Village Level Agriculture Contingency Plans for Climate Proofing of Watersheds in Akole Block, Ahmednagar, Maharashtra

Village Level Agriculture Contingency Plans for Climate Proofing of Watersheds in Akole Block, Ahmednagar, Maharashtra

Edited and Compiled by

Mr. Somnath Choudhury
Former Programme Manager, BAIF
and Sr. Consultant, NABCONS,
New Delhi

Er. Sachin V. Kamble
Assistant General Manager, NABARAD
Maharashtra Regional Office,
Pune

Dr. Ravi P. Andhale
Associate Professor (Agronomy),
Co-Nodal Officer, GKMS Project and
Member, CAAST-CSAWM, MPKV, Rahuri

Dr. Prabhat Kumar
National Coordinator, CAAST,
ICAR-NAHEP,
New Delhi

Dr. Mukund G. Shinde
Co-Principal Investigator (CAAST-CSAWM)
and Professor (SWCE),
MPKV, Rahuri

Dr. Snehal G. Kanade
Research Associate (Ag.Met.)
CAAST-CSAWM,
MPKV Rahuri

Dr. Vaibhav S. Malunjkar
Research Associate (SWCE)
CAAST-CSAWM,
MPKV Rahuri

Dr. Sunil D. Gorantiwar
Principal Investigator (CAAST-CSAWM)
and Head, Dept. of Agril. Engg.,
MPKV, Rahuri

Published by

Principal Investigator
Centre for Advanced Agricultural Science and Technology on Climate Smart Agriculture and Water Management (CAAST-CSAWM),
Mahatma Phule Krishi Vidyapeeth Rahuri, Ahmednagar, 413722, Maharashtra

Printed by

MPKV Printing Press
Mahatma Phule Krishi Vidyapeeth Rahuri, Ahmednagar, 413722, Maharashtra

ISBN 978-93-5408-947-3

Reviewed by

Dr. K. Sammi Reddy
Head, NRM, ICAR-CRIDA,
Hyderabad

Dr. K.A. Gopinath
Principal Scientist, ICAR-CRIDA,
Hyderabad

Dr. K.V. Rao
Principal Scientist (SWCE)
ICAR-CRIDA, Hyderabad

Dr. G. Ravindra Chary
Director (ICAR-CRIDA),
Hyderabad

Contributions

Dr. A.A. Atre
Professor (SWCE), and Procurement Officer,
CAAST-CSAWM, MPKV, Rahuri

Dr. J.D. Jadhav
Director, CAFT and Head,
Dept. of Agrometeorology, MPKV, Rahuri

Dr. N.V. Kashid
Officer Incharge, ARS,
Vadgaon Maval, MPKV Rahuri

Dr. R.D. Nigade
Associate Professor (Agronomy),
MPKV, Rahuri

Dr. V.E. Narawade
Associate Professor (AHDS),
MPKV, Rahuri

Dr. S.D. Mandakmale
Sr. Scientist, AICRP on Goat Improvament,
MPKV, Rahuri

Dr. A.M. Nawale
Associate Professor (Plant pathology),
MPKV, Rahuri

Dr. A.G. Durgude
Assistant Professor (SSAC),
MPKV, Rahuri

Dr. A.R. Walunj
Scientist-1 (Entomology),
MPKV, Rahuri

Dr. S.S. Kaushik
Sr. Scientist and Head, KVK,
Dahigaon-Ne

Dr. P.D. Hendre
Subject Matter Speciality (Horticulture),
KVK, Babhaleshwar

Mr. R.D. Nawale
Sr. P.E. BISLD, BAIF, Nashik

ICAR-NAHEP
Centre for Advanced Agricultural Science and Technology on Climate Smart Agriculture and Water Management (CAAST-CSAWM),
Mahatma Phule Krishi Vidyapeeth Rahuri, Ahmednagar, Maharashtra, 413722

National Bank for Agriculture and Rural Development (NABARD)
Shivajinagar, Pune, Maharashtra 411005

BAIF Development Research Foundation
Pune, Maharashtra 411058

ISBN 978-93-5408-947-3

Mahatma Phule Krishi Vidyapeeth

Rahuri- 413 722, Dist. Ahmednagar, Maharashtra (India)
02426-243206, Email: vcmpkv@gmail.com

Dr. K.P. Viswanatha
VICE CHANCELLOR

Foreword

Weather plays a key role for climate-smart agriculture. Timely onset and good rainfall distribution along with other factors such as inputs, labour, crop management and technology are crucial to achieve optimum crop yields, particularly during the Kharif season. A good amount of rainfall determines the success of rainfed crops, and also influences the availability of water to irrigated agriculture. However, the deviation from the normal monsoon pattern affects crop production, fodder availability and cause significant losses to farmers.

In line with the recommendations of the Parliamentary Advisory Committee on Agriculture, ICAR-CRIDA and developed District Agriculture Contingency Plans (DACPs) for 650 districts to overcome weather aberrations such as drought, unseasonal rainfall, flood, heat wave, cold wave and hailstorm addressing different sectors of agriculture including horticulture, livestock, poultry, fisheries, soil and water conservation and minimize productivity losses.

The contingency crop plans are currently available at district and state level. Significant weather aberrations occur frequently at micro-level, and scaling down of district level contingency crop plan to block level and further to village level would resolve these climatic anomalies for speedy response mechanisms and help the administration channel resources efficiently to effectively mitigate the adverse impacts of these eventualities.

The Centre for Advanced Agricultural Science and Technology for Climate Smart Agriculture and Water Management (CAAST-CSAWM), MPKV Rahuri has developed the Village Level Contingency Crop Plan (VLCCP) for seven villages in Akole block of Ahmednagar district based on the DACP's and Block Level Plans developed for the Ahmednagar district, in collaboration with various stakeholders and brought out in the form of this publication.

This book covers various aspects of the preparation of the village-level contingency crop plan for the seven villages in the Akole block of Ahmednagar District in the State of Maharashtra. I am sure that this publication will be extremely useful to all stakeholders, both at central and state level, in the planning and implementation of agricultural contingency during weather aberrations. I would like to compliment the efforts of CAAST-CSAWM, CRIDA, BAIF, NABARD and all others for coming out with this useful Book.

(K.P. Viswanatha)

भारतीय कृषि अनुसंधान परिषद
कृषि अनुसंधान भवन - २ , नई दिल्ली-११००१२
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
KRISHI ANUSANDHAN BHAVAN-II, PUSA, NEW DELHI-110012
Phone: +91-11-25841760; Fax: +91-11-25843932
Email: ddgedu.icar@gov.in, ddgedn@gmail.com

डा. राकेश चन्द्र अग्रवाल
उप. महानिदेशक (कृषि शिक्षा) (अ.प्र.)
Dr. Rakesh Chandra Agrawal
Deputy Director General (Agril. Edn.) (Act.)

Message

The changing climate and climate variability that have resulted in higher frequency of natural disasters like drought, hailstorms, floods, etc are major concerns for agricultural productivity in general and food security in particular. Hence, we need to be prepared for alleviating the undesirable effects of these events. The concept of contingency crop planning based on climate would be useful for this purpose. The core components of contingency crop planning are change in sowing or planting time of crops, change in seed rate, change in schedule of fertilizer use, use of short duration varieties, improved crop genotypes, adoption of appropriate management practices.

The Center for Advanced Agricultural Science and Technology (CAAST) being implemented under the Word Bank assisted National Agricultural Higher Education Project (NAHEP) of the Indian Council of Agricultural Research (ICAR), New Delhi in different Agricultural Universities are required to address the three engagement areas of integration, transformation and inclusion. These engagement areas foresee increased agricultural productivity and support quality improvements of higher education to create a more skilled workforce that continuously improves the productivity of key sectors, including agriculture. The CAAST Project is also a multi-Global Practice collaboration (Agriculture and Education) and is expected to support activities and results directly related to cross-cutting strategic areas of climate change, jobs and gender.

The Mahatma Phule Krishi Vidyapeeth (Agricultural University) (MPKV), Rahuri has been awarded with CAAST project on "Climate Smart Agriculture and Water Management"(CSAWM). This project has been making efforts to develop the techniques and means to achieve sustainable productivity of agriculture at village level. The District Agriculture Contingency Plans (DACPs) developed by ICAR-Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad in association with other partners for 650 districts in India are useful for preparedness and real time implementation for sustainable agriculture production. However recognizing the need to downscale these plans at the village level, CAAST-CSAWM, MPKV, Rahuri decided to develop the village level crop contingent plans (VLCCPs) based on DACPS developed by ICAR-CRIDA, Hyderabad.

Accordingly I am happy to know that they CAAST-CSAWM selected the cluster of seven villages in Ahmednagar district and developed the VLCCPs for these seven villages in association with all the collaborators and the stakeholders. The CAAST-CSAWM has also generated appropriate strategies and agro-techniques for growing crops under normal and delayed onset, early withdrawal and extended monsoon conditions. The project has also come up with sustainable agricultural practices, which are being actively adopted by the small, medium and large farmers in different parts of the block.

I compliment the efforts made by the Principal Investigator and his team of Scientists from MPKV, Rahuri in bringing out the plans and implementation strategies in the form publication entitled "Village Level Agriculture Contingency Plans for Climate Proofing of Watersheds in Akole Block, Ahmednagar, Maharashtra". I appreciate the support provided by the MPKV authorities; and the active participation of ICAR-CRIDA, Hyderabad; NABARD, Pune, BAIF, KVKs, farmers and other organizations for the preparation of plans

I am confident that this publication will be of immense use for the development agencies, which are involved in transfer of technology for agricultural crops in the block besides its utility to the farming community for achieving higher and stabilized productivity from the village areas of the Akole block.

(R.C. Agrawal)

मुख्य महाप्रबंधक
Chief General Manager

NABARD

Message

NABARD with its mandate for equitable and sustainable rural prosperity, has been implementing Watershed Development Programmes since 1990s and this initiative of NABARD for past 25 years have benefited 0.544 million households covering 1.959 million hectares of land area through 1959 watershed projects. In Maharashtra, more than 340 projects have been implemented under Watershed Development Fund of NABARD, covering about 4 lakh ha area.

Climate change has become real and tangible, affecting people's lives worldwide. It is a major challenge for agriculture, food security and rural livelihoods. According to "South Asia's Hotspots: The Impact of Temperature and Precipitation Changes on Living Standards", a report by World Bank, almost half of South Asia's population, including India, now lives in the vulnerable areas and will suffer from declining living standards that could be attributed to falling agricultural yields, lower labor productivity or related health impacts. Maharashtra has been indicated to be one of the most vulnerable states in the country.

Keeping this in view, since the past two years, NABARD has graduated from 'holistic/integrated community driven watershed development programme' to a 'climate resilient watershed development programme' by way of integration of climate change risk and adaptive measures under watershed projects, with necessary application of climate lens.

राष्ट्रीय कृषि और ग्रामीण विकास बैंक
National Bank for Agriculture and Rural Development

महाराष्ट्र क्षेत्रीय कार्यालय, 54, वेलेस्ली रोड, पो.बा.क्र. 5, शिवाजीनगर, पुणे – 411 005. टेली : (020) 2554 1439 / 2550 0172 • फैक्स : (020) 2554 2250 इ-मेल : pune@nabard.org • वेबसाईट : www.nabard.org
Maharashtra Regional Office, 54, Wellesley Road, P.B. No.5, Shivajinagar, PUNE 411 005. Tel.: (020) 2554 1439 / 2550 0172 • Fax : (020) 2554 2250 E-Mail : pune@nabard.org • Website : www.nabard.org

NABARD

It has also been observed that, dynamic nature of the climate change impacts necessitates the need for contingency planning, built into project implementation. The crop management, agronomic and water sector interventions need to be adjusted according to the need of changes in the weather parameters for the given season or a year. CRIDA has developed district level contingency plans and with objective of integrating this methodology for watershed / village level, NABARD in association with MPKV, Rahuri and BAIF under the guidance of CRIDA has developed village-wise contingency plans for four watershed projects in Akole Block of Ahmednagar district. This initiative is first of its kind in India. This document captures climate change impact scenarios and its effects on various rural sectors and also recommends scientifically validated adaptation strategies to be followed to tackle these contingencies.

The development of contingency plans at watershed level is expected to be a tool in the hands of watershed community to adopt location specific strategies in tune with climate change impacts in a timely manner.

NABARD looks forward to such innovative collaboration with academia, research institutions, civil society organisations and community based institutions to address the future challenges in agriculture and rural development sectors.

L L Raval
15th July 2020

गाँव बढ़े >> तो देश बढ़े www.nabard.org Taking Rural India >> Forward

BAIF Development Research Foundation
Dr. Manibhai Desai Nagar, National Highway No. 4, Warje, Pune - 411058, India
Phone: 91 20 25231661/63/64, Fax :91 20 25231662, E-mail: baif@baif.org.in, Website: www.baif.org.in

Girish Sohani
President and Managing Trustee,
BAIF Development Research Foundation

Message

India is one of the most vulnerable countries to climate change with number of mouths to be fed and with number of people that are dependent solely on rainfed agriculture. Climate change and variability have affected the India's farming communities badly since last few years. It not only posing the threat to India's future food and nutritional security but also has an ability to jeopardise all past development efforts. This situation definitely calls for urgent actions in the form of mitigation and adaptation programs. Despite of several affirmative actions on the part of government and scientific and research institutes, the exact pathways to build the resilience of vulnerable farming communities remains to be understood. The need is also felt to have a highly regional and context specific adaptation and mitigation approach owing to the variability in agroclimatic zones, bio -physical conditions and socio-economic settings in India. Since this issue is comparatively new and complex, even India's farmers need proper techno managerial hand holding support.

In view of this , I am happy to note that a team of multiple stakeholders could develop Village Level Contingency Crop Plans for Akole Block of District Ahmednagar, Maharashtra after having series of discussions involving local farmers, scientists from the MPKV, Rahuri, State Agriculture Department, KVKs, Senior Officials from NABARD R.O., Pune, my team members from BAIF and Experts from government line departments and with expert facilitation from Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad.

Contingency planning is one important intervention required in climate change efforts. CRIDA, Hyderabad has prepared district wise contingency plans at all India level. These plans are referred and used by many development actors in their climate change adaptation programs. I am sure these Village Level Contingency Plans will be seen as a one step forward in the direction of more downscaled and context specific planning process. This will also help to achieve a goal of community participation and ownership of climate change adaptation actions.

I can see that these plans have been very well developed by involving all concerned stakeholders, by taking note of all key climate change hazards, by covering crop-livestock based integrated farming system and by incorporating all suggested technically sound and people's knowledge-based adaptation and mitigation interventions. I am sure this will serve as an important guidance document to develop a village level contingency plans for many vulnerable villages in India

My compliments to the entire team who could lead and could contribute to this entire effort.

(Girish Sohani)

फोन/Phone: कार्यालय/Office: +91-040-24530177
फैक्स/Fax: 24531802, 24535336
ईमेल/Email: director.crida@icar.gov.in
वेब/Web: www.icar-crida.res.in

भाकृअनुप - केंद्रीय बारानी कृषी अनुसंधान संस्थान
ICAR - Central Research Institute for Dryland Agriculture
संतोषनगर/Santoshnagar, हैद्राबाद/Hyderabad- 500 059, भारत/India

डॉ. जी रविंद्र चारी
कार्यकारी निदेशक
Dr. G. Ravindra Chary
Director (A)

Message

The success of rainfed agriculture is largely dependent on timely onset of south-west monsoon and even distribution of rainfall during the cropping season which are critical for realizing better crop yields. Adequate amount of rainfall during the southwest monsoon season not only helps farmers with that frequency of unpredictable weather events, but also needs resources that provide them with advance knowledge and advice on how to tackle risks and opportunities.

A two pronged approach of preparedness and real-time response is needed to manage weather aberrations by farmers for climate risks reduction and enhancing their adaptive capacity. Contingency crop planning, weather based agromet advisory services, adoption of risk resilient crop management practices etc. are some of the adaptation strategies that could be suggested to farmers. The future hazard analysis indicates an increased frequency of droughts as well as high intensity rainfall events which would be affecting agriculture and allied sectors.

This publication is an outcome of collaborative effort of Center for Advanced Agricultural Science and Technology (CAAST) on Climate Smart Agriculture and Water Management (CSAWM)" Mahatma Phule Krishi Vidyapeeth, Rahuri; BAIF, Pune; NABARD, Pune; KVKs in the region, other related organizations and farmers for which ICAR-Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad provided the expert facilitation and technical backstopping.

In this publication, the advisory is suggested on key aspects of crop management, irrigation, nutrient, pest and disease management to cope with various weather aberrations in agriculture and allied sectors for enhancing resilience adaptive capacity leading to improved farm productivity and maintaining eco system. The template and information in preparation of District Agriculture Contingency Plans by ICAR-CRIDA formed the basis in preparation this publication.

The efforts by CAAST-CSAWM, MPKV, Rahuri in bringing out such an innovative publication are highly appreciated. I wish that the valuable information provided in this publication are of immense help to the primary and secondary stakeholders and rendering meaningful service to the farming community.

(G. Ravindra Chary)

भाकृअनुप - राष्ट्रीय जैविक स्ट्रैस प्रबंधन संस्थान
बरौंडा, रायपुर – 493225, छत्तीसगढ़, भारत
ICAR-NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT
Indian Council of Agricultural Research
(DARE, Ministry of Agriculture and Farmers' Welfare)
Baronda, Raipur - 493225, Chhattisgarh, India

Dr. Probir Kumar Ghosh
Director and Vice Chancellor

Message

In context of global warming and climate change, farmers are facing the vulnerability issues caused by increased frequency of occurrence of extreme weather such as droughts, floods, hailstorms, unseasonal rains, etc., which are causing severe economic losses, especially to small and marginal farmers leading to farm distress.

I am happy to note that CAAST-CSAWM sensitized about the agricultural contingencies and evolved the systems to address these issues by conducting several workshops to enhance preparedness of block level officials in order to effectively address local vulnerabilities, taking into account the need to downscale the available district and developed village level contingent plans in a holistic way for the ultimate benefit of the farming community of the respective villages.

Compilation of the proceedings of all these workshops in the form of a book along with a way forward to address several issues relating to operationalization is very timely and appreciable, which will make essential for State Government as well as State Agricultural University to establish Agricultural Contingency Cell.

I hope these efforts made by editors will continue in the years to come by CAAST-CSAWM for the betterment of farming community for managing weather abnormalities and extreme weather events so that Indian Agriculture becomes more resilient ultimately contributing to the mission of doubling farmers income.

I wish a grand success for such booming implementation of CAAST sub-project for the benefit of farming community.

Dr. Probir Kumar Ghosh

भाकृअनुप - राष्ट्रीय जैविक स्ट्रैस प्रबंधन संस्थान
बरौंडा, रायपुर – 493225, छत्तीसगढ़, भारत
ICAR-NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT
Indian Council of Agricultural Research
(DARE, Ministry of Agriculture and Farmers' Welfare)
Baronda, Raipur - 493225, Chhattisgarh, India

Dr. Prabhat Kumar
National Co-ordinator
CAAST (NAHEP)

Message

In context of global warming and climate change, farmers are facing the vulnerability issues caused by increased frequency of occurrence of extreme weather such as droughts, floods, hailstorms, unseasonal rains, etc., which are causing severe economic losses, especially to small and marginal farmers leading to farm distress. In order to cope up with these contingency situations, by ICAR-Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad has developed District Agricultural Contingency Plans and Block Level Agricultural Contingency Plans in technical cooperation with stakeholders from the National Agricultural Research Systems like SAUs, KVKs and line departments. Center for Advanced Agricultural Science and Technology (CAAST) on Climate Smart Agriculture and Water Management (CSAWM), Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, has developed a Village Level Contingent Crop Plan (VLCCP) in order to effectively address local vulnerabilities, taking into account the need to downscale the available district and block level contingent plans to village level. Since 2019 CAAST-CSAWM conducted several workshops before the commencement of kharif season to enhance preparedness of the block level officials to overcome anticipated weather aberrations during crop season. In these workshops, an appraisal was made on the critical analysis of the weather during crop season based on weather forecast by IMD and advocated the steps to be taken to face any weather related aberrations at local level.

I am very happy that CAAST-CSAWM has compiled the proceedings of all these workshops in the form of a book along with a way forward to address several issues relating to operationalization. There is an urgent need for establishment of Agricultural Contingency cells in State Governments as well as in State Agriculture Universities to deal with agricultural contingency implementation.

I hope these efforts will continue in the years to come by CAAST-CSAWM for the betterment of farming community for managing weather abnormalities and extreme weather events so that Indian Agriculture becomes more resilient ultimately contributing to the mission of doubling farmers income.

Dr. Prabhat Kumar

Directorate of Research
Mahatma Phule Krishi Vidyapeeth
Rahuri- 413 722, Dist. Ahmednagar, Maharashtra (India)
Email: dormpkv@rediffmail.com Website: http://mpkv.mah.nic.in

Dr. Sharad Gadakh
Director of Research

Message

Indian agriculture depends heavily on south west monsoon as it contributes production and productivity of major food grain crops. Global warming and climate change causes climatic variability resulting into delay in onset of monsoon and intermittent dry spells at different stages of crop growing season. This type of aberrations limit the production and productivity of crops leading to threat for food security of poor households. When the onset of monsoon gets delayed, farmers face difficulties in timely farm operations and it affects the economic yields. Whenever, there is deficient rainfall during the kharif season in Maharashtra, the agricultural production gets affected significantly.

It has been widely believed that due to the climate change, the variability is going to increase in the years to come. There is enough evidence now that shows increased frequency of droughts as well as high intensity rainfall are affecting agriculture production. We are increasingly witnessing drought and flood like situations during the same season. Contingency plans, which look at these adverse weather events, needs to be prepared for situations such as drought, flood, heat wave, cold wave, etc to take timely mitigation decisions for addressing the variability.

With the active support from Ministry of Agriculture, Government of India, CRIDA prepared such contingency plans at district and block level for different states of India.

I am happy to note that CAAST-CSAWM has down scaled and prepared the contingency crop plan at village level in collaboration with NABARD and BAIF considering four different components viz., agriculture, horticulture, livestock, soil and water conservation.

The preparation of contingency plans at the village level would go a long way in formalizing them at more decentralized locations such as village and is an essential component considering the divergence in crop production systems and natural resources available. The dissemination of information through advisories to farmers on what steps to take in the event of droughts, floods, etc. is an important activity to optimize productivity and for securing sustainable livelihoods.

The publication on contingency plans covers all aspects related to weather aberrations, preparedness and real time contingency measures which covers innovative interventions related to crops. I am sure this publication will be immensely useful to all the stakeholders at the block and the village level for taking decisions and operationalizing the contingency plans in the cluster of Akole block. I compliment the efforts of CAAST-CSAWM and their staff for bringing out this useful publication for the farmers.

(S.R. Gadakh)

Directorate of Instruction
Mahatma Phule Krishi Vidyapeeth
Rahuri- 413 722, Dist. Ahmednagar, Maharashtra (India)
Email: deanmpkv@gmail.com Website: http://mpkv.mah.nic.in

Dr. Ashok L. Pharande
M.Sc. (Agri.), Ph.D., PDF (UK)
Dean Faculty of Agriculture and
Director of Instruction

Preface

The climate and weather in a particular region influences crop development and climate crop relationship. The need for climate and weather information is particularly important for social and economic growth in the current scenario, where the sustainability of the village-level agricultural production system is threatened by climatic variability.

In the context of global warming, climate change and climate variability, the farming community is suffering from the havoc of weather aberration. With a view to reduce the adverse effects of climate change, the concept of a weather-based agromet advisory service needs to be downscaled at the village level from the district level. Centre for Advanced Agricultural Science and Technology for Climate Smart Agriculture and Water Management (CAAST-CSAWM) project functioning in MPKV, Rahuri is working on the concept of climate smart and digital villages. In this regard, CAAST-CSAWM has adopted seven villages of Akole block of Ahmednagar district.

Village Level Contingency Crop Plan (VLCCP) developed by the joint efforts of CAAST-CSAWM, MPKV Rahuri, CRIDA, BAIF, NABARD and other partners for the adopted villages viz., Manhere, Ambevangan, Ladgaon, Titavi, Kodani, Pimparkane and Dongarwadi in Akole block of Ahmednagar district is India's first initiative to scale down the district and block level contingency crop plan to village level.

This publication is a technical document aimed at undertaking different crop management practices under different weather aberrations, such as droughts, floods, cyclones, hailstorms, heat and cold waves, addressing various agricultural sectors, including horticulture, livestock, poultry and soil and water conservation etc. This plan will be useful for the preparation and real-time implementation of sustainable agriculture production systems in the event of weather aberrations and extreme climatic events in Akole block of Ahmednagar district in the State of Maharashtra.

I extend my best wishes to all the experts and stakeholders in the state including MPKV, Rahuri, NABARD, BAIF, State Agriculture Department, KVKs, Farmers, and Experts from line departments including NGOs and expert facilitation from CRIDA and ATARI involved in the development of this village level contingency crop plan and hope the contingency strategies will be helpful for the well being of the farming community of seven villages of Akole block.

Pharande

(A.L. Pharande)

ICAR- National Agricultural Higher Education Project (NAHEP)
Centre for Advanced Agricultural Science and Technology for Climate Smart Agriculture and Water Management (CAAST-CSAWM)
Mahatma Phule Krishi Vidyapeeth, Rahuri
413 722 Maharashtra, India
www.mpkv-caast.ac.in; info.rahuri@mpkv-caast.ac.in

Dr. S.D. Gorantiwar
Principal Investigator and
Head, Dept. of Ag. Engg.

02426-243268
caast.csawm2018@gmail.com

Acknowledgements

The project entitled "Center for Advanced Agricultural Science and Technology (CAAST) on Climate Smart Agriculture and Water Management (CSAWM)" is being implemented in Mahatma Phule Krishi Vidyapeeth (an Agricultural University), Rahuri, Maharashtra under the Word Bank assisted National Agricultural Higher Education Project (NAHEP) of the Indian Council of Agricultural Research (ICAR), New Delhi. One of the important objectives of the CAAST-CSAWM project is to develop smart technologies for the adoption of climate smart agriculture and precise water management practices.

The CAAST-CSAWM, MPKV, Rahuri in collaboration with the partners including NABARD, BAIF and others decided to explore the possibility of implementing the concept of the climate smart agriculture at village level and selected seven villages in Akole Taluka of Ahmednagar district in the State of Maharashtra for this purpose. Implementation of climate smart agriculture approach need the climate based crop contingent plans. The District Agriculture Contingency Plans (DACPs) developed by ICAR-Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad in association with other partners for 650 districts in India provide the technological interventions to manage various weather aberrations and extreme climatic conditions. These plans are useful for preparedness and real time implementation for sustainable agriculture production.

All the partners who are involved in this endeavor decided to adopt these DACPs but at the same time realized the need to down-scale these plans to the village level for the implementation in real time and also for the climate proofing of watersheds. Though there were some successful attempts to down-scale DACPs to Block level; but down-scaling to the village level is important for implementation. CAAST-CSAWM, MPKV, Rahuri along with all active partners BAIF, NABARD, State Dept. of Agriculture, KVK Babhaleshwar, Krishi Seva Kendras, and Farmers in the villages started the process of down-scaling the plans to village level and finally came out with this publication that includes the procedure adopted to down-scale the DACPs to village level; and village level crop contingent plans for seven villages in Akole Taluka and the implementation plan finalized after several rounds of the brain-storming sessions, workshops, visits and consultations.

We are thankful to all the authorities of Mahatma Phule Krishi Vidyapeeth, Rahuri wherein this NAHEP-CAAST-CSWAM is being implemented including the Heads, faculties and scientists of all the Departments involved in the development of the village level crop contingent plans (VLCCPs) for their timely input.

We are especially thankful to Dr. K.P. Viswanatha, Hon. Vice Chancellor, MPKV, Rahuri for his constant encouragement, enthusiastic support and guidance for implementing different activities of the CAAST-CSAWM including his active and vivid support for the development of the village level crop contingent plans. We are thankful to Dr. A.L. Pharande Dean (F/A) & Director of Instruction, MPKV, Rahuri; Dr. S.R. Gadakh, Director of Research & Director of Extension Education, MPKV, Rahuri and Dr. K.D. Kokate, former DDG (Extn.), ICAR and former Director of Extension Education, MPKV, Rahuri for their enthusiastic support and guidance for successful completion of VLCCP and corresponding documentations.

In this regard, we express our deep gratitude towards ICAR-National Agricultural Higher Education Project (NAHEP), New Delhi for giving us opportunity through the "Center for Advanced Agricultural Science and Technology (CAAST) on Climate Smart Agriculture and Water Management (CSAWM)" to develop the village level crop contingent plans and providing us all kind of support. We are specially thankful to Dr. R.C. Agrawal, National Director, ICAR-NAHEP; Dr. Prabhat Kumar, National Co-ordinator, CAAST-NAHEP; and Dr. P.K. Ghosh, former National Co-ordinator, ICAR-CAAST-NAHEP, New Delhi.

All the partners BAIF, NABARD, the State Department of Agriculture and Krishi Vigyan Kendras (KVKs) were equally involved in the development of the VLCCPs. We profusely thank all these organizations for actively participating and leading for the development of the different components of the VLCCPs.

We are specially thankful to Mr. U.D. Shirsalkar, Chief General Manager, NABARD; Mr. L.L. Raval, Chief General Manager, NABARD, Pune; Dr. Ushamani P, General Manager, NABARD, Pune and Er. Sachin Kamble, Asstt. General Manager, NABARD, Pune for their active participation, guidance and all kind of support required to develop the plans and produce this document at each and every stage of the process.

We are thankful to Mr. G.G. Sohani, President and Managing Trustee, BAIF; Mr. Somnath Choudhury, former Programme Manager, BAIF and Sr. Consultant, NABCONS, New Delhi and all the members of their team who contributed for the development of VLCCPs.

The ICAR-CRIDA, Hyderabad is the pioneering organization for the development of DACPs and they also guide line departments and NGOs for the implementation of the plans. We are profusely thankful to the ICAR-CRIDA for providing us all kind of expert advice and facilitation at every state of the development of VLCCPs, without whose support these plans and this publication would not have been possible. We are especially thankful to Dr. G. Ravindra Chary, the Director, ICAR-CRIDA for his enthusiastic and untiring guidance. We are also thankful to Dr. K. Sammi Reddy, Head, NRM, ICAR-CRIDA and Dr. K.A. Gopinath, the Principal Scientist, ICAR-CRIDA, Hyderabad for all kind of guidance and expert advice.

We are also thankful to Krishi Seva Kendras in the region for providing the timely help; and providing different data and facts required for developing the plans. Thanks are also due to Dr. J.R. Kulkarni, Former Scientist, Indian Institute of Tropical Meteorology, Pune for his guidance. Dr. Kailas Dakhore, Assistant Professor (Agrometeorology) and Dr. B.V. Asewar, Head (Agronomy), VNMKV Parbhani for their meaningful inputs in preparation of VLCCP.

Most importantly, the farmers are the important stakeholders for the implementation of the VLCCPs and we consider that their participation is very important. The farmers of all the seven villages contributed actively and meaningfully for the development of the VLCCPs by actively participating in each and every process. We are thankful to farmers of all these seven villages.

Finally, several CAAST-CSAWM team members and the Research Associates of CAAST-CSAWM, MPKV, Rahuri meticulously planned different activities, collaborated with different stakeholders and executed the process successfully. We are thankful to all of them and especially to Dr. R.P. Andhale, Associate Professor of Agronomy; Dr. M.C. Ahire, Head, Dept. of Extn. Education; Dr. M.G. Shinde, Professor of SWCE; Dr. J.D. Jadhav, Head, Dept. of Agril. Meteorology; Dr. Snehal Kanade, Research Associate (Agro-meteorology); Dr. Vaibhav Malunjkar, Research Associate (SWCE); Dr. Shubhangi Ghadge, Research Associate (Agril. Extn); and Dr. Sevak Dhenage, Research Associate (Agril. Extn).

(S.D. Gorantiwar)

Table of Contents

List of Abbreviations

AICRPDA	:	All India Coordinated Research Project for Dryland Agriculture
ATARI	:	Agricultural Technology Application Research Institute
BAIF	:	BAIF Development Research Foundation
CAAST	:	Centre for Advanced Agricultural Science and Technology
CRIDA	:	Central Research Institute for Dryland Agriculture
CSAWM	:	Climate Smart Agriculture and Water Management
CSO	:	Civil Society Organization
DACPs	:	District Agriculture Contingency Plans
DoA	:	Department of Agriculture
GIS	:	Geographic information system
ICAR	:	Indian Council of Agricultural Research
IITM	:	Indian Institute of Tropical Meteorology
IMD	:	India Meteorological Department
IoT	:	Internet of things
KVK	:	Krishi Vigyan Kendra
MPKV	:	Mahatma Phule Krishi Vidyapeeth
NABARD	:	National Bank for Agriculture & Rural Development
NAHEP	:	National Agricultural Higher Education Project
NGOs	:	Non-government organizations
NREGS	:	National Rural Employment Guarantee Scheme
NRM	:	Natural Resource Management
PFOs	:	Project Facilitating Organization
PIA	:	Project Implementation Agency
PRA	:	Participatory rural appraisal
PRI	:	Panchayat Raj Institution
REC	:	Regional Extension Centre
RTCP	:	Real Time Contingency Planning
SAUs	:	State Agricultural Universities
SHGs	:	Self Help Groups
VLCCP	:	Village Level Contingent Crop Plan
VWCs	:	Village Watershed Committees
ZARS	:	Zonal Agriculture Research Station

List of Figures

Village Level Agriculture Contingency Plans for Climate Proofing of Watersheds in Akole Block, Ahmednagar Maharashtra

1. Introduction

Agriculture in India is highly vulnerable to climate change, particularly in rainfed regions, which account for more than 60 per cent of India's total cultivated area. Akole Block of Maharashtra is part of the Western Ghat zone, which is directly dependent on the monsoon for agricultural production. Changing weather patterns due to climate change viz., early or late-onset and withdrawal dates of monsoon, unseasonal dry and wet spells, erratic rainfall, extreme temperature fluctuations and unexpected events such as hailstorms, and cloud bursts increase risks to crops, livestock and livelihoods, making farmers vulnerable to losses and damage. Unusual weather variations and shifts in local weather patterns are increasingly causing losses for farmers. Their traditional knowledge and experience must, therefore, be complemented by advanced information such as weather forecasting and contingency crop plans.

Central Research Institute for Dryland Agriculture (CRIDA) has developed 650 district level contingency crop plans based on soils, rainfall and micro-farming situations with the association of network of All India Coordinated Research Project for Dryland Agriculture (AICRPDA), Agromet centres and Agricultural Universities. These plans are developed in order to better equip farmers and stakeholders in India to effectively respond to contingent weather situations. In the present situation, the contingency crop plans are currently available at the district and the state level. Many times, the major weather aberrations happen at the micro-level, for example, a village may experience drought, flood situation which may not be the case at the district level. Further, the cropping systems being followed at village/ block level varies a lot within a district. Scaling down of district or block level contingency crop plan to the village level will address these climatic anomalies for quicker response mechanisms and help the administration to channelize the resources appropriately for effective mitigation of the adverse impacts of such eventualities.

The project entitled "Centre for Advanced Agricultural Science and Technology (CAAST) on Climate Smart Agriculture and Water Management (CSAWM)" is being implemented in Mahatma Phule Krishi Vidyapeeth (An Agricultural University), Rahuri, Maharashtra under World Bank Sponsored National Agricultural Higher Education Project (NAHEP) of Indian Council of Agricultural Research (ICAR), New Delhi, Government of India, Since 2018. One of the major objectives of CAAST-CSAWM project is to develop the capacity amongst the faculties and students of MPKV Rahuri and other Agricultural Universities and related organizations for the development and adoption of the precise Climate Smart Agriculture and Water Management technologies as well as to conduct on-the-job training and case study based learning to enhance the employment and placement rate; and business and entrepreneurship opportunities.

CAAST-CSAWM, MPKV Rahuri, has developed a Village Level Contingent Crop Plan (VLCCP) as part of the project objectives and considering the need to localize the available district and block-level contingent plans at the village level to effectively address the local vulnerability. This plan is innovative, rigorous and developed for the seven villages of Akole Block (viz., Manhere, Ambevangan, Ladgaon, Titavi, Kodani, Pimparkane and Dongarwadi),

Ahmednagar district. The plan is developed in consultation with various institutions and stakeholders in the state including MPKV Rahuri, NABARD, BAIF, State Agriculture Department, KVKs, Farmers, and Experts from line departments including NGOs and expert facilitation from CRIDA.

These seven villages are part of NABARD's four projects on "Climate Proofing of Watersheds" being implemented in Akole block of Ahmednagar District. Under climate proofing of watershed concept, NABARD applies climate lens in designing and implementation of watershed interventions/measures to arrive at additional soil and water conservation measures required, cropping patterns to be followed to respond to climate change impacts, and designing of risk mitigation and risk transfer mechanisms. The agriculture adaptation / resilience-building measures under these projects do consider current and projected climate change linked variability, however, these measures need to be adjusted/changed to respond the dynamic nature of climate change impacts. This necessitates the contingency planning under these projects so that the communities and village watershed committees would be able to respond to the climate change impacts in a real-time manner.

2. Akole Block

The Maharashtra state is divided into nine broad agro-climatic zones. Ahmednagar district comes under the Deccan Plateau, Hot semi-arid Eco- Region (6.1), Western Plateau and Hills Region (IX), Western Maharashtra Scarcity Zone (MH-6) with an average annual rainfall of 561 mm. Ahmednagar district has a total geographical area of 1702 ha, out of which total cultivable area is 1146 ha having shallow Red/ Grey soils, deep black soils and medium-deep black soils. Akole block of Ahmednagar district comes under Transition zone II. The rainfall in transition zone II ranges from 700 to 1200 mm. Principal crops grown in Kharif and Rabi seasons are paddy, finger millet, groundnut, wheat and gram. The soils of Akole block are classified as shallow (up to 30 cm), medium (30-60 cm), and deep soils (60-90 cm). However, the cluster of seven villages adopted by CAAST-CSAWM falls under light to medium type of soil.

Akole block falls under the rainfed region of Maharashtra and, as a general rule, early sowing of kharif crops is the best practice that gives higher reliable yields. However, crop yields are affected by delays in monsoon or long breaks during the growing season and also by early withdrawal or continuation of monsoon for longer periods. These weather aberrations often lead to poor crop yields or total crop failures in major crops.

Scientists from CAAST-CSAWM, MPKV, Rahuri visited Akole block of Ahmednagar district along with officials from NABARD and BAIF, studied and discussed major problems in agriculture, cultivation practices, livestock management and weather abnormalities. Farmers in Akole Block mostly follow conventional food grain production practices that resulted in less productivity and income. The need for a micro-level crop contingency plan to guide farmers to cope up with variable weather, soils and crop situations was strongly felt. After several field visits and surveys, the MPKV scientists, identified a cluster of seven villages in Akole Block viz., Manhere, Ambevangan, Ladgaon, Titavi, Kodani, Pimparkane and Dongarwadi for study. This cluster is dominated by tribal communities with minimum availability of resources for agricultural enterprises. In view of the need for a village-level crop contingency plan and implementation of climate smart technologies to double farmers' income, CAAST-CSAWM, MPKV, Rahuri decided to develop a contingency crop plan for these seven villages. Figure 1 shows the location map of selected villages from Akole block of Ahmednagar District (Maharashtra) and the other village details, including the soil, agro-climatic parameter and baseline information, are provided in the plan.

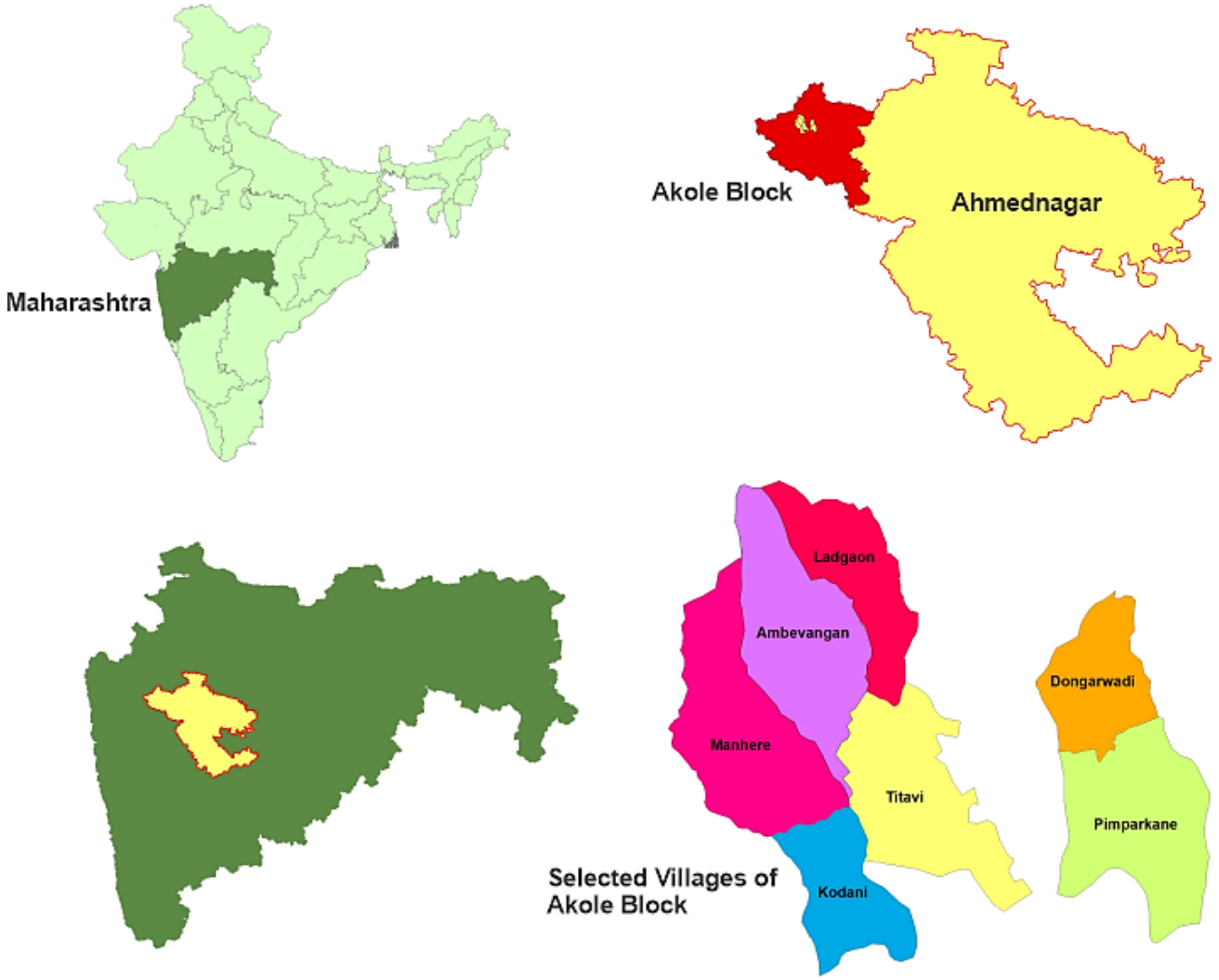

Fig 1. Location map of selected villages from Akole block of Ahmednagar District (Maharashtra)

3. Process of Preparation

The village contingency crop plan has been developed by CAAST-CSAWM, MPKV Rahuri along with NABARD, BAIF, State Agricultural Universities and KVKs under the overall guidance and supervision of ICAR and CRIDA. During the preparation of the plan, five orientation workshops were held to raise awareness among stakeholders about the standard template developed by CRIDA for this purpose during June 2019. Since July 2019, vetting workshops were organized to scrutinize and finalize the plan in the presence of ICAR institutes and subject matter experts from MPKV Rahuri. The process of the plan preparation is shown in Figure 2 and the vetting workshops organised for scrutiny and finalization of the plan are shown in Table 1.

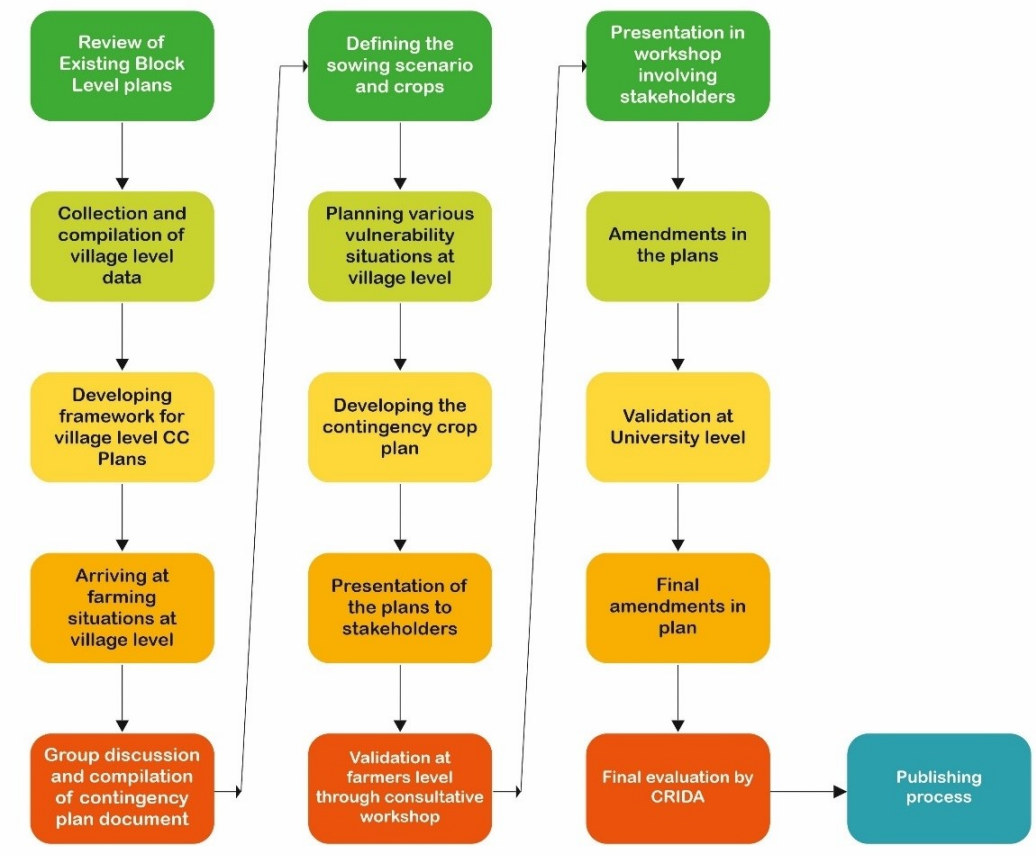

Fig. 2. Process of Preparation of Village level crop contingency plan

Table 1. Vetting Workshops organized for scrutiny and finalization of draft plans with SAUs and ICAR Institutes

Sr. No.	Date of Workshop	Name of Workshop	Venue of Workshop
1	09 April, 2019	Stakeholders workshop for Agro-climatic Networking	Shenit village, Akole Block
2	20-21 June, 2019	Developing village level contingency crop plans	MPKV, Rahuri
3	09 July, 2019	Field validation workshop on Developing village level contingency crop plans by conducting PRA	Shenit village, Akole Block
4	16 August, 2019	Validation workshop on Developing village level contingency crop plans	MPKV, Rahuri
5	04 October, 2019	Validation workshop on Developing village level contingency crop plans	MPKV, Rahuri

The village-level baseline data collection template was compiled by BAIF team and circulated among its Akole block level officials to collect information of selected villages. The baseline data collected contained, information related to cropping patterns, soil type, type of crops, livestock's, poultry and fisheries information etc. Collected data sets were then shared with Department of Agriculture, MPKV Rahuri and NABARD for further analysis and review.

3.1. Stakeholder Workshop on Agro climatic networking

CAAST-CSAWM, MPKV, Rahuri, organized a one-day stakeholder workshop on "Agro-climatic Networking" on 09 April 2019 at Rajendra Prasad Ashram School, Shenit Tal. Akole, Dist. Ahmednagar, in collaboration with NABARD and BAIF. In this workshop, initial deliberations were held between MPKV, BAIF, NABARD and village community regarding need for development of village level contingency plan and multi-stakeholder approach to develop the same. BAIF presented the preliminary data related to agro-climatic parameters, climate proofing project interventions and associated challenges.

3.2. Workshop on village level contingency crop planning

A two-day workshop on the development of the village contingency crop plan for the Akole block was held on 20-21 June 2019 at MPKV Rahuri. The workshop was attended by stakeholders from Department of Agriculture, CRIDA, MPKV-Rahuri, NABARD, representative form Agriculture Universities in other regions of Maharashtra, IITM, KVKs, scientists from different fields of agricultural sciences, BAIF and farmers from project villages. During the workshop, CRIDA elaborated on the need for development of such localised plans and explained the processes required to be followed to develop village-level contingency crop plans. The key elements of the framework included detailed analysis of the following aspects:

- *Identification of farming situations – resource mapping*
- *Sowing scenarios*
- *Cropping patterns*

- *Rainfall situations*
- *Soil types and soil classifications*
- *Climate Change Vulnerability issues*
- *Preparedness and real-time contingencies*

The frameworks and templates were prepared based on these key elements for respective village level scenarios. The planning was subsequently carried out for each of the villages selected, with the participation of domain experts from different agriculture sciences, Government Department officials of Akole block, farmers and NGO officials.

During the workshop, the participants were divided into four sectoral groups viz., Agriculture, Horticulture, Livestock and Soil and Water Management based on their field knowledge and expertise. Out of the selected seven villages, farming situation of each village is taken into consideration and sectoral challenges and solutions were summarised during individual group discussions. Following this, each village group was assigned the task of filling in the compiled information in the contingency planning template prescribed by CRIDA, depending upon the scenario for Kharif, Rabi, and summer seasons.

This task even though is time consuming (it required about one and a half days), it can be considered as most critical. After completion of the template document, each group presented sectoral village level contingency plans during the second day. Inputs from each of the groups helped in capturing micro-level situations, which facilitated in developing comprehensive village specific contingency measures. Recommendations and alternative planning options were deliberated among cross sectoral teams improvements as required were made in the plans. Experience sharing during the workshop facilitated clarity on crop management practices, rainfall situations, soil types and soil classifications, vulnerability issues, preparedness options, necessary real-time contingency measures, as well as cross sectoral challenges. The first draft of VLCCP was prepared at the end of the workshop.

3.3. Field validation

The BAIF field officials in each village took-up the task of validating the plans involving village community, farmers, and State Government Agriculture Department officials as well as Zonal Agriculture Research Station (ZARS), Igatpuri. This process involved Participatory Rural Approach (PRA) in the each of these villages in order to capture opinions/suggestions of the farming community.

Subsequent to these consultations, CAAST-CSAWM and BAIF arranged village level workshops to discuss the draft contingency plans earlier prepared during the workshop at MPKV Rahuri. Four groups were formed for sectors viz., agriculture, horticulture, livestock and soil water conservation. The approach followed in this workshop is indicated below:

- Each group consisted of:
  - *Subject Matter Experts*
  - *State Department Officials*
  - *BAIF officials and*
  - *2-3 farmers from each village*

- The event started with the preparation of village-level maps containing farming situation representation and including mapping of availability of natural resources at village level by using PRA techniques which were followed by a discussion on village level constraints under agriculture production systems.
- With the involvement of farmers who had earlier joined Participatory Rural Approach (PRA), the baseline information was further consolidated and response mechanism for each of contingency situation for various sectors was deliberated in consultation with scientists.
- Experts from MPKV, Rahuri, ZARS Igatpuri, State Agriculture Department, KVKs, and Experts from NGOs also conceptualised framework for village level Agromet Advisory Services.

3.4. Validation workshop at CAAST-CSAWM MPKV Rahuri

CAAST-CSAWM MPKV Rahuri hosted a final validation workshop on 16 August 2019 at the University campus. For this workshop, an expert from CRIDA, Government Department officials, University Scientists including Head of the Department of concerned subject areas, scientists of Zonal Agricultural Research Station Igatpuri, were invited for the final validation of developed VLCCP. CAAST-CSAWM subject matter specialists presented the validated plans, which were prepared involving farmers at the village level. The suggestions from farmers, expert, university scientists during the presentation were incorporated in the VLCCP and the final draft was communicated to CRIDA for vetting and approval.

3.5. Approval from CRIDA

The approval for the publication of the VLCCP was received from the CRIDA with certain suggestions which were incorporated subsequently in the final plan. The plans have also been translated in local language (Marathi) for use by watershed community.

4. Village Level Crop Contingency Plan

Village level crop contingency plan is a technical document containing integrated information on agriculture and related sectors, i.e. horticulture, livestock, soil and water conservation measures and technological solutions for all major weather-related aberrations, including extreme events, droughts, floods, heatwaves, cold waves, un-timely and high rainfall, frost, hailstorms and pest and disease outbreaks etc. and aimed to be utilised by village-level community-based organisations/PRIs. Figure 3 shows the broad steps followed during the development of VLCCP.

Initially, a standard template was developed in consultation with all stakeholders to cover the prevailing agro-ecological situations in the villages to prepare possible seasonal contingency scenarios and adaptive strategies. The template consisted of village agricultural profile with information on resource endowments such as rainfall, soil types, land use, irrigation sources, dominant crops and cropping systems along with their sowing windows; livestock, poultry and fisheries information; production and productivity statistics; major contingencies faced by the villages and GIS-based soil, rainfall and village cadastral maps and the detailed strategies for weather-related contingencies anticipated in crops/cropping systems such as delay in onset of the monsoon

of different duration; mid-season monsoon breaks resulting in drought both in rainfed and irrigated situations and adaptation strategies for weather-related extreme events.

Fig. 3. Steps followed during development of VLCCP for Akole block

This contingency plan contains information on alternate crop varieties/ crops to be chosen in case of delay in onset of monsoon or early season drought and also on agronomic measures for mid and terminal season droughts. Further, strategies for contingency situations in respect of livestock and poultry have also been included.

5. Way Forward

The VLCCP is a detailed document outlining the interventions for different weather aberrations to be taken up by individuals/line departments from the Akole block. The overall implementation of village-level crop contingent plan includes the following steps,

1. *Initial preparedness,*
2. *Real-time response to weather aberrations, and*
3. *Relief and rehabilitation.*

Considering the dynamic nature of climate change impacts as seen during the last few years, these plans also need to be made dynamic by updating and integrating the information on the following aspects:

- Evolving crop-climatic situation
- Improved seed varieties available as a response mechanism
- linkage with new developmental programmes to ensure preparedness as well as response.
- Experiences on handling the recent weather aberrations across the state also need to be captured for improving the effectiveness of the response.
- Innovative technologies evolving (e.g. IoT, Drone, Mobile app, Robotics) can be integrated in future for refinement and implementation of these plans.

5.1 Research and Development

- Research needs to be initiated at State Agricultural Universities (SAUs) through the establishment of multi-disciplinary teams, simulating contingencies and developing adaptation strategies to demonstrate the benefits to farmers and to respond to the needs of line departments.
- Technological advances in other scientific fields should be combined with research and development efforts to develop efficient and cost-effective technologies.
- Research on dissemination tools with extra weighting should be focused on the spread of contingency adaptation measures with a completely different extension approach, which is often time-bound.
- Strengthened research efforts on non-seasonal rains, etc., across different villages.
- Research on the use of IOTs. Drones, Robots and satellite data to understand the nature and extent of the contingency situation should be promoted through the planning and implementation of the adaptation strategies plan.

- Developing protocols for the initiation of interventions for droughts that may occur at different times during the growing season.
- The identification of drought-prone villages using recent weather data and special emphasis needs to be given to the preparation of agricultural priority plans.
- Seasonal weather forecast at district level requires an hour for appropriate agricultural planning. Efforts need to be stepped up to provide these forecasts to IMD well in advance.
- The establishment of a village-level interface mechanism with regional IMD centres is needed in order to make better use of the weekly block-level forecast made by IMD and to provide advice to farming communities in the villages.
- Dissemination of information to farming communities on prevailing weather conditions, the support provided by state and central governments through available media such as television, radio, internet, leaflets/brochures, need to be strengthened with proper feedback to the system.
- Widespread awareness of agricultural insurance to be created among the farming community.
- Information technology should be used extensively for two-way communication, i.e. for the short-term collection of ground-truth information, as well as for the transmission of adaptation strategies.

5.2 Implementation

- There is a need to bring about a change in the planning process for the agricultural plans at village level with the explicit use of seasonal weather forecasts.
- A long-term strategy for seed development by forming seed bank at village level/ fodder bank and custom hiring centres/self-help groups etc. needs to be developed.
- Agricultural contingency cells need to be established as part of Climate Resource Centre at the village level, involving PRIs and para-workers with support of experts in important sectors such as Agriculture, Livestock, Horticulture, Soil and Water Conservation, etc.
- Development projects/schemes are required to be identified, so that the necessary funds may be used for various interventions during the implementation period.
- Line departments concerned may use these plans to immediately initiate response measures in the affected areas for disasters such as floods, drought, etc.
- Details on the implementation processes of these village-level contingency plants is explained in the last chapter of this book.

6. Agriculture profile of Village(s)

State	Maharashtra
District	Ahmednagar
Block	Akole
Village(s)	Manhere, Kodani, Titavi, Ambevangan, Ladgaon, Dongarwadi and Pimperkane

6.1. Village: Manhere

6.1.1	**Agro-Climatic/Ecological Zone**	Western Ghat and coastal plain hot humid (6.2)		
	Agro Ecological Region /Sub Region (ICAR)	Western plateau and hills region (IX)		
	Agro-Climatic Region (Planning Commission)	Western Ghat Zone		
	Agro Climatic Zone (NARP)	Western Ghat Zone - Ahmednagar, Nashik (Western Part), Nandurbar, Satara, Kolhapur, Pune		
	Geographic coordinates of village(s)	**Latitude**	**Longitude**	**Altitude**
		N19° 33' and N19° 36'	E73° 46 and E73° 50'	821 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Agricultural Research Station, Igatpuri, Dist-Nashik, 422 403 E-mail: adrigatpuri@gmail.com		
	Mention the KVK located in the district	KVK Babhaleshwar		

6.1.2	**Rainfall**	**Average (mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-September)	864.88	MW22-MW23, June	MW38-MW39, September
	NE Monsoon (October-December)	105.87	MW40, October	MW43, October
	Winter Season (January- March)	7.58	-	-
	Summer Season (April-May)	16.56	-	-
	Annual	994.89	-	-

6.1.3	Land use pattern of the village(s) (latest statistics)	Geographical area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other Fallows
	Area (ha)	769	53.06	17	0	24.89	0	0	0	0

Source: Agricultural statistical information, Maharashtra state, PRA village meeting 2019.

6.1.4	Agricultural land use	Area (ha)	Cropping intensity %
	Net sown area	666.59	119.6
	Area sown more than once	290.00	
	Gross cropped area	290.00	

6.1.5	Irrigation	Area (ha)		
	Net irrigated area	5.49		
	Gross irrigated area	5.49		
	Rainfed area	661.10		
	Sources of Irrigation	**Number**	**Area (ha)**	**Percentage of total irrigated area**
	Canals	0	0	-
	Tanks	0	0	-
	Open wells	44	18	-
	Bore wells	02	-	-
	Micro-irrigation	0	0	-
	Other sources: Lift irrigation	02	2	-
	Total Irrigated Area		20	-
	Pump sets	44	0	-
	No. of Tractors	08	-	-

	Groundwater availability and use*	Yes/ No	-	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Semi- critical	-	-	-
	Safe	-	-	-
	Wastewater availability and use	-	-	-
	Ground water quality	Good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: PRA village meeting, 2019.

6.1.6	**Soil Type**			
	Characteristics	Upland	Medium land	Lowland
	Color	Strong brown	Brown	Grey to dark grey
	Texture	Sandy loam	Silty loam	Silty loam
	Drainage	Highly drained	Well drained	Well drained
	Soil reaction	Slightly acidic	Slightly acidic	Slightly acidic to neutral
	Soil fertility	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B

Source: Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.

6.1.7	Area under major field crops & horticulture etc. (*If break-up data (irrigated, rainfed) is not available, give total area)							
	Sr. No.	Major Field Crops cultivated	Area (ha)					
			Kharif		*Rabi*		Summer	Total
			Irrigated	Rain fed	Irrigated	Rain fed		
	1.	Paddy	20	230	0	0	0	**250**
	2.	Nagali (Finger millet)	0	12	0	0	-	**12**
	3.	Groundnut	0	15	0	0	-	**15**
	4.	Varai (little Millet)	0	05	0	0	-	**05**
	5.	Wheat	0	0	12	0	-	**12**
	6.	Gram	0	0	02	17	-	**19**
	7.	Bajra (Summer)	0	0	0		-	**0**
	Sr. No.	Horticulture crops - Fruits	Area (ha)					
			Total		Irrigated		Rainfed	
	1.	Mango	02		0		02	
	2.	Tomato	-		-		-	
	3.	Onion	-		-		-	
	4.	Others (specify)	-		-		-	

Source: Comprehensive District Agriculture Plan, Ahmednagar and PRA village meeting, 2019.

6.1.8	Production and Productivity of major crops (Crops to be identified based on total acreage)									
Sr. No.	Name of crop	*Kharif*		*Rabi*		Summer		Total		Crop residue as fodder (t/ha)
		Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	
1	Paddy	625	25000	0	0	0	0	0	0	0
2	Nagali (Finger Millet)	06	5000	0	0	0	0	0	0	0

3	Groundnut	22.5	15000	0	0	0	0	0	0	0
4	Varai (Little Millet)	2.5	5000	0	0	0	0	0	0	0
5	Wheat	0	0	21.6	18000	0	0	0	0	0
6	Gram	0	0	15.2	8000	0	0	0	0	0

Source: District Socio-Economic Review and PRA village meeting, 2019.

6.1.9	Livestock	Male (number)	Female (number)	Total (number)
	Non descriptive Cattle (local low yielding)	95	110	205
	Crossbred cattle	0	0	0
	Non descriptive Buffaloes (local low yielding)	19	44	63
	Graded Buffaloes	00	0	0
	Goat	30	123	143
	Sheep	0	0	00
	Others (Camel, Pig, Yak etc.)	0	0	0
	Commercial dairy farms (Number)	-	-	-

6.1.10	Poultry	No. of farms	Total No. of birds (number)
	Commercial	0	0
	Backyard	85	450

6.1.11	Fisheries			
	Capture			
	Inland	No. Farmer owned ponds	No. of Reservoirs	No. of village tanks
		07	01	01

Source: Chief Planning Officer, Fisheries Department.

6.1.12	Sowing window for 5 major crops (start and end of sowing period)	Paddy	Finger Millet/ Little Millet	Groundnut	Wheat	Gram
	Kharif- Rainfed	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	-	-
	Rabi- Rainfed	-	-	-	-	15th Oct to 15th Nov
	Rabi- Irrigated	-	-	-	15th Oct to 15th Nov	-

6.1.13	What is the major contingency the village(s) is/are prone to? (Tick mark)	Regular	Occasional	None
	Drought	-	√	-
	Water logging	-	√	-
	High intense storms	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Pests and diseases (specify)	√	-	-

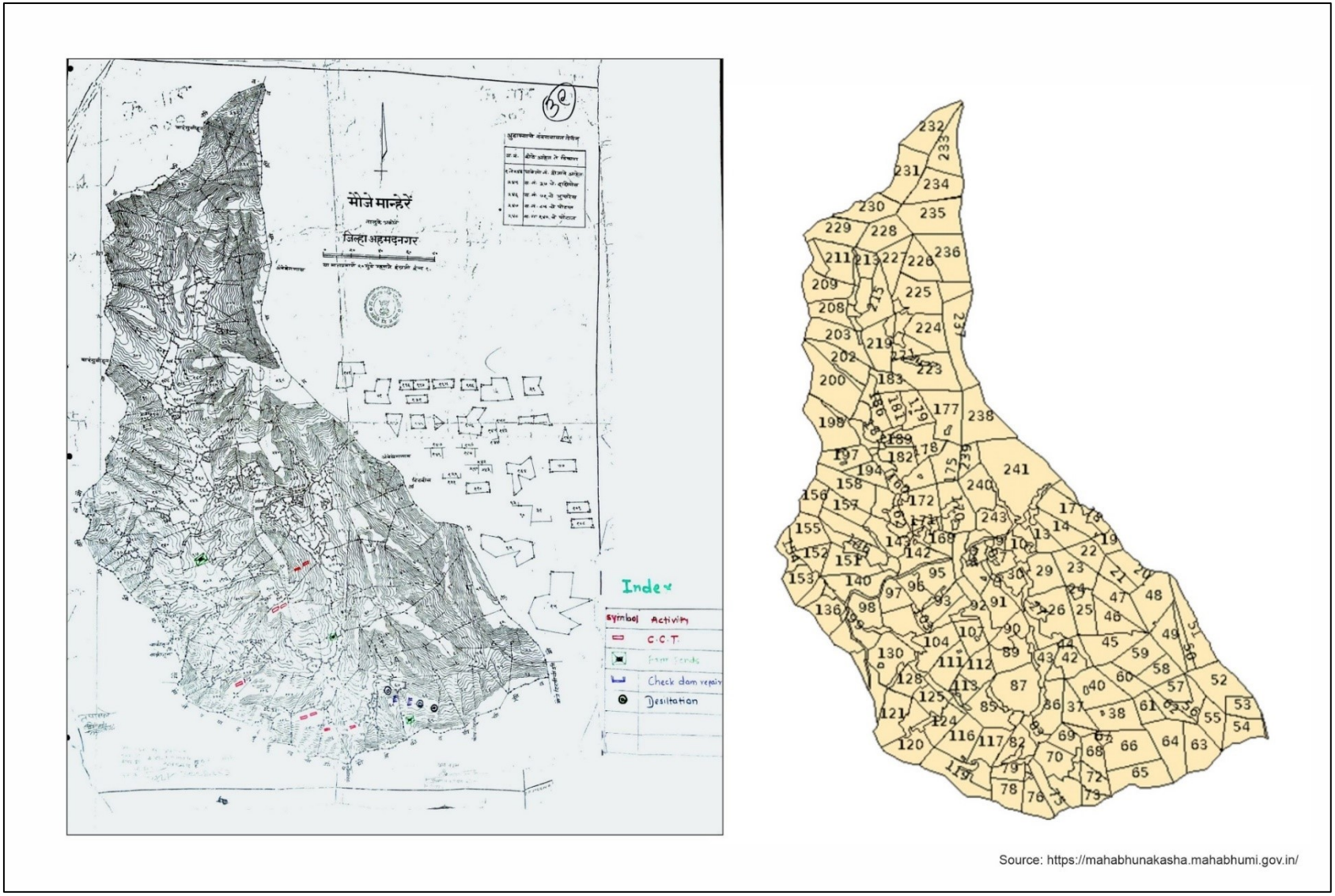

Fig. 4. Cadastral Maps of Manhere Village, Akole Block, Ahmednagar

6.2. Village: Kodani

6.2.1	**Agro-Climatic/Ecological Zone**	Western Ghat and coastal plain hot humid (6.2)		
	Agro Ecological Region /Sub Region (ICAR)	Western plateau and hills region (IX)		
	Agro-Climatic Region (Planning Commission)	Western Ghat Zone		
	Agro Climatic Zone (NARP)	Western Ghat Zone - Ahmednagar, Nashik (Western Part), Nandurbar, Satara, Kolhapur, Pune		
	Geographic coordinates of village(s)	**Latitude**	**Longitude**	**Altitude**
		N19° 33' and N19° 36'	E73° 46 and E73° 50'	698 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Agricultural Research Station, Igatpuri, Dist-Nashik, 422 403 E-mail: adrigatpuri@gmail.com		
	Mention the KVK located in the district	KVK Babhaleshwar		

6.2.2	**Rainfall**	**Average (mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-September)	862.36	MW22-MW23, June	MW38-MW39, September
	NE Monsoon (October-December)	105.64	MW40, October	MW43, October
	Winter Season (January- March)	7.44	-	-
	Summer Season (April-May)	16.64	-	-
	Annual	992.08	-	-

6.2.3	**Land use pattern of the village(s) (latest statistics)**	**Geographical area**	**Forest area**	**Land under non-agricultural use**	**Permanent pastures**	**Cultivable wasteland**	**Land under Misc. tree crops and groves**	**Barren and uncultivable land**	**Current fallows**	**Other Fallows**
	Area (ha)	393.03	22.85	2.79	0	2.4	0	5.42	0	0

Source: Agricultural statistical information, Maharashtra state, PRA village meeting 2019.

6.2.4	Agricultural land use	Area (ha)	Cropping intensity %
	Net sown area	334.3	119.6
	Area sown more than once	310	
	Gross cropped area	310	

6.2.5	Irrigation	Area (ha)		
	Net irrigated area	14		
	Gross irrigated area	14		
	Rainfed area	290		
	Sources of Irrigation	**Number**	**Area (ha)**	**Percentage of total irrigated area**
	Canals	0	0	-
	Tanks	0	0	-
	Open wells	06	14	-
	Bore wells	0	-	-
	Micro-irrigation	0	0	-
	Other sources: Lift irrigation	0	2	-
	Total Irrigated Area	14	14	-
	Pump sets	10	0	-
	No. of Tractors	06	-	-
	Groundwater availability and use*	Yes/ No	-	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Semi- critical	-	-	-
	Wastewater availability and use	-	-	-
	Ground water quality	Good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: PRA village meeting, 2019.

6.2.6	Soil Type			
	Characteristics	Upland	Medium land	Lowland
	Color	Strong brown	Brown	Grey to dark grey
	Texture	Sandy loam	Silty loam	Silty loam
	Drainage	Highly drained	Well drained	Well drained
	Soil reaction	Slightly acidic	Slightly acidic	Slightly acidic to neutral
	Soil fertility	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B

Source: Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.

6.2.7 Area under major field crops & horticulture etc. (*If break-up data (irrigated, rainfed) is not available, give total area)

Sr. No.	Major Field Crops cultivated	Area (ha)					
		Kharif		*Rabi*		Summer	Total
		Irrigated	Rain fed	Irrigated	Rain fed		
1.	Paddy	14	296	0	0	0	**310**
2.	Nagali (Finger millet)	0	03	0	0	-	**03**
3.	Groundnut	0	02	0	0	07	**09**
4.	Varai (little Millet)	0	01	0	0	-	**01**
5.	Wheat	0	0	08	0	-	**08**
6.	Gram	0	0	06	0	-	**06**
7.	Bajra (Summer)	0	0	0	-	05	**05**
	Horticulture crops - Fruits	**Area (ha)**					

	Sr. No.		Total	Irrigated	Rainfed
	1.	Mango	04	0	04
	2.	Tomato	-	-	-
	3.	Onion	-	-	-
		Others (specify)	-	-	-

Source: Comprehensive District Agriculture Plan, Ahmednagar and PRA village meeting, 2019.

6.2.8	Production and Productivity of major crops (Crops to be identified based on total acreage)									
Sr. No.	Name of crop	*Kharif*		*Rabi*		Summer		Total		Crop residue as fodder (t/ha)
		Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	
1	Paddy	775	25000	-	-	-	-	-	-	-
2	Nagali (Finger Millet)	1.5	5000	-	-	-	-	-	-	-
3	Groundnut	13.5	15000	-	-	-	-	-	-	-
4	Varai (Little Millet)	05	5000	-	-	-	-	-	-	-
5	Wheat	-	0	14.4	18000	-	-	-	-	-
6	Gram	-	-	4.8	8000	-	-	-	-	-
7	Bajra (Summer)	-	-	7.5	15000	-	-	-	-	-

Source: District Socio-Economic Review and PRA village meeting, 2019.

6.2.9	Livestock	Male (number)	Female (number)	Total (number)
	Non descriptive Cattle (local low yielding)	28	142	162
	Crossbred cattle	0	2	02
	Non descriptive Buffaloes (local low yielding)	12	38	50
	Graded Buffaloes	0	0	0
	Goat	28	132	150
	Sheep	0	0	0
	Others (Camel, Pig, Yak etc.)	0	0	0
	Commercial dairy farms (Number)	0	0	0

6.2.10	Poultry	No. of farms	Total No. of birds (number)
	Commercial	0	0
	Backyard	12	78

6.2.11	Fisheries			
	Capture			
	Inland	No. Farmer owned ponds	No. of Reservoirs	No. of village tanks
		02	01	01

Source: Chief Planning Officer, Fisheries Department.

6.2.12	Sowing window for 5 major crops (start and end of sowing period)	Paddy	Finger Millet/ Little Millet	Groundnut	Wheat	Gram
	Kharif- Rainfed	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	-	-
	Rabi- Rainfed	-	-	-	-	15th Oct to 15th Nov
	Rabi- Irrigated	-	-	-	15th Oct to 15th Nov	-

6.2.13	What is the major contingency the village(s) is/are prone to? (Tick mark)	Regular	Occasional	None
	Drought	-	√	-
	Water logging	-	√	-
	High intense storms	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Pests and diseases (specify)	√	-	-

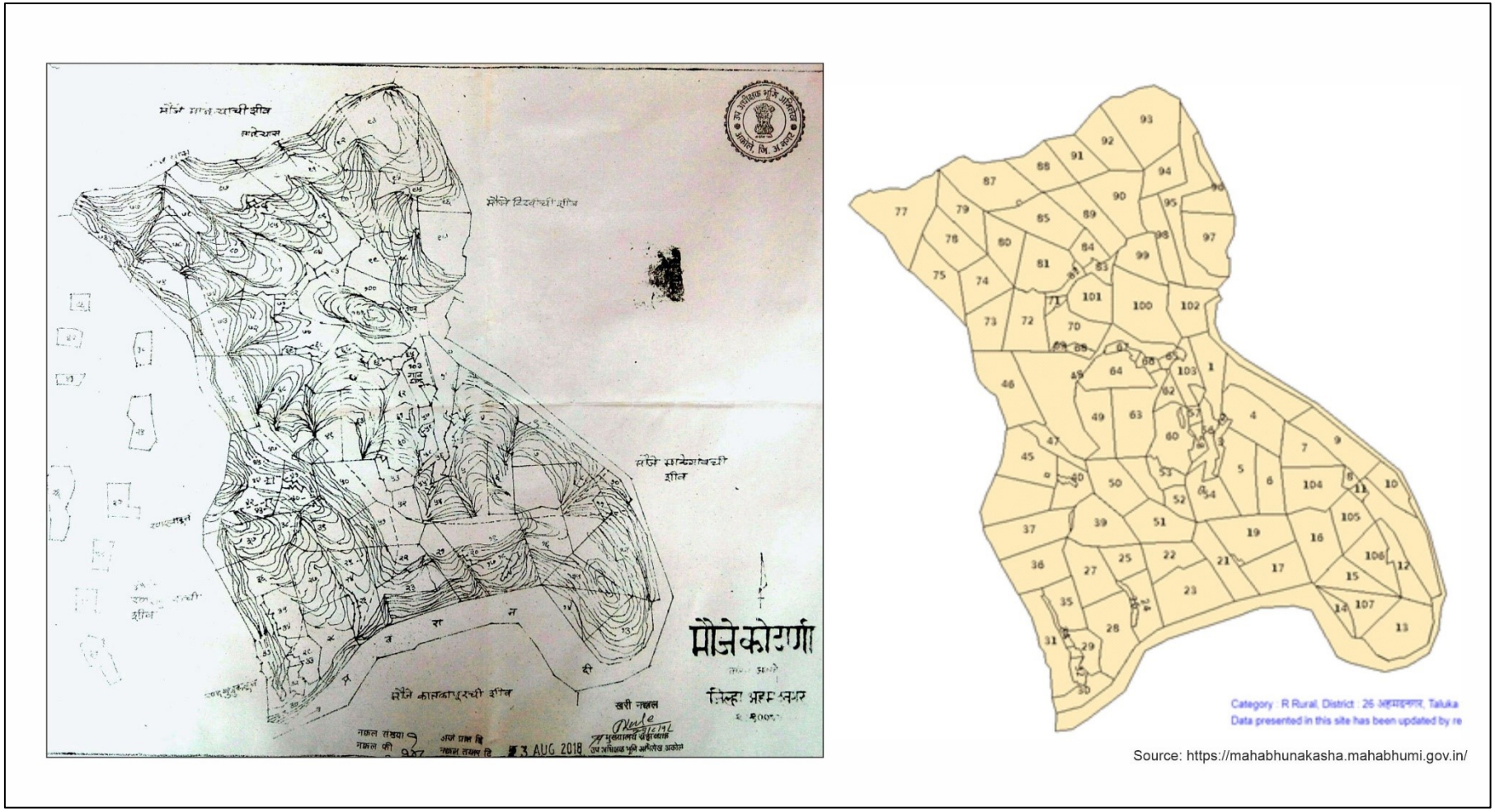

Fig. 5. Cadastral Maps of Kodani Village, Akole Block, Ahmednagar

6.3. Village: Titavi

6.3.1	**Agro-Climatic/Ecological Zone**	Western Ghat and coastal plain hot humid (6.2)		
	Agro Ecological Region /Sub Region (ICAR)	Western plateau and hills region (IX)		
	Agro-Climatic Region (Planning Commission)	Western Ghat Zone		
	Agro Climatic Zone (NARP)	Western Ghat Zone - Ahmednagar, Nashik (Western Part), Nandurbar, Satara, Kolhapur, Pune		
	Geographic coordinates of village(s)	**Latitude**	**Longitude**	**Altitude**
		N19° 33' and N19° 36'	E73° 46 and E73° 50'	698.5 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Agricultural Research Station, Igatpuri, Dist-Nashik, 422 403 E-mail: adrigatpuri@gmail.com		
	Mention the KVK located in the district	KVK Babhaleshwar		

6.3.2	**Rainfall**	**Average (mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-September)	821.40	MW22-MW23, June	MW38-MW39, September
	NE Monsoon (October-December)	105.01	MW40, October	MW43, October
	Winter Season (January- March)	7.6	-	-
	Summer Season (April-May)	16.85	-	-
	Annual	950.86	-	-

6.3.3	**Land use pattern of the village(s) (latest statistics)**	**Geographical area**	**Forest area**	**Land under non-agricultural use**	**Permanent pastures**	**Cultivable wasteland**	**Land under Misc. tree crops and groves**	**Barren and uncultivable land**	**Current fallows**	**Other Fallows**
	Area (ha)	678.33	66.72	4.16	0.3	22.26	0	0	0	0

Source: Agricultural statistical information, Maharashtra state, PRA village meeting 2019.

6.3.4	Agricultural land use	Area (ha)	Cropping intensity %
	Net sown area	573.32	119.6
	Area sown more than once	410.20	
	Gross cropped area	-	

6.3.5	Irrigation	Area (ha)		
	Net irrigated area	15		
	Gross irrigated area	15		
	Rainfed area	395		
	Sources of Irrigation	**Number**	**Area (ha)**	**Percentage of total irrigated area**
	Canals	0	0	-
	Tanks	0	0	-
	Open wells	08	15	-
	Bore wells	0	0	-
	Micro-irrigation	4	1	-
	Other sources: Lift irrigation	Lake, pump	15	-
	Total Irrigated Area	15	15	-
	Pump sets	12	15	-
	No. of Tractors	06	-	-
	Groundwater availability and use*	Yes/ No	-	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Safe	-	-	-
	Wastewater availability and use	-	-	-
	Ground water quality	Good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: State/ Central Ground water Department /Board, PRA village meeting, 2019.

6.3.6	Soil Type			
	Characteristics	Upland	Medium land	Lowland
	Color	Strong brown	Brown	Grey to dark grey
	Texture	Sandy loam	Silty loam	Silty loam
	Drainage	Highly drained	Well drained	Well drained
	Soil reaction	Slightly acidic	Slightly acidic	Slightly acidic to neutral
	Soil fertility	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B

Source: Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.

6.3.7 Area under major field crops & horticulture etc. (*If break-up data (irrigated, rainfed) is not available, give total area)

Sr. No.	Major Field Crops cultivated	Area (ha)					
		Kharif		*Rabi*		Summer	Total
		Irrigated	Rain fed	Irrigated	Rain fed		
1.	Paddy	15	395	0	0	0	410
2.	Nagali (Finger millet)	0	6	0	0	0	6
3.	Groundnut	0	12	0	0	4	16
4.	Varai (little Millet)	0	4	0	0	0	4
5.	Wheat	0	0	12	2	0	14
6.	Gram	0	0	0	7	0	7
7.	Bajra (Summer)	0	0	0	0	6	6

	Sr. No.	Horticulture crops - Fruits	Area (ha)		
			Total	Irrigated	Rainfed
	1.	Mango	04	0	04
	2.	Tomato	-	-	-
	3.	Onion	-	-	-
		Others (specify)	-	-	-

Source: PRA village meeting, 2019.

6.3.8	Production and Productivity of major crops (Crops to be identified based on total acreage)									
Sr. No.	Name of crop	*Kharif*		*Rabi*		Summer		Total		Crop residue as fodder (t/ha)
		Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	
1	Paddy	102.50	25000	0	0	0	0	0	0	-
2	Nagali (Finger Millet)	03	5000	0	0	0	0	0	0	-
3	Groundnut	24	15000	0	0	0	0	0	0	-
4	Varai (Little Millet)	02	5000	0	0	0	0	0	0	-
5	Wheat	-	0	25.20	18000	0	0	0	0	-
6	Gram	-	0	5.60	8000	0	0	0	0	-
7	Bajra (Summer)	-	0	9.00	15000	0	0	0	0	-

Source: District Socio-Economic Review and PRA village meeting, 2019.

6.3.9	Livestock	Male (number)	Female (number)	Total (number)
	Non descriptive Cattle (local low yielding)	138	95	232
	Crossbred cattle	8	10	18
	Non descriptive Buffaloes (local low yielding)	0	0	0
	Graded Buffaloes	66	85	151
	Goat		222	222
	Sheep	0	0	0
	Others (Camel, Pig, Yak etc.)	0	0	0
	Commercial dairy farms (Number)	0	0	0

6.3.10	Poultry	No. of farms	Total No. of birds (number)
	Commercial	1	5000
	Backyard	38	375

6.3.11	Fisheries			
	Capture			
	Inland	No. Farmer owned ponds	No. of Reservoirs	No. of village tanks
		06	01	01

Source: Chief Planning Officer, Fisheries Department.

6.3.12	Sowing window for 5 major crops (start and end of sowing period)	Paddy	Finger Millet/ Little Millet	Groundnut	Wheat	Gram
	Kharif- Rainfed	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	-	-
	Rabi- Rainfed	-	-	-	-	15th Oct to 15th Nov
	Rabi- Irrigated	-	-	-	15th Oct to 15th Nov	-

6.3.13	What is the major contingency the village(s) is/are prone to? (Tick mark)	Regular	Occasional	None
	Drought	-	√	-
	Water logging	-	√	-
	High intense storms	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Pests and diseases	√	-	-

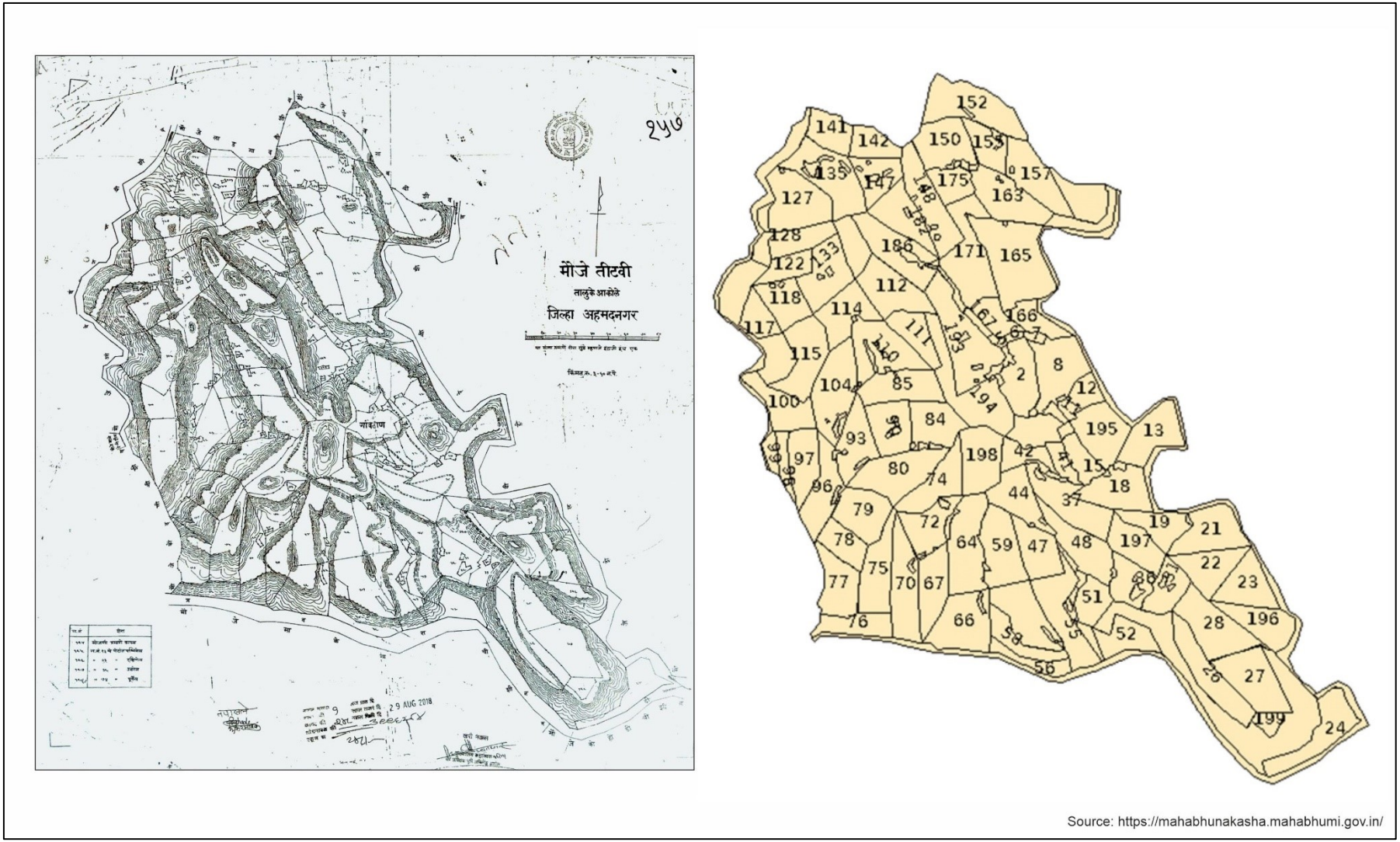

Fig. 6. Cadastral Maps of Titavi Village, Akole Block, Ahmednagar

6.4. Village: Ambevangan				
6.4.1	**Agro-Climatic/Ecological Zone**	Western Ghat and coastal plain hot humid (6.2)		
	Agro Ecological Region /Sub Region (ICAR)	Western plateau and hills region (IX)		
	Agro-Climatic Region (Planning Commission)	Western Ghat Zone		
	Agro Climatic Zone (NARP)	Western Ghat Zone - Ahmednagar, Nashik (Western Part), Nandurbar, Satara, Kolhapur, Pune		
	Geographic coordinates of village(s)	**Latitude**	**Longitude**	**Altitude**
		N19° 45' and N19° 49'	E73° 40 and E73° 42'	917 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Agricultural Research Station, Igatpuri, Dist-Nashik, 422 403 E-mail: adrigatpuri@gmail.com		
	Mention the KVK located in the district	KVK Babhaleshwar		

6.4.2	**Rainfall**	**Average (mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-September)	838.08	MW22-MW23, June	MW38-MW39, September
	NE Monsoon (October-December)	105.62	MW40, October	MW43, October
	Winter Season (January- March)	7.7	-	-
	Summer Season (April-May)	16.66	-	-
	Annual	968.06	-	-

6.4.3	**Land use pattern of the village(s) (latest statistics)**	**Geographical area**	**Forest area**	**Land under non-agricultural use**	**Permanent pastures**	**Cultivable wasteland**	**Land under Misc. tree crops and groves**	**Barren and uncultivable land**	**Current fallows**	**Other Fallows**
	Area (ha)	693.93	133.8	1.9	2.79	0	0	138.49	0	0

Source: Agricultural statistical information, Maharashtra state, PRA village meeting 2019.

6.4.4	Agricultural land use	Area (ha)	Cropping intensity %
	Net sown area	-	-
	Area sown more than once	-	
	Gross cropped area	-	

6.4.5	Irrigation	Area (ha)		
	Net irrigated area	3.34		
	Gross irrigated area			
	Rainfed area	534.34		
	Sources of Irrigation	**Number**	**Area (ha)**	**Percentage of total irrigated area**
	Canals	0	-	-
	Tanks	0	-	-
	Open wells	12	3.34	-
	Bore wells	0	-	-
	Micro-irrigation	0	-	-
	Other sources: Lift irrigation	-	-	-
	Total Irrigated Area	0	3.34	-
	Pump sets	12	3.34	-
	No. of Tractors	06	-	-
	Groundwater availability and use*	Yes/ No	-	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Safe	-	-	-
	Wastewater availability and use	-	-	-
	Ground water quality	Good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: PRA village meeting, 2019.

6.4.6	Soil Type			
	Characteristics	Upland	Medium land	Lowland
	Color	Strong brown	Brown	Grey to dark grey
	Texture	Sandy loam	Silty loam	Silty loam
	Drainage	Highly drained	Well drained	Well drained
	Soil reaction	Slightly acidic	Slightly acidic	Slightly acidic to neutral
	Soil fertility	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B

Source: Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.

6.4.7 Area under major field crops & horticulture etc. (*If break-up data (irrigated, rainfed) is not available, give total area)

Sr. No.	Major Field Crops cultivated	Area (ha)					
		Kharif		*Rabi*		Summer	Total
		Irrigated	Rain fed	Irrigated	Rain fed		
1.	Paddy	3.34	210.00	0	0	0	213.34
2.	Nagali (Finger millet)	0	7.5	0	0	0	7.5
3.	Groundnut		9.00	0	0	0	9.00
4.	Varai (little Millet)		5.00	0	0	0	5.00
5.	Wheat		0	3.34		0	3.34
6.	Gram		0		12.00	0	12.00
7.	Bajra (Summer)		0	0	0	0	0

	Sr. No.	Horticulture crops - Fruits	Area (ha)		
			Total	Irrigated	Rainfed
	1.	Mango	03	0	03
	2.	Tomato	-	-	-
	3.	Onion	-	-	-
		Others (specify)	-	-	-

Source: Comprehensive District Agriculture Plan, Ahmednagar and PRA village meeting, 2019.

6.4.8	Production and Productivity of major crops (Crops to be identified based on total acreage)									
Sr. No.	Name of crop	*Kharif*		*Rabi*		Summer		Total		Crop residue as fodder (t/ha)
		Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	
1	Paddy	525	25000	0	0	0	0	0	0	0
2	Nagali (Finger Millet)	37.5	5000	0	0	0	0	0	0	0
3	Groundnut	13.5	15000	0	0	0	0	0	0	0
4	Varai (Little Millet)	2.5	5000	0	0	0	0	0	0	0
5	Wheat	0	0	6.30	18000	-	-	-	-	-
6	Gram	0	0	9.6	8000	-	-	-	-	-
7	Bajra (Summer)	-	0	0	0	0	0	-	0	0

Source: District Socio-Economic Review and PRA village meeting, 2019.

6.4.9	Livestock	Male (number)	Female (number)	Total (number)
	Non descriptive Cattle (local low yielding)	170	232	402
	Crossbred cattle	0	0	0
	Non descriptive Buffaloes (local low yielding)	25	18	43
	Graded Buffaloes	0	0	0
	Goat	42	206	248
	Sheep	0	0	0
	Others (Camel, Pig, Yak etc.)	0	0	0
	Commercial dairy farms (Number)	0	0	0

6.4.10	Poultry	No. of farms	Total No. of birds (number)
	Commercial	1	50000
	Backyard	47	580

6.4.11	Fisheries			
	Capture			
	Inland	No. Farmer owned ponds	No. of Reservoirs	No. of village tanks
		05	02	01

Source: Chief Planning Officer, Fisheries Department.

4.12	Sowing window for 5 major crops (start and end of sowing period)	Paddy	Finger Millet/ Little Millet	Groundnut	Wheat	Gram
	Kharif- Rainfed	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	-	-
	Rabi- Rainfed	-	-	-	-	15th Oct to 15th Nov
	Rabi- Irrigated	-	-	-	15th Oct to 15th Nov	-

4.13	What is the major contingency the village(s) is/are prone to? (Tick mark)	Regular	Occasional	None
	Drought	-	√	-
	Water logging	-	√	-
	High intense storms	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Pests and diseases	√	-	-

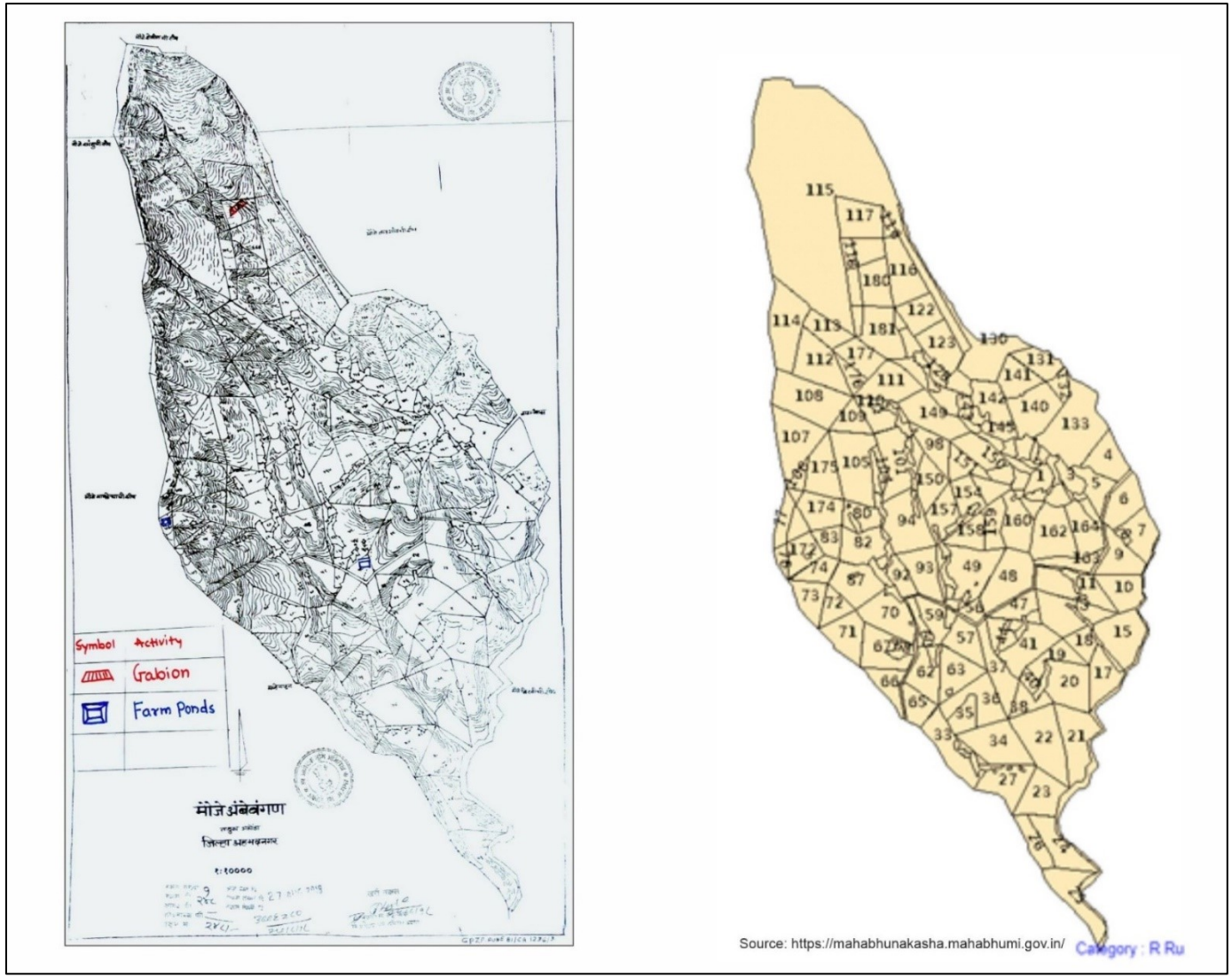

Fig. 7. Cadastral Maps of Ambevangan Village, Akole Block, Ahmednagar

6.5. Village: Ladgaon

6.5.1	**Agro-Climatic/Ecological Zone**	Western Ghat and coastal plain hot humid (6.2)		
	Agro Ecological Region /Sub Region (ICAR)	Western plateau and hills region (IX)		
	Agro-Climatic Region (Planning Commission)	Western Ghat Zone		
	Agro Climatic Zone (NARP)	Western Ghat Zone - Ahmednagar, Nashik (Western Part), Nandurbar, Satara, Kolhapur, Pune		
	Geographic coordinates of village(s)	**Latitude**	**Longitude**	**Altitude**
		N19° 50' and N19° 51'	E73° 68 and E73° 70'	872 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Agricultural Research Station, Igatpuri, Dist-Nashik, 422 403 E-mail: adrigatpuri@gmail.com		
	Mention the KVK located in the district	KVK Babhaleshwar		

6.5.2	**Rainfall**	**Average (mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-September)	818.13	MW22-MW23, June	MW38-MW39, September
	NE Monsoon (October-December)	105.46	MW40, October	MW43, October
	Winter Season (January- March)	7.78	-	-
	Summer Season (April-May)	16.71	-	-
	Annual	948.08	-	-

6.5.3	**Land use pattern of the village(s) (latest statistics)**	**Geographical area**	**Forest area**	**Land under non-agricultural use**	**Permanent pastures**	**Cultivable wasteland**	**Land under Misc. tree crops and groves**	**Barren and uncultivable land**	**Current fallows**	**Other Fallows**
	Area (ha)	329.45	67.08	1.04	2.08	2.30	0	0	0	0

Source: PRA village meeting 2019.

6.5.4	Agricultural land use	Area (ha)	Cropping intensity %
	Net sown area	329.45	119.6
	Area sown more than once	230	
	Gross cropped area	230	

6.5.5	Irrigation	Area (ha)		
	Net irrigated area	0		
	Gross irrigated area	0		
	Rainfed area	230		
	Sources of Irrigation	**Number**	**Area (ha)**	**Percentage of total irrigated area**
	Canals	0	0	-
	Tanks	0	0	-
	Open wells	12	08	-
	Bore wells	0	0	-
	Micro-irrigation	5	1.5	-
	Other sources: Lift irrigation	-	0	-
	Total Irrigated Area	0	9.5	-
	Pump sets	-	-	-
	No. of Tractors	-	-	-
	Groundwater availability and use*	Yes/ No	-	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Safe	-	-	-
	Wastewater availability and use	-	-	-
	Ground water quality	Good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: State/ Central Ground water Department /Board, PRA village meeting, 2019.

6.5.6	Soil Type			
	Characteristics	Upland	Medium land	Lowland
	Color	Strong brown	Brown	Grey to dark grey
	Texture	Sandy loam	Silty loam	Silty loam
	Drainage	Highly drained	Well drained	Well drained
	Soil reaction	Slightly acidic	Slightly acidic	Slightly acidic to neutral
	Soil fertility	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B

Source: Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.

6.5.7 Area under major field crops & horticulture etc. (*If break-up data (irrigated, rainfed) is not available, give total area)

Sr. No.	Major Field Crops cultivated	Area (ha)					
		Kharif		*Rabi*		Summer	Total
		Irrigated	Rain fed	Irrigated	Rain fed		
1.	Paddy	08	222	0	0	0	230
2.	Nagali (Finger millet)	0	05	0	-	0	0
3.	Groundnut	0	12	0	-	0	0
4.	Varai (little Millet)	0	03	0	-	0	0
5.	Wheat	0	0	0	2.5	0	0
6.	Gram	0	0	0	04	0	0
7.	Bajra (Summer)	0	0	-	-	0	0
	Horticulture crops - Fruits	**Area (ha)**					

	Sr. No.		Total	Irrigated	Rainfed
	1.	Mango	03	0	03
	2.	Tomato	-	-	-
	3.	Onion	-	-	-
		Others (specify)	-	-	-

Source: Comprehensive District Agriculture Plan, Ahmednagar and PRA village meeting, 2019.

6.5.8	Production and Productivity of major crops (Crops to be identified based on total acreage)									
Sr. No.	Name of crop	*Kharif*		*Rabi*		Summer		Total		Crop residue as fodder (t/ha)
		Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	Production (t)	Productivity (kg/ha)	
1	Paddy	575.00	25000	0	0	0	0	0	0	0
2	Nagali (Finger Millet)	2.5	5000	0	0	0	0	0	0	0
3	Groundnut	18.00	15000	0	0	0	0	0	0	0
4	Varai (Little Millet)	1.5	5000	0	0	0	0	0	0	0
5	Wheat	0	0	4.5	18000	0	0	0	0	0
6	Gram	0	0	0	8000	0	0	0	0	0
7	Bajra (Summer)	-	0	0	0	0	0	-	0	0

Source: District Socio-Economic Review and PRA village meeting, 2019.

6.5.9	Livestock	Male (number)	Female (number)	Total (number)
	Non descriptive Cattle (local low yielding)	96	69	165
	Crossbred cattle	0	0	0
	Non descriptive Buffaloes (local low yielding)	47	99	146
	Graded Buffaloes	0	0	0
	Goat	0	328	328
	Sheep	0	0	0
	Others (Camel, Pig, Yak etc.)	0	0	0
	Commercial dairy farms (Number)	0	0	0

6.5.10	Poultry	No. of farms	Total No. of birds (number)
	Commercial	0	0
	Backyard	15	110

6.5.11	Fisheries			
	Capture			
	Inland	No. Farmer owned ponds	No. of Reservoirs	No. of village tanks
		05	0	01

Source: Chief Planning Officer, Fisheries Department.

6.5.12	Sowing window for 5 major crops (start and end of sowing period)	Paddy	Finger Millet/ Little Millet	Groundnut	Wheat	Gram
	Kharif- Rainfed	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	-	-
	Rabi- Rainfed	-	-	-	-	15th Oct to 15th Nov
	Rabi- Irrigated	-	-	-	15th Oct to 15th Nov	-

6.5.13	What is the major contingency the village(s) is/are prone to? (Tick mark)	Regular	Occasional	None
	Drought	-	√	-
	Water logging	-	√	-
	High intense storms	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Pests and diseases	√	-	-

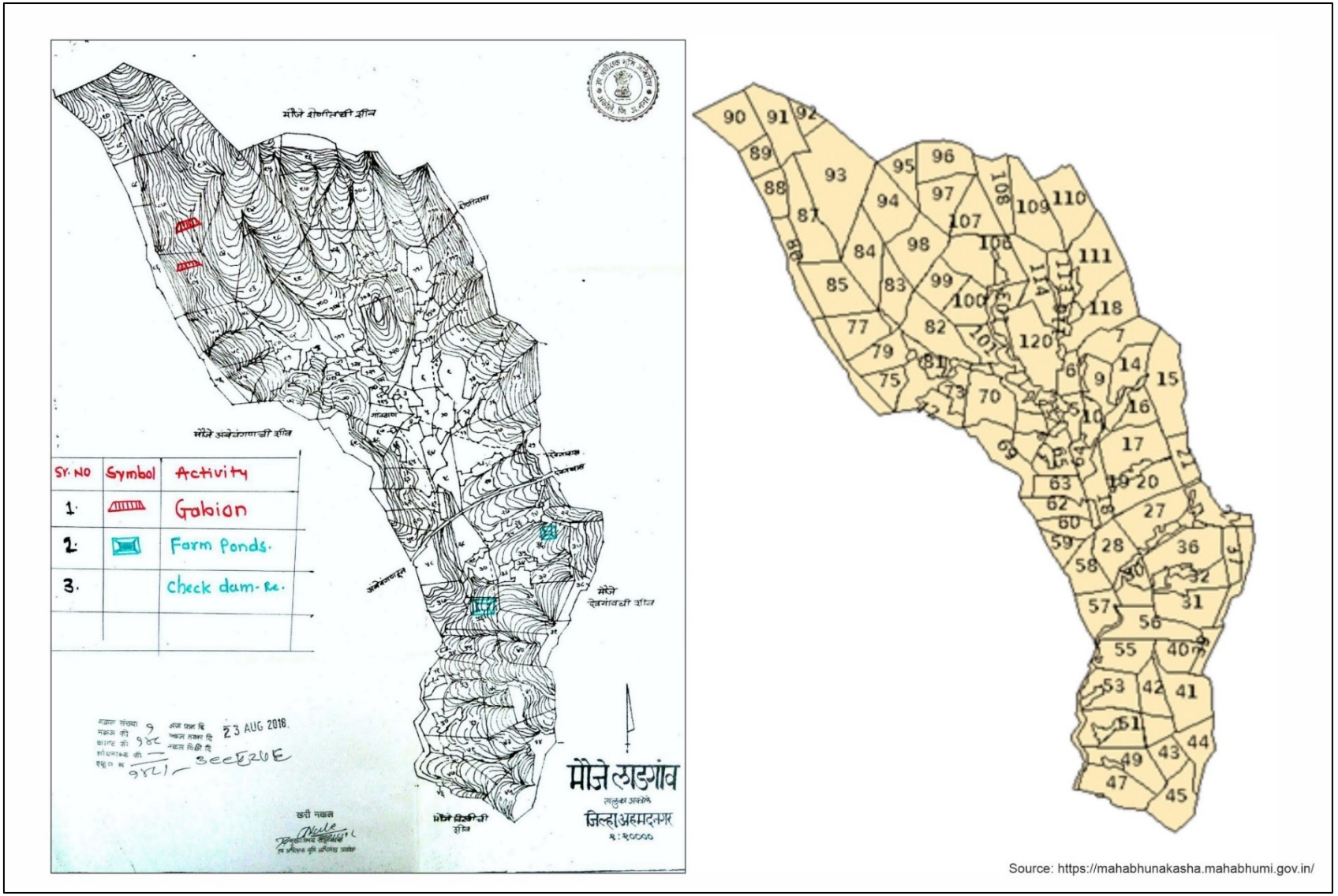

Fig. 8. Cadastral Maps of Ladgaon Village, Akole Block, Ahmednagar

6.6. Village: Dongarwadi

6.6.1	**Agro-Climatic/Ecological Zone**	Western Ghat and coastal plain hot humid (6.2)		
	Agro Ecological Region /Sub Region (ICAR)	Western plateau and hills region (IX)		
	Agro-Climatic Region (Planning Commission)	Western Ghat Zone		
	Agro Climatic Zone (NARP)	Western Ghat Zone - Ahmednagar, Nashik (Western Part), Nandurbar, Satara, Kolhapur, Pune		
	Geographic coordinates of village(s)	**Latitude**	**Longitude**	**Altitude**
		N19° 58' and N19° 59'	E73° 50 and E73° 52'	900 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Agricultural Research Station, Igatpuri, Dist-Nashik, 422 403 E-mail: adrigatpuri@gmail.com		
	Mention the KVK located in the district	KVK Babhaleshwar		

6.6.2	**Rainfall**	**Average (mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-September)	756.59	MW22-MW23, June	MW38-MW39, September
	NE Monsoon (October-December)	104.04	MW40, October	MW43, October
	Winter Season (January- March)	7.83	-	-
	Summer Season (April-May)	17.16	-	-
	Annual	885.62	-	-

6.6.3	**Land use pattern of the village(s) (latest statistics)**	**Geographical area**	**Forest area**	**Land under non-agricultural use**	**Permanent pastures**	**Cultivable wasteland**	**Land under Misc. tree crops and groves**	**Barren and uncultivable land**	**Current fallows**	**Other Fallows**
	Area (ha)	1121	120.31	4.44	0.55	14.51	0	0	0	0

Source: Agricultural statistical information, Maharashtra state, PRA village meeting 2019.

6.6.4	Agricultural land use	Area (ha)	Cropping intensity %
	Net sown area	904.06	-
	Area sown more than once	730.50	
	Gross cropped area	-	

6.6.5	Irrigation	Area (ha)		
	Net irrigated area	115		
	Gross irrigated area	115		
	Rainfed area	790		
	Sources of Irrigation	**Number**	**Area (ha)**	**Percentage of total irrigated area**
	Canals	0	0	-
	Tanks	06	115	-
	Open wells	36	15	-
	Bore wells	03	01	-
	Micro-irrigation	5	1.5	-
	Other sources: Lift irrigation	-	0	-
	Total Irrigated Area	115	136	-
	Pump sets	18	-	-
	No. of Tractors	16	-	-
	Groundwater availability and use*	Yes/ No	-	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Safe	-	-	-
	Wastewater availability and use	-	-	-
	Ground water quality	Good		
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: PRA village meeting, 2019.

6.6.6	Soil Type			
	Characteristics	Upland	Medium land	Lowland
	Color	Strong brown	Brown	Grey to dark grey
	Texture	Sandy loam	Silty loam	Silty loam
	Drainage	Highly drained	Well drained	Well drained
	Soil reaction	Slightly acidic	Slightly acidic	Slightly acidic to neutral
	Soil fertility	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B

Source: Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.

6.6.7 Area under major field crops & horticulture etc. (*If break-up data (irrigated, rainfed) is not available, give total area)

Sr. No.	Major Field Crops cultivated	Area (ha)					
		Kharif		*Rabi*		Summer	Total
		Irrigated	Rain fed	Irrigated	Rain fed		
1.	Paddy	115	615	0	0	0	730
2.	Nagali (Finger millet)	-	15	-	-	-	15
3.	Groundnut	-	12	-	-	35	47
4.	Varai (little Millet)	-	05	-	-	-	05
5.	Wheat	-	-	35	-	-	35
6.	Gram	-	-	25	-	-	25
7.	Bajra (Summer)	-	-	-	-	15	15

Sr. No.	Horticulture crops - Fruits	Area (ha)		
		Total	Irrigated	Rainfed
1.	Mango	05	0	05
2.	Tomato	-	-	-

	3.	Onion	-	-	-
		Others (specify)	-	-	-

Source: Comprehensive District Agriculture Plan, Ahmednagar and PRA village meeting, 2019.

6.6.8	Production and Productivity of major crops (Crops to be identified based on total acreage)									
Sr. No.	**Name of crop**	***Kharif***		***Rabi***		**Summer**		**Total**		**Crop residue as fodder (t/ha)**
		Production (t)	**Productivity (kg/ha)**	**Production (t)**	**Productivity (kg/ha)**	**Production (t)**	**Productivity (kg/ha)**	**Production (t)**	**Productivity (kg/ha)**	
1	Paddy	182.5	25000	0	0	-	-	-	-	-
2	Nagali (Finger Millet)	7.5	5000	0	0	-	-	-	-	-
3	Groundnut	70.00	15000	0	0	-	-	-	-	-
4	Varai (Little Millet)	25.00	5000	0	0	-	-	-	-	-
5	Wheat	-	0	63.00	18000	-	-	-	-	-
6	Gram	-	0	20.00	8000	-	-	-	-	-
7	Bajra (Summer)	-	0	22.50	15000	-	-	-	-	-

Source: District Socio-Economic Review and PRA village meeting, 2019.

6.6.9	**Livestock**	**Male (number)**	**Female (number)**	**Total (number)**
	Non descriptive Cattle (local low yielding)	145	352	497
	Crossbred cattle	0	5	05

	Non descriptive Buffaloes (local low yielding)	28	72	90
	Graded Buffaloes	0	6	06
	Goat	33	320	352
	Sheep	0	0	0
	Others (Camel, Pig, Yak etc.)	0	0	0
	Commercial dairy farms (Number)	0	0	0

6.6.10	**Poultry**	**No. of farms**	**Total No. of birds (number)**
	Commercial	0	0
	Backyard	35	185

6.6.11	**Fisheries**			
	Capture			
	Inland	No. Farmer owned ponds	No. of Reservoirs	No. of village tanks
		05	0	01

Source: Chief Planning Officer, Fisheries Department.

6.6.12	**Sowing window for 5 major crops (start and end of sowing period)**	**Paddy**	**Finger Millet/ Little Millet**	**Groundnut**	**Wheat**	**Gram**
	Kharif- Rainfed	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	-	-
	Rabi- Rainfed	-	-	-	-	15th Oct to 15th Nov
	Rabi- Irrigated	-	-	-	15th Oct to 15th Nov	-

6.6.13	What is the major contingency the village(s) is/are prone to? (Tick mark)	Regular	Occasional	None
	Drought	-	√	-
	Water logging	-	√	-
	High intense storms	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Pests and diseases	√	-	-

7.7. Village: Pimparkane

7.7.1	**Agro-Climatic/Ecological Zone**	Western Ghat and coastal plain hot humid (6.2)		
	Agro Ecological Region /Sub Region (ICAR)	Western plateau and hills region (IX)		
	Agro-Climatic Region (Planning Commission)	Western Ghat Zone		
	Agro Climatic Zone (NARP)	Western Ghat Zone - Ahmednagar, Nashik (Western Part), Nandurbar, Satara, Kolhapur, Pune		
	Geographic coordinates of village(s)	**Latitude**	**Longitude**	**Altitude**
		N19° 58' and N19° 59'	E73° 50 and E73° 52'	449 m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Zonal Agricultural Research Station, Igatpuri, Dist-Nashik, 422 403 E-mail: adrigatpuri@gmail.com		
	Mention the KVK located in the district	KVK Babhaleshwar		

7.7.2	**Rainfall**	**Average (mm)**	**Normal Onset (specify week and month)**	**Normal Cessation (specify week and month)**
	SW monsoon (June-September)	749.54	MW22-MW23, June	MW38-MW39, September
	NE Monsoon (October-December)	103.65	MW40, October	MW43, October
	Winter Season (January- March)	7.74	-	-
	Summer Season (April-May)	17.3	-	-
	Annual	878.23	-	-

7.7.3	**Land use pattern of the village(s) (latest statistics)**	**Geographical area**	**Forest area**	**Land under non-agricultural use**	**Permanent pastures**	**Cultivable wasteland**	**Land under Misc. tree crops and groves**	**Barren and uncultivable land**	**Current fallows**	**Other Fallows**
	Area (ha)	1121	120.31	4.44	0.55	14.51	0	0	0	0

Source: Agricultural statistical information, Maharashtra state, PRA village meeting 2019.

7.7.4	Agricultural land use	Area (ha)	Cropping intensity %
	Net sown area	904.06	-
	Area sown more than once	730.50	
	Gross cropped area	-	

7.7.5	Irrigation	Area (ha)		
	Net irrigated area	115		
	Gross irrigated area	115		
	Rainfed area	790		
	Sources of Irrigation	**Number**	**Area (ha)**	**Percentage of total irrigated area**
	Canals	0	0	-
	Tanks	06	115	-
	Open wells	36	15	-
	Bore wells	03	01	-
	Micro-irrigation	5	1.5	-
	Other sources: Lift irrigation	-	0	-
	Total Irrigated Area	115	136	-
	Pump sets	18	-	-
	No. of Tractors	16	-	-
	Groundwater availability and use*	Yes/ No	-	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited	-	-	-
	Critical	-	-	-
	Safe	-	-	-
	Wastewater availability and use	-	-	-
	Ground water quality	Good		

*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%

Source: PRA village meeting, 2019.

7.7.6	Soil Type			
	Characteristics	Upland	Medium land	Lowland
	Color	Strong brown	Brown	Grey to dark grey
	Texture	Sandy loam	Silty loam	Silty loam
	Drainage	Highly drained	Well drained	Well drained
	Soil reaction	Slightly acidic	Slightly acidic	Slightly acidic to neutral
	Soil fertility	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B	Low in Available N Low in P Low in K Deficient in Ca, Mg, S Deficient in Fe & B

Source: Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.

7.7.7 Area under major field crops & horticulture etc. (*If break-up data (irrigated, rainfed) is not available, give total area)

Sr. No.	Major Field Crops cultivated	Area (ha)					
		Kharif		*Rabi*		Summer	Total
		Irrigated	Rain fed	Irrigated	Rain fed		
1.	Paddy	115	615	0	0	0	730
2.	Nagali (Finger millet)	-	15	-	-	-	15
3.	Groundnut	-	12	-	-	35	47
4.	Varai (little Millet)	-	05	-	-	-	05
5.	Wheat	-	-	35	-	-	35
6.	Gram	-	-	25	-	-	25
7.	Bajra (Summer)	-	-	-	-	15	15

Sr. No.	Horticulture crops - Fruits	Area (ha)		
		Total	Irrigated	Rainfed

	1.	Mango	05	0	05
	2.	Tomato	-	-	-
	3.	Onion	-	-	-
		Others (specify)	-	-	-

Source: Comprehensive District Agriculture Plan, Ahmednagar and PRA village meeting, 2019.

7.7.8	**Production and Productivity of major crops (Crops to be identified based on total acreage)**									
Sr. No.	**Name of crop**	***Kharif***		***Rabi***		**Summer**		**Total**		**Crop residue as fodder (t/ha)**
		Production (t)	**Productivity (kg/ha)**	**Production (t)**	**Productivity (kg/ha)**	**Production (t)**	**Productivity (kg/ha)**	**Production (t)**	**Productivity (kg/ha)**	
1	Paddy	182.5	25000	0	0	-	-	-	-	-
2	Nagali (Finger Millet)	7.5	5000	0	0	-	-	-	-	-
3	Groundnut	70.00	15000	0	0	-	-	-	-	-
4	Varai (Little Millet)	25.00	5000	0	0	-	-	-	-	-
5	Wheat	-	0	63.00	18000	-	-	-	-	-
6	Gram	-	0	20.00	8000	-	-	-	-	-
7	Bajra (Summer)	-	0	22.50	15000	-	-	-	-	-

Source: District Socio-Economic Review and PRA village meeting, 2019.

7.7.9	Livestock	Male (number)	Female (number)	Total (number)
	Non descriptive Cattle (local low yielding)	145	352	497
	Crossbred cattle	0	5	05
	Non descriptive Buffaloes (local low yielding)	28	72	90
	Graded Buffaloes	0	6	06
	Goat	33	320	352
	Sheep	0	0	0
	Others (Camel, Pig, Yak etc.)	0	0	0
	Commercial dairy farms (Number)	0	0	0

7.7.10	Poultry	No. of farms	Total No. of birds (number)
	Commercial	0	0
	Backyard	35	185

7.7.11	Fisheries			
	Capture			
	Inland	No. Farmer owned ponds	No. of Reservoirs	No. of village tanks
		05	0	01

Source: Chief Planning Officer, Fisheries Department.

7.7.12	Sowing window for 5 major crops (start and end of sowing period)	Paddy	Finger Millet/ Little Millet	Groundnut	Wheat	Gram
	Kharif- Rainfed	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	1st Week of June to 1st Week of July	-	-
	Rabi- Rainfed	-	-	-	-	15th Oct to 15th Nov
	Rabi- Irrigated	-	-	-	15th Oct to 15th Nov	-

7.7.13	What is the major contingency the village(s) is/are prone to? (Tick mark)	Regular	Occasional	None
	Drought	-	√	-
	Water logging	-	√	-
	High intense storms	-	√	-
	Cyclone	-	-	√
	Hail storm	-	-	√
	Heat wave	-	-	√
	Cold wave	-	-	√
	Frost	-	-	√
	Pests and diseases	√	-	-

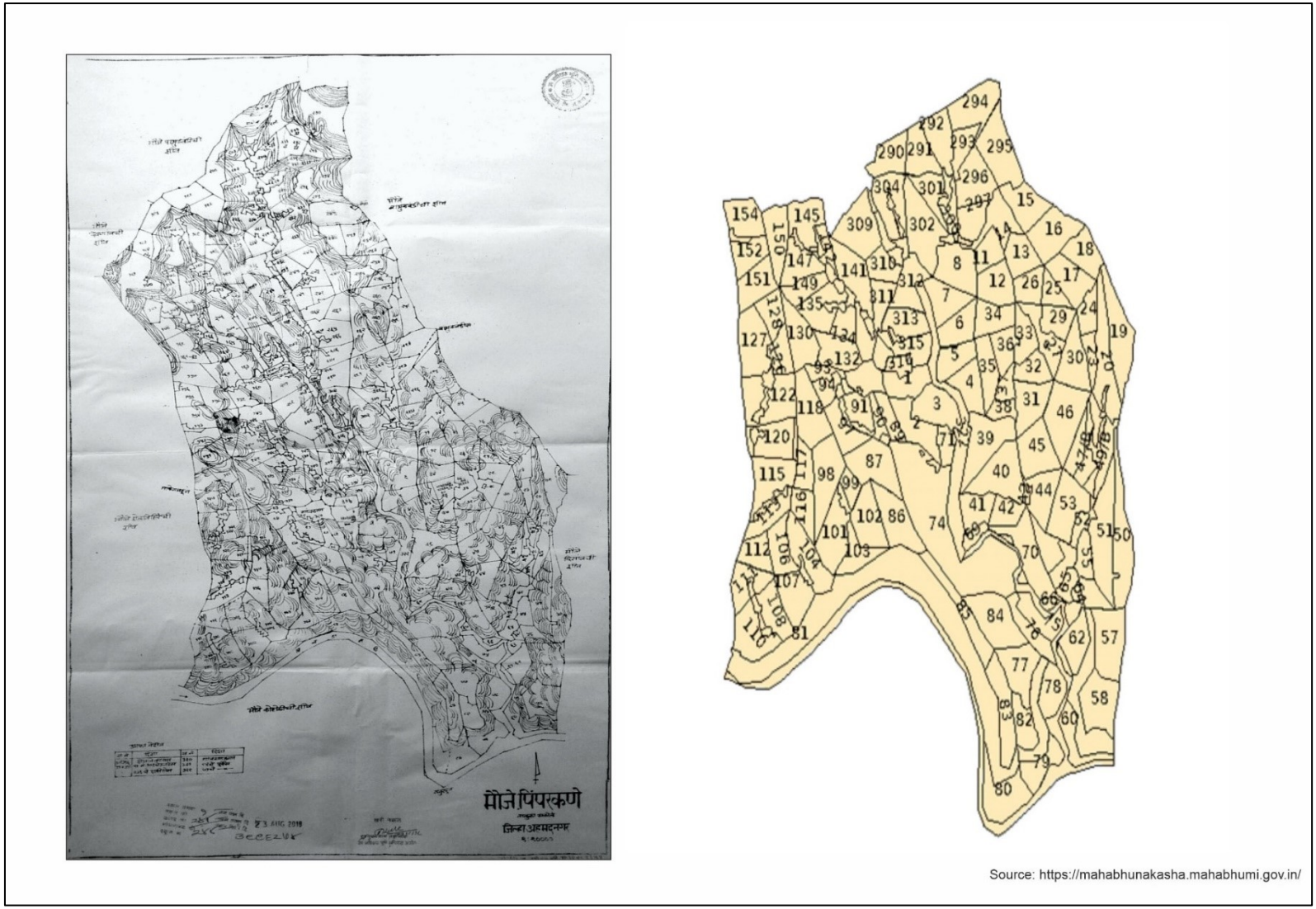

Fig. 9. Cadastral Maps of Pimparkane Village, Akole Block, Ahmednagar

7. Strategies for weather related contingencies

Name of the village (s)	Farming Situation (s)
Manhere, Kodani, Titavi, Ambevangan, Ladgaon, Dongarwadi and Pimperkane	Rainfed
	Partially protected irrigation through farm pond and co-operative irrigation projects

7.1	**Drought**				
7.1.1	**Rainfed situation (information to be given for each farming situation)**				
Condition	**Major Farming situation**	**Normal crop/ cropping system**	**Suggested Contingency measures**		
Early season drought (delayed onset)			**Change in crop/ cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks (4th Week of June i.e.26th SMW)	Soil type: Light to Medium soil with high rainfall (847 mm -1017 mm)	Paddy	1. *Early variety* (Phule- Radha, Karjat-184, Karjat-7, R-24) 2. *Mid Late variety* Phule- Samruddhi, Phule-5	1. Staggered line sowing in nurseries on raised beds 2. Use of 21 days old seedlings (2-3 seedlings/ Hill) with controlled transplanting 3. Use *Vaibhav sickle* at the time of harvesting for control of stem borer 4. Use of 6 Scales leaf colour chart for identification of deficiency 5. Seed treatment with Trichoderma and Carbendenzim 6. Nursery management-Raised bed-8 to 10 cm height, fertilizer management FYM+15:15:15 NPK 7. Follow nursery management in two steps, before rainfall and after rainfall	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, Mahabeej, NSC

				8. Use green manure and "*Charsutri*" method of Paddy transplantation 9. Use Aceprid for control of crabs after first monsoon shower 10. Initiate seed bank at village level	
		Finger Millet	Phule Nachani, Phule-Kasari, Dapoli-1	1. Line sowing behind the plough 2. Initiate seed bank at village level	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, Mahabeej, NSC
		Little Millet	Phule- Ekadashi, Use improved Local Var.	1. Line sowing behind the plough 2. Initiate seed bank at village level	Seed Source: MPKV, Rahuri, KVK, Mahabeej, NSC
		Groundnut	JL-286, Phule-Unnati, Phule-Bharati	1. Use BBF Technique, farm mechanization through custom hiring centers 2. Initiate seed bank at village level	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, KVK, Mahabeej, NSC
Delay by 4 weeks (2nd Week of July i.e.28th SMW)	Soil type: Light to Medium soil with high rainfall (847 mm -1017 mm)	Paddy	Early variety (Phule- Radha, Karjat-184, Karjat-7, R-24)	1. Staggered line sowing in nurseries on raised beds 2. Use of 14 days old seedlings (2-3 seedlings/Hill) with controlled transplanting 3. Organic manure like PROM is also good source for organic carbon and phosphorus to various crops. 4. Soils are especially deficient in Zinc and Boron; hence micronutrient grade II foliar spray is very important after withdrawal of monsoon or during dry spell for	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, KVK, Mahabeej, NSC

				resistance against climate change. 5. Initiate seed bank at village level	
		Finger Millet	Phule-Kasari, Dapoli-1	Line sowing behind the plough	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, KVK, Mahabeej, NSC
		Little Millet	Phule- Ekadashi, Use improved Local Var.	Line sowing behind the plough	Seed Source: MPKV, Rahuri, KVK, Mahabeej, NSC
		Groundnut	JL-286, Phule-Unnati, Phule-Bharati	Use BBF Technique, farm mechanization through custom hiring centers	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, Mahabeej, NSC
Delay by 6 weeks (4th Week of July i.e.30 SMW)	Soil type: Light to Medium soil with high rainfall (847 mm - 1017 mm)	Paddy	Early variety (Phule- Radha, Karjat-184, Karjat-7, R-24)	*Rahu Method* • Soak the Rice seeds in water for 24 hrs • After soaking pack, the seeds in gunny bag for 24 hrs for sprouting • After sprouting use the seeds for sowing by broadcasting or by drum seeder	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, KVK, Mahabeej, NSC
		Finger Millet	Phule-Kasari, Dapoli-1	1. Line sowing behind the plough 2. Intercropping of Finger millet with Black Gram (4:1)	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, KVK, Mahabeej, NSC

		Little Millet	Phule- Ekadashi, Use improved Local Var.	1. Line sowing behind the plough 2. Intercropping of Little millet with Niger (4:1)	Seed Source: MPKV, Rahuri, KVK, Mahabeej, NSC
Delay by 8 weeks (2nd week of August i.e.33 SMW)	Soil type: Light to Medium soil with high rainfall (847 mm - 1017 mm)	Paddy	Early variety (Phule- Radha, Karjat-184, Karjat-7, R-24)	*Rahu Method* • Soak the Rice seeds in water for 24 hrs • After soaking pack, the seeds in gunny bag for 24 hrs for sprouting • After sprouting use the seeds for sowing by broadcasting or by drum seeder • Initiate seed bank at village level	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, KVK, Mahabeej, NSC
		Finger Millet	Phule-Kasari, Dapoli-1	1. Line sowing behind the plough 2. Intercropping of Finger millet with Black Gram (4:1)	Seed Source: MPKV, Rahuri, DBSKKV Dapoli, KVK, Mahabeej, NSC
		Little Millet	Phule- Ekadashi, Use improved Local Var.	1. Line sowing behind the plough 2. Intercropping of Little millet with Niger (4:1)	Seed Source: MPKV, Rahuri, KVK, Mahabeej, NSC

Condition	**Major Farming situation**	**Crop/ cropping system**	**Suggested Contingency measures**		
Early season drought (Normal onset)			**Crop management**	**Soil management**	**Remarks on Implementation**
15-20 days dry spell after sowing leading to poor germination/crop stand etc.)	Soil type: Light to Medium soil with high rainfall (847 mm - 1017 mm)	Paddy	Proper nursery management, weeding with possible protective irrigation (Evening), if available	-	KVK, REC
		Finger Millet	Gap filling	Interculturing, farm	KVK, REC

				mechanization through custom hiring centers	
		Little Millet	Gap filling	Interculturing, farm mechanization through custom hiring centers	KVK, REC
		Groundnut	Gap filling	Interculturing, farm mechanization through custom hiring centers	KVK, REC
Condition	**Major Farming situation**	**Crop/ cropping system**	**Suggested Contingency measures**		
Mid-season drought (long dry spell, > 2 consecutive weeks rainless (>2.5 mm) period			**Crop management**	**Soil management**	**Remarks on Implementation**
At vegetative stage	Soil type: Light to Medium soil with high rainfall (847 mm - 1017 mm)	Paddy	Weeding/ Post Emergence Herbicide 2-4 D, Almix, 10% Nominogold, Protective Irrigation, Use weedicide- 1. Nominogold + washing powder + sticker- Low cost technology 2. 100 lit water+1.25 kg 13:0:45 3. 2 kg DAP+ 100 lit water spray, Repeat for 30 Days delay transplanting 4. Use of Blue Green Algae 2 to 3 Days after transplanting, 8 to 10 kg/acre	Soil solarization in May, Mulching, Nursery management BBF, farm mechanization through custom hiring centers, Use of palas leaves (*Butea monosperma*) for rust eradication	KVK, REC, NGO, Krishi Seva Kendra

		Finger Millet	Weeding, Protective Irrigation (if available), spraying of 19:19:19 @ 1%	-	KVK, REC, NGO, Krishi Seva Kendra
		Little Millet	Weeding, Protective Irrigation (if available)	-	KVK, REC, NGO
		Groundnut	Weeding/ Post Emergence Herbicide Imazethapyr, Quizalofop ethyl @ 21 DAS, Protective Irrigation (if possible), Spraying of 1 % Potassium Nitrate,	-	KVK, REC, NGO, Krishi Seva Kendra
Condition	**Major Farming situation**	**Crop/ cropping system**	**Suggested Contingency measures**		
Mid-season drought (long dry spell)			**Crop management**	**Soil management**	**Remarks on Implementation**
At flowering/ reproductive stage	Soil type: Light to Medium soil with high rainfall (847 mm - 1017 mm)	Paddy	Weeding, Protective Irrigation (if available)	-	KVK, REC
		Finger Millet	Weeding, Protective Irrigation (if available)	-	KVK, REC
		Little Millet	Weeding, Protective Irrigation (if available)	-	KVK, REC
		Groundnut	Protective Irrigation (if available), Spraying of 1% Potassium Nitrate	-	KVK, REC
Condition	**Major Farming situation**	**Crop/cropping system**	**Suggested Contingency measures**		
Terminal drought (Early withdrawal of monsoon)			**Crop management**	**Rabi Crop planning**	**Remarks on Implementation**

	Soil type: Light to Medium soil with high rainfall (847 mm - 1017 mm)	Paddy	Protective Irrigation (if available)	-	KVK, REC
		Finger Millet	Protective Irrigation (if available)	-	KVK, REC
		Little Millet	Protective Irrigation (if available)	-	KVK, REC
		Groundnut	Protective Irrigation (if available)	-	KVK, REC

7.1.2	**Irrigated situation (*Rabi*)**				
Condition	**Suggested Contingency measures**				
Delayed release of water in canals due to low rainfall	**Major Farming situation**	**Normal Crop/ Cropping system**	**Change in crop/ Cropping system**	**Agronomic measures**	**Remarks on Implementation**
	Soil type- Light to Medium soil with high rainfall (847 mm -1017 mm)	Wheat	Samadhan, Netravati, Trimbak	Irrigate at critical growth stages through Sprinkler irrigation	Linkages with MPKV, Rahuri, College of Agriculture Pune, Dhule, Kolhapur, NSC, MSSC, Private co. distributors
		Chickpea	Vijay, Digvijay, Vishal, Virat, Vikram	Irrigate at critical growth stages through Sprinkler irrigation	
Condition	**Major Farming situation**	**Normal Crop/ Cropping system**	**Change in crop/ Cropping system**	**Agronomic measures**	**Remarks on Implementation**
Limited release of water in canals due to low rainfall					
	Soil type- Light to Medium soil with	Wheat	Phule-Samadhan, Netravati, Trimbak or	Irrigate at critical growth stages	Linkages with MPKV, Rahuri, College of Agriculture Pune,

	high rainfall (847 mm -1017 mm)		Chickpea (Vijay, Digvijay, Vishal)	through micro sprinkler irrigation	Dhule, Kolhapur, NSC, MSSC, Private co. distributors
Non release of water in canals under delayed onset of monsoon in catchment	**Major Farming situation**	**Normal Crop/ Cropping system**	**Change in crop/ Cropping system**	**Agronomic measures**	**Remarks on Implementation**
	Soil type- Light to Medium soil with high rainfall (847 mm -1017 mm)	Wheat	Phule-Samadhan , Netravati	Irrigate at critical growth stages through micro sprinkler irrigation	Linkages with MPKV, Rahuri, College of Agriculture Pune, Dhule, Kolhapur, NSC, MSSC, Private co. distributors
		Chickpea	Vijay, Digvijay, Vishal ,Virat , Vikram	Irrigate at critical growth stages through Micro sprinkler irrigation	
Condition	**Major Farming situation**	**Normal Crop/ Cropping system**	**Suggested Contingency measures**		
Lack of inflows into tanks due to Insufficient /delayed onset of monsoon			**Change in crop/ Cropping system**	**Agronomic measures**	**Remarks on Implementation**
	Soil type: Light to Medium soil with high rainfall (847 mm -1017 mm)	Wheat	Fallow	-	-
		Chickpea			
		Vegetable			
Condition	**Major Farming situation**	**Normal Crop/ Cropping system**	**Suggested Contingency measures**		
Insufficient groundwater recharge due to low rainfall			**Change in crop/ Cropping system**	**Agronomic measures**	**Remarks on Implementation**
	Soil type: Light to Medium soil with high rainfall (847 mm -1017 mm)	Wheat	Chickpea (Vijay, Digvijay, Vishal)	Micro sprinkler irrigation	Convergence of Micro irrigation schemes of State Department of Agriculture, MS
		Chickpea	Chickpea (Vijay, Digvijay, Vishal)	Micro sprinkler irrigation	

7.1.3	Unusual rains (untimely, unseasonal etc.) (for both rainfed and irrigated situations)			
Condition	**Suggested contingency measure**			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post-harvest**
Field crops				
Paddy	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Soils are deficient in N, P, K, Ca and due to high leached soil during dry spell or after cessation of rainfall at critical growth stage it is essential to spray potassium nitrate @ 2% at grain filling stage of any crops.	1. Shift the dry produce in safer place 2. Dry the grains to optimum moisture content before storage
Finger Millet	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Shift the dry produce in safer place 2. Dry the grains to optimum moisture content before storage
Little Millet	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Shift the dry produce in safer place 2. Dry the grains to optimum moisture content before storage
Groundnut	1. Drain out the excess water, Recharge existing bore wells and open wells 2. Spray 2% Urea	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Shift the dry produce in safer place 2. Dry the grains to optimum moisture content before storage

Horticulture crops				
Mango	1. Drain out excess water 2. Soil conditioner (Gypsum) is necessary to add in soil as a source of secondary calcium and Sulphur nutrients and as well as far as a amendment for improvement of soil structure. Where the soluble salts are loosed through rainwater and highly leached soil (Tomato/ Mango/ Vegetable crops)	1. Drain out the excess water 2. Recharge existing bore wells and open wells	Harvest at physiological maturity	Cold storage or immediate marketing
Onion	1. Drain out excess water 2. Drenching with fungicide	1. Drain out the excess water 2. Recharge existing bore wells and open wells	1. Drain out the excess water 2. Recharge existing bore wells and open wells	Protect produce properly
Tomato	1. Drain out excess water 2. Drenching with fungicide	1. Staking to plants 2. Drain out excess water	1. Drain out the excess water 2. Recharge existing bore wells and open wells	Protect produce properly
Pomegranate	1. Drain out excess water 2. Plant protection measures	1. Staking to plants 2. Drain out excess water	1. Drain out the excess water 2. Recharge existing bore wells and open wells	Protect produce properly

7.1.4	Outbreak of pests and diseases due to unseasonal rains		
Field Crops	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**
Paddy	***Diseases*** 1. **Leaf Blast/ Neck Blast**: Carbendazim 50 WP 1 g/L subsequent 2-3 spray at interval of 15 days. Mancozeb 75% WP 20 g/ 10 lit 2. **Leaf scald:** Spraying of Carbendazim 50 WP 1 g/Propiconazole 25 EC 1 ml/L 3. **Sheath blight:** Spraying of Propiconazole1 ml/L ***Pests*** 1. **Leaf roller / Leaf folder /Stem borer:** Spraying of Chlorantraniliprole 18.5 SC @0.30ml/L or Cartaphydrochloride 50SP @2.0g/L. *Bacillus thuringiensis* 2.5g/L. *Beauveria bassiana* @ 4g/L 2. **Brown plant hoppers**: Fipronil 5SC 2.0 ml/L or Flonicamid 50WG 0.30ml/L 3. **Crabs:** Application of small pillets in the crab holes around the terrace. (Acephate 75 gm in 1 kg cooked Paddy	***Diseases*** 1. **Leaf Blast /Neck Blast**: Spraying of Carbendazim 50 WP 1 g/L subsequent 2-3 spray at interval of 15 days 2. **Leaf scald:** Spraying of Carbendazim 50 WP 1 g/Propiconazole 25 EC 1 ml/L 3. **Sheath rot:** Spraying of Propiconazole 25 EC /Hexaconazole 25 EC 2 ml/L 4. **False smut**: Spraying with Chlorothalonil 75WP 2g/L ***Pest*** 1. **Leaf roller/ Stem borer:** Spraying of Chlorantraniliprole 18.5 SC @0.30ml/L or Cartaphydrochloride 50SP @2.0g/L. *Bacillus thuringiensis* 2.5g/L. *Beauveria bassiana* @ 4g/L	***Diseases*** 1. **Sheath rot:** Spraying of Propiconazole 25 EC/Hexaconazole 2 ml/L 2. **False smut**: Spraying with Chlorothalonil 75WP2g/L ***Pest*** 1. **Brown plant hoppers**: Fipronil 5SC 2.0 ml/L or Flonicamid 50WG 0.30ml/L
Finger millet	***Diseases*** 1. **Leaf Blast and Neck Blast**: Spraying of Carbendazim50 WP 1g /L water and subsequent 2-3 spray at interval of 15 days 2. **Rust:** Spraying of 1% Trichodermaviride	***Pest*** 1. **Earhead Caterpillar:** Quinolphos 25 EC @20ml/L or dusting with Methyl parathion 2% @ 20kg/ha	
Groundnut	***Pest*** 1. **Leaf miner/ Aphids/ Thrips:** Spraying of methyl demeton 10 ml in 10 ml of water 2. **Leaf eating caterpillars:** Spraying of chloropyriphos 25 ml/10 lit of water or cypermethrin 4 ml/ 10 lit 3. **White grub:** Use of Trichoderma 5 kg/ acre with	***Disease*** 1. **Tikka and Rust:** Spraying of M-45, 25 gm+ Carbendenzim 25 gm 10 lit water	

	FYM at the time of sowing		
Pearl millet	***Pest*** 1. **Grass hopper:** Dusting of methyl parathion 2% @ 20 kg/ha	***Disease*** 1. **Rust:** Spraying of Mancozeb 75 WP 2.5g/L ***Pest*** 2. **Blister beetle:** Dusting of methyl parathion2% @ 20 kg /ha	
Chickpea	***Disease*** 1. **Wilt / root rot:** seed treatment with carbendazim 50WP + thirum (2 g each / kg) or Phule trichoderma 5 g /kg ***Pest*** 1. **Gram pod borer:** Emamectin benzoates 5SC @ 0.40g/L, Heliokil 1.0ml/L	***Disease*** 1. **Wilt / root rot:** seed treatment with carbendazium 50WP + thirum (2 g each / kg) or Phule trichoderma 5 g /kg ***Pest*** 1. **Gram pod borer:** - Use of pheromen traps @ 5 /ha - Spraying of Quinolphos 25% / Chloropyriphos 20%@ 20 ml / 10 lit. Heliokil 1.0ml/L	**Pest** 1. **Heliothis (Gram pod borer):** Use of pheromen traps @ 5 /ha, Spraying of Quinolphos 25% / Chloropyriphos 20% @ 2.0 ml / L
Horticultural Crops	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**
Mango	***Pest*** 1. **Hoppers:** Imidacloprid 17.8 SL @ 0.3 ml / L or Spinosad @ 0.3 ml / L water 2. **Jassid:** Spray 5 % NSKE, Spray 0.005 % Imidachloprid 3. **Mango Stem borer:** Pasting of 10 % Bordeaux paste + 0.1 % Chloropyriphos, Injection with Dichlorovos and water (1:1)	***Disease*** 1. **Powdery mildew**- Spray wettable sulphur 80 WP 0.2 % or dust 300 mesh sulphur @ 20 kg/ha., Apply Sulphur 0.2 % WP, Spray 0.1 % Hexaconazole 2. **Fungle wilt**: Apply Trichoderma 2 lit./acre (25 gm/plant), Drenching of Copper Oxychloride 0.25 %, Drenching of 0.1 % Carbendenzim ***Pest*** 1. **Hoppers:** 50 % carbaryl spray @ 2 g/L or 10 % carbaryl dust @ 20 kg /ha	-

Onion	***Disease*** 1. **Alternaria leaf blight & Purple Blotch**: Mancozeb 75% 2.5g. orCarbondenzim 50WP 1g. or Tebuconazole 1 ml/L ***Pest*** 1. **Thrips: Fipronil** 80WG @20g/100L water	***Pest*** 1. **Thrips:** Fipronil 80WG @20g/100L water	-
Tomato	• For control of Sucking complex, Aphids, Jassids, Thrips, White fly, Leaf miner, Mite Under nursery- use of Carbofuron 50 gm or Phorate 20 gm/ 10 sq m on raised bed • At the time of transplanting dipping of seedlings in Emidacloprid 5 ml + Mancozeb 20 gm per 10 lit of water for 15 minutes • After transplanting- spraying of Chloropyriphos 2 ml/lit or Methyl Demeton 1 ml or Emidachloroprid 0.5 ml/lit ***Disease*** 1. **Alternaria leaf blight**: Mancozeb 75WP 2.5g /L or COC 2.5g or Propineb 1.5g /L 2. **White fly/Mites/Thrips**: Spiromesifen 22.9% @1.0ml/L, Thiamethoxam 25WG @ 0.50g/L ***Pest*** 1. **Mites:** Fenazaquin 10EC 2.0 ml/L Imidacloprid 17 SL 0.5ml/L	***Disease*** 1. **Alternaria leaf blight**: Mancozeb 75WP 2.5g /L or COC 2.5g /L or Propineb 1.5g /L 2. **Leaf curl virus** -Cyantrilprole 1.8 ml/lit 3. **Downey mildew** -Mancozeb 2.5 gm / copper Oxychloride 2.5 gm/ Azostrobin 1 ml/ lit of water ***Pest*** 1. **Fruit borer** -Spraying of 5 % NSKE or chlorantrilprole @ 1 ml/ lit 2. **Root knot nematode and wilt -**Use of Trichoderma @ 5 kg with FYM at the time of planting Use of Paecilomyces lilacinum @ 5 kg/ha	***Pest*** 1. **Fruit borer**: Flubendiamide 39.35SC @ 20g/100lit of water. HaNPV @ 1.0ml /lit of water. Spraying of quinolphos 2 ml/ lit of water.
Cauliflower/ Cabbage	***Pest*** 1. **Thrips/Aphids/Jassids**: Soil application of Phorate 10G 10 kg/ha or Spinosad 2.5SC @1.0ml/L or Diamethoate 30% 1.5ml/L 2. **Diamond black moth:** *Bacillus thuringiensis* @ 2.0g/L. *Beauveria bassiana* 10% SC @ 3.00ml/L. Emamectin benzoates 5 SG @ 0.40g/L. Lufenurons 4EC @ 1.0ml/L. Fipronil 5SC @2.0ml/L	*Disease* 1. **Anthracnose** – spraying of Mancozeb 75WP 2.5g or Copper oxichloride 50WP 2.5g or chlorothalonil 2.5 g/L 2. **Black rot:** Spraying of Copper oxichloride 50WP 3g + Streptomycin 0.01 g/L ***Pest***	-

		1. **Thrips/Aphids/Jassids**: Soil application of Phorate 10G 10 kg/ha or Spinosad 2.5SC @1.0ml/L or Diamethoate 30% 1.5ml/L 2. **Diamond black moth:** *Bacillus thuringiensis* @ 2.0g/L. *Beauveria bassiana* 10% SC @ 3.00ml/L. Emamectin benzoate 5 SG @ 0.40g/L.Lufenurons 4EC @ 1.0ml/L. Fipronil 5SC @2.0ml/L	
Pomegranate	***Disease*** 1. **Bacterial oily spot** (*Xanthomonas spp.*) – Adopt recommended special package of University / NRC, Pomegranate 2. **Fungal spot**- Spraying of carbendazim 50 WP 0.1 % ***Pest*** 1. **Shot hole borer** - Use Geru paste with chloropyriphos 20% 2.0ml/L, Soil application of phorate 10G @ 10g/plant in basin	***Disease*** 1. **Bacterial oily spot** (Xanthomonas spp.) – Adopt recommended special package of University / NRC, Pomegranate 2. **Fungal spot**- Spraying of carbendazim 50WP 0.1 % ***Pest*** 1. **Shot hole borer:** Use Geru paste with chloropyriphos 20% 2.0ml/L, Soil application of phorate 10G @ 10g/plant in basin	***Disease*** 1. **Bacterial oily spot** (*Xanthomonas spp.*) – Adopt recommended special package of University / NRC, Pomegranate

7.2	**Floods**			
	Not applicable			
7.3	**Extreme events**			
7.3.1	**Heat wave/ Cold wave/ Frost/ Hailstorm/ Cyclone- Not applicable**			
7.3.2	**High temperature and long dry spell**			
Horticultural crops	**Normal Cropping System**	**Suggested Change in System**	**Change in Technologies including variety / practices etc.**	**Convergence / Linkages**
	Mango, Jambhul	Jackfruit, Lemon, Drumstick, Curry leaf	In-situ grafting for new plantation and rejuvenation for old plantation Mulching, 2 % DAP Spray/ 20 PPM NAA for fruit and flower drop control. Apply antitranspirant or 5-8 % Kaolin, Apply 1 % KNO3	Linkage MREGS/ PF Plantation Scheme
	Wild-Karvanda, Jambhul, Hirda	-	Mulching-Stone mulching	-
	Tomato, Chilli, Brinjal& Cabbage	Use short duration vegetables like Frenchbeen, Pea / Leafy vegetables	use of drip + mulching for tomato	-

8. Contingent strategies for Livestock, Poultry & Fisheries

8.1	Livestock		
Drought	**Suggested contingency measures**		
	Before the event	**During the event**	**After the event (Recovery from damage wherever revisable)**
Breeding strategies	The existing livestock germplasm must be conserved on mission mode particularly for Dangi cattle, Goats and Poultry		
Feed and fodder availability	• Awareness towards feed and fodder conservation be created • Initiate Fodder Bank • Store sufficient quantity of feed and fodder at farmers level • Motivate farmers to convert green maize fodder into silage • To avoid malnutrition, Prepare "Uromol blocks." (4 kg Urea + 12 kg molasses +10 lit. water heat it and mix with 16 kg wheat bran and use for feeding animal). • Store Umbar (*Ficus spp*.) fruits after drying • Store Babul pods (Acacia Spp.) for feeding of Goat and Sheep • Conserve wheat straw, Pulses straw, (Paddy Straw, Green gram, black gram), Gram Husk, Tur bhusa, Bajara, Groundnut haulms. • Store tree loppings of Leucacia (Subabhul), *Ficus spp*. (Umbar, Vad,	• Adequate feeding of animals with available feed resources, which are stored before the event such as Uromol blocks, silage, stored leaves etc. • Treat dry fodder like Sorghum straw, wheat straw, Pulses straw, Tur, bhusa, Jawar kadba with 2% Urea, 5% Jaggary, 1% mineral mixture, 1% salt and keep air tight for 18 hrs and then feed the animal • Use Non-conventional feed resources like agro industrial by products such as banana peel, mango peel, citrus pumac etc. • Use Hydroponic maize for green fodder production. • Give additional mineral mixture up to 100-150 gm for large animals • Use locally available cheap feed ingredients especially Groundnut haulms as protein supplement • Harvest all the top fodder available (Subabhul, Pipal) and Mulberry to feed the livestock.	• Encourage farmers to grow multi cut fodder crops like berseem, Lucern hybrid Napier • Avoid feeding of succulent green grass, otherwise may lead to Pasture bloat and Magnesium Tetany • Adequate quantity of fodder and concentrate with Minerals and Vitamin should be given. • Plantation of forage cactus

	Pimpal) and grasses of Marvel, Madras, Anjan, Marvel etc. • Plantation of perennial crops like shevari (*Seasbania spp*.) Tuti (*Malberia spp*.) and Subabhul on the bunds • Grow Azolla cultivation at backyard • Procure and store low grade grains available in the market • Establishment of fodder bank • Use feed tubs	• Concentrate ingredients such as Grains, brans, chunnies and oilseed cakes, low grade grains unfit for human consumption be procured and feed livestock • 100 kg straw (Paddy & Wheat) be enriched with 2%, Urea, 10% molasses and 1% common salt and feed to livestock, will help in increase in palatability and Digestibility of fodder • Progressive dairy farmers may provide chelated mineral mixture to cows for better bioavailability	
Drinking water	• Identify water resources • Desilting of ponds at community/ individual level • Construction of drinking water tanks in herding places/ Village Junctions/relief camp locations • Preparation of farm ponds • Community drinking water through can be arranged in community grazing areas • Rain water harvesting and water conservation measures • Use water tubs	• Supply adequate drinking water • Add Alum or bleaching powder in stagnated water bodies • Restrict wallowing of animals in water bodies/resources • Water should be available 24 hrs.	• Water shed management practices shall be promoted to conserve the rain water • Provide clean drinking water • To prevent worm infestation, avoid animals to drink water from stagnated water resources
Health and disease management	• Vaccination against HS, BQ, FMD in cattle, ET in Sheep and PPR in Goat and other endemic diseases in area • Deworming of livestock should be carried out. • Ectoparasite control and management	• Sufficient quantity of Concentrate and Fodder, clean potable water be given • To increase immunity and to overcome stress provide minerals, vitamins and immuno modulators • Prompt treatment in event of disease (FMD, HS, BQ etc). occurrence or any adverse ill health is observed	• Keep close surveillance on disease revisable/ill health events. • Sufficient feed/fodder and water • Continuous of Minerals/Vitamins/anti stress medications

	• Procurement and stocking of multivitamins, mineral mixture, immuno modulators, medicines etc. • Surveillance and disease monitoring network be established at Animal Husbandry office in the Block • Analysis of past disease prevalence *vis-a-vis* climate change will help anticipating adverse effects in near future • Maintain health records	• Isolation of sick animal. • Perform ring vaccination (8 Km radius) in case of any outbreak • Restrict movements of livestock in case of any epidemic • Restricted entry with sanitary and hygienic precautions at relief camps. • Special diet for Pregnant and stressed animals. • To prevent negative energy balance in advance pregnant animals additional concentrate and mineral mixture should be given • Inseminate the cows and Buffaloes according to health • Maintain health records	• Keep the animal house clean, hygienic and spray disinfectants. • Proper housing and management practices in animal shed • Deworming the livestock • Maintain health records
Low temperature	• Store dry grass/paddy straw to be used as bedding material • Store high energy feed grains like maize and different oil cakes • Arrange/Procure curtains (Gunny bags) to be used for sheds/light brooders to protect kids, Lambs and Calves from cold wave	• Cover the animal shed openings with gunny bags curtains. • Provide bedding to animals with dry grass/straws • Provide mineral mixture and concentrate mixture rich in energy • If possible, offer luke warm water especially to young ones to avoid arthritis problem • To prevent incidence of Lumber paralysis in goat kids, provide mineral mixture enrich with vitamins B_1	• Replace the gunny bag curtains as per the situation to prevent respiratory problems especially in young ones.
Shelter/ environment management	• Orientation of byre should be east-west • Length of the Cattle/Sheep and Goat shed should be in between 25 to 30 feet for better ventilation	• Provide clean and dry shelter • Provide ventilation to shed as suggested in before the event	• Follow suggested contingency given in before the event

	• The asbestos roof should be 2 and 1/2feet outside the shed, so that sunlight and rain does not enter in the shed directly • Plantation of fast growing trees. • Keep the shed clean and dry • To avoid Blood Protozon infestation, ticks eradication Programme be undertaken • Dusting of lime powder weekly in rainy days on floor considering moisture intensity	• To avoid Blood Protozon infestation, ticks eradication Programme be taken this would come under health management • House should be designed properly • Height of shed should be proper for sufficient ventilation • Proper floor space may be provided for reducing heat stress • Dusting of lime powder weekly in rainy days on floor considering moisture intensity • Orientation of shed would be east-west to reduce heat load	• Due to cloudy environment there are chances of epidemic of HS and BQ in cattle. To avoid this vaccinate the animals in time • To avoid Blood Protozon infestation, ticks eradication Programme be taken • Dusting of lime powder weekly in rainy days on floor considering moisture intensity
Insurance	• Encourage livestock insurance	• Encourage livestock insurance	• Encourage livestock insurance

8.2	**Poultry**			
Drought	**Suggested contingency measures**			
	Before the event	**During the event**	**After the event (Recovery from damage wherever revisable)**	**Convergence/linkages with ongoing programs, if any**
Shortage of feed ingredients	Prepared/ Arrange for • Storage of Raw material like Paddy husk, Paddy bran Broken Paddy, wheat and Maize, Soybean Doc • Prevent mould infestation to Raw material	• Use adequate raw material stored for feeding • Use mould inhibitors in feed (toxin binders)	• Purchase new fresh raw material which should be cost effective	Linkages with MPKV, Rahuri, State Agriculture Department, NGOs

Drinking Water	• Create temporary drinking water storage facilities in the feeding yard • Water sanitization with bleaching powder	• Provide adequate clean, fresh potable water	• Check the pH, TDS, Coli count of fresh water and treat accordingly. • Dilute the water to reduce the pH, TDS, Coli count and make it available for animals.	Linkages with MPKV, Rahuri, State Agriculture Department, NGOs
Health and disease management	• Plan vaccination schedule for IB, IBD, RD, VVND, (Bird flu) • Disinfection of sheds with Khrosolin TH/Formalin 5% (Anti-bacterial, Viral and Fungal) to prevent viral & bacterial diseases. • Burning of sheds with flame gun.	• Follow the vaccination schedule • Give preventive medication having vitamins, trace minerals in first week • Use growth promoters with Amino acids and Liver tonics for better weight gain and feed conversion ratio and also act as anti stress in drought • Monitor intake of feed and water • Deworming before vaccination in layers • Dispose the dead birds by burning or buried with salt.	• Check the New fresh water for PH, TDS, and Coli count and treat accordingly. Dilute the water to reduce the pH, TDS, Coli count and make it available for animals. • Use Coccidiostat in feed to avoid cocci outbreaks (200gm to 500gm per ton of feed)	Linkages with MPKV, Rahuri, State Agriculture Department, NGOs
Low temperature	• Arrange Brooders: • Light brooders Gas brooders • Wooden/Charcoal • Brooders (Shegadi) • Arrange for Side curtains	• Manage Temperature inside the shed for chicks First week – 95 °f Second week 90 °f Third week 85 °f Further Management as per the requirement	• Reduce or Replace inside, outside, side and sealing curtains as per the situation to maintain proper ventilation.	Linkages with MPKV, Rahuri, State Agriculture Department, NGOs

	• Inside and outside curtains Sealing curtains upto 7 feet	• Curtain Management as per the situation to reduce the respiratory problems • If possible, provide Luke warm drinking water during first two weeks to avoid gout (Arthritis)		
Shelter Management	• Length of the sheds should be east west • The asbestos roof should be 2 and ½feet outside the shed, so that sunlight and rain does not enter in the shed directly • Plant trees (which grow in the height and birds do not make their nest) in between the two sheds • Width of shed should be in between 25 to 30 feet of better ventilation	-	-	Linkages with MPKV, Rahuri, State Agriculture Department, NGOs

Layer feeding schedule Chick mash: upto 580 gm Grower mash: upto 1100 gm Prelayer: After 1100 gm (for 3 wks) 16-18 Layer feed	Chick mash	Grower	Pre-layer	Layer		
				I	II	III
Energy (MEK cal/kg)	2750	2500	2500	2500	2500	2500
Protein (%)	20.5	17.0	17.0	17.5	16	15.5
Methionine (%)	0.45	0.35	0.40	0.40	0.80	0.30
Lysine (%)	1.04	0.80	0.72	0.80	0.70	0.70
Calcium (%)	1.00	1.00	2.5	3.6	4.0	4.0
Phosphate (%)	0.45	0.40	0.4	0.35	0.30	0.30
Sodium (%)	0.18	0.18	0.18	0.18	0.18	0.18
Chloride (%)	0.20	0.20	0.2	0.2	0.20	0.20
Linoleic Acid (%)	1.20	1.00	1.4	1.4	1.20	1.20

Broiler feeding schedule 1. Broiler Starter: 0 to 21 days 2. Broiler Finisher: 22 to 45 days	Feed Composition	
	Starter	Finisher
Energy (MEK cal/kg)	2900-2000	3100-3150
Protein (%)	22	20
Crude fibre (%)	4 %	4 %
Ether Extract (%)	4.5	6.5
Calcium (%)	1	1
Available Phosphorus (%)	0.45	0.45
Sodium (%)	0.18	0.18
Chloride (%)	0.17	0.15
Lysine (%)	1.20	1.05
Methionine (%)	0.50	0.45
Linoleic Acid (%)	3.00	3.50
Feed Ingredients	Maize/ Soybean/ Groundnut cake/ Broken Paddy/ Paddy Polish/ Bajara/ Wheat/ Fisk meal/ Deoiled Paddy bran/ Mineral Mixture/ Salt Dicalcium Phosphate	

8.3 Fisheries				
Drought	**Suggested contingency measures**			
	Before the event	**During the event**	**After the event (Recovery from damage wherever revisable)**	**Convergence/linkages with ongoing programs, if any**
Shallow water depth due to insufficient rains/inflows	• Proper planning of water storage • Conservation & development of water resources by construction of reservoirs & dams. • Avoid seepage losses by lining the canals. • Adopt rain water harvest techniques. • Farmer's organizations, water users & private sectors should be involved in construction, operation & maintenance of irrigation system. • To make people aware about conservation of water. • Critical analysis of long range a Forecast data. • Storage of water. • A forestation program.	• Maintenance of dams & reservoirs to avoid leakage & to control theft of water. • Proper use of water resources on priority base. • Add water in shallow water pond. • Use stored water. • Use surface water flow. • Divert water from unutilized areas. • Utilize canal water. • 8. Aeration of water in ponds/reservoirs.	• Regular desiltation of reservoirs & dams. • Govt. should make laws on water conservation. • To develop demand-oriented system. • Govt. should make laws to stop deforestation. • Need based monitoring through research plan. • Intensive forestation program. • Augmentation of surface water flow. • Strengthening of water reservoirs. • Rain water harvesting. • Compensation claims. • Prepare vulnerability map and place it to management committee	Linkages with MPKV, Rahuri, State Agriculture Department, NGOs

	• Conservation of rivers/reservoir/ponds. • Re-excavation of local canals and reservoirs.			
Changes in Water Quality	• Storage of water disinfectant such as chlorine, alum etc. at district level. • Prohibit dumping of solid, liquid and waste in water sources. • Preparedness with stocks of chemicals, disinfectants and therapeutic drugs.	• Provision of water filtration system for the ponds to overcome the water contamination- • Use disinfectants and therapeutic drugs. • Adoption of bio-remedial measures	• Removal of runoff from land by proper means before decomposition. • Supply of water filtration system even after the event & creating awareness in farmers. • Need based research data should be generated on water quality. • Dumping of solid, liquid and waste in water bodies should be stopped through enactment of legislation.	Linkages with MPKV, Rahuri, State Agriculture Department, NGOs

9. Measures suggested for Soil and Water Conservation

9.1 Preparedness				
Natural Resources available at Village level including ground water	**Protection of NRM**	**Income generation from the NRM without damaging**	**Convergence / Linkages**	**Remarks for implementation**
-	Cultivation across the slope	-	State department of agriculture and NGOs	-
-	Opening of ridges and furrows across the slope	-	State department of agriculture and NGOs	-
CCT, Percolation tanks, CNB, Gabions, LBS, Plantation on CCT, Community wells	Capacity building of villagers	-	Organization of training to the farmers regarding importance of water conservation, repair and maintenance of SWC structures	Before each seasons and during the different crop growth stages
-	Desilting of percolation tanks, Cement Nala Bund, Loose Boulder Structures, Gabion structures	Recharge existing bore wells and open wells. Retain storage capacities of the structures, removed silt can be used for shallow soil, Use of harvested water for protective irrigation to adjoining fields, groundwater recharge	State department of agriculture, NGOs	Planning and execution of water conservation strategies should be done after *Rabi* season
-	Repairing of leakages in Cement Nala Bund, Loose Boulder Structures, Gabion, Bench terracing, naturally filled farm ponds,	Use of harvested water for protective irrigation to adjoining fields, groundwater recharge	State department of agriculture, NGOs	Planning and execution of water conservation strategies should be done after *Rabi* season

-	Repairing of Continuous Counter Trenches, plantation on CCT,	Groundwater recharge	State department of agriculture, NGOs, social forest, KVKs	Planning and execution of water conservation strategies should be done after R*abi* season
Stream	Drainage line treatment	Use of harvested water for protective irrigation to adjoining fields, groundwater recharge	State department of agriculture, NGOs	Planning and execution of water conservation strategies should be done after *Rabi* season
Construction of storage tanks at field level Lining of ponds Use of Cetyl Alcohol for reducing evaporation (10 ml per sq. m)	Storage of excess water during *Kharif* season	Use of stored water for protective irrigation during flowering/grain filling stages of *Kharif* crop and initial growth stages of *Rabi* crops	State department of agriculture and NGOs	Stored water should be used for protective irrigation using sprinkler /drip irrigation methods
Pasture development on barren/fallow land (*Stylo hemata*), Palas, Bhendi etc.	Control of erosion and infiltration of runoff	Fodder for animals, reduce erosivity of rainfall and soil erosion	State department of agriculture and Animal Husbandry and NGOs	-
Horticultural plantation on sloppy land	Semi-circular basins across the slope	Harvesting of runoff and reduction in erosion	State department of agriculture and NGOs	-

9.2 Contingency

Extreme Event / Conditions	Suggested Contingency Measures	Convergence / Linkages			Remarks for implementation
		Before the event	During the event	After the event	
High rainfall with runoff	Diversion drains	Diversion of runoff through paddy fields	-	State department of agriculture and NGOs	State department of agriculture, NGOs
Dry spell	Harvesting excess runoff if available	Protective irrigation from the harvested water	-	State department of agriculture and NGOs	State department of agriculture, NGOs
Storage tanks	Plantation of bamboo/silver oak around the storage tanks as wind breaks	Use of Cetyl Alcohol for reducing evaporation (10 ml per sq. m)	-	State department of agriculture and NGOs	-

10. Contingency Plans for Rabi and Summer Crops

10.1	Field crops (For crops grown with residual moisture i.e., under rainfed condition)				
Condition	**Soil type**	**Crop name**	**Sowing Window**	**Variety**	**Management practices**
Excess residual moisture	Soil type: Light to Medium soil with high rainfall (847-1017 mm)	Summer Groundnut	15th Jan to 15th Feb	TAG-24, JL-286, Phule-Unnati, Phule-Bharati	Use BBF technique for sowing
		Pearl Millet	15th Jan to 15th Feb	Phule- Mahashakti, Phule- Adishakti, Phule- Dhanshakti,	Planning of cropping system as per land capability class. Eg. Strip cropping (Pearl millet + Horse gram or Pearl millet + Moth bean 3:1), on class III and class IV and paddy on class II and III.
		Cow pea	15th Jan to 15th Feb	Phule Pandhari Phule Vithai	Seed treatment with trichoderma plus @ 5 g /kg seed
		Summer Green gram	15th Jan to 15th Feb	Phule Vaibhav	Seed treatment with Thiomethaxam @ 3 g /kg seed
Condition	**Soil type**	**Crop name**	**Sowing Window**	**Variety**	**Management practices**
Less than optimum moisture i.e., 25% less than normal, which can happen due to insufficient rainfall during September/October months. Deficit of 20-40% rainfall	Soil type: Light to Medium soil with high rainfall (847-1017 mm)	Beans	15th Sept –15th oct	Vijay	1.Applicatuion of DAP fertilizer at the time of sowing. 2.Pest management-collection and destruction of larvae, use of pheromone trap 5 traps/acre. 3.Errection of wooden antennae as a bird parch and spraying of 5% NSKE.
		Gram	15th Sept –15th oct	Vijay , Digvijay	1.Applicatuion of DAP fertilizer at the time of sowing. 2.Pest management-collection and destruction of larvae, use of pheromone trap 5 traps/acre. 3.Errection of wooden antennae as a bird parch and spraying of 5% NSKE.

11. Operationalisation of Climate Change Contingency Plans

A successful contingency plan can support appropriate action following a risk event by delivering a more rapid and organised response, as the risk event is identified early, it can minimise further impacts. Contingency planning can ensure a more rapid response, as decisions about when and how to respond have been made and agreed in advance. Thresholds and trigger points are decided and therefore acted on quickly and with agreement. The response are better organised and more effective, as plans are better prepared as there is time to collect information and decide adaptation options. Decision making is more thorough as it is not hurried or made under pressure. Stakeholders are informed about the risks, prepared in advance for the responses required, and key players are identified and assigned responsibilities. Where a multi-agency response is necessary the appropriate communication channels and operational processes can be established, individuals/institutions can be identified and assigned responsibility, and decision making criteria and response options are agreed in advance (Climate Exchange, 2018).

In order to ensure that the contingency plans prepared are used to address the real needs of the climate change linked weather aberrations, necessary institutional and implementation framework needs to be put in place at village level. As indicated by CRIDA, any contingency measure, either technology related (land, soil, water, crop) or institutional and policy based, which is implemented based on real time weather pattern (including extreme events) in any crop growing season is considered as Real Time Contingency Planning (RTCP). If done timely and effectively, RTCP contributes household and village food and fodder security. In order to ensure the contingency plans work on a real time basis suitable operational/ implementation mechanism need to be evolved carefully based on the actions proposed under such plans.

Climate Change contingency plans prepared for 7 villages in Akole block of Ahmednagar district of Maharashtra, give important tools at the hands of Village Watershed Committees (VWCs) under NABARD's 'Climate Proofing of Watershed' projects. These plans essentially suggest coping strategies/measures in agriculture, horticulture, livestock, fisheries and poultry sectors in an event of delayed onset of monsoon, seasonal drought, unseasonal rainfall events, floods, cyclones, hail storm, heat/cold wave, etc. The contingency actions suggested under these plans needs to be executed in a timely manner and would require range of operational and technical measures in dealing with various climate change variabilities / impacts before they occur or when they are in progress.

As indicated by Rao, *et.al.*,2016 , the real-time contingency measures aim to (i) to establish a crop with optimum plant population during the delayed onset of monsoon; (ii) to ensure better performance of crops during seasonal drought (early/mid and terminal drought) and extreme events, enhance performance, improve productivity and income; (iii) to minimize damage to horticultural crops/produce; (iv) to minimize physical damage to livestock, poultry and fisheries sector and ensure better performance) to ensure food security at village level and (vi) to enhance the adaptive capacity and livelihoods of the farmers. Srinivasa Rao, *et al.*, 2013, suggested that initial preparedness for drought - for implementation of real time contingency planning, may consist of four stages: preparedness, mitigation, relief and rehabilitation. For this, village level institutions play greater role to provide inputs such as suitable seed, fertilizers, and need based farm implements during crop growing season and they need to be liked to suitable institutional mechanisms.

One of the advantages of implementation of climate change contingency plans at village level on a watershed basis is the availability of community based institutions such as Village Watershed Committee, Farmers Collectives/ Farmer Producer Organisations, Self Help Groups (SHGs), for operationalisation of these plans. These institutions during implementation of watershed projects have demonstrated collective action for common goods. The role of these stakeholders for operationalisation of the contingency plan need to be structured such as way that the necessary action is triggered in a required timeframe.

11.1 Preparedness Action

As seen from the contingency plan documents, various initiatives under the contingency plan can be considered as readiness measures. As the villages for which this contingency plan is prepared were part of the watershed project implementation and subsequently the watersheds were also included under NABARD's climate proofing projects, it is expected that the required prepared/ readiness actions should have been covered as part of the watershed and climate proofing project implementation. However, based on the contingency plans now prepared, the VWCs of these 4 watersheds can revisit the status of watersheds/ villages in terms of the preparedness action required/ prescribed in the contingency plans.

11.2 Agriculture and Horticulture Sector

The action areas, under agriculture sector, based on further village level deliberations, to address prevalent/proposed cropping system challenges, may include (i) training and capacity building of farmers on suggested measures crop cultivation and its management need to be imparted (KVKs, Agri. Dept., Research Centre – ZRS, REC may be involved) (ii) creation seed banks and promotion of seed village concept (FPOs may take-up the initiative with support of PIA – BAIF) (iii) collective input and post-harvest management (PFOs with support of PIA – BAIF) (iv) creation of implement bank as per the cropping system requirement (collaboration/ convergence with government programmes, support under NABARD's sanction programme savings,if any, – BAIF can facilitate the process). (v) Operationalisation of weather based crop advisory services and its sustainability (PIA- BAIF to facilitate as per the sanction project components under NABARD project, use of *Gramin Krishi Mausam Seva*). (vi)Vegetable crops under *kharif* and *rabi* season are particularly vulnerable to climate variability. Separate training and capacity building efforts would be made for vegetable and fruit crop growers. (v) The crop demonstrations planned under the climate proofing projects of NABARD, need to be planned in such a way that they demonstrate the ability to respond to the climate variability. (vi) Local youth need to be trained to work as para-workers supporting the implementation of climate change contingency and action planned. The climate resource centres approved under NABARD's climate proofing projects would be supported by these local youths. These resource centres would work as local data centres having information regarding current scenarios of agriculture, weather and current field activities, etc.

11.3 Irrigation and Water Management

Many of the measures under the irrigation and water management sector can be considered from preparedness point of view. VWCs may revisit these actions proposed under the contingency plan vis-à-vis already implemented measures under watershed and climate proofing projects. (i) The water saving devices such as sprinkler and drip irrigation measures can support prudent water management strategy proposed under contingency plan. The same is

also part of implementation of climate proofing measures. Further efforts may be made to promote use of micro irrigation under suitable cropping patterns in convergence with government programmes. PIA- BAIF may prepare the eligible list of farmers and coordinate with the Agri. Department as well as with financial institutions (if required), to promote micro irrigation in project villages. (ii) To ensure availability of water resources structures/interventions to support lifesaving irrigation as suggested under contingency planning, VWC/PRIs may implement additional measures under climate proofing project (based on saving and feasibility) or through convergence with Government programmes (e.g. NREGS). (iii) Creation of necessary drainage system for management of excess rainfall, consequent water stagnation and crop loss, is critical as suggested under contingency plan. PIA-BAIF may in consultation with VWCs/ PRIs may identify such locations where there is possibility of such water stagnation and crop loss suitable drainage measures may be implemented. Irrigation Advisory System can be implemented by MPKV Rahuri with the help of localized weather and agriculture information.

11.4 Livestock, Poultry & Fisheries Sector

The action areas suggested under the AH & Fisheries sector would involve some of the preparedness action such as promotion of local resilient breed, creation of fodder banks (including silage making), fodder cultivation on field bunds and village commons, training and capacity building of farmers on animal health management, conducting of animal health camps/vaccination camps at regular interval, training of youths to work as animal health para-workers, etc. In each village, one or two youths can be identified to work as animal health para-workers, who would coordinate with the VWC, PRI and PIA-BAIF for supporting delivery of animal health services. BAIF may make necessary efforts for promotion cattle insurance. Specific efforts are required by VWC and PIA - BAIF to promote climate resilient / scientific animal / poultry shelters. Awareness campaign on livestock health management and vaccination may be conducted with the support of local livestock extension machinery to counter climate variability and its impact.

Based on the processes indicated above, each village level implementation framework need to be evolved by the VWCs and PIA – BAIF. The contingency plans have already been translated in the local language (*Marathi*) which would facilitate the village level stakeholder consultation and action planning. Multi stakeholder engagement is important for implementation of contingency plans. The role of stakeholders, viz., community-based organisations (VWC, SHGs, etc.), PRIs (gram panchayat), local KVK/ Research Centres (ZARS), CSO (NGO-BAIF), districts/block agriculture department/ administration, etc., is critical in implementation of these plans. Consultative processes are to be held at village level based on the above approach to arrive at the village specific implementation and response mechanism to operationalise these plans. The contingency plan implementation processes indicated above are summarised in the flow chart given below.

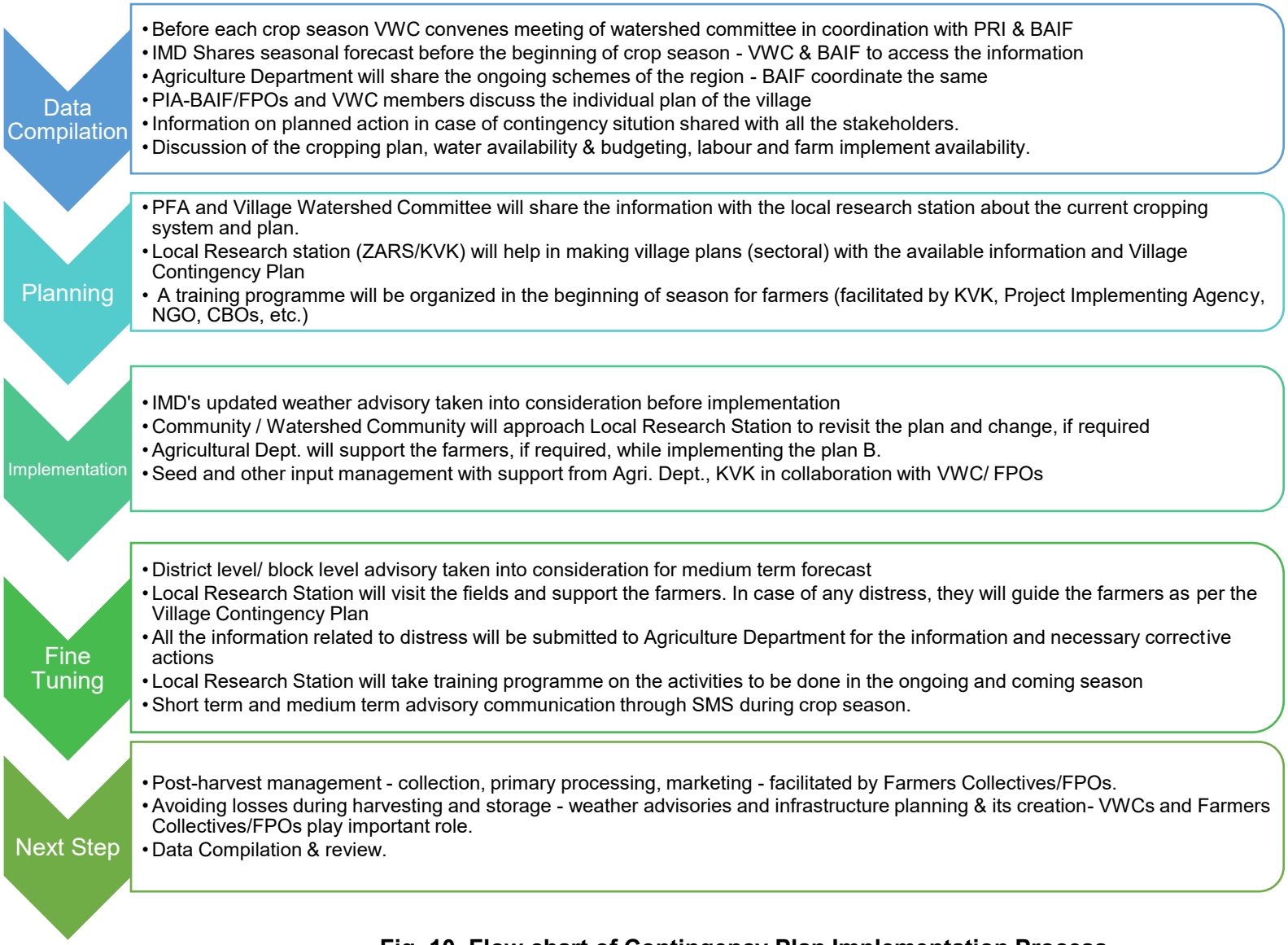

Fig. 10. Flow chart of Contingency Plan Implementation Process

12. References

- Agricultural Statistical Information, Maharashtra State, 2019.
- Ahmednagar District Socio-Economic Review, 2019. https://ahmednagar.nic.in/document-category/dsa/
- Cadastral maps of Akole block, https//mahabhunakasha.mahabhumi.gov.in, 2019.
- Chief Planning Officer, Fisheries Department, 2019.
- Climate Exchange, 2018, "The Role of Contingency Planning in Climate Change Adaptation for the Forestry Sector in Scotland". www.climatexchange.org.uk
- Comprehensive District Agriculture Plan, Ahmednagar, 2019.
- Department of Soil Science and Agricultural Chemistry, MPKV Rahuri, 2019.
- PRA Village Meeting, 2019.
- Srinivasa Rao, Ch., Rattan Lal, Prasad, J.V.N.S., Gopinath, K.A., Rajbir Singh, Vijay S. Jakkula, Sahrawat, K.L., Venkateswarlu, B., Sikka, A.K. and Virmani, S.M., 2015b, "Potential and Challenges of Rainfed Farming in India", Adv. Agron., 133, 113-181.
- Srinivasarao Ch, Ravindra Chary G, Mishra PK, Nagarjuna Kumar R, Maruthi Sankar GR,
- Srinivasarao, Ch., Ravindra Chary, G., Rani, N. and Baviskar V.S., 2016, "Real Time Implementation of Agricultural Contingency Plans to Cope with Weather Aberrations in Indian Agriculture", MAUSAM, 67, 183-194.
- State/ Central Ground Water Department /Board, 2019.
- Venkateswarlu B and Sikka AK. 2013. Real Time Contingency Planning: Initial Experiences from AICRPDA. All India Coordinated Research Project for Dryland Agriculture (AICRPDA), Central Research Institute for Dryland Agriculture (CRIDA), ICAR, Hyderabad - 500 059, India. 63 p.

13. Annexure

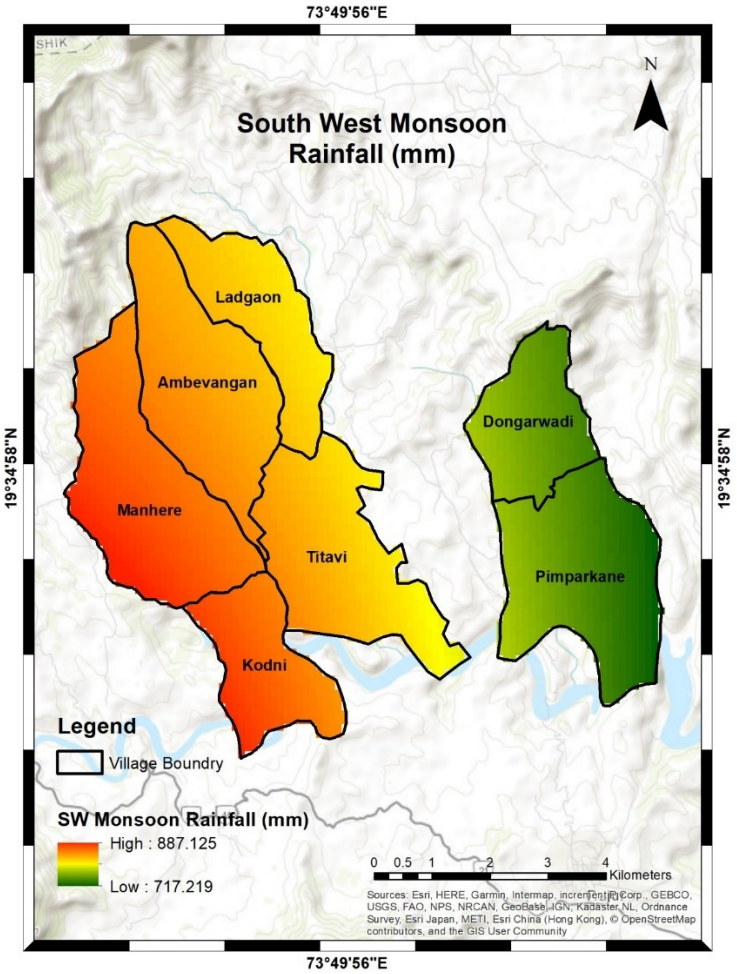

Fig. 11. Map of South West Monsoon Rainfall (mm) of selected villages in Akole Block of Ahmednagar district

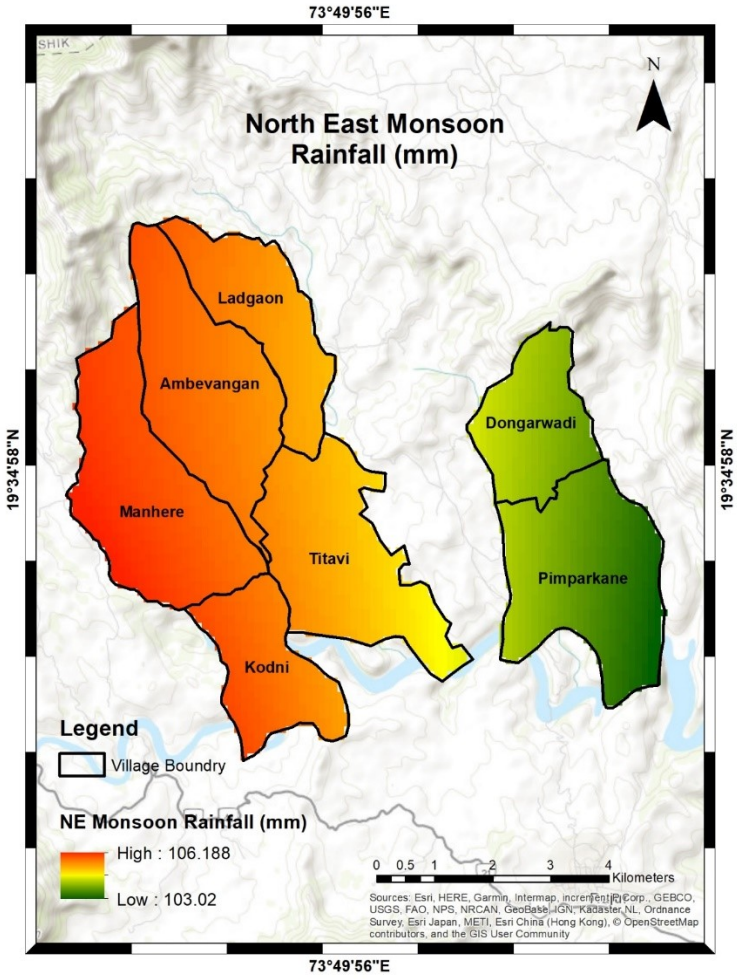

Fig. 12. Map of North East Monsoon Rainfall (mm) of selected villages in Akole Block of Ahmednagar district

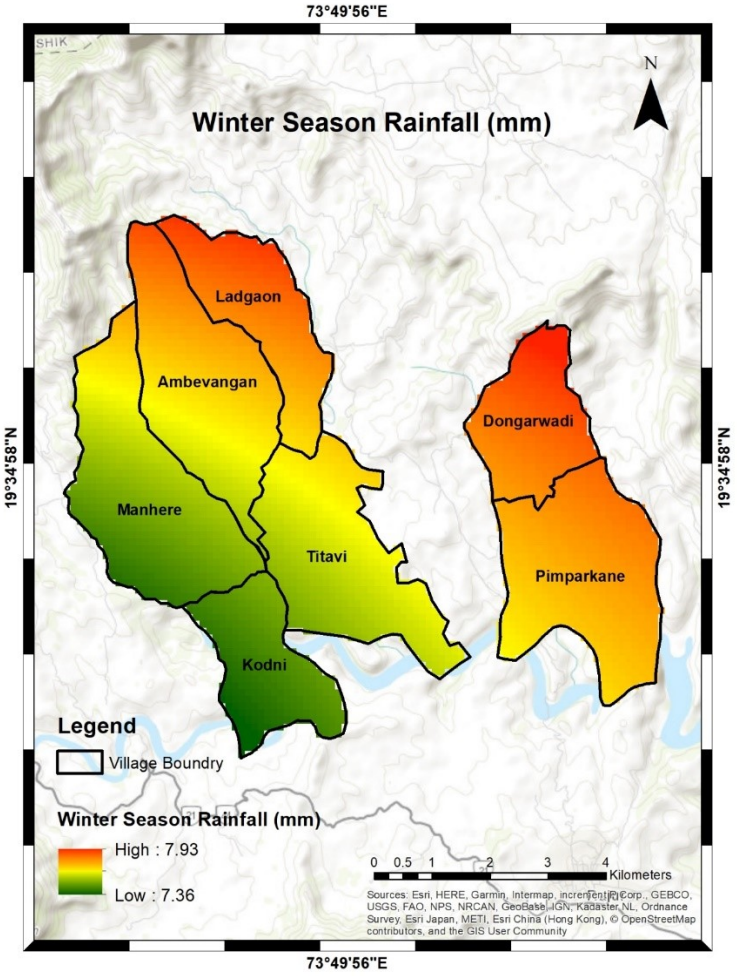

Fig. 13. Map of Winter Season Rainfall (mm) of selected villages in Akole Block of Ahmednagar district

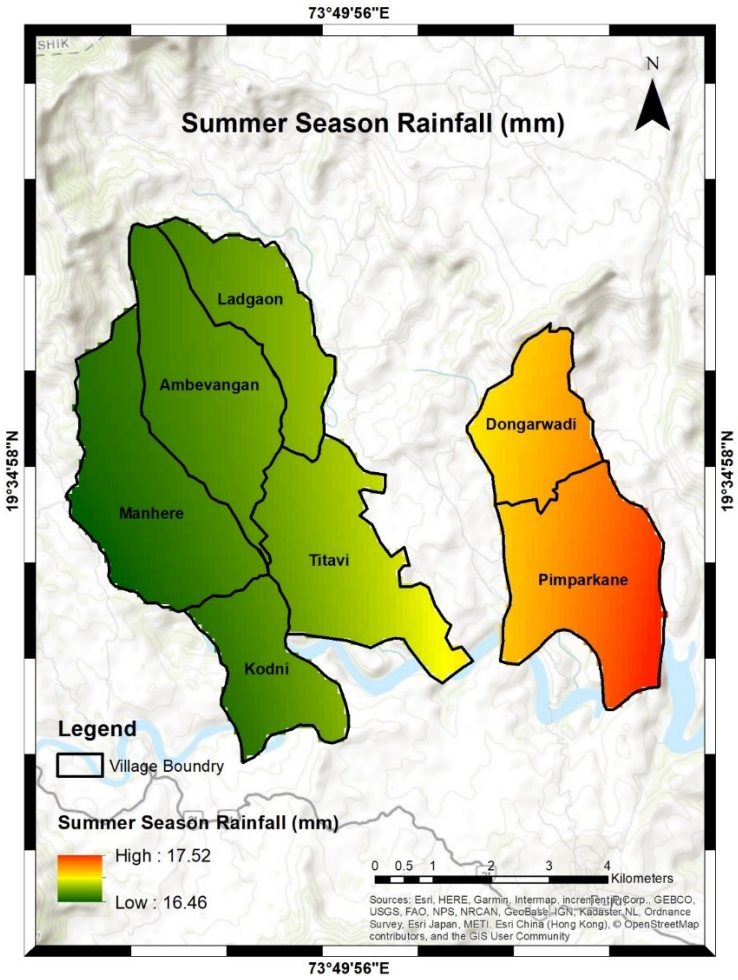

Fig. 14. Map of Summer Season Rainfall (mm) of selected villages in Akole Block of Ahmednagar district

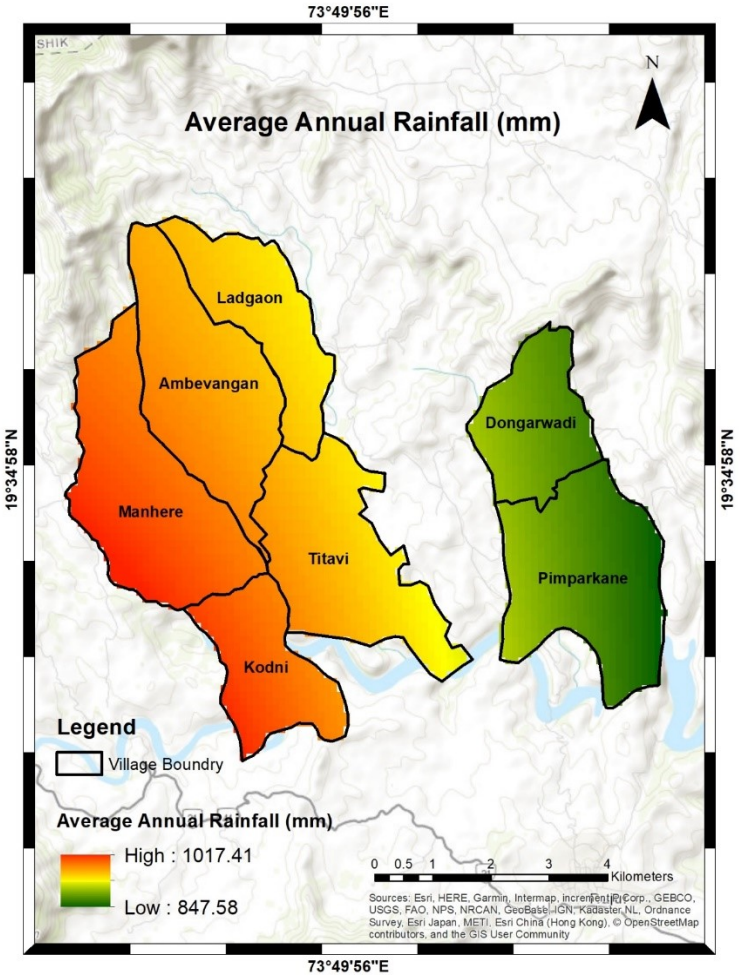

Fig. 15. Map of Average Annual Rainfall (mm) (1989-2018) of selected villages in Akole Block of Ahmednagar district

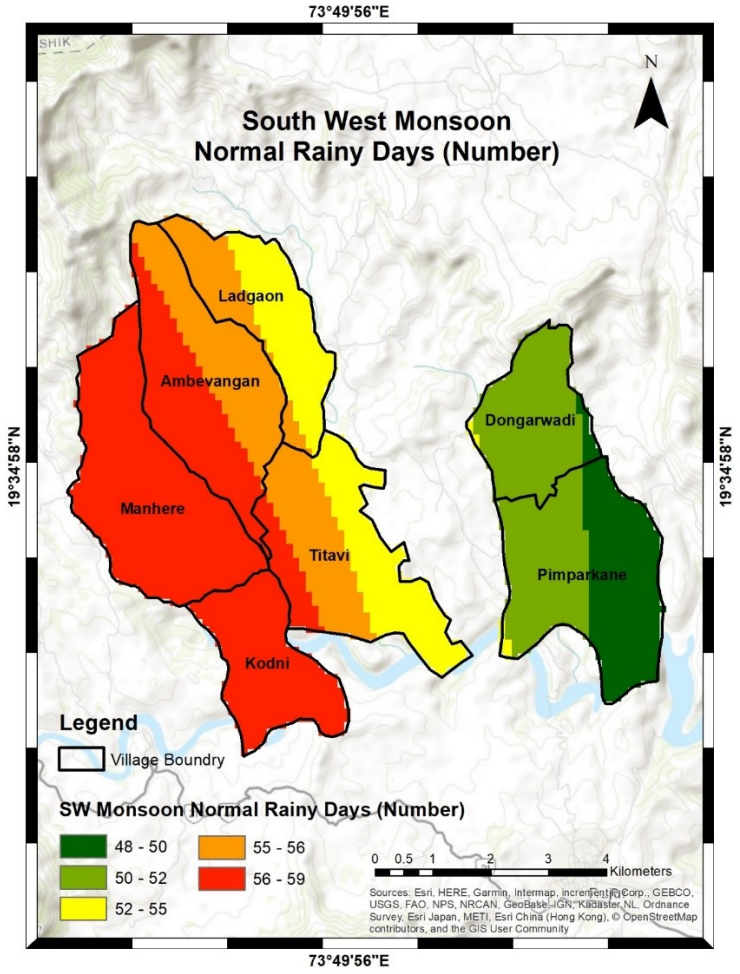

Fig. 16. Map of South West Monsoon Normal Rainy Days (Number) of selected villages in Akole Block of Ahmednagar district

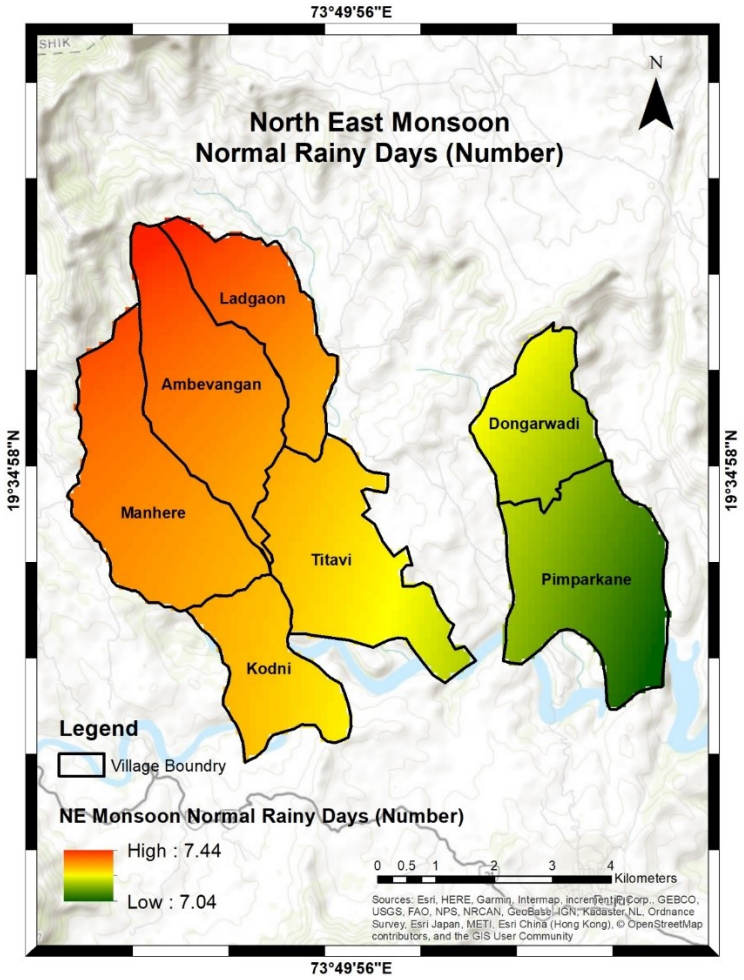

Fig. 17. Map of North East Monsoon Normal Rainy Days (Number) of selected villages in Akole Block of Ahmednagar district

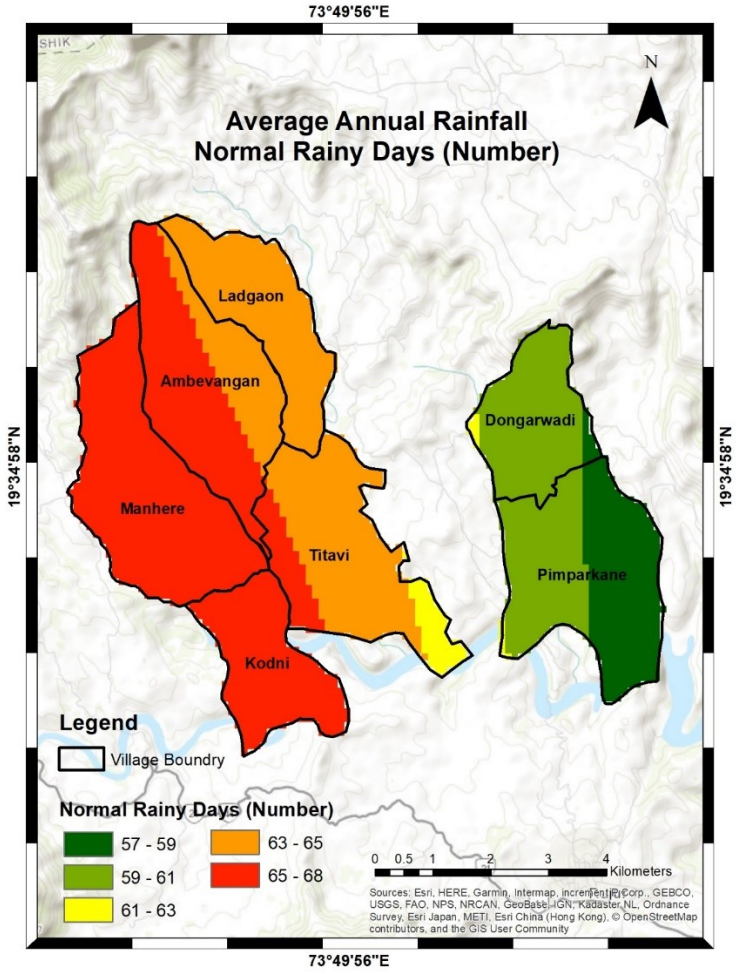

Fig. 18. Map of Average Annual Normal Rainy Days (Number) of selected villages in Akole Block of Ahmednagar district

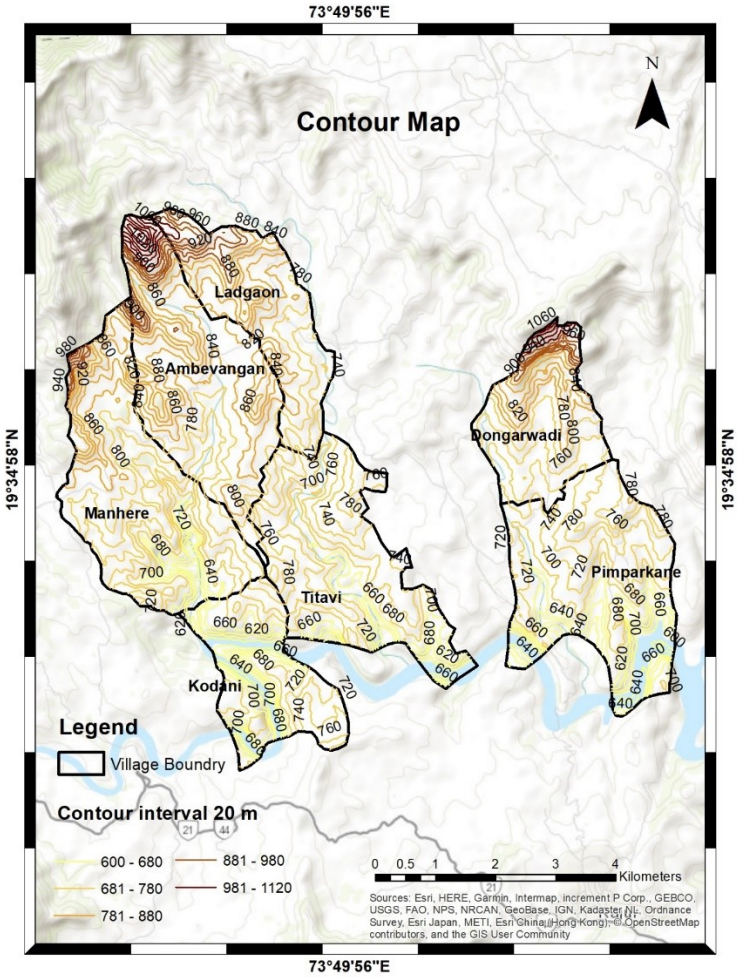

Fig. 19. Contour Map of selected villages in Akole Block of Ahmednagar district

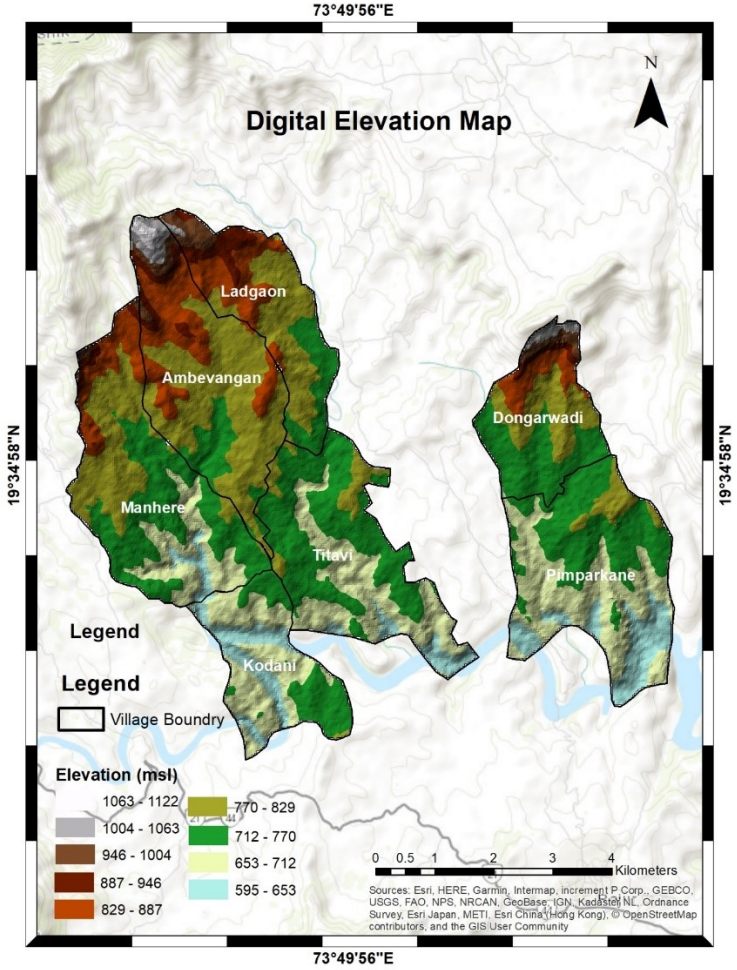

Fig. 20. Digital Elevation Map of selected villages in Akole Block of Ahmednagar district

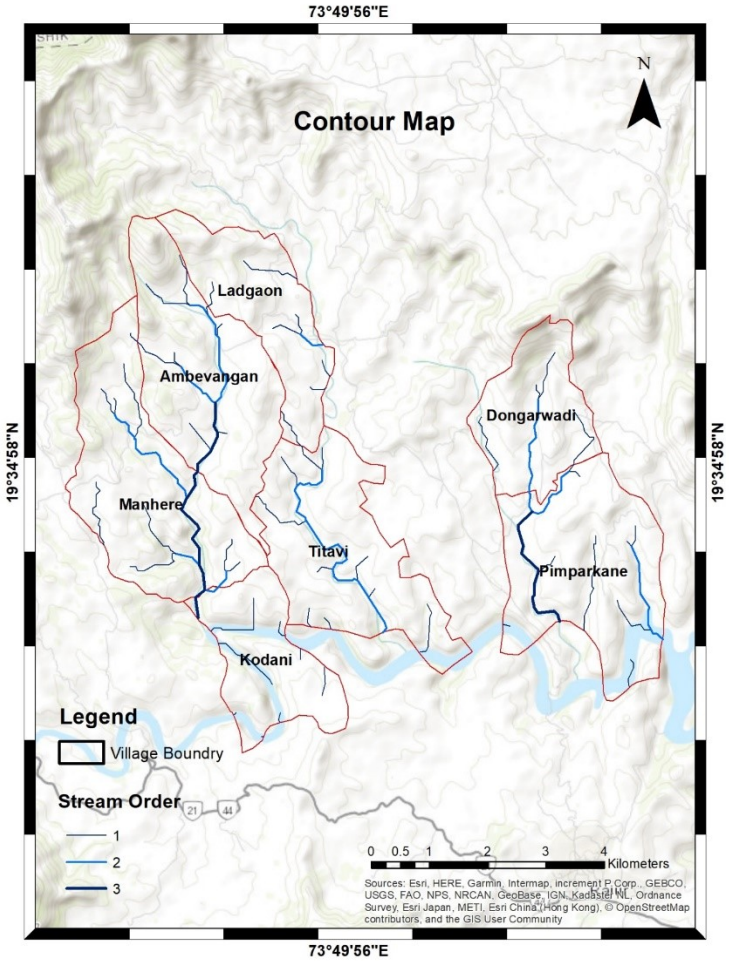

Fig. 21. Drainage Network Map of selected villages in Akole Block of Ahmednagar district

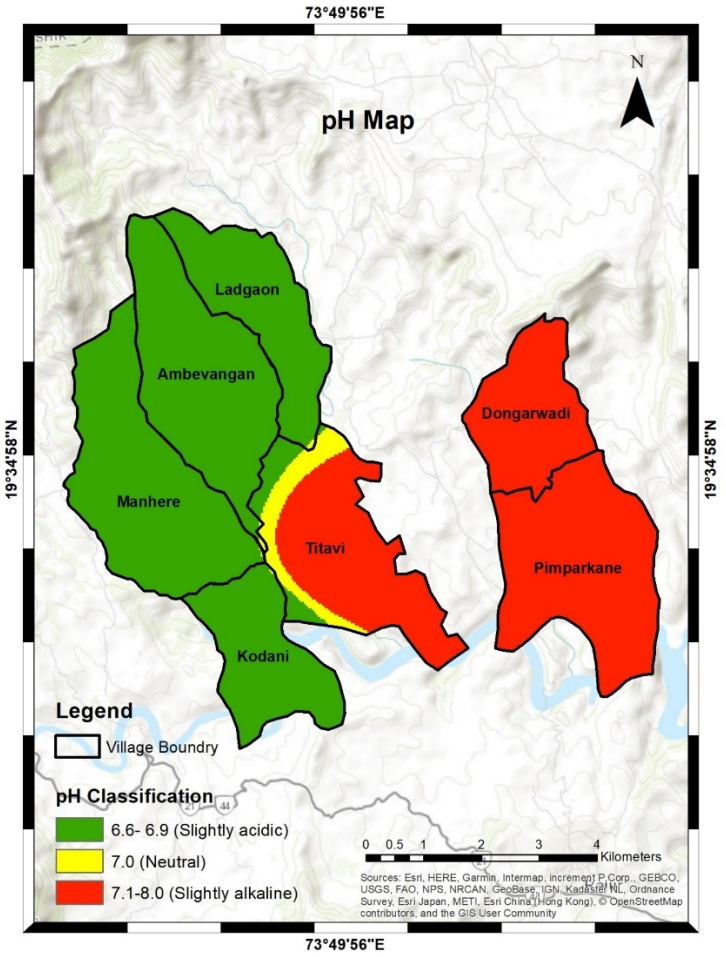

Fig. 22. pH Map of selected villages in Akole Block of Ahmednagar district

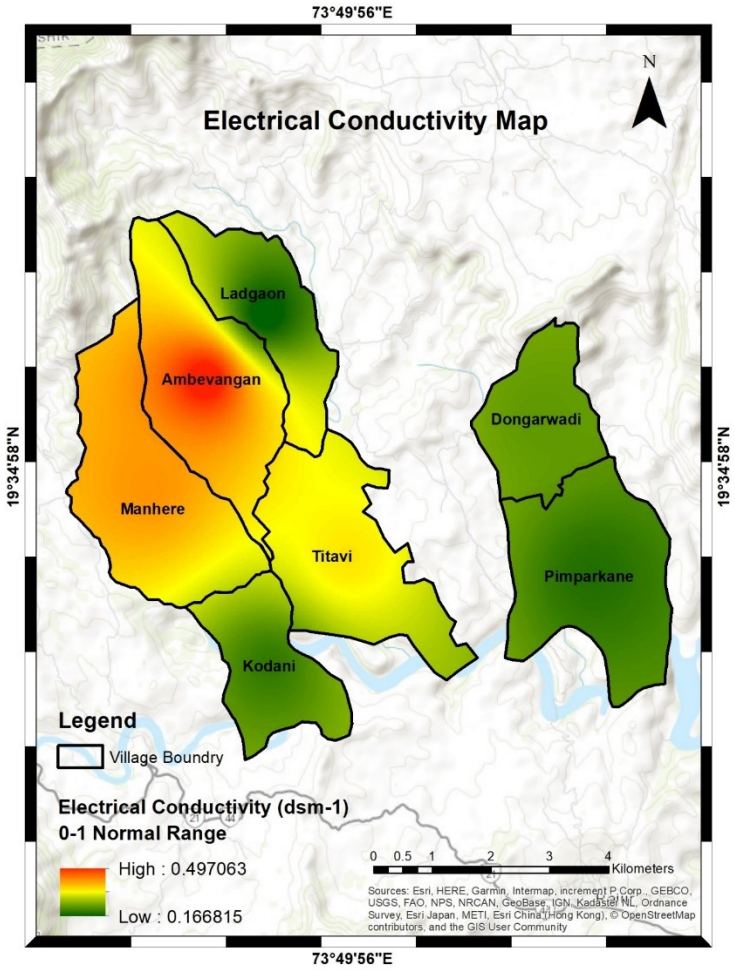

Fig. 23. Electrical Conductivity Map of selected villages in Akole Block of Ahmednagar district

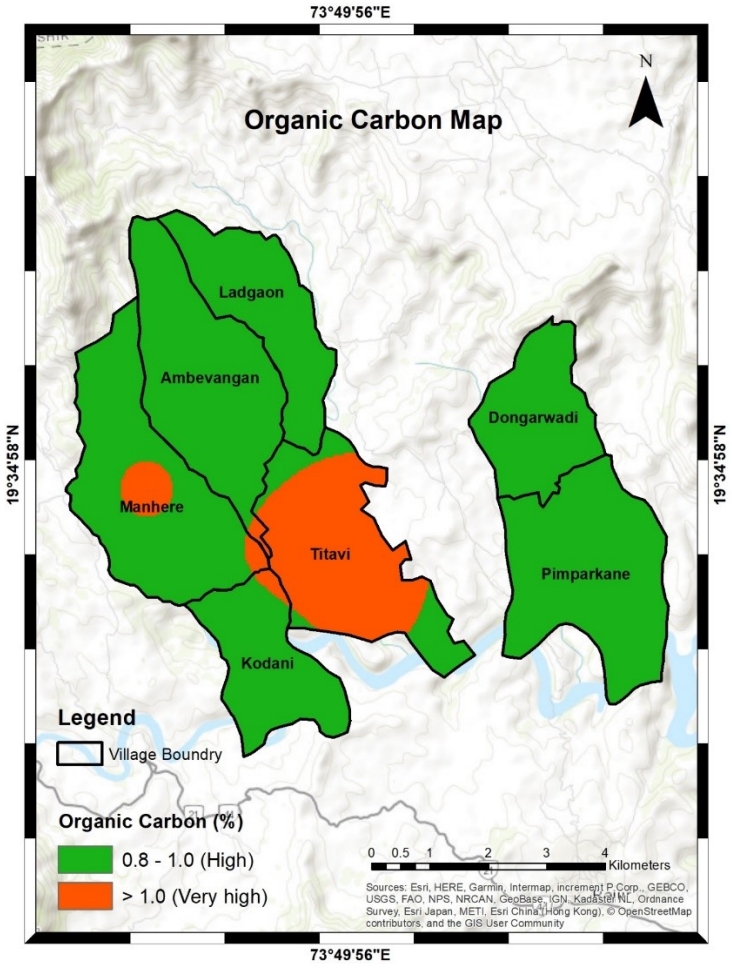

Fig. 24. Organic Carbon Map of selected villages in Akole Block of Ahmednagar district

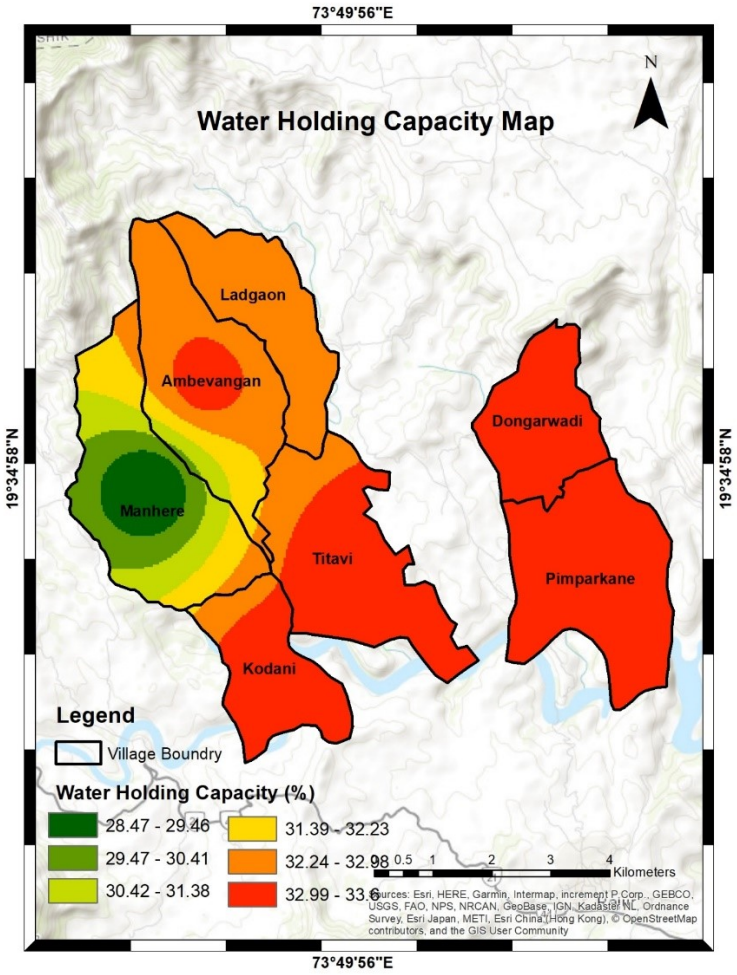

Fig. 25. Water Holding Capacity Map of selected villages in Akole Block of Ahmednagar district

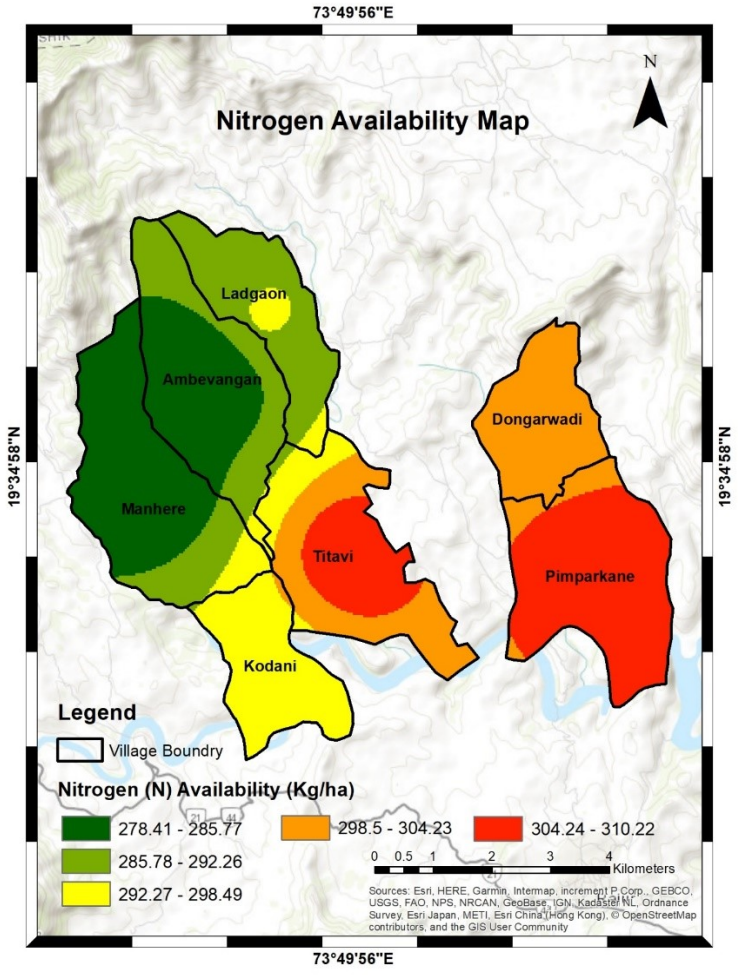

Fig. 26. Nitrogen Availability (N) Map of selected villages in Akole Block of Ahmednagar district

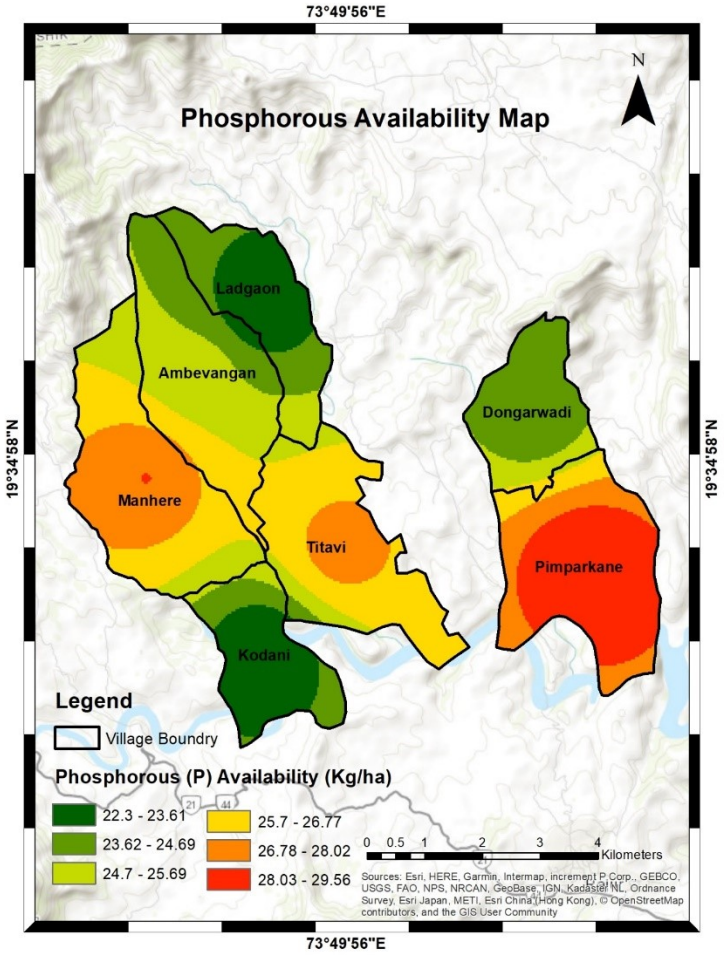

Fig. 27. Phosphorus (P) Availability Map of selected villages in Akole Block of Ahmednagar district

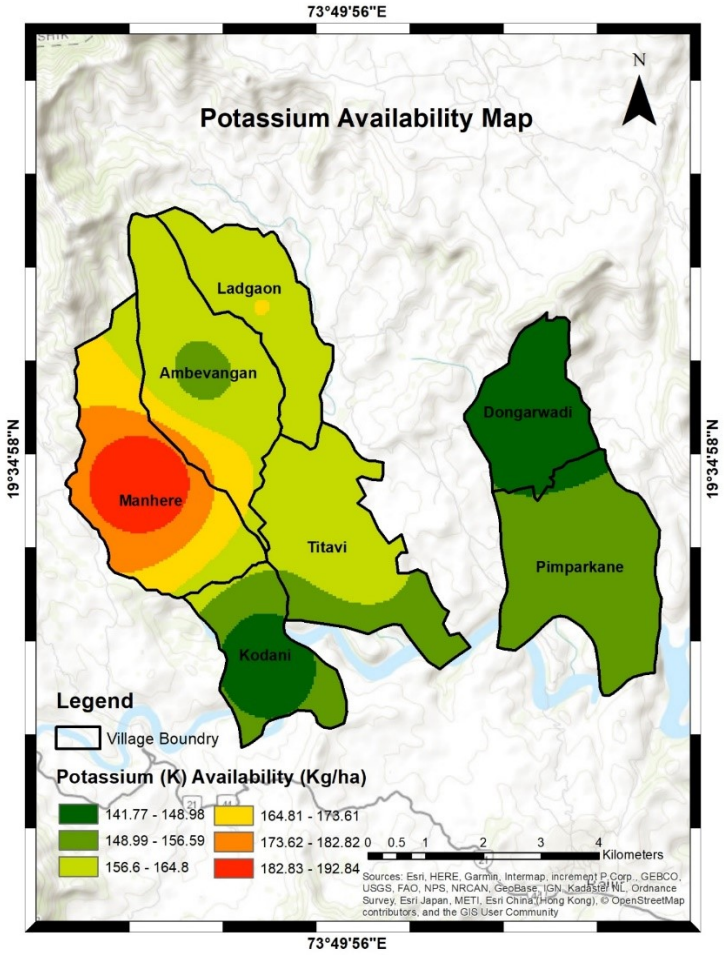

Fig. 28. Potassium (K) Availability Map of selected villages in Akole Block of Ahmednagar district

14. Experts/ participants attended the VLCCP workshops

- Dr. K.D. Kokate, Former DDG (Edn.), ICAR New Delhi and Former Director of Extension Education, MPKV Rahuri
- Dr. D.D. Pawar, Associate Dean, Dr. ASCAET, MPKV, Rahuri
- Dr. N.N. Firake, Head, Dept. of Irrigation and Drainage Engineering, Dr. ASCAET, MPKV, Rahuri
- Dr. M.C. Ahire, Head, Dept. of Extension Education, MPKV, Rahuri
- Dr. B.D. Bhakare, Head, Dept. of Soil Science and Agril. Chemistry, MPKV Rahuri
- Dr. V. M. Amrutsagar, Chief Scientist and ADR, ZARS, Solapur
- Dr. P.U. Raundal, Associate Professor (Agronomy), College of Agriculture, Dhule, MPKV Rahuri
- Dr. S.M. Nalawade, Head, Dept. of Farm Machinery and Power Engineering, MPKV, Rahuri
- Dr. K.J. Kamble, Head, Dept. of Agriculture Process Engineering, Dr. ASCAET, MPKV, Rahuri
- Dr. S.A. Kadam, Scientist (IDE), AICRP on IWM, MPKV Rahuri
- Dr. S.K. Upadhye, Assistant Professor (SWCE), ZARS, Solapur
- Dr. R.M. Gethe, Sr. Scientist (Agronomy), AICRP on Dry Land Agriculture, Solapur
- Dr. K.K. Dakhore, Agrometeorologist, VNMKV, Parbhani
- Dr. D.K. Kathmale, Officer Incharge, Agricultural Research Station, Sangli
- Dr. B.V. Asewar, Chief Scientist AICRP on Dry Land Agriculture, VNMKV, Parbhani
- Dr. P.S. Bodake, Head, Dept. of Agronomy, DBSKKV Dapoli
- Mr. Balnath Sonwane, B.T.M. ATMA, Akole
- Mr. G.N. Nirwan, BAIF, Akole Block
- Mr. P.P. Survase, Sr. P.O. BAIF, Nasik
- Mr. Sandip Pawar, Program Engineer (SWCE), BAIF, Satara
- Mr. Prasad Rao, Programme Manager, BAIF, Nasik
- Mr. S.B. Thete, A.P. O. BISLD, Igatpuri
- Mr. Sanjay Patil, BAIF, Nasik
- Mr. P.S. Hinge, Farm Manager, BAIF, Akole Block
- Mr. J.G. Sathe, RI, BAIF, Nasik
- Dr. Rajeshree Joshi, CTPE, BAIF, Pune
- Dr. J. R. Kulkarni, Ex. Advisor, IITM, Pune
- Mr. N.B. Dahatonde, SMS, Horticulture, KVK, Dahigaon
- Mr. T.B. Gabhale, Farmer, Akole Block
- Mr. K. D. Kurwande, Farmer, Akole Block
- Mr. G. R. Wambere, Farmer, Akole Block
- Mr. D. D. Mundhe, Farmer, Akole Block
- Mr. S. G. Bambale, Farmer, Akole Block
- Mr. S. N. Dhonde, Farmer, Akole Block
- Mr. T. B. Gabhale, Farmer, Akole Block
- Mr. K. D. Kurwande, Farmer, Akole Block
- Mr. G. R. Wambere, Farmer, Akole Block
- Mr. D. D. Mundhe, Farmer, Akole Block
- Mr. S. G. Bambale, Farmer, Akole Block


Stakeholder Workshop
BAIF


REDMI NOTE 5 PRO


REDMI NOTE 5 PRO


YAMAHA


BAIF


COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY

NAHEP

Indian Council of Agricultural Research-National Agricultural Higher Education Project
(ICAR-NAHEP), New Delhi

Centre for Advanced Agricultural Science and Technology for Climate Smart Agriculture and Water Management (CAAST-CSAWM)

Mahatma Phule Krishi Vidyapeeth, Rahuri

413 722 Maharashtra, India

www.mpkc-caast.ac.in, info.rahuri@mpkv-caast.ac.in

ISBN 978-93-5408-947-3