helps in the revitalizing and enrichment of the soil. Jeevamrut constitutes a rich source of nutrients like carbon, phosphorus, potassium along with rich soil microorganisms that help in fixing the nitrogen, solubilize phosphorus. It increases the uptake of N, P, and K, growth and yield parameters like plant height, root length, fruit yield, and yield attributes like protein and fiber content which adds to the overall yield results. This organic liquid formulates can be applied in different doses and various forms like foliar spray, soaking, drenching, and fertigation based on the requirement and goals (Patil, 2019). Vermiwash plays an important role in plant growth and development, contributing to the initiation of rooting, root growth, plant development, promotion growth rate, improvement in crop production increasing the soil organic matter and increasing nutrient content which is readily available for the plants (Sundararasu, 2016).

• Kharif Season

From Figure 14, it is revealed that the advisory application of Amrutpani and Jeevamruit, and Vermiwash spray followed by 21% to 97% of farmers in the different blocks. The advisory followers were highest in the Jafrabad, Ambad, Bhokardan, and Sangamner blocks and lowest in the Bhoom, Akole, Sakri, and Parner blocks.

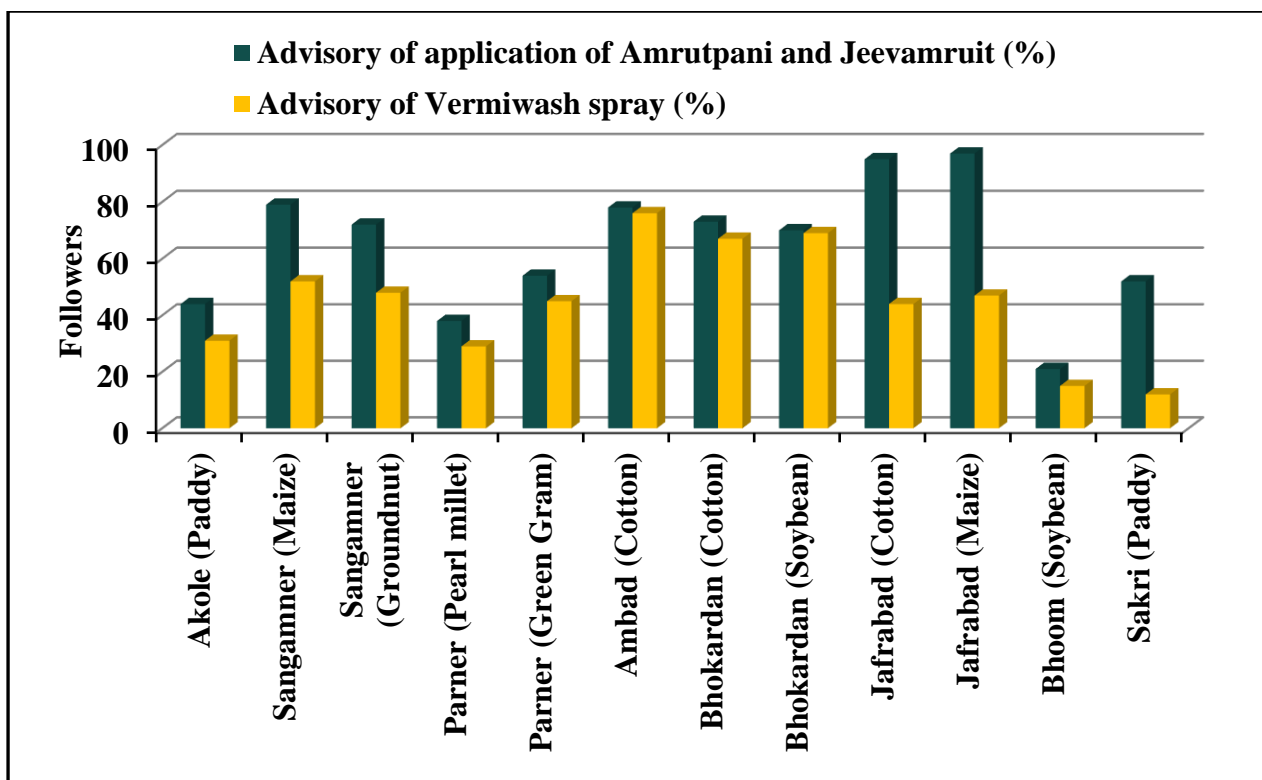


Figure 14 Status of farmer's adaptability for advisories of Amrutpani, Jeevamruit and Vermi-wash for Kharif season crops in the different blocks

- **Rabi Season**

From Figure 15, it is revealed that the advisory application of Amrutpani and Jeevamruit, and Vermiwash spray followed by 11% to 95% of farmers in the different blocks. The advisory followers are higher in the Sangamner, Jafrabad, Bhokardan, and Sakri blocks and lowest in the Parner, Bhoom, Akole, and Ambad blocks.

There is a wide scope to increase the usage of Amrutpani, Jeevamruit, and Vermi-wash by knowing their importance, process of preparation, and collection process at the household level to farmers by in-house and field training, field demonstration, and addition of small videos of preparation with e-agro advisories.

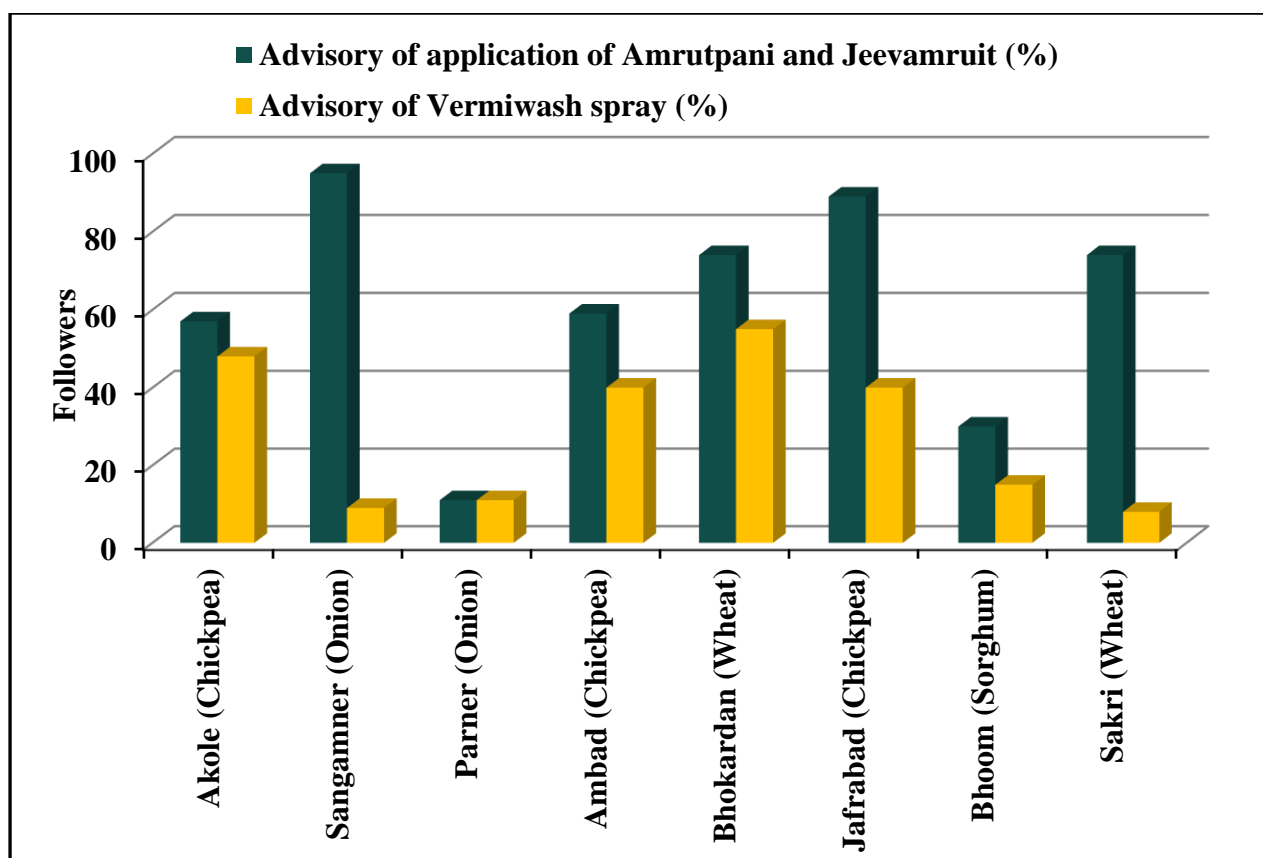


Figure 15 Status of farmer's adaptability for advisories of Amrutpani, Jeevamruit, and Vermi-wash for Rabi season crops in the different blocks

19. Advisories of Application of Bio-Pesticides (Dashparni ark/NSKE/Neemark)

Bio-pesticides only kill/ repel/ prevent the target pests and do not damage the soil, water supply, or wildlife ecosystem including the beneficial insects. The use of bio-pesticides improves root and plant growth by enhancing the soil micro-flora and results in increased agriculture production. It also can increase the farmer's income through the reduction of input costs on chemical pesticides. In addition to this, bio-pesticides support the stability and sustainability of agro-ecosystem and decompose quickly, resulting in lower exposures and largely avoiding the pollution problems caused by conventional pesticides (Kumar et. al., 2021; EPA, 2016). Dashparni ark, NSKE, and Neemark extract are some of the very effective in controlling all kinds of insect pests and diseases prepared using all-natural ingredients. It strengthens the plant's overall immunity. It is antiviral and antifungal. The farmers can prepare the solution in-house (Agrostar, 2019; India Development (Vikaspedia) Gateway, 2022).

• Kharif Season

From Figure 16, it is revealed that the advisory application of bio-pesticides followed by 1% to 93% of farmers in the different blocks. The advisory followers were highest in the Jafrabad, Ambad, Bhokardan, and Sangamner blocks and lowest in the Akole, Bhoom, Parner, and Sakri blocks.

- **Rabi Season**

From Figure 17, it is revealed that the advisory application of bio-pesticides followed by 2% to 78% of farmers in the different blocks. The advisory followers were highest in the Ambad, Jafrabad, Bhokardan, and Sakri blocks and lowest in the Sangamner, Bhoom, Parner, and Sakri blocks.

There is large scope to increase the adaptability of advisories and usage of bio-pesticides through capacity building of farmers, field demonstration for preparation at the household level, and also the inclusion of short videos of preparation with e-agro advisories.

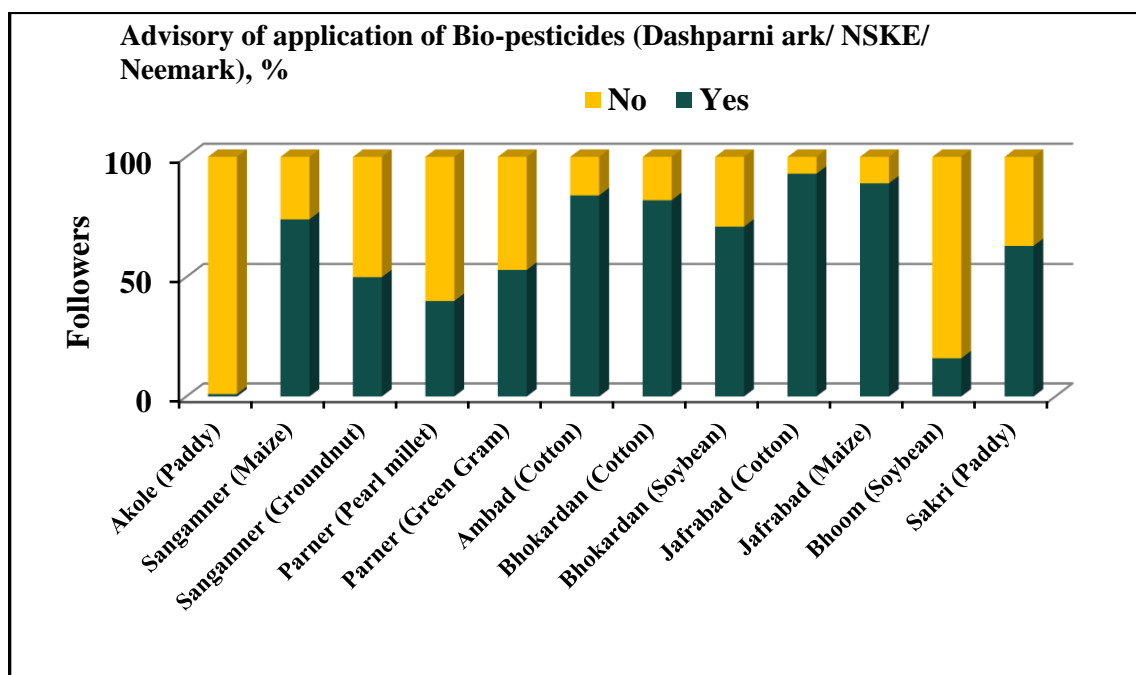


Figure 16 Status of farmer's adaptability for advisories of bio-pesticides for the Kharif season crops in the different blocks

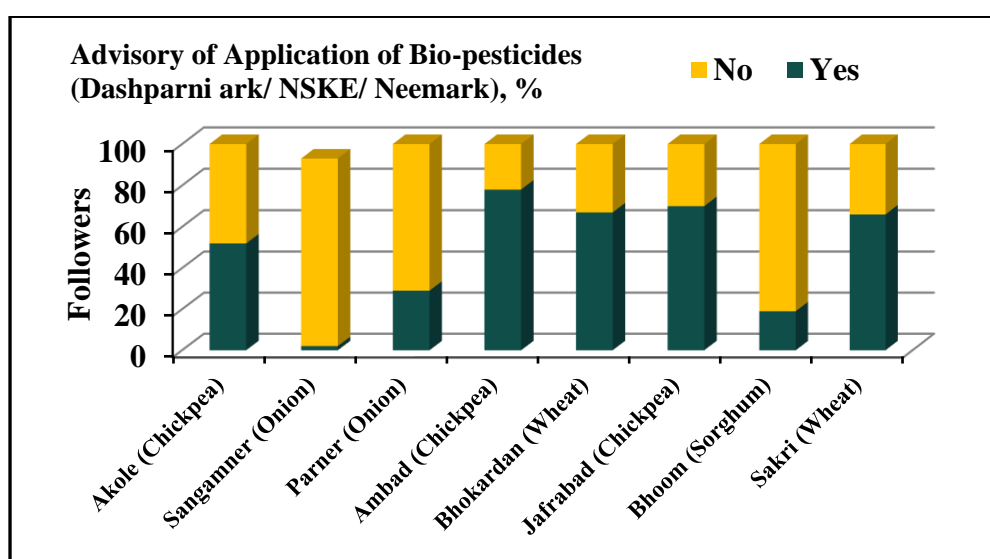


Figure 17 Status of farmer's adaptability for advisories of bio-pesticides for the Rabi season crops in the different blocks

20. Advisories of Application of Irrigation

The main objectives for irrigation management are to promote the proper growth of plants and maintain the optimum soil moisture level. Soil water affects plant growth directly through its controlling effect on plant water status. Plants need it continuously during their life and in appropriate quantities.

- **Kharif Season**

From Figure 18, it is revealed that the advisories of irrigation followed by 0% to 90% of farmers in the different blocks. The advisory followers were highest in the Jafrabad, Bhokardan, Ambad, and Sangamner blocks and lowest in the Akole, Parner, Bhoom, and Sakri blocks.

- **Rabi Season**

From Figure 19, it is revealed that the advisories of irrigation followed by 50% to 96% of farmers in the different blocks. The advisory followers were highest in the Sangamner, Parner, Jafrabad, and Sakri blocks and lowest in the Akole, Ambad, Bhoom, and Bhokardan blocks.

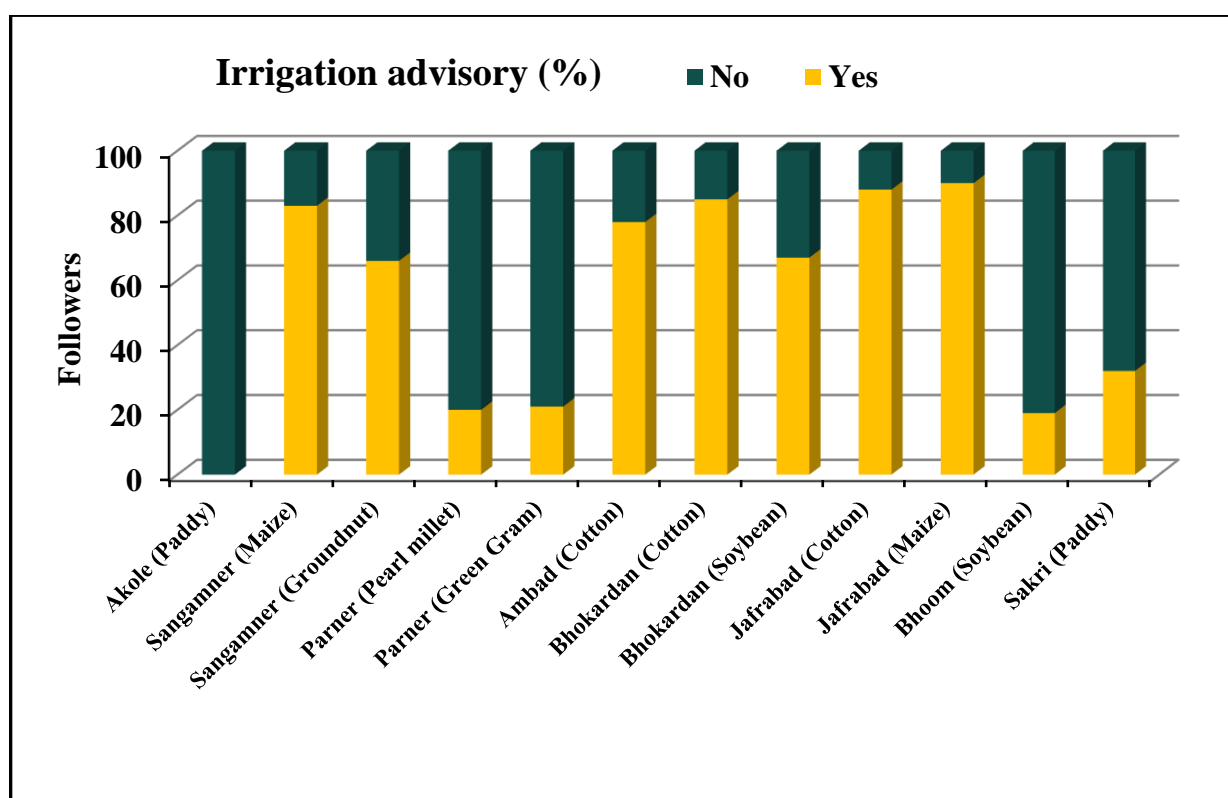


Figure 18 Status of farmer's adaptability for advisories of irrigation for Kharif season crops in the different blocks

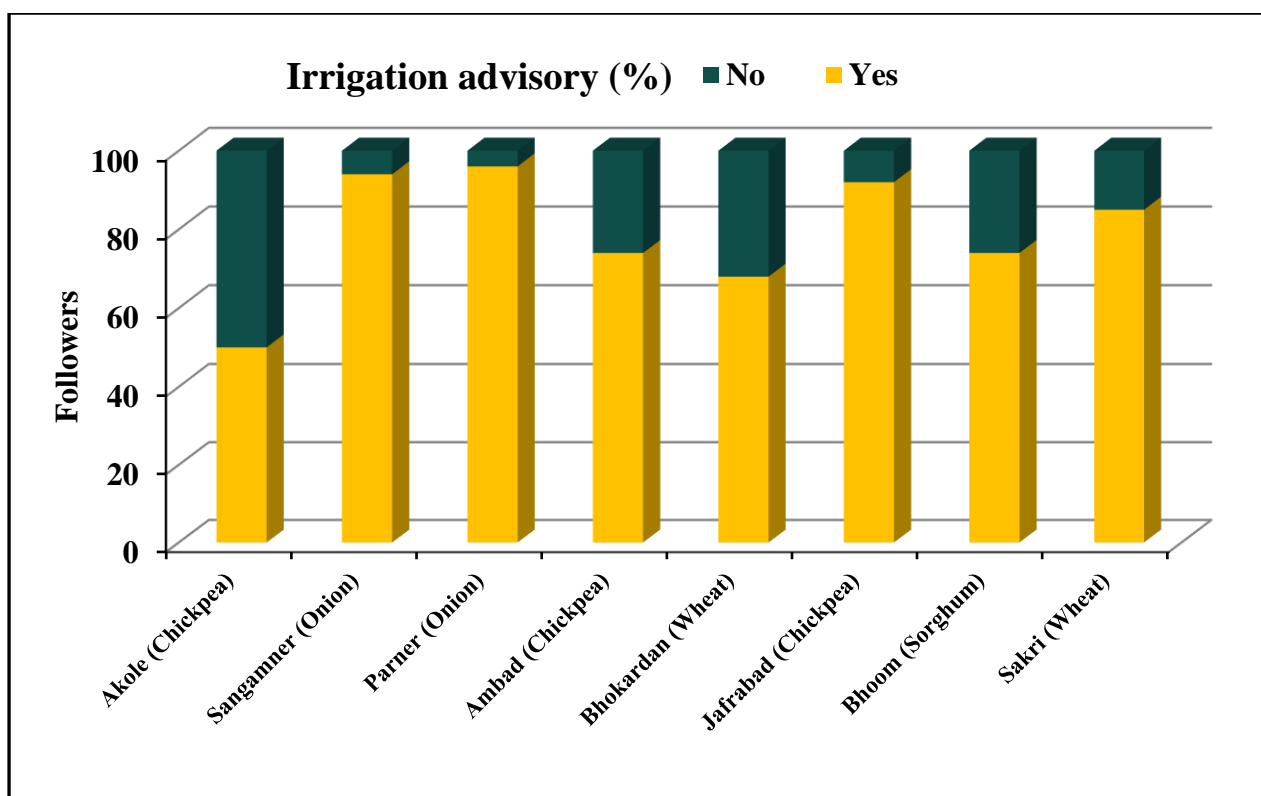


Figure 19 Status of farmer's adaptability for advisories of irrigation for Rabi season crops in the different blocks

21. Advisories of Application of Chemical Fertilizers/Pesticides, and Use of Fertilizer Calculator

Chemical fertilizers are quick in providing plant nutrients which can be easily absorbed and results in the increased productivity. However, excess use of chemical fertilisers is harmful to soil health and ultimately the whole ecosystem. Therefore application of recommended dose of chemicals fertiliser preferably along with organic manures and inputs is an effective way to use appropriate chemicals in agriculture.

• Kharif Season

From Figure 20, it is revealed that the advisories of the recommended dose of chemical fertilizers followed by 27% to 100% of farmers in the different blocks while, the advisory followers were highest in the Akole, Jafrabad, Sangamner, and Ambad blocks and lowest in the Parner, Bhokardan, Bhoom, and Sakri blocks. The advisories of spilt dose of chemical fertilizers were followed by 2% to 80% of farmers in the different blocks while, the advisory followers were highest in the Jafrabad, Sangamner, and Ambad blocks and lowest in the Parner, Akole, Bhoom, Bhokardan, and Sakri blocks. The use of fertilizer calculator developed in the FarmPrecise App to calculate fertilizer dose followed by 15% to 81% of farmers in the different blocks while the fertilizer calculator users were highest in the Ambad, Bhokardan, Sangamner, and Akole blocks and lowest in the Sakri, Bhoom, Parner, and Jafrabad blocks. The fertilizer cost was saved using the fertilizer calculator by 6% to 68% of farmers in the different blocks while, their active users were highest in the Ambad, Bhokardan, and Sangamner blocks and lowest in the Sakri, Bhoom, Jafrabad, Parner, Akole, and Sakri blocks. The advisories of application of chemical pesticides

followed by 20% to 99% of farmers in the different blocks while the advisory followers were highest in the Akole, Ambad, Jafrabad, Bhokardan, and Sangamner blocks and lowest in the Parner, Bhoom, and Sakri blocks.

- **Rabi Season**

From Figure 21, it is revealed that the advisories of the recommended dose of chemical fertilizers followed by 4% to 98% of farmers in the different blocks while, the advisory followers are higher in the Sakri, Parner, Bhokardan, and Jafrabad, blocks and lower in the Sangamner, Ambad, Bhoom, and Akole blocks. The advisories of spilt dose of chemical fertilizers followed by 0% to 67% of farmers in the different blocks while, the advisory followers are higher in the Jafrabad, Bhokardan, Sakri, and Akole blocks and lower in the Sangamner, Bhoom, Ambad, and Parner blocks. The use of fertilizer calculator developed in the FarmPrecise App to calculate fertilizer dose followed by 0% to 82% of farmers in the different blocks while, the users are higher in the Akole, Ambad, Bhokardan, Jafrabad, and Sakri blocks and lower in the Sangamner, Parner, and Bhoom, blocks. 0% to 81% farmers in the different blocks saved fertilizer cost using the fertilizer calculator by while, the active users are higher in the Akole, Ambad, Sakri, and Bhokardan blocks and lower in the Sangamner, Bhoom, Parner, and Jafrabad blocks. The advisories of application of chemical pesticides followed by 0% to 64% of farmers in the different blocks while, the advisory followers were higher in the Ambad, Akole, and Parner blocks and lower in the Bhoom, Sangamner, Sakri, Bhokardan, and Jafrabad blocks.

The advisories of chemical fertilizers and pesticides need to be followed very precisely to control the excessive and unwanted use of chemicals to protect the soil health and ecosystem. The adaptability of split-dose application can be increased by disseminating the benefits of the split-dose application and how farmers can save the fertilizers and increase crop production through the split-dose application through in-house training and farmer's field demonstration. Also, there is large scope to increase the use of fertilizer calculator to save the cost of fertilizers. The adaptability can be increased by developing an easy user interface of fertilizer calculator in FarmPrecise application and knowing the importance of recommended doses of chemicals in agriculture through the demonstration on farmer's field plots. The overall adaptability of advisories of chemical inputs was quite less compared to the adaptability of other advisories, evidences that the nature based solutions and organic farm inputs are playing greater role in soil health management, crop protection and overall crop production system. On farmer's demand, the advisories of use of chemical fertilizers/pesticides/insecticides need to be updated additionally with information of their latest brands available in markets.

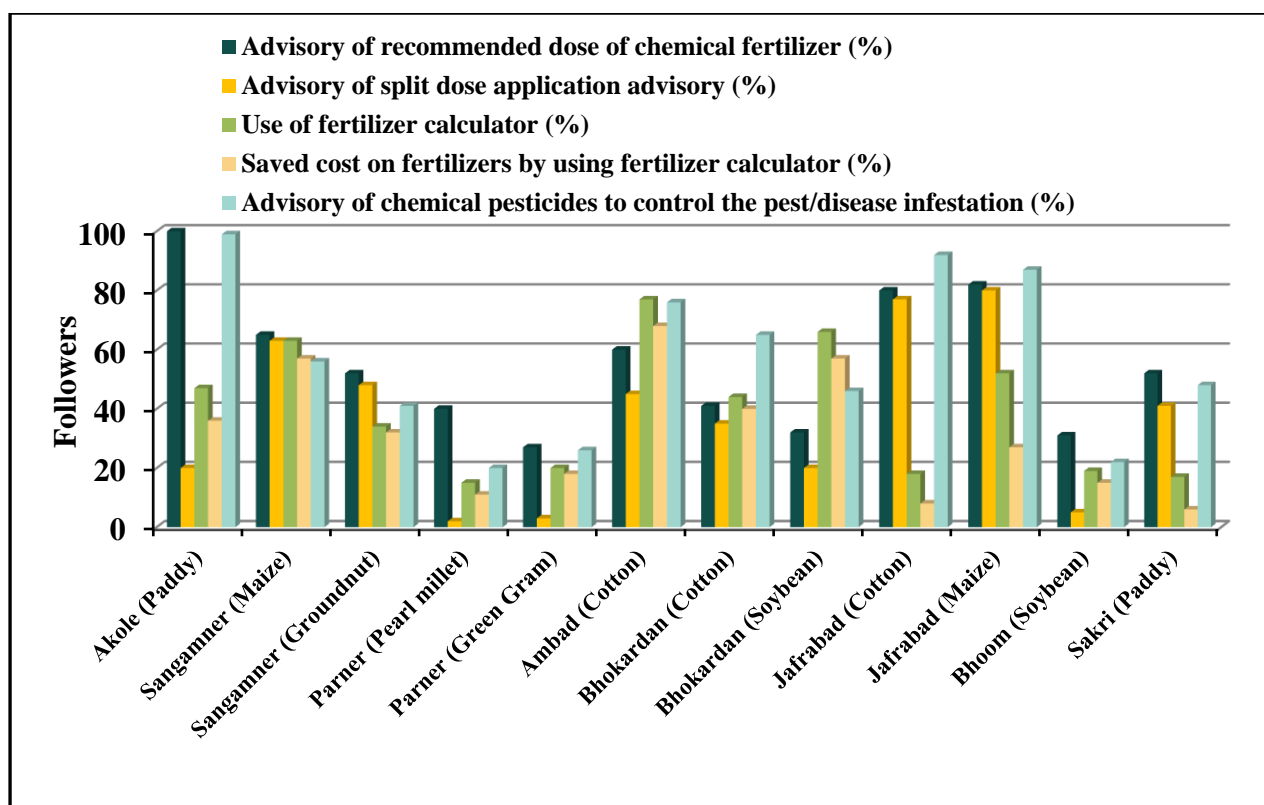


Figure 20 Status of farmer's adaptability for advisories of application of chemical fertilizers/ pesticides and use of fertiliser calculator for the Kharif season crops in the different blocks

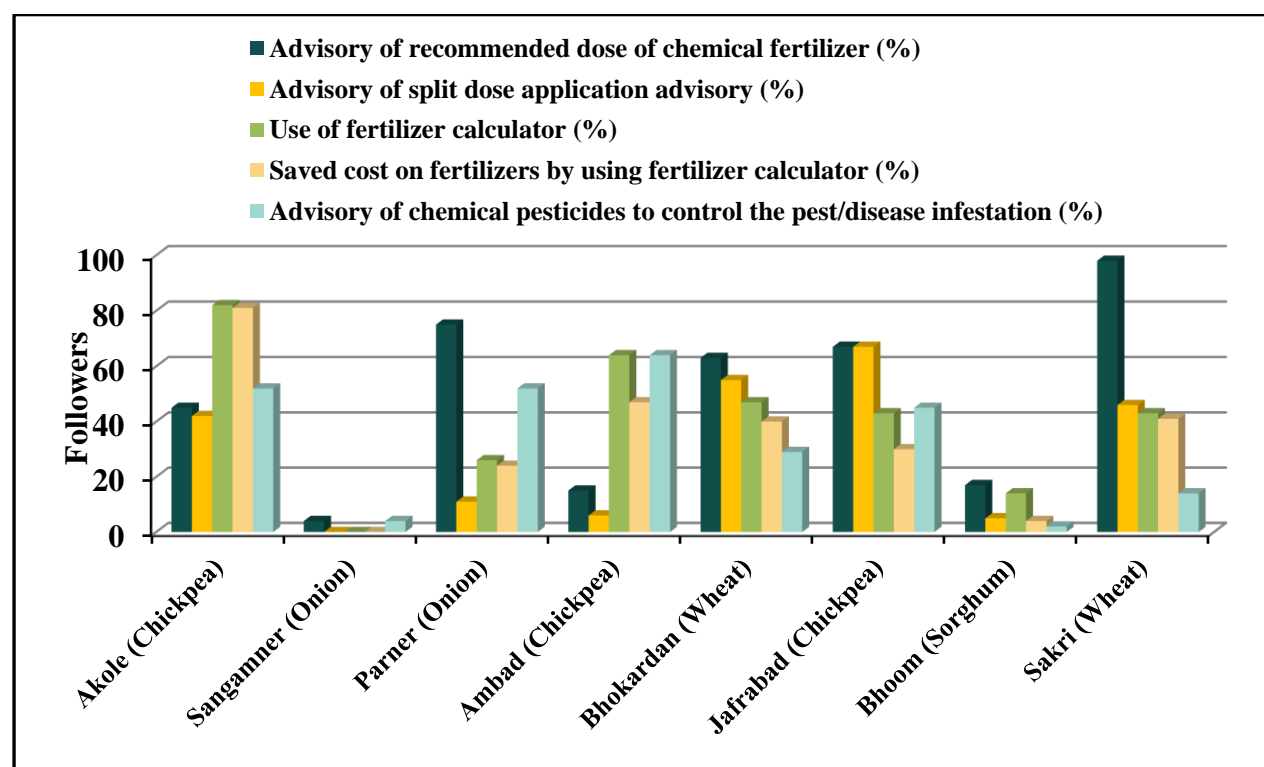


Figure 21 Status of farmer's adaptability for advisories of application of chemical fertilizers and pesticides and use of fertiliser calculator for the Rabi season crops in the different blocks

22. Advisories of Daily Weather and Weather Alerts

Weather plays an important role in agricultural production. It has a profound influence on crop growth, development, and yields; on the incidence of pests and diseases; on water needs; and on fertilizer requirements. Most field crops are dependent solely upon weather to get life-sustaining water and energy. Adverse weather conditions may lead to production losses, especially if experienced during critical stages of growth. So the advisories of daily weather and weather alerts (heavy rainfall/hail storm/pest-disease attacks) are very useful for farmers.

- **Kharif Season**

From Figure 22, it is revealed that most of the farmers (80-100%) in the different blocks followed the advisories of daily weather and weather alerts and reported that those were very useful in agriculture to save the crop. The crop-wise and block-wise details followers of advisories of daily weather and weather alerts are shown in the Figure 22.

- **Rabi Season**

From Figure 23, it is revealed that most of the farmers (60-100%) in the different blocks followed the advisories of daily weather and weather alerts and reported that those were very useful in agriculture to save the crop. The crop-wise and block-wise details followers of advisories of daily weather and weather alerts are shown in the Figure 23.

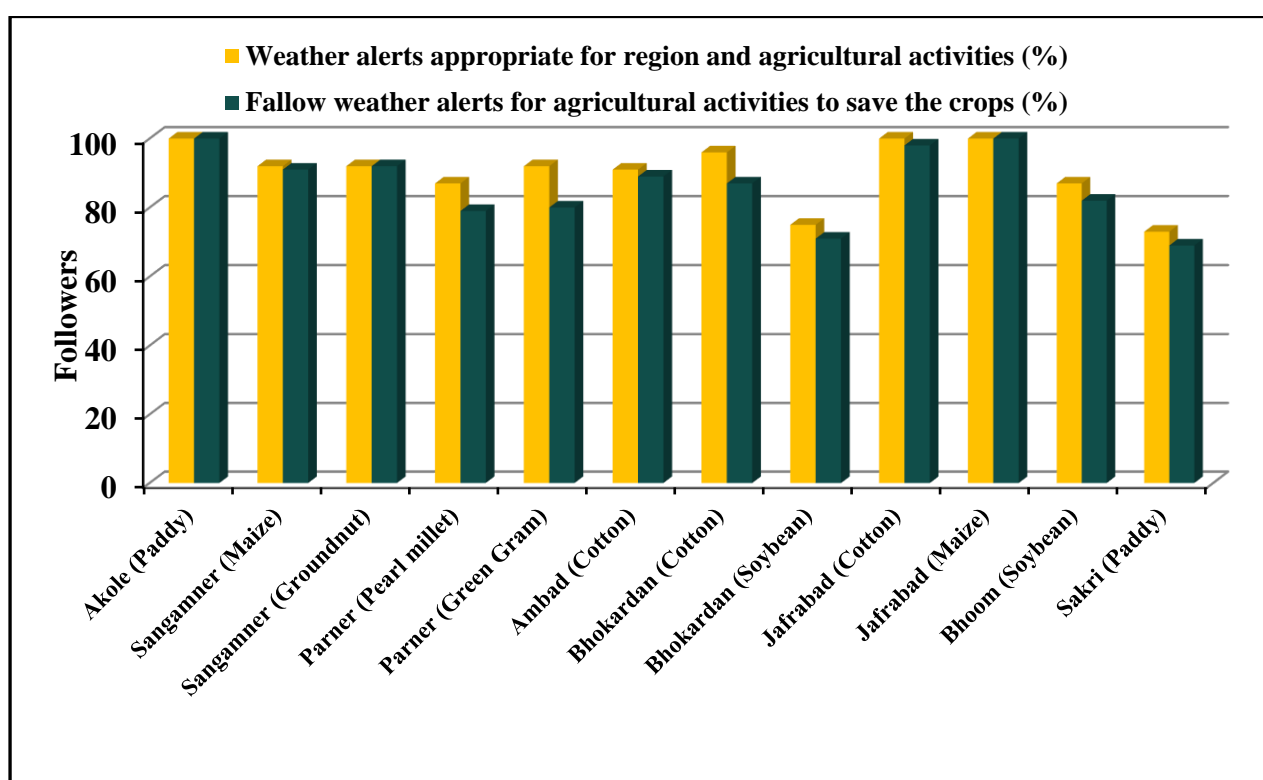


Figure 22 Status of farmer's adaptability for advisories of weather alerts for the Kharif season crops in the different blocks

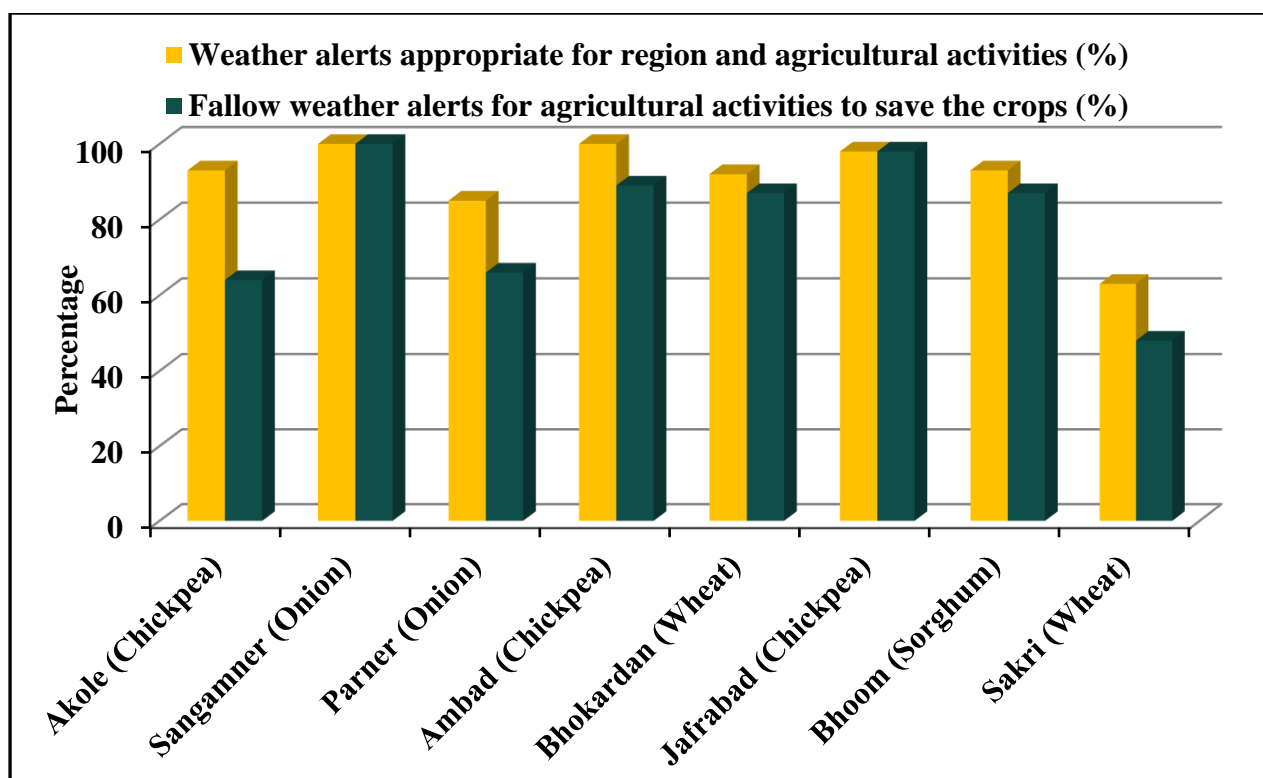


Figure 23 Status of farmer's adaptability for advisories of weather alerts for the Rabi season crops in the different blocks

23. Impacts of the Agromet Advisories

The agromet advisory services (FarmPrecise App) provide a very special kind of inputs to the farmers as advisories that can make a great difference to agriculture production by taking the advantage of benevolent weather and minimizing the adverse impact of malevolent weather. The impacts of agro-advisories disseminated through the FarmPrecise mobile App are given below.

Impacts of the Agromet Advisories on the Crop Yield

- **Kharif Season**

The block-wise details of impacts of the agromet advisories on the crop yield of different crops are given in the Table 1. Table 1 revealed about 23% to 100% farmers observed that crop yield was increased by 25%, about 0 to 70% farmers observed that crop yield increased but no big change with respect to the average historical crop yield, and about 0% to 45% farmers observed that no change with respect to the average historical crop yield.

Table 1 Impact of the agromet advisories on crop yield for the Kharif season crops in the different blocks

Advisories/Block/Crop	Crop yield increased after following agro-advisory(%)			
	Yes (Increased by 25%)	Yes, but crop yield is near about equal to the average historical yield	No	Total
Akole (Paddy)	100	00	0	100
Sangamner (Maize)	69	21	10	100
Sangamner (Groundnut)	57	25	18	100
Parner (Pearl millet)	31	24	45	100
Parner (Green Gram)	36	26	38	100
Ambad (Cotton)	46	35	19	100
Bhokardan (Cotton)	23	70	07	100
Bhokardan (Soybean)	43	28	29	100
Jafrabad (Cotton)	44	56	00	100
Jafrabad (Maize)	42	58	00	100
Bhoom (Soybean)	55	39	06	100
Sakri (Paddy)	34	48	18	100

Source: Farmer's feedback survey data 2020-21

- Rabi Season**

The block-wise details of impacts of the agromet advisories on the crop yield of different crops are given in the Table 2. Table 2 revealed about 10% to 77% farmers observed that crop yield was increased by 25%, about 5% to 88% farmers observed that crop yield increased but no big change with respect to the average historical crop yield, and about 3% to 18% farmers observed that no change with respect to the average historical crop yield.

Table 2 Impact of the agromet advisories on crop yield for the Rabi season crops in the different blocks

Advisories/Block/Crop	Crop yield increased after following agro-advisory(%)			
	Yes (Increased by 25%)	Yes, but crop yield is near about equal to the average historical yield	No	Total
Akole (Chickpea)	77	15	08	100
Sangamner (Onion)	10	88	02	100
Parner (Onion)	50	35	15	100
Ambad (Chickpea)	69	13	18	100
Bhokardan (Wheat)	77	05	18	100
Jafrabad (Chickpea)	53	44	03	100
Bhoom (Sorghum)	40	44	16	100
Sakri (Wheat)	57	41	03	100

Source: Farmer's feedback survey data 2020-21

Impacts of the Agromet Advisories on the Cost of Field Inputs

• Kharif Season

The block-wise details of impacts of the agromet advisories on the cost of field inputs of different crops are given in the Table 3. Table 3 revealed about 38% to 100% farmers observed that cost of field inputs was decreased by 25%; 0% to 60% farmers observed that cost of field inputs decreased but no big change with respect to the average historical cost of field inputs, and 0% to 45% farmers observed that no change with respect to the average historical cost of field inputs.

Table 3 Impact of the agromet advisories on cost of field inputs for the Kharif season crops in the different blocks

Advisories/Block/Crop	Cost of field inputs (like fertilizers, Pesticides, Insecticides) decreased after following agro-advisory(%)			
	Yes (Decreased by 25%)	Yes, but the cost of field inputs is near about equal to the average historical cost	No	Total
Akole (Paddy)	100	00	00	100
Sangamner (Maize)	68	21	11	100
Sangamner (Groundnut)	65	20	15	100
Parner (Pearl millet)	49	26	25	100
Parner (Green Gram)	40	22	38	100
Ambad (Cotton)	59	26	15	100
Bhokardan (Cotton)	80	12	08	100
Bhokardan (Soybean)	45	32	23	100
Jafrabad (Cotton)	42	58	00	100
Jafrabad (Maize)	40	60	00	100
Bhoom (Soybean)	41	39	20	100
Sakri (Paddy)	38	39	23	100

Source: Farmer's feedback survey data 2020-21

• Rabi Season

The block-wise details of impacts of the agromet advisories on the cost of field inputs of different crops are given in the Table 4. Table 4 revealed about 21% to 80% farmers observed that cost of field inputs was decreased by 25%; 11% to 78% farmers observed that cost of field inputs decreased but no big change with respect to the average historical cost of field inputs, and 1% to 50% farmers observed that no change with respect to the average historical cost of field inputs.

Table 4 Impact of the agromet advisories on the cost of field inputs for the Rabi season crops in the different blocks

Advisories/Block/Crop	Cost of field inputs (like fertilizers, Pesticides, Insecticides) decreased after following agro-advisory(%)			
	Yes (Decreased by 25%)	Yes, but the cost of field inputs is near about equal to the average historical cost	No	Total
Akole (Chickpea)	78	19	03	100
Sangamner (Onion)	21	78	01	100
Parner (Onion)	32	18	50	100
Ambad (Chickpea)	80	11	09	100
Bhokardan (Wheat)	69	18	13	100
Jafrabad (Chickpea)	75	24	01	100
Bhoom (Sorghum)	36	44	21	100
Sakri (Wheat)	69	18	13	100

Source: Farmer's feedback survey data 2020-21

Impacts of the Agromet Advisories on the Cost of Cultivation and Labor

- Kharif Season**

The block-wise details of impacts of the agromet advisories on the cost of cultivation and labor of different crops are given in the Table 5. Table 5 revealed about 26% to 87% farmers observed that the cost of cultivation and labor is decreased by 25%; about 0% to 57% farmers observed that the cost of cultivation and labor decreased but no big change with respect to the average historical cost of cultivation and labor, and about 0% to 56% farmers observed that no change with respect to the average historical cost of cultivation and labour.

Table 5 Impact of the agromet advisories on the cost of cultivation and labour cost for the Kharif season crops in the different blocks

Advisories/Block/Crop	Cost of cultivation and labour cost decreased after following agro-advisory(%)			
	Yes (Decreased by 25%)	Yes, but the cost of cultivation and labour is near about equal to the average historical cost	No	Total
Akole (Paddy)	87	00	13	100
Sangamner (Maize)	42	48	10	100
Sangamner (Groundnut)	57	25	18	100
Parner (Pearl millet)	26	32	42	100
Parner (Green Gram)	27	17	56	100
Ambad (Cotton)	49	30	21	100
Bhokardan (Cotton)	77	21	02	100
Bhokardan (Soybean)	39	34	27	100
Jafrabad (Cotton)	43	57	00	100
Jafrabad (Maize)	44	56	00	100
Bhoom (Soybean)	39	41	20	100
Sakri (Paddy)	26	54	20	100

Source: Farmer's feedback survey data 2020-21

- **Rabi Season**

The block-wise details of impacts of the agromet advisories on the cost of cultivation and labor of different crops are given in the Table 6. Table 6 revealed about 26% to 87% farmers observed that the cost of cultivation and labor is decreased by 25%; about 0% to 57% farmers observed that the cost of cultivation and labor decreased but no big change with respect to the average historical cost of cultivation and labor, and about 0% to 56% farmers observed that no change with respect to the average historical cost of cultivation and labour.

Table 6 Impact of the agromet advisories on cost of cultivation and labour cost for the Rabi season crops in the different blocks

Advisories/Block/Crop	Cost of cultivation and labour cost decreased after following agro-advisory (%)			
	Yes (Decreased by 25%)	Yes, but the cost of cultivation and labour cost is near about equal to the average historical cost	No	Total
Akole (Chickpea)	65	12	23	100
Sangamner (Onion)	05	94	01	100
Parner (Onion)	20	20	60	100
Ambad (Chickpea)	76	10	14	100
Bhokardan (Wheat)	69	08	23	100
Jafrabad (Chickpea)	53	41	08	100
Bhoom (Sorghum)	44	34	22	100
Sakri (Wheat)	36	61	03	100
Source: Farmer's feedback survey data 2020-21				

Impacts of the Agromet Advisories on the Amount of Irrigation Water Applied

- **Kharif Season**

The block-wise details of impacts of the agromet advisories on the amount of irrigation water applied for different crops are given in the Table 7. Table 7 revealed about 17% to 99% farmers observed that amount of irrigation water applied is decreased up to 25%, about 0% to 61% farmers observed that amount of irrigation water applied decreased but no big change with respect to the average historical amount of irrigation water applied, and about 0% to 45% farmers observed that no change with respect to the average historical amount of irrigation water applied.

Table 7 Impact of the agromet advisories on irrigation water requirement of the Kharif season crops in the different blocks

Advisories/Block/Crop	The amount of irrigation water applied decreased after following agro-advisory(%)			
	Yes (Decreased up to 25%)	Yes, but irrigation water requirement is near about equal to the average historical value	No	Total
Akole (Paddy)	99	00	01	100
Sangamner (Maize)	68	24	08	100
Sangamner (Groundnut)	76	19	05	100
Parner (Pearl millet)	54	19	27	100
Parner (Green Gram)	50	12	38	100
Ambad (Cotton)	54	26	20	100
Bhokardan (Cotton)	78	15	07	100
Bhokardan (Soybean)	46	29	25	100
Jafrabad (Cotton)	48	52	00	100
Jafrabad (Maize)	38	61	00	100
Bhoom (Soybean)	41	52	07	100
Sakri (Paddy)	17	56	27	100

Source: Farmer's feedback survey data 2020-21

- Rabi Season**

The block-wise details of impacts of the agromet advisories on the amount of irrigation water applied for different crops are given in the Table 8. Table 8 revealed about 9% to 77% farmers observed that amount of irrigation water applied is decreased up to 25%, about 5% to 89% farmers observed that amount of irrigation water applied decreased but no big change with respect to the average historical amount of irrigation water applied, and about 0% to 34% farmers observed that no change with respect to the average historical amount of irrigation water applied.

Table 8 Impact of the agromet advisories on irrigation water requirement of Rabi season crops in the different blocks

Advisories/Block/Crop	The amount of irrigation water applied decreased after following agro-advisory(%)			
	Yes (Decreased up to 25%)	Yes, but irrigation water requirement is near about equal to the average historical value	No	Total
Akole (Chickpea)	70	15	15	100
Sangamner (Onion)	09	89	02	100
Parner (Onion)	42	24	34	100
Ambad (Chickpea)	76	11	13	100
Bhokardan (Wheat)	77	05	18	100
Jafrabad (Chickpea)	69	31	00	100
Bhoom (Sorghum)	37	49	14	100
Sakri (Wheat)	39	58	03	100

Source: Farmer's feedback survey data 2020-21

24. Usefulness (Farmers Rating) of e-Agromet Advisories

The overall usefulness of agro-advisories disseminated through the FarmPrecise application was rated by farmers in the spectrum of Very Low, Low, Average, Good, and Very Good. The farmer's ratings for various agro-advisories are given below.

➤ Overall Usefulness (Farmers Rating) of Advisories of Land Preparation Before-After Sowing, Crop Geometry, and Seed Treatment

The details of farmers rating on the usefulness of the advisories of land preparation and other activities before-after sowing disseminated during crop period of the Kharif and Rabi season crops in the different blocks are shown in the Figure 24.

• Kharif Season

Figure 24 revealed that about 0-16%, 1-98%, 1-99%, 0-16% and 0-7% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

• Rabi Season

Figure 24 revealed that about 2-27%, 36-66%, 1-51%, 0-19%, and 0-6% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

➤ Overall Usefulness (Farmers Rating) of Advisories of Application of Organic Manures

The details of farmers rating on the usefulness of the advisories of application of organic manures disseminated during crop period of the Kharif and Rabi season crops in the different blocks are shown in the Figure 25.

• Kharif Season

Figure 25 revealed that about 0-10%, 3-90%, 8-97%, 0-28%, and 0-11% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

• Rabi Season

Figure 25 revealed that about 0-25%, 21-92%, 5-60%, 0-18%, and 0% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

➤ Overall Usefulness (Farmers Rating) of Advisories of Use of Trap Crop, Pheromone Trap, and Light Trap

The details of farmers rating on the usefulness of the advisories use of traps disseminated during crop period of the Kharif and Rabi season crops in the different blocks are shown in the Figure 26.

- **Kharif Season**

Figure 26 revealed that about 0-17%, 0-87%, 5-100%, 0-39%, and 0-18% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

- **Rabi Season**

Figure 26 revealed that about 0-19%, 11-90%, 6-55%, 1-34%, and 0-12% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

➤ **Overall Usefulness (Farmers Rating) of Advisories of Applications of Amrutpani, Jeevamruit, Vermiwash, and Bio-Pesticides**

The details of farmers rating on the usefulness of the advisories of application of Amrutpani, Jeevamruit, Vermiwash, and Bio-Pesticides disseminated during crop period of the Kharif and Rabi season crops in the different blocks are shown in the Figure 27.

- **Kharif Season**

Figure 27 revealed that about 0-17%, 1-90%, 8-99%, 0-35%, and 0-16% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

- **Rabi Season**

Figure 27 revealed that about 1-22%, 14-85%, 2-65%, 0-20%, and 0-6% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

➤ **Overall Usefulness (Farmers Rating) of Daily Weather Advisories**

The details of farmers rating on the usefulness of the daily weather advisories disseminated during the crop period of the Kharif and Rabi season crops in the different blocks shown in the Figure 28.

- **Kharif Season**

Figure 28 revealed that about 0-17%, 1-91%, 8-99%, 0-18%, and 0-9% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

- **Rabi Season**

Figure 28 revealed that about 0-29%, 38-78%, 4-41%, 0-19%, and 0-4% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

➤ **Overall Usefulness (Farmers Rating) of Advisories of Weather Alerts**

The details of farmers rating on the usefulness of the advisories of weather alerts disseminated during the crop period of the Kharif and Rabi season crops in the different blocks are shown in the Figure 29.

- **Kharif Season**

Figure 29 revealed that about 0-17%, 1-99%, 0-99%, 0-15%, and 0-8% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

- **Rabi Season**

Figure 29 revealed that about 0-29%, 27-96%, 2-51%, 0-18%, and 0-5% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

➤ **Overall Usefulness (Farmers Rating) of Agromet Advisories**

The details of farmers rating on the overall usefulness of all the advisories disseminated during the crop period of the Kharif and Rabi season crops in the different blocks are shown in the Figure 30.

- **Kharif Season**

Figure 30 revealed that about 1-25%, 4-82%, 8-94%, 0-12%, and 0-12% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

- **Rabi Season**

Figure 30 revealed that about 0-31%, 28-64%, 2-52%, 0-14%, and 0-9% farmers rated the advisories were 'Very Good', 'Good', 'Average', 'Low', and 'Very Low' respectively.

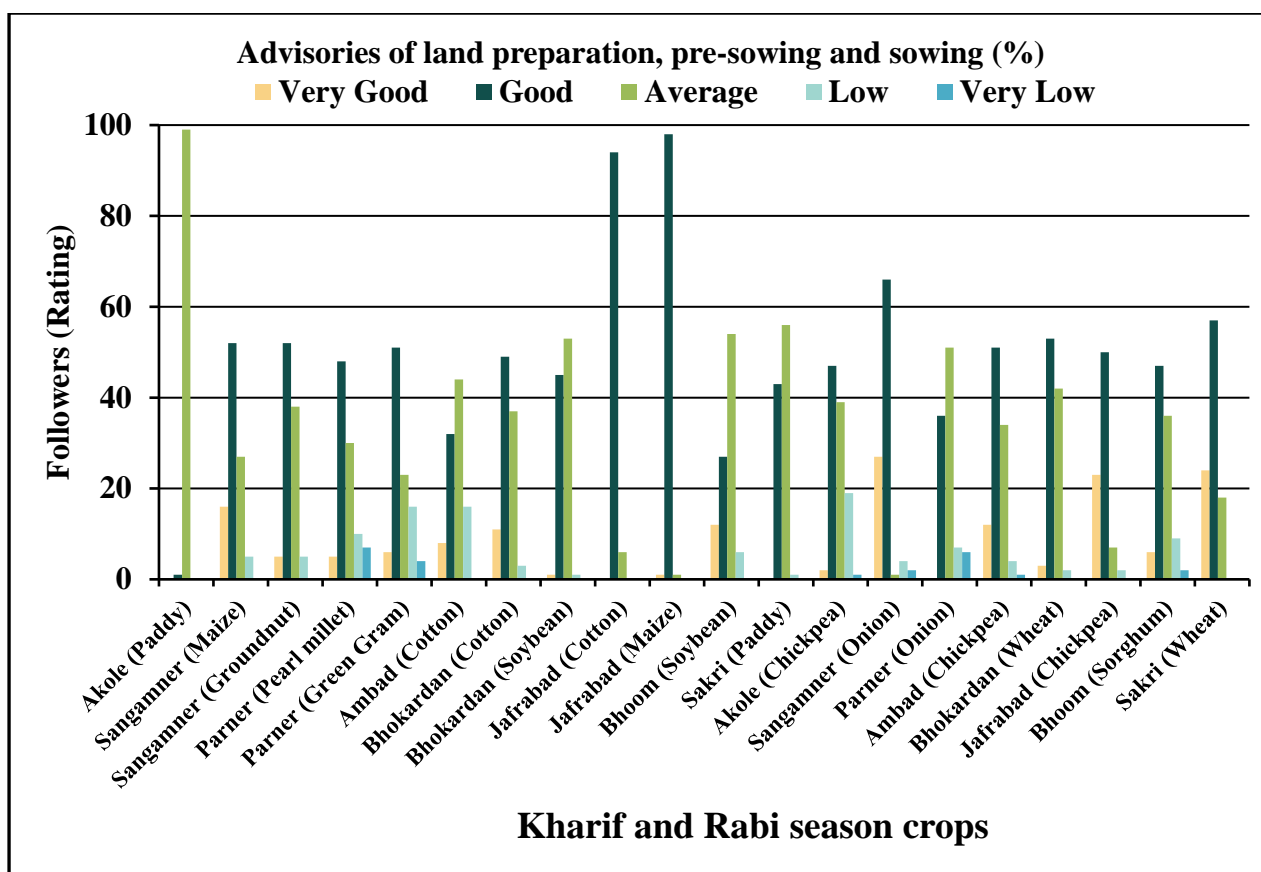


Figure 24 Status of the overall usefulness of the advisories of land preparation before-after sowing, crop geometry, and seed treatment for the Kharif and Rabi season crops in the different blocks

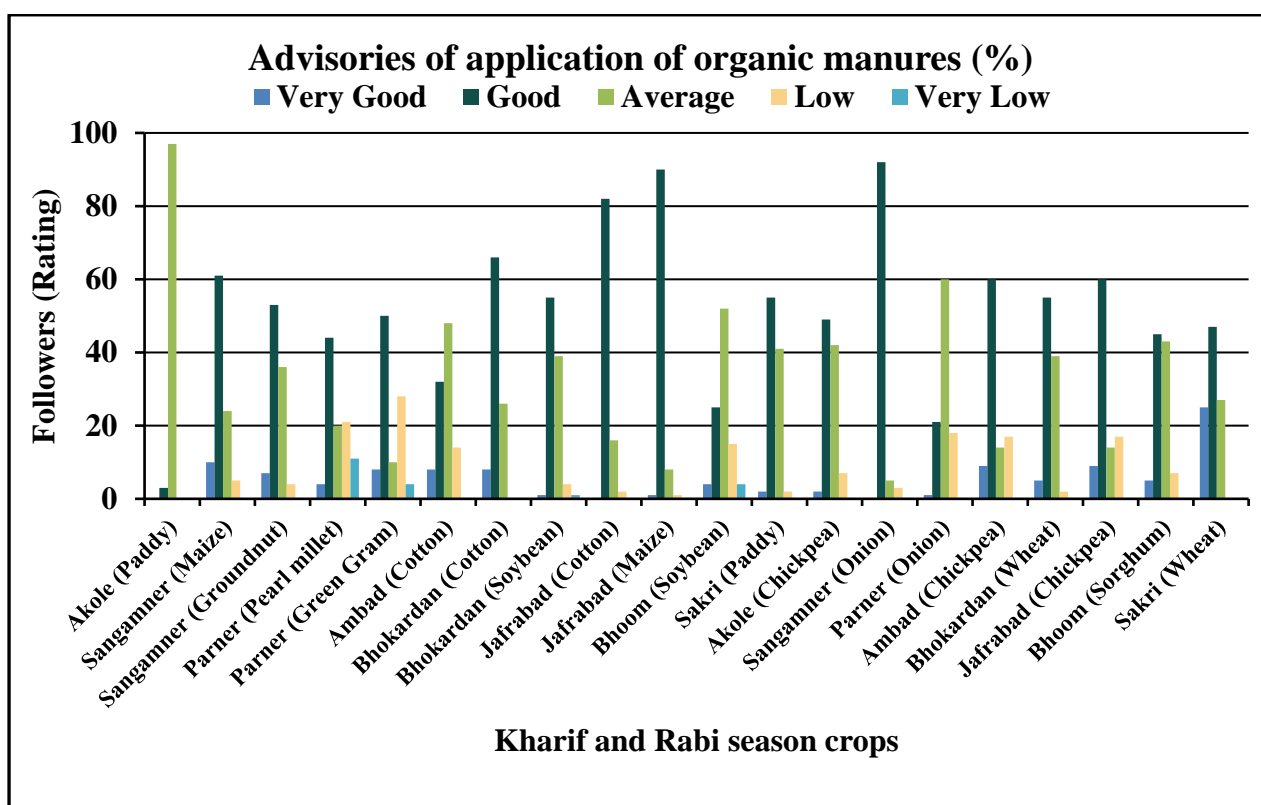


Figure 25 Status of the overall usefulness of the advisories of application of organic manures for the Kharif and Rabi season crops in the different blocks

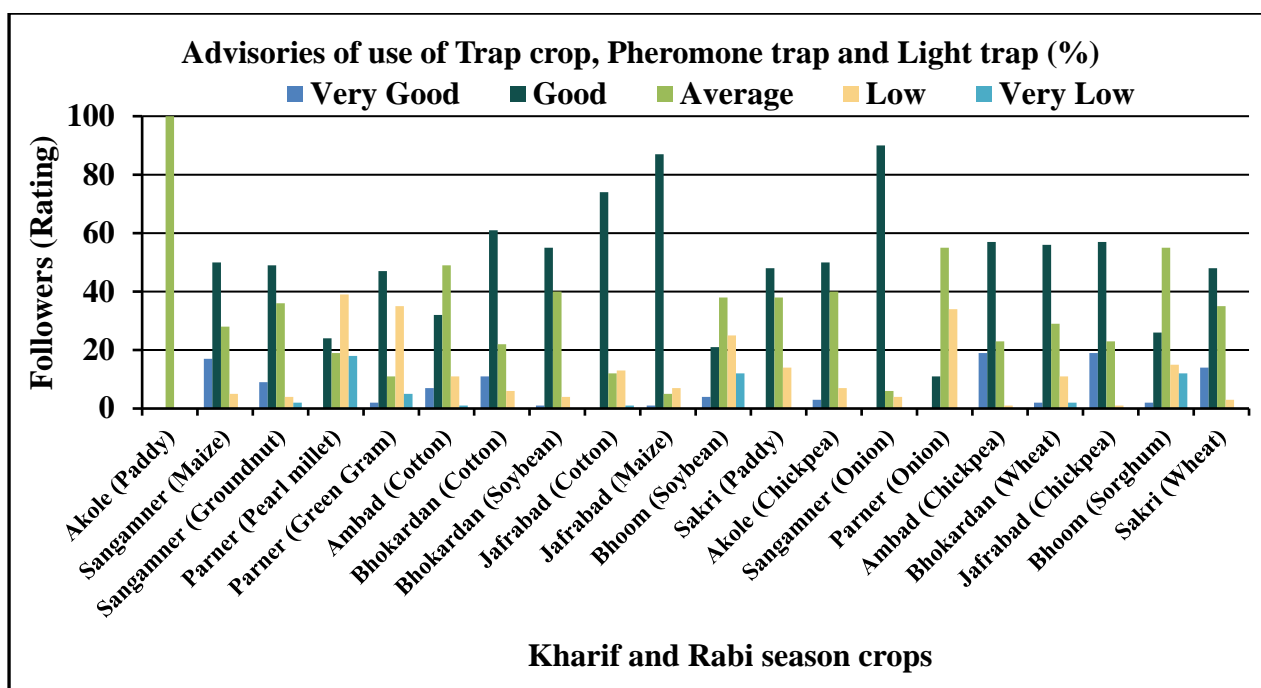


Figure 26 Status of the overall usefulness of the advisories of use of Trap crop, Pheromone trap and Light trap for the Kharif and Rabi season crops in the different blocks

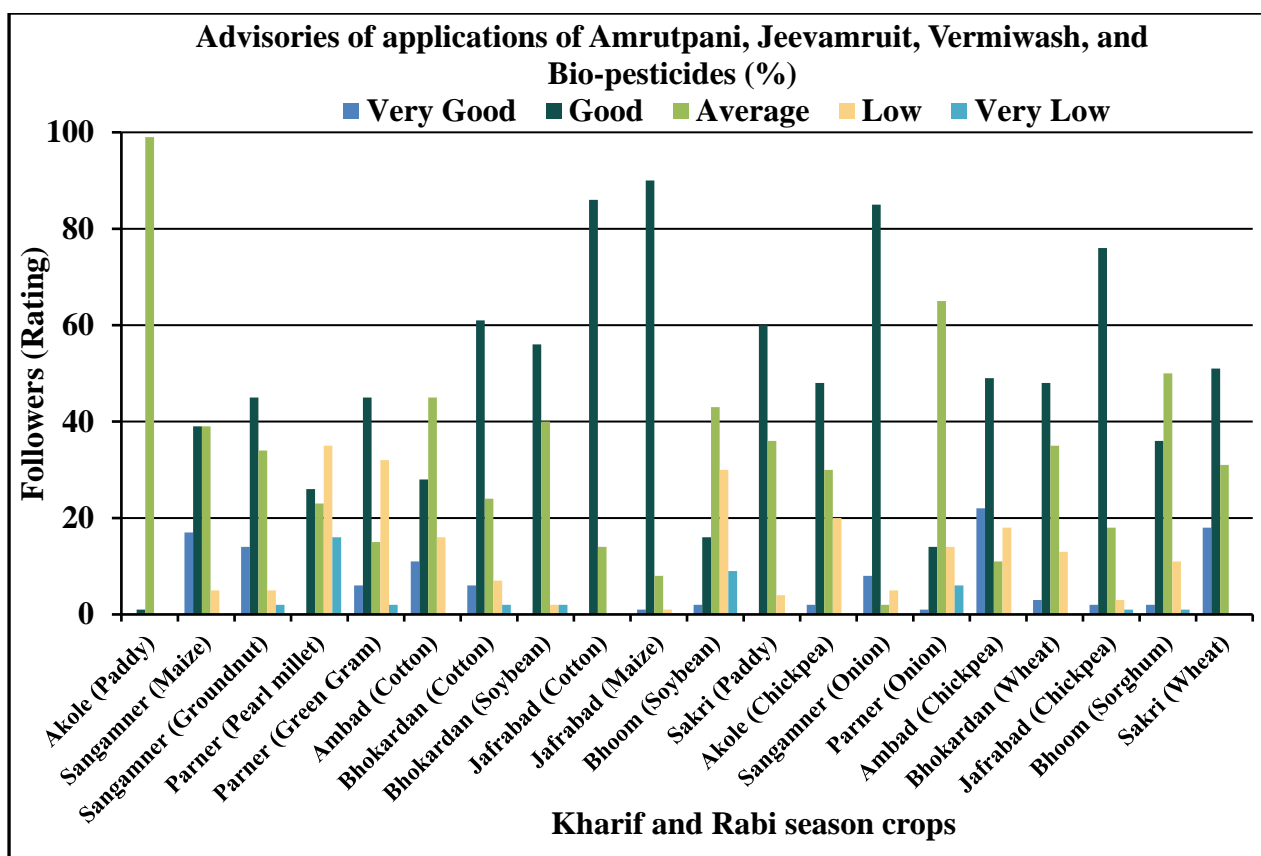


Figure 27 Status of the overall usefulness of the advisories of applications of Amrutpani, Jeevamruit, Vermiwash and Bio-pesticides for the Kharif and Rabi season crops in the different blocks

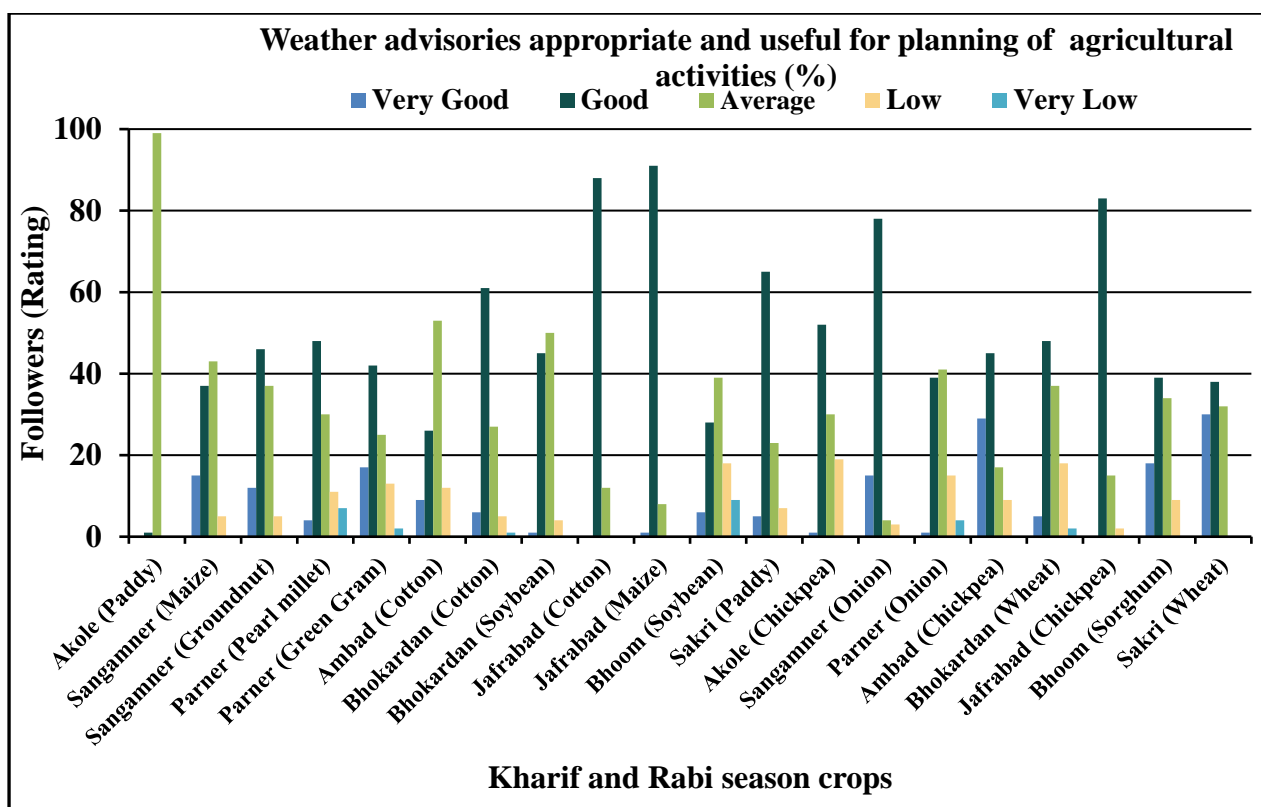


Figure 28 Status of the overall usefulness of the weather advisories for the Kharif and Rabi season crops in the different blocks

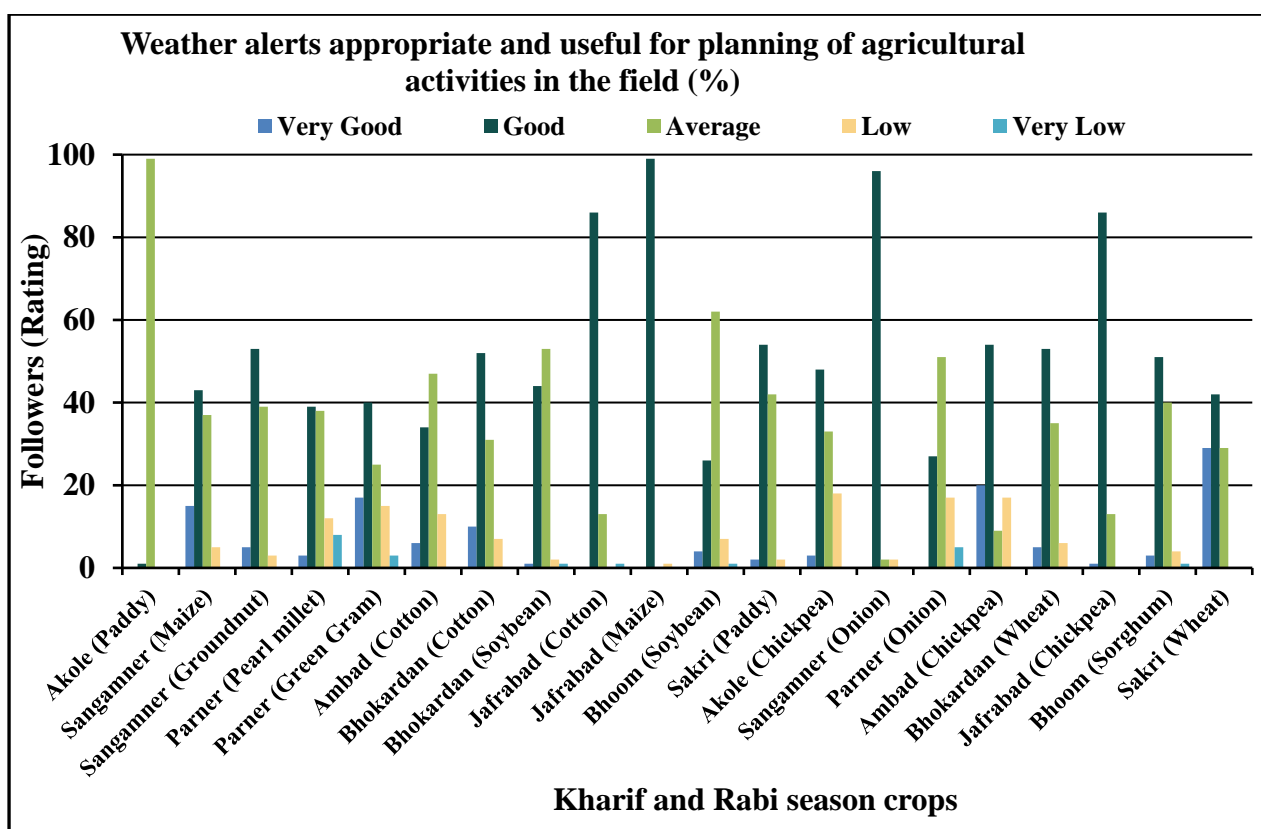


Figure 29 Status of the overall usefulness of the advisories of weather alerts for the Kharif and Rabi season crops in the different blocks

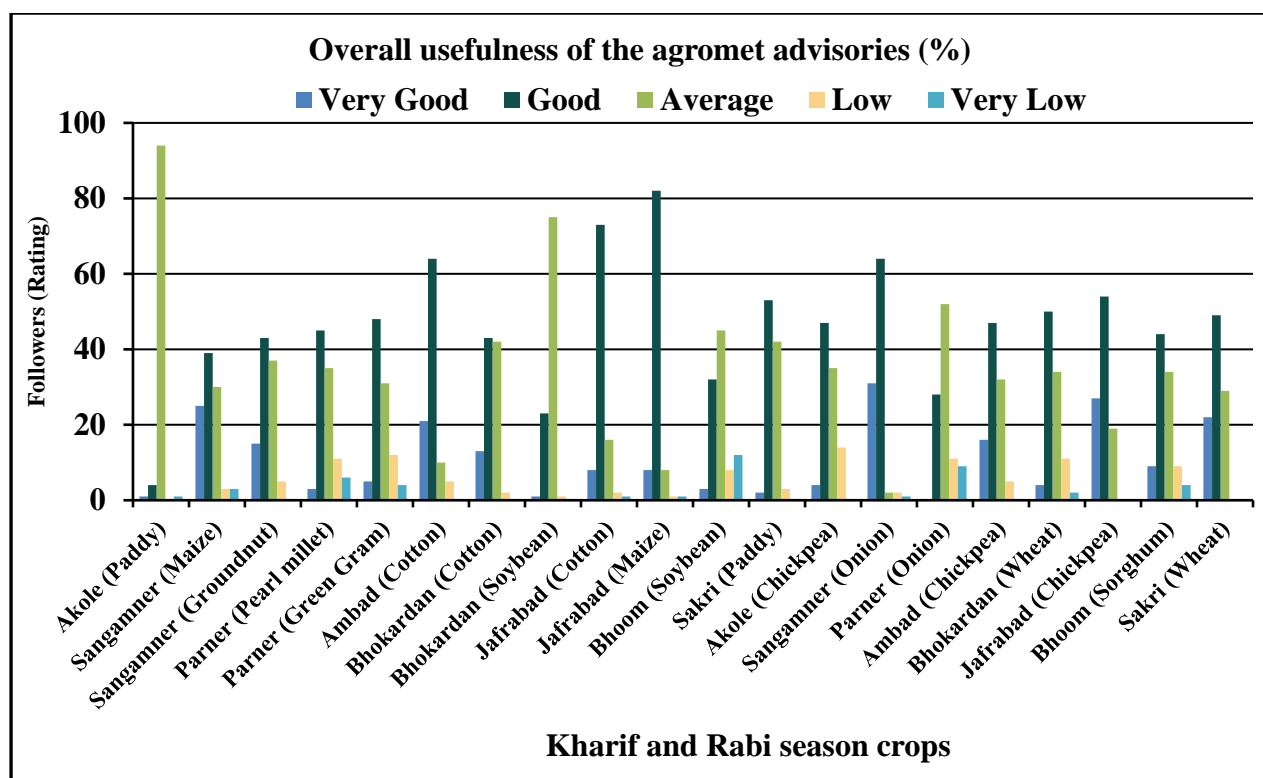


Figure 30 Status of the overall usefulness of the agromet advisories for the Kharif and Rabi season crops in the different blocks

25. Farmers Feedbacks on the Adaptability of Advisories of Land Preparation before Sowing

Farmer's feedbacks on observed impacts after following the advisories; challenges to follow the advisories; and difficulties encountered during following the advisories of land preparation (ploughing and harrowing) for Kharif and Rabi season's crops in the different blocks are given below.

• Kharif Season

Table 9 revealed that about all the farmers follow the advisory of ploughing. The percentage of machine (tractor) users is higher than the draft animal users for ploughing. About 56-100% farmers observed the good germination of seeds, and about 12-87% farmers observed that the partial control of weeds in the field. The block-wise details of the observed impacts of the advisories of land preparation for different crops are given in Table 9.

• Rabi Season

Table 10 revealed that about all the farmers in the different blocks follow the advisory of ploughing except few farmers of Ambad, Bhokardan, and Bhoom blocks. The percentage of draft animal users is higher than the tractor users for ploughing. About 43-96% farmers observed the good germination of seeds, and about 23-92% farmers observed partial control of weeds in field. The block-wise details of the observed impacts of the advisories of land preparation for different crops are given in Table 10.

Tables 9 and 10 jointly revealed that, some farmers did not ploughing before the rabi season to conserve residue moisture but they mostly prefer harrowing operation in the Rabi while ploughing was done at the start of the Kharif season only. For both the Kharif and Rabi seasons, the adaptability of land preparation advisories/practices was quite encouraging. However, farmers demanded information on new/modern field implements for agricultural operations, especially land preparation. Therefore the advisories of land preparation should include information on modern tools and technologies to save both energy and time. In the future, there is scope to develop land preparation advisories built with short information of the use of specific machines/implements/tools/equipments.

26. Farmers Feedbacks on the Adaptability of Advisories of Application of Organic Manures

Farmer's feedbacks on challenges to follow the advisories, and difficulties encountered in following the advisories of application of organic manures for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedback on the application of organic manures is given in Table 11. From Table 11 it is observed that about 0-11% of farmers responded that the application of organic manures was costly, about 0-21% of farmers didn't use any organic manure in their field, about 0-11% of farmers thought that it was not needed, about 0-18% of farmers responded that they have applied to this plot in last year, about 0-21% of farmers didn't have sufficient quantity, about 0-11% of surveyed farmers were willing to purchase the manures but it was not available in the market, about 0-29% of farmers responded that organic manure was not ready apply, and about 0-21% of farmers responded that the raw material was not available at household to prepare it.

- **Rabi Season**

The farmer's feedback on the application of organic manures is given in Table 12. From Table 12 it is observed that that about 0-7% of farmers responded that the application of organic manures was costly, about 0-15% of farmers didn't use any organic manure in their field, about 0-5% of farmers thought that it was not needed, about 0-26% of farmers responded that they have applied to this plot in last year, about 0-13% of farmers didn't have sufficient quantity, about 0-13% of farmers responded that they have applied to other plot, about 0-16% of surveyed farmers were willing to purchase the manures but it was not available in the market, about 0-22% of farmers responded that organic manure was not ready apply, and about 0-3% of farmers responded that the raw material was not available at household to prepare it.

The overall adaptability of the advisory to incorporate organic manures (FYM, Vermicompost, compost) while land preparation is about 74% for Kharif and Rabi seasons. Though there is moderate use of vermi-compost and other organic manures in the region, however, most of the farmers follow green manuring in their field with Sunnhemp and Dhaincha crops because green manuring is one of the alternatives to fulfill demand and to address the shortage of organic manure locally. The adaptability of the technique of green manuring can be increased through field training, technology

demonstration, and building a network for seed availability. Also, a large percentage of farmers are willing to purchase organic manures then there is scope to produce the organic manures at a commercial level and make them ready to sell during the appropriate period. Else, farmers have to develop their capacity to produce a sufficient amount of organic manure (FYM, Vermicompost, compost) to apply in their field. The appropriate number of livestock as per the landholding of the household is required to fulfil the demand of FYM.

Table 9 Farmer's feedback on the adaptability of the advisory of land preparation (Ploughing) for the Kharif season crops in the different blocks

Advisories/Block/Crop	Advisory of land preparation (Ploughing)(%)															
	Followers									Non-followers						
	Done with draft animal	Done with tractor	Good germination of seeds	Good control of weeds	Partial control of weeds	Control of soil born pests and soil born diseases	Partial control of pests and soil born diseases	No control of pests and soil born diseases	Other	Increasing cost of production	Un-availability of tractor / draft animals	Deep ploughing is done last year so not needed now	Deep ploughing reduces fertility of soil	It is time consuming	No need of deep ploughing	Other
Akole (Paddy)	34	32	56	0	55	0	0	0	0	16	0	22	0	0	29	0
Sangamner (Maize)	17	83	100	0	65	0	0	0	0	0	0	0	0	0	0	0
Sangamner (Groundnut)	28	72	90	0	47	0	0	0	0	0	0	0	0	0	0	0
Parner (Pearl millet)	66	32	94	0	81	0	0	0	0	2	0	0	0	0	2	0
Parner (Green Gram)	50	41	69	0	92	0	0	0	0	3	0	7	0	0	6	0
Ambad (Cotton)	48	52	93	0	23	0	0	0	0	0	0	0	0	0	0	0
Bhokardan (Cotton)	36	64	87	0	64	0	0	0	0	0	0	0	0	0	0	0
Bhokardan (Soybean)	49	51	88	0	59	0	0	0	0	0	0	0	0	0	0	0
Jafrabad (Cotton)	31	69	91	0	77	0	0	0	0	0	0	0	0	0	0	0
Jafrabad (Maize)	35	63	98	0	83	0	0	0	0	2	0	0	0	0	2	0
Bhoom (Soybean)	49	40	84	0	39	0	0	0	0	6	0	7	3	0	5	0
Sakri (Paddy)	29	61	89	0	69	0	0	0	0	5	0	5	4	0	0	0

Source: Farmer's feedback survey data 2020-21

Table 10 Farmer's feedback on the adaptability of the advisory of land preparation (Ploughing) for the Rabi season crops in the different blocks

Advisories/Block/Crop	Advisory of land preparation (Ploughing)(%)															
	Followers									Followers						
	Done with draft animal	Done with tractor	Good germination of seeds	Good control of weeds	Partial control of weeds	Control of soil born pests and soil born diseases	Partial control of pests and soil born diseases	No control of pests and soil born diseases	Other	Increasing cost of production	Unavailability of tractor / draft animals	Deep Ploughing is done last year so not needed now	Deep ploughing reduces fertility of soil	It is time consuming	No need of deep ploughing	Other
Akole (Chickpea)	88	10	88	0	35	0	0	0	0	2	0	0	0	0	0	0
Sangamner (Onion)	31	69	96	0	87	0	0	0	0	0	0	0	0	0	0	0
Parner (Onion)	69	31	87	0	23	0	0	0	0	0	0	0	0	0	0	0
Ambad (Chickpea)	66	10	62	0	64	0	0	0	0	16	0	12	0	0	17	0
Bhokardan (Wheat)	38	20	43	0	12	0	0	0	0	22	0	39	0	0	19	0
Jafrabad (Chickpea)	64	36	67	0	63	0	0	0	0	0	0	0	0	0	0	0
Bhoom (Sorghum)	64	5	64	0	37	0	0	0	0	11	0	13	0	0	22	0
Sakri (Wheat)	73	20	48	0	44	0	0	0	0	5	0	0	0	0	6	0

Source: Farmer's feedback survey data 2020-21

Table 11 Farmer's feedback on the adaptability of the advisory of use of organic manures for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Incorporated organic manures (FYM, Vermicompost, and Compost) while land preparation (%)								
	It is costly	I don't think it is needed	I don't use any organic manure	Last year applied to this plot	Not in sufficient quantity and applied to other crops	Organic manure was not available in market	Organic manure was not ready	Raw material was not available at home	Other
Akole (Paddy)	10	4	16	10	9	6	24	21	0
Sangamner (Maize)	0	3	0	4	0	0	1	1	0
Sangamner (Groundnut)	0	1	1	0	0	0	0	0	0
Parner (Pearl millet)	2	11	0	18	2	0	3	2	0
Parner (Green Gram)	0	5	0	13	0	2	3	0	0
Ambad (Cotton)	4	1	2	4	1	3	29	0	0
Bhokardan (Cotton)	0	0	2	3	0	1	6	0	0
Bhokardan (Soybean)	0	1	0	12	0	0	6	1	0
Jafrabad (Cotton)	0	3	1	9	3	0	22	18	0
Jafrabad (Maize)	0	5	2	4	11	0	20	21	0
Bhoom (Soybean)	11	1	21	11	3	11	18	3	0
Sakri (Paddy)	8	4	7	2	11	7	14	13	0

Source: Farmer's feedback survey data 2020-21

Table 12 Farmer's feedback on the adaptability of the advisory of use of organic manures for the Rabi season crops in the different blocks

Advisories/ Block/Crop	Incorporated organic manures (FYM, Vermicompost, and Compost) while land preparation (%)								
	It is costly	I don't think it is needed	I don't use any organic manure	Last year applied to this plot	Not in sufficient quantity and applied to other crops	Organic manure was not available in market	Organic manure was not ready	Raw material was not available at home	Other
Akole (Chickpea)	0	1	3	0	1	0	8	3	0
Sangamner (Onion)	0	0	0	0	0	0	0	0	0
Parner (Onion)	0	5	0	21	2	0	4	1	0
Ambad (Chickpea)	6	0	15	8	2	6	17	2	0
Bhokardan (Wheat)	0	3	2	0	0	5	8	0	0
Jafrabad (Chickpea)	7	1	0	16	13	1	22	3	0
Bhoom (Sorghum)	5	1	9	1	1	1	7	2	0
Sakri (Wheat)	0	0	0	26	0	5	1	0	0

Source: Farmer's feedback survey data 2020-21

27. Farmers Feedbacks on the Adaptability of Advisories of Seed Treatment

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of seed treatment for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the advisories of seed treatment are given in Table 13. Table 13 revealed that about 84% farmers follow the advisories of seed treatment.

- **Rabi Season**

The farmer's feedbacks on the advisories of seed treatment are given in Table 14. Table 14 revealed that about 68% farmers follow the advisories of seed treatment.

For both the Kharif and Rabi season, farmers observed that good germination, healthy seedlings, uniform growth, and prevented disease and pest infestation while about 16% and 32% farmers of Kharif and Rabi season respectively were not aware of the technique of seed treatment, some of them feel that seed treatment increase cost of production, and also some of them felt that it was not needed.

In the Kharif season, the percentage of followers of the advisory of seed treatment is higher than in Rabi season and also observed that crop-wise and block-wise variation is very high. Therefore there is need to develop unique strategies of adaptability of advisories crop-wise and block-wise. Due to the seed treatment, the percentage of farmers who go for the gap-filling and re-sowing was very low or equal to none. The followers of advisory of seed treatment are encouraging. However, to increase the accuracy of proper seed treatment and proper use of ingredients of seed treatment, field demonstrations are necessary, and also need to update the advisory with a short video of the process of seed treatment. There is huge scope to spread the technology throughout the region to increase productivity and reduce the input cost of crops production.

28. Farmers Feedbacks on the Adaptability of Advisories of Crop Geometry

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of crop geometry for the Kharif and Rabi season crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory of crop geometry are given in Table 15. Table 15 revealed that overall 56% of the farmers follow the advisories of crop geometry.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory of crop geometry are given in Table 16. Table 16 revealed that overall 48% of the farmers follow the advisories of crop geometry.

In both the seasons, observed benefits of the advisory of crop geometry are reduced seed rate, healthy crop, increased standing ability of crop in strong winds, increased vegetation, tillers, and branches, easiness in intercultural operations, and reduced pest and disease infestation. The crop-wise and block-wise variation in the adaptability of advisories is very high because farmers are facing the problem of availability of machines and labours during the period of sowing or transplanting. Therefore there is an opportunity to make available the machines through custom hiring centres. Else group/ communities can purchase the machine with their contribution.

Table 13 Farmer's feedback on the adaptability of the advisory of seed treatment for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of seed treatment(%)															
	Followers						Non-followers									
	Good Germination	Healthy seedlings and uniform growth	Partial Germination	Prevented disease infestation on seedlings	Prevented pest attack on seedlings	Other	It is time consuming	No idea about seed treatment	Not availability of seed treatment material	It was not needed	Observed disease infestation on Seedling	Observed pest attack on Seedling	Sowing of seeds due to sudden rainfall (appropriate sowing condition)	No need of seed treatment	Increases cost of production	other
Akole (Paddy)	52	41	0	7	14	0	11	10	9	6	2	1	9	12	9	0
Sangamner (Maize)	91	89	0	70	65	0	5	0	2	2	0	0	2	0	0	0
Sangamner (Groundnut)	93	93	0	61	62	0	0	0	1	0	0	0	0	0	0	0
Parner (Pearl millet)	72	44	2	31	8	0	0	2	0	0	0	0	0	0	0	0
Parner (Green Gram)	77	52	0	30	10	0	0	0	0	0	0	0	0	0	0	0
Ambad (Cotton)	73	23	1	6	7	0	0	17	0	1	0	0	0	3	1	0
Bhokardan (Cotton)	77	71	6	12	14	0	0	3	0	0	0	0	0	6	0	0
Bhokardan (Soybean)	78	65	0	22	26	0	0	1	4	0	0	0	4	1	3	0
Jafrabad (Cotton)	98	95	48	64	0	0	0	0	0	0	0	0	0	0	0	0
Jafrabad (Maize)	96	96	0	50	76	0	0	0	0	0	0	0	0	0	0	0
Bhoom (Soybean)	20	16	2	2	1	0	9	32	15	0	0	0	0	15	21	0
Sakri (Paddy)	75	71	7	19	25	0	2	5	13	5	2	6	5	11	7	0

Source: Farmer's feedback survey data 2020-21

Table 14 Farmer's feedback on the adaptability of the advisory of seed treatment for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Advisory of seed treatment(%)															
	Followers						Followers									
	Good Germination	Healthy seedlings and uniform growth	Partial Germination	Prevented disease infestation on seedlings	Prevented pest attack on seedlings	Other	It is time consuming	No idea about seed treatment	Not availability of seed treatment material	It was not needed	Observed disease infestation on Seedling	Observed pest attack on Seedling	Sowing of seeds due to sudden rainfall (appropriate sowing condition)	No need of seed treatment	Increases cost of production	other
Akole (Chickpea)	72	54	3	8	8	0	1	14	0	4	1	0	0	1	0	0
Sangamner (Onion)	2	2	0	1	1	0	0	4	2	93	0	0	0	6	0	0
Parner (Onion)	89	61	0	26	8	0	0	0	0	0	0	0	0	0	0	0
Ambad (Chickpea)	77	55	4	12	39	0	0	4	1	1	0	0	0	0	0	0
Bhokardan (Wheat)	85	36	3	10	11	0	2	2	1	3	0	0	0	0	0	0
Jafrabad (Chickpea)	73	81	11	47	73	0	0	0	0	0	0	0	0	0	0	0
Bhoom (Sorghum)	60	31	1	3	3	0	2	15	13	2	0	2	0	9	2	0
Sakri (Wheat)	75	16	1	0	0	0	0	0	2	5	0	0	1	0	0	0

Source: Farmer's feedback survey data 2020-21

Table 15 Farmer's feedback on the adaptability of the advisory of crop geometry for the Kharif season crops in the different blocks

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Advisories/ Block/Crop	Advisory of crop geometry(%)														
	Followers								Non-followers						
	Healthy crop	Increased sustainability in strong winds	Increased vegetation, number of tillers, branches	Does not observed any specific change	Due to proper spacing intercultural operations can do easily	Reduced/prevent attach of pests and diseases infestation	Reduced seed rate	Other	It is costly	Not needed	Does not have time for it	It is time consuming	Due unavailability of the machines/ labours	Other	
Akole (Paddy)	29	14	21	4	5	15	27	0	18	4	16	35	37	0	
Sangamner (Maize)	73	58	69	0	61	46	51	0	0	20	4	20	0	0	
Sangamner (Groundnut)	57	35	53	2	27	25	24	0	1	35	0	38	1	0	
Parner (Pearl millet)	32	20	32	0	17	21	24	0	21	17	6	5	23	0	
Parner (Green Gram)	41	24	38	0	27	23	12	0	4	18	9	5	18	0	
Ambad (Cotton)	69	14	17	0	15	6	2	0	0	6	9	1	4	0	
Bhokardan (Cotton)	28	10	20	1	12	6	10	0	6	53	3	21	1	0	
Bhokardan (Soybean)	33	16	28	1	17	15	9	0	8	55	8	17	8	0	
Jafrabad (Cotton)	87	70	84	0	59	54	58	0	0	3	3	4	0	0	
Jafrabad (Maize)	78	73	73	0	62	42	57	0	1	1	7	8	1	0	
Bhoom (Soybean)	1	0	0	0	0	0	0	0	37	6	27	22	55	0	
Sakri (Paddy)	51	33	65	3	35	37	46	0	17	13	9	19	11	0	
Source: Farmer's feedback survey data 2020-21															

Source: Farmer's feedback survey data 2020-21

Table 16 Farmer's feedback on the adaptability of advisory of the crop geometry for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Advisory of crop geometry(%)														
	Followers								Followers						
	Healthy crop	Increased sustainability in strong winds	Increased vegetation, number of tillers, branches	Does not observed any specific change	Due to proper spacing intercultural operations can do easily	Reduced/prevent attach of pests and diseases infestation	Reduced seed rate	Other	It is costly	Not needed	Does not have time for it	It is time consuming	Due unavailability of the machines/ labours	Other	
Akole (Chickpea)	46	2	45	0	1	16	2	0	6	6	3	11	33	0	
Sangamner (Onion)	25	23	27	1	2	22	23	0	0	65	1	9	0	0	
Parner (Onion)	0	0	0	0	0	0	0	0	6	67	5	33	4	0	
Ambad (Chickpea)	24	8	21	1	9	3	8	0	20	23	20	20	34	0	
Bhokardan (Wheat)	21	6	12	0	2	3	2	0	3	56	16	8	19	0	
Jafrabad (Chickpea)	71	77	80	4	52	64	69	0	0	0	0	0	0	0	
Bhoom (Sorghum)	25	2	13	0	1	2	3	0	11	39	12	12	18	0	
Sakri (Wheat)	66	7	67	1	34	6	40	0	0	24	3	1	4	0	
Source: Farmer's feedback survey data 2020-21															

Source: Farmer's feedback survey data 2020-21

29. Farmers Feedbacks on the Adaptability of Advisories of Trap Crops

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of trap crops for Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory of trap crop are given in Table 17. Table 17 revealed that about 65% farmers follow the advisories of trap crop.

- **Rabi Season**

The farmer's feedbacks on the observed benefit, and challenges in the adaptability of advisory of trap crop are given in Table 18. Table 18 revealed that about 66% farmers follow the advisories of trap crop.

Tables 17 and 18 jointly revealed that for both Kharif and Rabi season, the advisory of trap crops partially prevented the pest attacks on the crop. However, more than 35% of farmers didn't followed the advisory due to unaware of the trap crops and exact selection of trap crops, non-availability of seeds, extra input cost, reduce the yield of the main crop, and difficulty in intercultural operations.

For both seasons, there is a large scope to increase the adaptability of the technique of trap crops by knowing the importance role of trap crops through field training, technology demonstration, building a network for seed availability, and selection of appropriate trap crops to reduce the risk of crop failure and to increase the final income. Also there is scope to update the trap crop advisory with information on the selection of trap crops.

30. Farmers Feedbacks on the Adaptability of Advisories of Intercropping

Farmer's feedbacks on the observed impacts after following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of intercropping for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory of intercropping are given in Table 19. Table 19 revealed that about 63% farmers follow the advisories of intercropping.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory of intercropping are given in Table 20. Table 20 revealed that about 48% farmers follow the advisories of intercropping.

Tables 19 and 20 jointly revealed that for both Kharif and Rabi seasons, more than 40% farmers didn't followed the advisory of intercropping due to unaware of the technique of intercropping, some of them felt that there will be a difficulty in intercultural operations due to intercropping, some of them thought that intercropping increased competition for water and nutrient between main and intercrop, some of them feel observed that intercropping reduces the yield of the main crop and increase cost of production. Also, due to intercropping, farmers benefited by increased total income, reduced cost of production, in the same fertilizer dose they got the production of two crops, and reduced pest and diseases attack than monocropping.

Therefore, the overall adaptability of intercropping is increased by proper guidance of the selection of intercrop, knowing risk reduction of crop failure and increase the final income, and training and field demonstration. There is a need to update the advisory of the intercropping season-wise for different crops.

Table 17 Farmer's feedback on the adaptability of the advisory of trap crop for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of trap crop(%)																
	Followers							Non-followers									
	To prevent pest attack on main crop	To know the attack of pest	To get additional income	No effect of trap crop	Satisfactory pest reduction	Partial pest reduction	Other (Increased attack of pest on main crop)	It attracts pest and increased incidence of pest than natural enemies	It creates shadow for main crop	Difficulty in growing of trap crop	No idea about trap crops	Increasing cost of production	It is not needed	It reduces the area under main crop	It requires extra time and efforts	Trap crop seed not available	Other (Increased attack of pest on main crop)
Akole (Paddy)	0	34	0	9	4	22	0	0	0	1	9	56	0	0	0	0	0
Sangamner (Maize)	43	73	80	7	73	40	0	1	0	1	1	1	0	1	4	4	0
Sangamner (Groundnut)	70	48	24	7	54	37	0	1	2	2	1	1	3	0	0	14	0
Parner (Pearl millet)	35	16	5	3	9	35	0	1	2	12	6	2	18	1	0	4	0
Parner (Green Gram)	57	35	11	0	40	0	17	0	1	6	4	0	4	4	3	2	0
Ambad (Cotton)	38	59	19	48	21	41	0	3	2	7	9	1	2	0	1	5	0
Bhokardan (Cotton)	61	37	31	10	65	18	0	0	3	2	4	5	3	2	1	5	7
Bhokardan (Soybean)	68	42	25	23	52	32	0	0	1	0	1	0	3	1	2	0	0
Jafrabad (Cotton)	80	83	6	13	84	22	0	0	1	2	1	0	0	1	9	9	0
Jafrabad (Maize)	85	87	12	11	15	89	0	0	0	5	0	0	1	2	7	6	0
Bhoom (Soybean)	13	36	16	18	11	19	0	0	2	1	3	45	4	3	3	9	0
Sakri (Paddy)	43	21	2	5	42	6	0	9	8	15	10	11	8	11	14	34	42

Source: Farmer's feedback survey data 2020-21

Table 18 Farmer's feedback on the adaptability of the advisory of trap crop for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Advisory of trap crop (%)																
	Followers							Followers									
	To prevent pest attack on main crop	To know the attack of pest	To get additional income	No effect of trap crop	Satisfactory pest reduction	Partial pest reduction	Other	It attracts pest and increased incidence of pest than natural enemies	It creates shadow for main crop	Difficulty in growing of trap crop	No idea about trap crops	Increasing cost of production	It is not needed	It reduces the area under main crop	It requires extra time and efforts	Trap crop seed not available	Other
Akole (Chickpea)	0	0	0	15	34	36	0	0	1	3	14	1	2	2	8	0	0
Sangamner (Onion)	91	90	5	0	90	2	0	0	1	1	3	0	2	1	0	0	0
Parner (Onion)	52	49	2	2	21	53	0	0	2	5	3	3	8	3	2	9	0
Ambad (Chickpea)	73	57	19	0	0	0	0	1	0	0	9	0	0	0	1	7	0
Bhokardan	37	34	3	0	0	35	0	0	2	10	5	2	23	0	3	8	0

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(Wheat)																	
Jafrabad (Chickpea)	66	65	13	23	64	26	0	1	1	4	0	1	2	1	0	4	0
Bhoom (Sorghum)	3	8	0	7	2	0	0	2	1	13	33	1	30	3	2	31	0
Sakri (Wheat)	50	44	20	4	46	31	0	0	5	28	2	1	9	7	4	28	0
Source: Farmer's feedback survey data 2020-21																	

Table 19 Farmer's feedback on the adaptability of the advisory of intercropping for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of inter-cropping(%)															
	Followers							Non-followers								
	Increased total income	If one crop fails there is income from second crop	Reduced cost of production	Reduced pest and diseases attack than mono cropping	Does not require additional pest control	Wish same fertilizer dose we get two crops	Other (Increased attack of pest on main crop)	Difficulty in inter-cultural operations	No idea about inter-cropping	Increased competition for water and nutrient between main and inter crop	Increasing cost of production due to labour and other inputs	Inter-cropping reduces yield of main crop	Does not have time for it	Not needed	It requires extra time and efforts	Other (Increased attack of pest on main crop)
Akole (Paddy)	2	0	0	0	1	1	0	6	12	0	0	0	0	80	0	0
Sangamner (Maize)	28	4	1	20	11	28	0	40	23	2	0	12	0	23	3	0
Sangamner (Groundnut)	42	6	3	18	18	38	0	23	7	8	0	6	0	13	2	26
Parner (Pearl millet)	9	5	3	4	2	15	0	8	3	1	10	21	11	14	5	0
Parner (Green Gram)	10	5	7	10	13	12	15	9	4	8	6	23	9	3	7	0
Ambad (Cotton)	46	21	2	32	23	45	0	15	10	1	3	1	0	1	2	0
Bhokardan (Cotton)	47	41	10	44	24	45	0	12	0	3	0	6	1	0	0	7
Bhokardan (Soybean)	40	23	5	58	14	42	0	7	1	0	0	3	2	4	0	0
Jafrabad (Cotton)	29	65	11	39	29	89	0	5	2	1	1	3	1	0	0	0
Jafrabad (Maize)	33	56	14	39	21	79	0	11	3	3	3	4	1	0	7	0
Bhoom (Soybean)	34	1	4	19	8	14	0	32	11	4	2	5	4	6	5	0
Sakri (Paddy)	8	1	0	17	0	4	0	16	11	14	9	32	5	40	17	0
Source: Farmer's feedback survey data 2020-21																

Table 20 Farmer's feedback on the adaptability of the advisory of intercropping for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Advisory of inter-cropping(%)															
	Followers							Followers								
	Increased total income	If one crop fails there is income from second crop	Reduced cost of production	Reduced pest and diseases attack than mono cropping	Does not require additional pest control	Wish same fertilizer dose we get two crops	Other	Difficulty in intercultural operations	No idea about inter-cropping	Increased competition for water and nutrient between main and inter crop	Increasing cost of production due to labour and other inputs	Intercropping reduces yield of main crop	Does not have time for it	Not needed	It requires extra time and efforts	Other
Akole (Chickpea)	59	5	23	35	14	20	0	15	7	1	1	1	1	2	1	0
Sangamner (Onion)	1	0	3	3	0	2	0	69	0	1	0	5	0	78	1	0
Parner (Onion)	2	1	1	1	0	11	0	7	26	2	4	38	3	18	4	0
Ambad (Chickpea)	40	14	4	40	26	32	0	15	7	0	0	0	7	3	0	0
Bhokardan (Wheat)	8	3	10	2	0	6	0	35	11	3	2	16	5	40	6	0
Jafrabad (Chickpea)	45	32	11	63	36	62	0	11	0	3	1	3	0	0	3	0
Bhoom (Sorghum)	10	0	2	3	1	5	0	45	17	2	5	8	1	30	3	0
Sakri (Wheat)	36	28	41	41	0	32	34	32	0	0	1	38	2	9	3	0
Source: Farmer's feedback survey data 2020-21																

31. Farmers Feedbacks on the Adaptability of Advisories of Use of Pheromone Trap

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of use of Pheromone traps for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of the advisory of the pheromone trap are given in Table 21. Table 21 revealed that about 55% farmers follow the advisories of the Pheromone trap.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of the advisory of the pheromone trap are given in Table 22. Table 22 revealed that about 55% farmers follow the advisories of the Pheromone trap. It is exactly similar to the Kharif season.

Tables 21 and 22 jointly revealed that Pheromone trap were helpful to identify ETL level of pest attack and reduction in cost of pesticides application. While, 45% farmers were not following the advisory due to unaware of the techniques, timely availability of lures and traps in the local market, and some of them feel that it is easy to use chemical spraying than pheromone trap.

Therefore, there is huge scope to increase the adaptability and build the capacity of farmers for appropriate use of Pheromone trap in the field by both in-house and field training, demonstration of pheromone trap installation and lure changing, and knowing their benefits over the other techniques. Also the availability of the trap and lure in the local market also can be increased by the building network with the agriculture service centre. In addition to this, there is a need to update the advisory of the use of the pheromone traps by the inclusion of short video of installation pheromone trap and their benefits.

32. Farmers Feedbacks on the Adaptability of Advisories of Use of Light Trap

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of use of light traps for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of the advisory of light trap are given in Table 23. Table 23 revealed that about 45% farmers follow the advisories of light trap.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of the advisory of light trap are given in Table 24. Table 24 revealed that about 25% farmers follow the advisories of light trap.

Tables 23 and 24 jointly revealed that the light trap were helpful to partial control of pests/insects, and reduce cost on pesticides application, also observed that light trap kills both beneficial and harmful pests/insects. While, overall adaptability of advisory of light trap was very low (35% farmers) due to the no idea about the technique and installation procedure, issues of electricity availability in the field, unavailability of material/ instrument, and lack of awareness of battery can also be used to operate the trap.

Therefore, the adaptability can be increased through proper training to use a light trap, updated facilities available in the light trap, and increasing the availability in the local market by building a network with the agriculture service centre. Similar to the pheromone trap, there is a need to update the advisory of the use of light traps by the inclusion of short video of installation trap and their benefits.

Table 21 Farmer's feedback on the adaptability of the advisory of use of Pheromone trap for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of pheromone trap(%)								
	Followers				Non-followers				
	Helped in identifying ETL level of pest attack	Reduces the cost of pesticides application	Trapping other adult/moths instead of required adult/moths	Other	No idea about the technique and Installation	It is costly	None availability of lures & trap	Easy to use chemical spraying than this	Other
Akole (Paddy)	26	16	0	0	74		0	14	0
Sangamner (Maize)	72	62	0	0	18		0	18	0
Sangamner (Groundnut)	49	34	0	0	42		0	42	0
Parner (Pearl millet)	22	19	0	0	75		0	75	0
Parner (Green Gram)	32	29	0	0	61		0	61	0
Ambad (Cotton)	77	65	0	0	13		0	13	0
Bhokardan (Cotton)	68	46	0	0	22		0	22	0
Bhokardan (Soybean)	84	80	0	0	11		0	11	0
Jafrabad (Cotton)	52	49	0	0	38		0	38	0
Jafrabad (Maize)	47	51	0	0	33		0	33	0
Bhoom (Soybean)	29	23	0	0	71		0	71	0
Sakri (Paddy)	11	9	0	0	86		0	86	0

*Source: Farmer's feedback survey data 2020-21***Table 22 Farmer's feedback on the adaptability of the advisory of use of Pheromone trap for the Rabi season crops in the different blocks**

Advisories/ Block/ Crop	Advisory of pheromone trap(%)								
	Followers				Followers				
	Helped in identifying ETL level of pest attack	Reduces the cost of pesticides application	Trapping other adult/moths instead of required adult/moths	Other	No idea about the technique and Installation	It is costly	None availability of lures & trap	Easy to use chemical spraying than this	Other
Akole (Chickpea)	75	69	0	0	6	0	4	4	0
Sangamner (Onion)	100	90	0	0	0	0	0	0	0
Parner (Onion)	5	5	0	0	53	14	17	7	0
Ambad (Chickpea)	83	59	0	0	10	8	3	0	0
Bhokardan (Wheat)	55	38	0	0	45	8	6	2	0
Jafrabad (Chickpea)	35	24	0	0	18	27	9	17	0
Bhoom (Sorghum)	10	9	0	0	76	14	0	0	0
Sakri (Wheat)	74	53	0	0	11	6	2	7	0

Source: Farmer's feedback survey data 2020-21

Table 23 Farmer's feedback on the adaptability of the advisory of use of Light trap for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of light trap(%)										
	Followers					Non-followers					
	Killed both beneficial and harmful pests	Partial control of pests	Reduced cost on pesticides application	Reduced pest attack in field	Other	Don't know to that battery can also be used	Due to night time operation it is not followed	Electricity not available at field	No idea about the technique and Installation	Unavailability of material /instrument	Other
Akole (Paddy)	0	0	0	0	0	0	0	0	97	3	0
Sangamner (Maize)	9	45	20	41	0	0	1	22	15	19	0
Sangamner (Groundnut)	3	18	10	19	0	3	7	46	19	18	0
Parner (Pearl millet)	0	1	1	6	0	13	17	45	12	15	0
Parner (Green Gram)	0	2	4	5	0	5	13	55	5	16	0
Ambad (Cotton)	12	29	34	48	0	5	1	21	9	1	0
Bhokardan (Cotton)	2	23	19	28	0	2	3	20	19	17	0
Bhokardan (Soybean)	3	31	31	48	0	1	1	28	0	2	0
Jafrabad (Cotton)	0	2	16	49	0	1	5	8	5	24	0
Jafrabad (Maize)	0	25	69	74	0	5	2	8	2	17	0
Bhoom (Soybean)	4	4	4	10	0	3	9	50	30	2	0
Sakri (Paddy)	5	5	2	8	0	25	18	42	41	13	0
Source: Farmer's feedback survey data 2020-21											

Table 24 Farmer's feedback on the adaptability of the advisory of use of Light trap for the Rabi season crops in the different blocks

Advisories/ Block/Crop	Advisory of light trap(%)										
	Followers					Followers					
	Killed both beneficial and harmful pests	Partial control of pests	Reduced cost on pesticides application	Partial control of pests	Other	Don't know to that battery can also be used	Due to night time operation it is not followed	Electricity not available at field	No idea about the technique and Installation	Unavail- ability of material /instrument	Other
Akole (Chickpea)	2	25	37	23	0	3	1	11	36	11	0
Sangamner (Onion)	0	0	0	0	0	1	0	3	4	96	0
Parner (Onion)	0	0	0	0	0	22	15	59	29	10	0
Ambad (Chickpea)	5	34	26	45	0	6	22	12	5	16	0
Bhokardan (Wheat)	2	23	5	13	0	26	11	42	4	5	0
Jafrabad (Chickpea)	4	9	10	14	0	0	1	2	3	66	0
Bhoom (Sorghum)	2	3	2	10	0	11	19	60	33	4	0
Sakri (Wheat)	2	23	5	13	0	4	22	49	4	46	0
Source: Farmer's feedback survey data 2020-21											

33. Farmers Feedbacks on the Adaptability of Advisories of Application of Amrutpani and Jeevamruit

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of application of Amrutpani and Jeevamruit for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory of Amrutpani and Jeevamruit are given in Table 25. Table 25 revealed that about 64% of the farmers follow the advisories of Amrutpani and Jeevamruit application.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory of Amrutpani and Jeevamruit are given in Table 26. Table 26 revealed that about 64% of the farmers follow the advisories of Amrutpani and Jeevamruit application.

Tables 25 and 26 jointly revealed that advisory of application of Amrutpani and Jeevamruit are increased crop vigor and canopy, and overall health of crop, increased water holding capacity of soil, and reduced chemical fertilizer doses. While, 40% farmers were not followed due to the unaware of methods of preparation, availability of ingredients and raw material, and not being readily available in the market. The adaptability of advisory of Vermiwash spray is very low due to the no proper provision to collect Vermiwash from the Vermi-bed.

Therefore, there is a wide scope to increase the usage of Amrutpani, Jeevamruit, and Vermiwash by knowing their importance, process of preparation, and collection process at the household level to farmers by in-house and field training, and field demonstration. To increase the ready availability in the local market, there is a need to identify the opportunity for commercial business locally. However, there is a need to update the advisory by the inclusion of a short video of standard installation Vermi-beds.

34. Farmers Feedbacks on the Adaptability of Advisories of Application of Bio-Pesticides

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of application of bio-pesticides (Dashparni ark/ NSKE/ Neemark) for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory are given in Table 27. Table 27 revealed that about 60% of the farmers follow the advisories of application of bio-pesticides.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory are given in Table 28. Table 28 revealed that about 48% of the farmers follow the advisories of application of bio-pesticides.

Tables 27 and 28 jointly revealed that the observed benefits of bio-pesticides application were reduction of the pest population, and reduced chemical spraying. While 50% farmers were not followed the advisories due to not aware of technology, it increases the cost of production, the raw material was not available to prepare, and readily not available in the market.

Therefore to increase the adaptability of the use of bio-pesticides; there is a need to increase the awareness about methods of preparation through in-house and field training. To increase the availability in the local market, there is a need to identify the opportunity of commercial business by local preparation of bio-pesticides. The availability of raw material at the household can be done by growing the plants on field borders. However, there is a need to update the advisory by the inclusion of a short video of preparation of Dashparni ark/ NSKE/ Neemark.

35. Farmers Feedbacks on the Adaptability of Advisories of Application of Irrigation

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of application of irrigation water for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory application of irrigation are given in Table 29. Table 29 revealed that about 54% of the farmers follow the advisories of application of irrigation.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisory application of irrigation are given in Table 30. Table 30 revealed that about 79% of the farmers follow the advisories of application of irrigation.

Tables 29 and 30 jointly revealed that observed benefits of advisory of application of irrigation were good crop growth, saved the irrigation water, crop saved due to life-saving irrigation, and partially controlled disease and pest attacks. While, about 20-40% farmers didn't follow the advisories because they observed that there was sufficient moisture in their field, and some are busy with other works.

Therefore, the adaptability of irrigation advisory can be increased by knowing the importance of the timely and appropriate amount of application of water, and their effect on crop production and productivity through in-house training, field demonstration, and use of efficient irrigation methods. The irrigation advisories need to be updated for water application through modern technologies (drip and sprinkler). Also need to develop the mechanism of generation of irrigation advisories in the FarmPrecise application.

Table 25 Farmer's feedback on the adaptability of the advisories of Amrutpani and Jeevamruit application for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of Amrutpani and Jeevamruit application(%)																
	Followers									Non-followers							
	Enhance flowering and increased size of fruits/pods	Increase earthworms in soil	Increasing number of natural enemies	Increasing soil fertility and productivity	Increased vigour growth/health of crop/ crop canopy	Increased water holding capacity	No additional benefit	Reduced chemical fertilizer doses	Other	No idea about preparation methods	Not available in market	It requires extra time and efforts	Unavailability of ingredients and raw material	Increasing cost of production	Labour was not available	Non availability of operational equipment	Other
Akole (Paddy)	33	2	2	0	44	33	0	34	0	0	0	0	0	0	0	0	0
Sangamner (Maize)	40	13	10	13	77	53	4	61	0	4	12	0	5	0	0	1	0
Sangamner (Groundnut)	55	14	8	12	70	29	8	48	0	4	16	3	0	1	0	3	0
Parner (Pearl millet)	22	1	1	9	25	11	0	12	0	0	5	15	14	1	8	3	0
Parner (Green Gram)	27	6	1	13	43	16	1	12	0	2	8	1	5	4	10	13	0
Ambad (Cotton)	22	16	6	14	58	33	8	32	0	11	5	4	9	2	2	1	0
Bhokardan (Cotton)	23	15	3	20	40	27	2	34	0	11	4	12	15	1	1	9	0
Bhokardan (Soybean)	26	4	4	7	44	30	3	34	0	3	1	5	5	1	1	2	0
Jafrabad (Cotton)	63	34	9	69	91	45	5	72	0	3	1	2	4	0	1	0	0
Jafrabad (Maize)	51	30	13	76	96	59	0	81	0	0	0	0	4	0	0	2	0
Bhoom (Soybean)	4	1	1	5	18	15	0	12	0	11	3	21	33	12	15	15	0
Sakri (Paddy)	2	3	0	25	44	5	0	23	0	4	9	27	31	10	12	16	0

Source: Farmer's feedback survey data 2020-21

Table 26 Farmer's feedback on the adaptability of the advisories of Amrutpani and Jeevamruit application for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Advisory of Amrutpani and Jeevamruit application(%)																
	Followers									Followers							
	Enhance flowering and increased size of fruits/pods	Increase earthworms in soil	Increasing number of natural enemies	Increasing soil fertility and productivity	Increased vigour growth/health of crop/ crop canopy	Increased water holding capacity	No additional benefit	Reduced chemical fertilizer doses	Other	No idea about preparation methods	Not available in market	It requires extra time and efforts	Unavailability of ingredients and raw material	Increasing cost of production	Labour was not available	Non availability of operational equipment	Other
Akole (Chickpea)	7	5	5	40	51	28	2	9	0	12	4	12	10	7	2	0	0
Sangamner (Onion)	92	1	3	1	94	91	1	92	0	0	0	4	1	0	0	1	0
Parner (Onion)	4	0	0	6	11	8	0	6	0	2	7	33	32	9	14	17	0
Ambad (Chickpea)	20	5	11	4	53	30	4	31	0	18	9	2	36	1	1	5	0
Bhokardan (Wheat)	18	13	0	15	66	19	0	16	0	8	3	10	13	5	8	0	0

Jafrabad (Chickpea)	55	65	21	62	67	66	10	55	0	1	0	0	4	2	1	1	0
Bhoom (Sorghum)	6	2	2	2	28	15	2	9	0	18	2	7	42	4	7	7	0
Sakri (Wheat)	29	32	1	37	72	48	0	41	0	0	1	16	20	3	0	3	0

Source: Farmer's feedback survey data 2020-21

Table 27 Farmer's feedback on the adaptability of the advisories of use of Bio-pesticides for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of bio-pesticides (Dashparni ark/NSKE/Neemark),%										
	Followers				Non-followers						
	Reduced no. of chemical sprays	Reduction of pest population	Saved cost on chemical spraying	Other	Increases the cost of production	It is time consuming	No idea about technology	Not available in the market	Not effective in controlling pests	Raw material was not available to prepare it	Other
Akole (Paddy)	1	1	0	0	0	0	92	0	0	3	0
Sangamner (Maize)	69	68	67	0	1	3	4	14	0	7	0
Sangamner (Groundnut)	37	41	39	0	2	9	6	22	0	17	0
Parner (Pearl millet)	25	28	12	0	2	10	2	9	6	7	0
Parner (Green Gram)	17	37	21	0	4	14	2	8	2	11	0
Ambad (Cotton)	56	56	44	0	2	0	5	1	0	10	0
Bhokardan (Cotton)	57	50	44	0	1	2	9	2	0	12	0
Bhokardan (Soybean)	51	38	30	0	2	3	1	1	0	5	0
Jafrabad (Cotton)	91	79	69	0	0	3	2	1	0	7	0
Jafrabad (Maize)	88	83	65	0	0	2	0	0	0	11	0
Bhoom (Soybean)	12	9	8	0	11	23	17	10	5	29	0
Sakri (Paddy)	33	59	30	0	10	13	10	14	14	34	0
Source: Farmer's feedback survey data 2020-21											

Table 28 Farmer's feedback on the adaptability of the advisories of use of Bio-pesticides for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Advisory of bio-pesticides (Dashparni ark/NSKE/Neemark),%										
	Followers				Followers						
	Reduced no. of chemical sprays	Reduction of pest population	Saved cost on chemical spraying	Other	Increases the cost of production	It is time consuming	No idea about technology	Not available in the market	Not effective in controlling pests	Raw material was not available to prepare it	Other
Akole (Chickpea)	13	35	33	0	9	14	11	7	2	10	0
Sangamner (Onion)	02	02	02	0	2	07	03	0	0	90	0
Parner (Onion)	14	27	06	0	7	28	01	14	21	10	6
Ambad (Chickpea)	48	46	50	0	2	01	14	5	0	16	0

Bhokardan (Wheat)	32	58	21	0	0	08	05	0	5	19	0
Jafrabad (Chickpea)	55	54	49	0	3	03	03	1	3	18	0
Bhoom (Sorghum)	11	17	07	0	13	13	23	8	2	42	0
Sakri (Wheat)	61	62	40	0	0	15	00	7	6	27	0
Source: Farmer's feedback survey data 2020-21											

Table 29 Farmer's feedback on the adaptability of the advisories to apply irrigation for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Irrigation advisory(%)											
	Followers					Non-followers						
	Crop saved due to life saving irrigation	Disease and pest control	Good crop growth	Saved the irrigation water	Other	Already irrigated the crop	Issue of electricity supply	Lack or faulty irrigation infrastructure	Not followed due to other work	There was Sufficient soil moisture in the field	Water scarcity and unavailability of irrigation water	Other
Akole (Paddy)	0	0	0	0	0	0	0	0	0	0	0	0
Sangamner (Maize)	76	38	74	49	0	0	0	0	0	14	0	0
Sangamner (Groundnut)	54	15	58	44	0	0	2	3	0	29	0	0
Parner (Pearl millet)	12	3	14	3	0	3	6	1	4	57	4	0
Parner (Green Gram)	16	10	15	9	0	1	6	1	3	52	4	0
Ambad (Cotton)	47	17	45	34	0	5	1	2	1	12	0	0
Bhokardan (Cotton)	44	19	51	56	0	9	0	0	0	10	3	0
Bhokardan (Soybean)	26	4	46	51	0	5	2	0	0	10	1	0
Jafrabad (Cotton)	82	22	84	80	0	8	1	0	0	9	2	0
Jafrabad (Maize)	87	17	89	66	0	2	1	0	0	6	2	0
Bhoom (Soybean)	17	2	6	4	0	10	19	8	5	63	6	0
Sakri (Paddy)	26	5	12	5	0	19	8	19	11	47	12	0
Source: Farmer's feedback survey data 2020-21												

Table 30 Farmer's feedback on the adaptability of the advisories to apply irrigation for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Irrigation advisory(%)											
	Followers					Followers						
	Crop saved due to life saving irrigation	Disease and pest control	Good crop growth	Saved the irrigation water	Other	Already irrigated the crop	Issue of electricity supply	Lack or faulty irrigation infrastructure	Not followed due to other work	There was Sufficient soil moisture in the field	Water scarcity and unavailability of irrigation water	Other
Akole (Chickpea)	29	23	45	6	0	1	5	2	3	42	2	0
Sangamner (Onion)	93	92	94	91	0	3	0	0	0	4	0	0
Parner (Onion)	51	32	72	38	0	3	0	0	0	2	1	0
Ambad (Chickpea)	55	10	38	40	0	0	2	4	2	21	6	0
Bhokardan (Wheat)	35	10	44	39	0	16	5	5	0	19	5	0
Jafrabad (Chickpea)	55	43	75	71	0	2	0	0	0	4	0	0
Bhoom (Sorghum)	54	7	55	26	0	7	1	1	1	15	8	0
Source: Farmer's feedback survey data 2020-21												

36. Farmers Feedbacks on the Adaptability of Advisories of Application of Recommended Dose of Chemical Fertilizers

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of application of a recommended dose of chemical fertilizers for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisories of application of a recommended dose of chemical fertilizers are shown in Table 31. Table 31 revealed that about 32% farmers follow the advisories of application of a recommended dose of chemical fertilizers.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges in the adaptability of advisories of application of a recommended dose of chemical fertilizers are shown in Table 32. Table 32 revealed that about 48% farmers follow the advisories of application of a recommended dose of chemical fertilizers.

Tables 31 and 32 jointly revealed about 60% farmers were not following the advisory of application of a recommended dose of chemical fertilizers due to healthy crop, costly, didn't available in the market, some though it was not needed, and also continuous rainfall were limit to apply recommended doses timely.

Table 31 Farmer's feedback on the adaptability of the advisories to apply recommended dose of chemical fertilizers for the Kharif season crops in the different blocks

Advisories/ Block/ Crop	Advisory of recommended dose of chemical fertilizer for the selected crop (%)				
	Due to continuous rainfall not able to apply the dose	It is costly	Not available in market	Not needed	Other
Akole (Paddy)	00	00	0	00	0
Sangamner (Maize)	09	14	1	19	0
Sangamner (Groundnut)	07	12	1	30	0
Parner (Pearl millet)	09	12	5	30	0
Parner (Green Gram)	08	18	1	50	0
Ambad (Cotton)	12	11	3	22	0
Bhokardan (Cotton)	06	11	4	26	0
Bhokardan (Soybean)	08	28	3	19	0
Jafrabad (Cotton)	04	06	3	09	0
Jafrabad (Maize)	01	13	1	08	0
Bhoom (Soybean)	09	29	3	39	0
Sakri (Paddy)	03	09	17	27	0

Source: Farmer's feedback survey data 2020-21

Table 32 Farmer's feedback on the adaptability of the advisories to apply recommended dose of chemical fertilizers for the Rabi season crops in the different blocks

Advisories/ Block/ Crop	Advisory of recommended dose of chemical fertilizer for the selected crop(%)				
	Due to continuous rainfall not able to apply the dose	It is costly	Not available in market	Not needed	Other
Akole (Chickpea)	05	23	17	27	0
Sangamner (Onion)	02	64	04	56	0
Parner (Onion)	06	11	17	16	0
Ambad (Chickpea)	04	17	27	19	0
Bhokardan (Wheat)	01	29	13	39	0
Jafrabad (Chickpea)	01	14	01	24	0
Bhoom (Sorghum)	00	54	13	60	0
Sakri (Wheat)	00	02	00	02	0

Source: Farmer's feedback survey data 2020-21

37. Farmers Feedbacks on the Adaptability of Advisories of Application of Chemical pesticides

Farmer's feedbacks on observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of application of chemical pesticides for Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges to adapt the advisory the application of chemical pesticides are given in Table 33. Table 33 revealed that about 57% of the farmers follow the advisories of application of chemical pesticides.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges to adapt the advisory the application of chemical pesticides are given in Table 34. Table 34 revealed that about 33% of the farmers follow the advisories of application of chemical pesticides.

Tables 33 and 34 jointly revealed about 55% farmers were not following the advisory of application of a recommended dose of chemical pesticides due to no infestation of pests/diseases on crops, costly, suggested pesticides were not available in the market and some though it was not needed. On farmers demand, the advisories of application of chemical pesticides need to be updated additionally with information of their latest brands available in markets.

38. Farmers Feedbacks on the Adaptability of use of Advisories of Weather Alerts

Farmer's feedbacks on the observed impacts by following the advisories, challenges to follow the advisories, and difficulties encountered during following the advisories of weather alerts for the Kharif and Rabi seasons crops in the different blocks are given below.

- **Kharif Season**

The farmer's feedbacks on the observed benefits, and challenges were faced by farmers to follow advisories of weather alerts are given in Table 35. Table 35 revealed that about 90% of the farmers follow the advisories of weather alerts.

- **Rabi Season**

The farmer's feedbacks on the observed benefits, and challenges were faced by farmers to follow advisories of weather alerts are given in Table 36. Table 36 revealed that about 91% of the farmers follow the advisories of weather alerts.

Tables 35 and 36 jointly revealed that the advisories of weather alerts were followed by more than 90% of farmers. The observed that 50% crop yield obtained, average crop yield obtained and diseases and pests controlled significantly. The adaptability of weather alerts advisories is very encouraging and scope to increase their accuracy spatially.

39. Crop Specific Advisories

The crop-specific advisories cover the advisories specifically applicable for particular crops. The status of farmer's adaptability for crop-specific advisories, and feedbacks on the adaptability of advisories of various crops in the Kharif and Rabi season are given below.

- **Kharif Season**

The status of farmer's adaptability for crop-specific advisories of various crops in the Kharif season is given in Tables 37 to 41 of the Appendix. Tables revealed that adaptability was varying crop-wise and block-wise.

- **Rabi Season**

The status of farmer's adaptability for crop-specific advisories of various crops in the Kharif season is given in Tables 42 to 45 of the Appendix. Tables revealed that adaptability was varying crop-wise and block-wise.

The challenges faced by farmers who didn't follow the advisory are lack of awareness of the technologies, its purpose and benefits, unavailability of raw material in the nearby areas and also in the local market. One of the major reason for the lower adaptability of crop-specific advisories of pesticides/insecticides application were due to the effective precautionary measures followed by farmers using non-chemical nature-based solutions which reduced the no infestation of pests and diseases on the crops. Also observed that, the adaptability of crop-specific advisories of cash crops (e.g. Cotton) were higher than other cereals and pulses, and extent of availability of irrigation water during the cropping season playing great role in

adaptability of crop specific advisories. In addition to this, farmers demanded that the advisories of application of chemical pesticides/insecticides should include not only contains details of pesticides/insecticides but also the latest brands names available in markets.

Therefore, to increase the overall adaptability of crop-specific advisories, there is a need to develop crop-specific training and technology demonstration at farmer's field and to develop a linkage of demand and supply of agricultural inputs in the local market by building a network with the agriculture service centre and other suppliers.

40. Remark

In lieu of changing climate, the study on e-agromet advisories feedback helped us to cater and provide the agromet advisories with more actionable information for farmers. The study revealed that the advisories need to be updated timely with less technical language, and simple user-friendly interface for dissemination. The appropriate use of technologies and advisories are key factors to increase the adaptability, benefits, and building resilience to climate change. Therefore the continuous capacity building program for not only farmers but also the technical staff is very much essential. The village/community level training to demonstrate the climate-resilient agricultural (CRA) practices conveyed through advisories will help to increase the adaptability and build confidence among recipients. In addition to this, the crops specific strategies need to be developed to increase the adaptability of climate-resilient techniques, and hands-on training of the FarmPrecise app is needed to boost app usage. The detailed remarks on observed benefits of climate resilient advisories, and farmer's feedback, and future demands are given below.

Particular	Remark
Observed Benefits and incitement	<ul style="list-style-type: none"> Agromet advisories disseminated through the FarmPrecise mobile app helped farmers to increase their knowledge about CRA farming practices, reduce the input cost and increase the net profit. FarmPrecise users/ farmers got benefited atleast by an increase in crop yield or reduction in the cost of field inputs or reduction in the cost of cultivation and labor cost or saving of irrigation water. Farmers rated the highest utilities of advisories of daily weather and weather alerts for management of crops. Farmer's rating in respect of advisories of land preparation, plant protection, use of organic manures and chemical fertilizers, seed treatment, and crop geometry were found quite encouraging. Also, the overall utility of the advisories rated by the respondents is also very inspirational. However, all agromet advisories need to be updated with not only their appropriate use but also the exact benefits.
Advisories of land preparation and Sowing	<ul style="list-style-type: none"> On farmer demand, the advisories of land preparation need to be updated with new mechanization techniques to reduce the cost of cultivation, and new machines/implements/ tools for harvesting

	<p>and sowing seeds to save both energy and time.</p> <ul style="list-style-type: none"> • However, to resolve the issues of availability of machines during the time period of sowing/transplanting to follow the advisories of crop geometry, there is an opportunity to make availability of the machines commercially like custom hiring centres else group/ community people can purchase the machines.
Advisories of application of Bio/ Organic inputs	<ul style="list-style-type: none"> • The advisories of application of organic manures and bio-pesticides need to be updated with a short video of their preparation at household, and similarly the advisories of use insect trap updated with video of their proper installation in the field. • Needs to train/re-train the farmers for the preparation of bio/ organic inputs (e.g. Vermicompost, Compost, Green manure, Amrutpani, Jeevamruit, Vermiwash, Dashparni ark/NSKE/Neemark) to increase uptake and appropriate use to reduce the input cost. Besides, there is great scope to make availability of bio-inputs locally through commercial production. • To fulfill the demand for organic manures locally, there is a need to produce the organic manures individually or commercially. Also, the current practice of green manuring is also one of the better options to overcome the shortage of organic inputs, and to reduce input cost.
Advisories of application of inorganic/ chemical inputs	<ul style="list-style-type: none"> • On farmer's demand, the advisories of use of chemical fertilizers/ pesticides/insecticides need to be updated additionally with information of their latest brands available in markets. • For better uptake, fertilizer calculator tool in the FarmPrecise mobile application needs a user-friendly interface for information on selection of better fertilizer mixtures and soil nutrient management.
Advisories of application of irrigation	<ul style="list-style-type: none"> • On farmer's demand, the irrigation advisories need to explore especially during times of shortage of water supply. Also, need to be updated for water application through modern methods/ technologies (drip and sprinkler).
Capacity building of farmers and staff	<ul style="list-style-type: none"> • Frequent village/community level training for both male and female farmers to help them better interpret and use agromet-advisories. It will reduce the knowledge gap across the farmers and gender. • The region specific strategies for in-house and field trainings and field demonstration need to be developed for the better adaptation of climate resilient agriculture techniques. • Seasonally interactive region and crop-specific trainings, Farmers Field School (FFS) for discussions on agro-advisories and hands-on

	<p>mobile application (FarmPrecise mobile app) for capacity building of farmers.</p> <ul style="list-style-type: none"> Periodically trainings for the field staff to update their knowledge to become familiar with new climate-resilient techniques, and interaction session with internal and external experts builds their capacities.
Field demonstration	<ul style="list-style-type: none"> The strict implementation of in-house training, field training, and field demonstration of climate-resilient agricultural technologies and practices through selective farmer field plots to improve the overall adaptability and build resilience to climate change.
Language	<ul style="list-style-type: none"> Use of less technical and regional languages in advisories for easy interpretation.
FarmPrecise Uptake	<ul style="list-style-type: none"> Seasonally interactive crop-wise region specific field training sessions need to be organised for better implementation of climate-resilient practices and to improve the uptake of the FarmPrecise mobile app.
Network	<ul style="list-style-type: none"> In some areas, farmers sometimes face difficulties due to poor networks so it would be great if the FarmPrecise mobile app can be operated in low network connectivity as well as in offline mode with a simple user interface.
Linkages	<ul style="list-style-type: none"> For better adaptability, climate-resilient advisories/practices need to develop a linkage between demand and supply of agricultural inputs in the local market (agricultural service centre).
Awareness	<ul style="list-style-type: none"> To enable farmers to adopt climate-resilient agriculture technologies, the very important step required is to make them aware of future risks of climate change.

Table 33 Farmer's feedback on the adaptability of the advisories to use chemical pesticides for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Advisory of use of chemical pesticides to control the pest/disease infestation(%)														
	Followers					Non-followers									
	Pest/disease infestation is controlled significantly	Control the pest/ disease in some amount	Not controlled pest/ disease infestation	Maturity period is extended	Other	Crop is healthy	There is no infestation of pests/diseases	Crop is about to die.	Suggested pesticide was not available	Water was not readily available on field for spraying	It is Costly	I don't spray any chemicals	Can't take spray due to continuous rain	Labour was not available	Other
Akole (Paddy)	91	29	0	0	0	1	1	0	0	0	0	0	0	0	0
Sangamner (Maize)	55	1	0	0	0	42	34	0	12	0	6	0	0	0	0
Sangamner (Groundnut)	40	11	0	0	0	53	47	0	14	0	11	0	0	0	0
Parner (Pearl millet)	19	2	0	0	0	80	62	0	9	0	3	0	0	0	0
Parner (Green Gram)	25	3	0	0	0	71	57	0	7	0	9	0	0	0	0
Ambad (Cotton)	72	6	0	0	0	22	14	0	6	0	12	0	0	0	0
Bhokardan (Cotton)	61	15	0	0	0	32	25	0	17	0	7	0	0	0	0
Bhokardan (Soybean)	43	16	0	0	0	53	44	0	11	0	9	0	0	0	0
Jafrabad (Cotton)	91	12	0	0	0	8	6	0	0	0	0	0	0	0	0
Jafrabad (Maize)	80	7	0	0	0	12	7	0	0	0	0	0	0	0	0
Bhoom (Soybean)	21	2	0	0	0	74	42	0	3	0	39	0	0	0	0
Sakri (Paddy)	43	8	0	0	0	52	41	0	4	0	11	0	0	0	0

Source: Farmer's feedback survey data 2020-21

Table 34 Farmer's feedback on the adaptability of the advisories to use chemical pesticides for the Rabi season crops in the different blocks

Advisories/ Block/Crop	Advisory of use of chemical pesticides to control the pest/disease infestation(%)														
	Followers					Followers									
	Pest/disease infestation is controlled significantly	Control the pest/ disease in some amount	Not controlled the pest/ disease infestation	Maturity period is extended	Other	Crop is healthy	There is no infestation of pests/diseases	Crop is about to die.	Suggested pesticide was not available	Water was not readily available on field for spraying	It is Costly	I don't spray any chemicals	Can't take spray due to continuous rain	Labour was not available	Other
Akole (Chickpea)	52	16	0	0	0	46	28	0	38	0	18	7	0	0	0
Sangamner (Onion)	4	0	0	0	0	86	56	0	26	0	16	0	0	6	0
Parner (Onion)	52	11	0	0	0	38	38	0	18	0	08	2	0	0	0
Ambad (Chickpea)	64	14	0	0	0	28	23	0	13	0	03	6	0	5	0
Bhokardan (Wheat)	29	3	0	0	0	51	49	0	19	0	09	0	0	2	0
Jafrabad (Chickpea)	45	6	0	0	0	45	39	0	26	0	06	3	0	0	0
Bhoom (Sorghum)	2	0	0	0	0	88	77	0	27	0	11	0	0	0	0
Sakri (Wheat)	14	1	0	0	0	66	44	0	25	0	9	13	0	1	0

Source: Farmer's feedback survey data 2020-21

Table 35 Farmer's feedback on the adaptability of the advisories of weather alerts for the Kharif season crops in the different blocks

Advisories/ Block/Crop	Weather alerts (Heavy rainfall/ hail storm/pest-disease attacks) for agricultural activities in the field to save the crops(%)												
	Followers							Non-followers					
	50 crop yield obtained	Atleast 50 crop saved	Average crop yield obtained	Complete crop saved	Disease and pest controlled significantly	Crop failed completely	Other	Crop was already harvested	Not followed due to other work	Increases the cost of production	Instantly material was not available	Labour was not available	Other
Akole (Paddy)	100	0	0	0	0	0	0	0	0	0	0	0	0
Sangamner (Maize)	34	43	34	76	31	11	0	6	0	0	0	0	0
Sangamner (Groundnut)	14	40	22	67	1	18	0	1	0	0	1	1	0
Parner (Pearl millet)	4	27	16	21	6	7	0	3	0	1	11	4	0
Parner (Green Gram)	7	25	13	21	12	6	0	3	4	1	8	1	0
Ambad (Cotton)	20	44	29	28	19	2	0	3	1	5	1	0	0
Bhokardan (Cotton)	5	26	26	48	21	0	0	3	4	5	4	2	0
Bhokardan (Soybean)	5	42	27	23	3	0	0	5	2	2	0	0	0
Jafrabad (Cotton)	5	9	43	87	20	0	0	1	1	2	2	1	0
Jafrabad (Maize)	2	8	48	93	22	1	0	0	0	0	0	0	0
Bhoom (Soybean)	4	41	12	36	3	4	0	11	4	3	1	5	0
Sakri (Paddy)	0	30	20	19	6	0	0	6	9	17	17	16	0

Source: Farmer's feedback survey data 2020-21

Table 36 Farmer's feedback on the adaptability of the advisories of weather alerts for the Rabi season crops in the different blocks

Advisories/ Block/Crop	Weather alerts (Heavy rainfall/ hail storm/pest-disease attacks) for agricultural activities in the field to save the crops(%)													
	Followers							Followers						
	50 crop yield obtained	Atleast 50 crop saved	Average crop yield obtained	Complete crop saved	Disease and pest controlled significantly	Crop failed comple- tely	Other	Crop was already harvested	Not followed due to other work	Increases the cost of production	Instantly material was not available	Not followed due to other work	Labour was not available	Other
Akole (Chickpea)	17	7	7	19	34	1	0	26	4	5	0	0	4	0
Sangamner (Onion)	0	0	3	0	0	98	0	0	0	0	0	0	0	0
Parner (Onion)	2	1	17	43	23	1	0	24	0	6	3	0	2	0
Ambad (Chickpea)	1	50	16	38	1	0	0	12	1	3	0	0	1	0
Bhokardan (Wheat)	0	31	19	66	10	5	0	6	0	5	0	0	0	0
Jafrabad (Chickpea)	8	18	10	76	32	0	0	1	0	0	1	0	0	0
Bhoom (Sorghum)	2	31	20	44	2	12	0	8	1	3	0	0	2	0
Sakri (Wheat)	0	0	0	48	0	0	0	49	0	0	2	0	0	0

Source: Farmer's feedback survey data 2020-21

41. Conclusions

Agromet advisories provide basic, timely, and accurate pre-information of different climate and weather conditions of different crops. But still there exist considerable knowledge gaps in understanding climate vulnerability and suitable ways to build resilience and adaptability. There is a need to improve agromet advisories into more actionable information for farmers. Based on the current study, the major conclusions derived are as follows.

1. FarmPrecise mobile app is effective way to disseminate agromet advisories and build resilience to climate change.
2. The crop weather advisories helped farmers to increase their knowledge about farming practices including modern technologies and good practices. They are able to reduce the input cost and increase the net profit for the crops.
3. The community level capacity building is required to increase the adaptability of appropriate nature-friendly solutions. Dissemination with small videos on the good practices will greatly benefit the use of FarmPrecise.
4. The region specific strategies for in-house and field trainings and field demonstration need to be developed for the better adaptation of climate resilient agriculture techniques.
5. Village/community level hands-on trainings of how to use the FarmPrecise mobile app will be helpful to farmers.
6. Seasonally interactive crop-wise region specific field training sessions need to be organised for better implementation of climate-resilient practices and to improve the uptake of the FarmPrecise mobile app
7. Challenges of poor networks need to be addressed. If the mobile app can be operated in low network connectivity as well as in offline mode with a simple user interface, it will benefit many users.
8. Communicating the messages in colloquial language will have a greater uptake.
9. There is need to explore the irrigation advisories especially during times of shortage of water supply and the same have to be updated for water application through modern methods/technologies (drip and sprinkler).
10. For better uptake of fertilizer calculator tool in the FarmPrecise mobile application needs to develop a user-friendly interface.
11. To enable farmers to adopt climate-resilient agriculture technologies, the very important step required is to make them aware of future risks of climate change, it will help them prepare their mind-set to deal with climate change and respond in adverse situations. Ultimately uptake of the FarmPrecise mobile app will improve.

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Appendix

Table 37 Status of farmer's adaptability for crop-specific advisories of Paddy for Kharif season in the Akole and Sakri blocks

Block/Crop specific advisories	Akole (Paddy)(%)			Sakri (Paddy)(%)		
	Yes	No	Total	Yes	No	Total
Advisory of nursery preparation followed	49	51	100	74	26	100
Advisory of Azolla application followed	78	13	100	0	100	100
Advisory of application of buried green leaves of Glyricidia @ 3 tones/ha during puddling followed	85	15	100	7	93	100
Advisory of Paddy transplanting at 20 x 20 cm or 25 x 25 cm	38	62	100	72	28	100
Advisory of application of Urea:DAP briquettes	30	70	100	44	56	100
Advisory of silicon spray @ 1-2 gram or 1-3 ml/liter of water followed	0	100	100	1	99	100
Advisory of spray of 00:52:34 @ 70 G, Multi Micro-Nutrients @ 50 G and Silicon @ 15 ml in 15 liters of water at Panicle Emergence Stage	0	100	100	9	91	100
Source: Farmer's feedback survey data 2020-21						

Table 38 Status of farmer's adaptability for crop-specific advisories of Maize for Kharif season in the Sangamner and Jafrabad blocks

Block/Crop specific advisories	Sangamner (Maize)(%)			Jafrabad (Maize)(%)		
	Yes	No	Total	Yes	No	Total
Advisory of spraying of 70 gram 00:52:34 and 50 gram multi-micronutrient in 15 liters of water to enhance grain filling in the Cob	63	27	100	67	33	100
Advisory of application of Earthening up	86	14	100	100	0	100
Source: Farmer's feedback survey data 2020-21						

Table 39 Status of farmer's adaptability for crop-specific advisories of Soybean for Kharif season in the Bhoom and Bhokardan blocks

Block/Crop specific advisories	Bhoom (Soybean)(%)			Bhokardan (Soybean)(%)		
	Yes	No	Total	Yes	No	Total
Advisory of spraying of 70 Gram 00:52:34 and 50 Gram Multi-Micronutrient in 15 Liters of Water to enhance flowering and pods	22	78	100	62	38	100
Advisory of spraying of 70 gram of 0:00:50 and 50 Gram Multi-Micronutrient in 15 Liters of Water dose to increase weight and size of the grains	25	75	100	58	42	100
Advisory on providing protective irrigation, if moisture stress condition at pod filling stage	28	72	100	76	21	100
Advisory of to install bird perches @ 15-20 per ha for the control of leaf eating caterpillar during flower induction/branching	24	76	100	73	27	100
Source: Farmer's feedback survey data 2020-21						

Table 40 Status of farmer's adaptability for crop-specific advisories of Cotton for Kharif season in the Ambad, Jafrabad and Bhokardan blocks

Block/Crop specific advisories	Ambad (Cotton)(%)			Jafrabad (Cotton)(%)			Bhokardan (Cotton)(%)		
	Yes	No	Total	Yes	No	Total	Yes	No	Total
Advisory of preparation of shallow furrows for cotton cultivation (For BT cotton, prepare furrow of 90 cm and for desi cotton, prepare furrow of 60 cm) to save the water	61	39	100	81	19	100	8	92	100
Advisory to provide pre-sowing irrigation, if soil moisture not sufficient	75	25	100	15	85	100	33	67	100
Advisory to provide light irrigation if dry spell occur for three to four days after sowing	68	32	100	8	92	100	31	69	100
Advisory of preparation of seedlings for gap filling by using porous bag filling with soil and compost (4-6 inch) to grow 2-3 seeds per bag by sprinkling ample amount of water	72	28	100	75	25	100	3	97	100
Advisory of application of solution of urea @ 1.5kg, MOP 1.5 kg in 100 liters of water and drench 150-200 ml per crops when possibility of disease infestation due to increase in day temperature and irrigation interval	73	27	100	4	60	100	47	53	100
Advisory to spray magnesium sulphate @ 45 gram per 15 liters of water if you observed reddening of cotton leaves	80	20	100	94	6	100	57	43	100
Advisory to spray Naphthalene Acetic Acid (NAA, Planofix) @ 40 ml per 100 liters of water to reduce dropping of leaves, flower and boll of cotton	81	19	100	82	18	100	51	49	100
Source: Farmer's feedback survey data 2020-21									

Table 41 Status of farmer's adaptability for crop-specific advisories of Pearl Millet and Green Gram for Kharif season in the Parner block

Block/Crop specific advisories	Sangamner (Groundnut),%			Block/Crop specific advisories	Parner (Pearl millet),%			Block/Crop specific advisories	Parner (Green Gram),%		
	Yes	No	Total		Yes	No	Total		Yes	No	Total
Advisory of spray of Nitrobenzene 30 ml, 00:52:34 @70 gram and multi-	27	73	100	Advisory of spraying of 70 gram of 0:00:50 and 50 gram multi-	36	64	100	Advisory of spraying of 70 gram 0:00:50 to increase weight and	36	64	100

micronutrient @ 50 gram per 15 liter of water				micronutrient in 15 liters of water dose to increase weight and size of the grains					size of the grains			
Advisory of rolling of empty drum over the crop at 45 and 55 days after sowing	40	60	100									
Advisory of application of gypsum @ 200 kg per ha after 50 flowering of crop	28	72	100									
Advisory of spray 00:00:50 @ 70 gram and multi-micronutrient @ 50 gram per 15 liter of water to increase the size and weight of the pods at the time of pod filling	34	66	100									
Source: Farmer's feedback survey data 2020-21												

Table 42 Status of farmer's adaptability for crop-specific advisories of Wheat for Rabi season in the Sakri and Bhokardan blocks

Block/Crop specific advisories	Sakri (Wheat)			Bhokardan (Wheat)		
	Yes	No	Total	Yes	No	Total
Advisory of spraying of 100 g 19:19:19 and 70 g micronutrient/15 liters of water, if you observed the yellowing of the leaves and stunted growth of the plants	27	73	100	40	60	100
Advisory of spraying of verticillium lecani @ 75ml/15 liters of water, if you observed the infestation of aphid	5	95	100	44	56	100
Advisory of spraying of Mancozeb 75 WP @ 15 g/15 liters of water, if you observed the infestation of rust disease	14	86	100	21	79	100
Advisory of spraying of carbaryl 50 WP @ 20 g/10 liters of water to control armyworm attack	0	100	100	11	89	100
Advisory of spraying of Propiconazole 25 EC @ 15 ml or Tebuconazole 25 EC @ 15 ml/15 liters of water, if you observed the infestation of rust and Kernel bunt diseases	1	99	100	19	81	100
Advisory of spraying of 00:52:34 @ 70 g and Micronutrient 50 g/15 liters of water at panicle stage of the crop to increase the number of grains	10	90	100	21	79	100
Advisory of spraying of 00:00:50 @ 70 g and Micronutrient 50 g/15 liters of water to Increase size and weight of grains	7	93	100	74	26	100

Source: Farmer's feedback survey data 2020-21

Table 43 Status of farmer's adaptability for crop-specific advisories of Onion for Rabi season in the Sangamner and Parner blocks

Block/Crop specific advisories	Sangamner (Onion)			Parner (Onion)		
	Yes	No	Total	Yes	No	Total
Advisory of Onion seedling should be transplanted after dipping roots in carbendazim solution (0.10) to reduce the incidence of fungal diseases	78	22	100	31	69	100
Advisory of foliar spray of ZnSO4 @ 50-75 g/15 lit of water to improve the nutritional quality of onion bulbs after third week of transplanting (66 days from starting)	15	85	100	18	82	100
Advisory of spray calcium nitrate @ 45gram/15 liters of water after 5th weeks of transplanting	19	81	100	24	76	100
Advisory of spray of 00:00:50 @ 70 gram and micronutrient @ 50 ml/15 lit of water (98 days)	97	3	100	30	70	100
Advisory of spray 19:19:19 @ 75 gram/15 lit of water (105 days)	94	6	100	26	74	100
Advisory of foliar application of micronutrient mixture @ 75 gram/15 liters of water (115 days)	18	82	100	30	70	100

Source: Farmer's feedback survey data 2020-21

Table 44 Status of farmer's adaptability for crop-specific advisories of chickpea for Rabi season in the Akole, Ambad and Jafrabad blocks

Block/Crop specific advisories	Akole (Chickpea)			Ambad (Chickpea)			Jafrabad (Chickpea)		
	Yes	No	Total	Yes	No	Total	Yes	No	Total
Advisory of Nipping to enhance branching, flowering, pod formation and yield of the crop	91	9	100	99	1	100	57	43	100
Advisory of spraying of nitrobenzene @ 30 ml and 70 g 00:52:34 in 15 liters of water at the flowering stage	57	43	100	51	49	100	86	14	100
Advisory of spraying of 50 g 00:00:50 and 50 g multi micronutrient per 15 liters of water at the pod filling stage	64	36	100	65	35	100	90	10	100
Advisory of spraying of heliokill @ 500 ml in 500 liters of water per hectare If you observed eggs and larvae of pod borer	51	49	100	44	56	100	35	65	100
Advisory of spraying of cholpyrifos 20 E.C. @ 2 ml per litre of water for the control gram pod borer	59	41	100	76	24	100	42	58	100

Source: Farmer's feedback survey data 2020-21

Table 45 Status of farmer's adaptability for crop-specific advisories of Sorghum for Rabi season in the Bhoom block

Block/Crop specific advisories	Bhoom (Sorghum)		
	Yes	No	Total
Advisory of preparation of flat bed of 10 x 12 sqm for in-situ moisture conservation	32	68	100
Advisory of mulching with the crop residues of green gram, blackgram, pigeonpea, paddy etc @ 5 tons/ hectare	26	74	100
Advisory of spraying of mancozeb 75 WP @ 20 g per 10 litres of water, if you observed the infestation of rust disease	17	83	100
Advisory of spraying of zineb 75 WS @ 20 g per 10 litres of water for the control of blight disease	19	81	100
Advisory of spraying of copper oxychloride 50 WP@ 2 g or mancozeb 75 WP @ 2 g per liter of water for the control of ergot disease	27	73	100
Advisory of spraying of Diammonium phosphate (DAP) @ 100 g in 10 liters of water to enhance the growth of the crop	21	79	100
Advisory of spraying of 70 g 00:52:34 and 50g multi-micronutrient in 15 liters of water to enhance maximum grain filling in the ear head	13	87	100
Advisory of spraying of 00:00:50 @ 50 g /15 liters of water to increase size and weight of the grain in ear head	23	77	100

Source: Farmer's feedback survey data 2020-21



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