Inception Report
For
Monitoring & Evaluation (M&E) for Project on Climate Resilient Agriculture (PoCRA) in the Rest of the Project Area

Submitted To

PMU-Project on Climate Resilient Agriculture (PoCRA)

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1. Introduction

1.1. Climate Change Context

Climate Change is one of the biggest challenges of the 21st Century, affecting people's lives worldwide. Even though the impacts of climate change are global, countries like India are at a higher risk, due to a large vulnerable population dependent on climate sensitive sectors for livelihoods. These include agriculture, animal husbandry, forestry, water resources and biodiversity. As per the climate trend analysis, India has seen an increase of 0.4°C in the mean surface air temperature over the past century (1901-2000).

Analyses of the country's historic climate data support the extent of the change taking place: an increase in mean annual temperature (0.56 degree Celsius between 1901 and 2007), as well as a decrease in seasonal mean rainfall with more frequent extreme rainfall events. Looking ahead, temperatures are projected to increase further and at a faster rate than before (by 1.7 to 2.0 degree Celsius by 2030s), coupled with an overall increase in monsoon rainfall (with an increase in geographic variability) and extreme precipitation events.

With an economy tied to its natural resource base and climate sensitive sectors, this could cost India around 2.8 per cent of the GDP and impact the lives of more than half the population. This will also significantly reduce the crop yields by 4.5 to 9 per cent, depending on the magnitude and distribution of warming (Source: National Initiative on Climate Resilient Agriculture).

1.2. Maharashtra & Project Area Context

Agriculture is the major occupation of the people in Maharashtra. The share of agriculture and allied activities in the total Gross State Value Added (GSVA) is 12.5 per cent[1]. Even though it shows a decreasing trend[2], a large population, especially in the rural areas is dependent on the sector for their livelihoods. Reduction in the average landholdings size[3], increase in small & marginal farmers, monsoon variabilities, water use efficiency and market fluctuations are some of the major challenges for the state. Around 40% of the state falls under drought prone area, having annual average rainfall less than 750 mm (29.5 in). Drought is observed in the state once every 5 years. In Maharashtra, agriculture has grown at an annual

[1] Economic Survey (ES), 2016-17
[2] 15.3 per cent in 2001-02 (ES, 2016-17)
[3] The State ranks 10th in average size of operational land holding (1.44 ha) amongst all states, as per Agriculture Census 2010-11. Small & marginal (up to 2.0 ha) constitute 78.6 per cent of the total number of operational land holdings (Source: ES, 2016-17)

average of 3.5 per cent from 2004-05 to 2014-15, but growth in the sector fluctuates heavily and is depending on highly erratic rainfall during any particular year and rainfall variability over time. The distribution of rainfall is highly uneven within the state and ranges from over 4000 mm per annum in coastal areas to less than 400 mm in some of the most arid districts.

Agriculture remains the highest user of freshwater, withdrawing more than 80 per cent of the surface and groundwater ("blue water") available to the state. Since the continuation of the State's strong economic growth performance would have to be supported by higher water availability in all three sectors of the economy, there is a need for Maharashtra to better manage its water resources and in particular to enhance the efficiency of the water used for agriculture and focus on increasing the availability and use by the agriculture sector of "green water" (rainwater stored in the soil as soil moisture). Severe consecutive droughts experienced in large parts of Maharashtra in recent years have considerably affected the state's agricultural performance and social fabric in rural areas, and have prompted the highest-level state authorities to declare "drought proofing" of agriculture a key development priority of Maharashtra.

Vidarbha is one of the most drought prone area in the state, along with Marathwada. Vidharbha region lies in the eastern part of Maharashtra comprising 11 districts out of which 7 have been selected as part of the Rest of Project area for PoCRA. The region occupies 31.6% of total area and holds 21.3% of total population of Maharashtra. Most of the crops are rain-fed comprising of cotton, soybean, pigeon peas and chickpeas. According to ministry of Agriculture, cultivation of BT cotton in the region has added to the crisis, since the variety is sensitive to the water shortages. This has made cotton cultivation a high risk –high cost cultivation system in the region without assured irrigation and irregular rainfall.

According ICRISAT reports, Climate Change has become a reality in Vidarbha region. IPCC states that extreme weather events are on the rise. The AR5 of IPCC says that rainfall will become more erratic, rainy days will reduce and intensity of rainfall will increase.

Given the above challenges, the Agriculture task force constituted by the NITI Aayog along with State govt. has proposed the following objectives for the DoA, GoM:

- Integrated farming approach, which includes Horticulture, Dairy & Animal Husbandry, Poultry, Fishery, Watershed infrastructure etc.
- Increasing production and productivity of crops.
- Timely supply of quality inputs viz. fertilizers, Insecticides, Seed etc. to farmers.

- Dissemination of technology developed in agriculture and allied sector.
- Collection of agriculture and allied data and area, production, productivity through crop cutting experiments and use of collected data for future planning.
- Horticulture development and soil health improvement through Mission.
- Use of micro-irrigation system for increasing area under irrigation and productivity of water.
- Promotion of Agriculture Mechanization to overcome the problems of labour shortage.
- Promotion for Organic Farming.
- Preparing for exploiting global opportunities in fruits & vegetables while emphasizing the dual approach increase in food security.

In the light of above challenges and strategy, a flagship *Project on Climate Resilient Agriculture in Maharashtra (PoCRA)* with the support of the World Bank is being implemented in the drought prone regions of Maharashtra.

Figure 1: PoCRA Project Area (Source: PoCRA PAD)

1.3. PoCRA Project & Its Significance

The strategy for accelerating agricultural growth requires action in terms of bringing technology to the farmers, improving the efficiency of investments, increasing areas under irrigation, increasing systems

support and rationalizing subsidies, diversifying cropping pattern, while protecting food security concerns, and fostering inclusiveness through a group approach, by which the small and marginal farmers will get better access to land, credit and skills.

Enhancing climate-resilience in agriculture involves the integration of adaptation, mitigation, and other practices in agriculture that increase the capacity of the farmer and his/her production system to respond to various climate-related disturbances by resisting or tolerating the damage and recovering quickly. To ensure the sustainability of the comprehensive on-farm and off-farm interventions required to build resilience in agriculture, there is a need to strengthen institutions, in particular at the local level, and improve their capacity to plan for adaptation to evolving climatic conditions and induce a change in local farming practices. In addition, the successful adoption of climate-resilient farming practices will largely depend on the farmer's perception of income gains from the new technologies, as profitability remains the most important incentive for change at farm level. To that effect, crop diversification, access to knowledge and farm assets needs to be accompanied by more market opportunities, which can be achieved through improved participation of organized smallholders in the corresponding value chains and the mobilization of private sector (e.g. Farmer Producer Organizations, agri business SMEs).

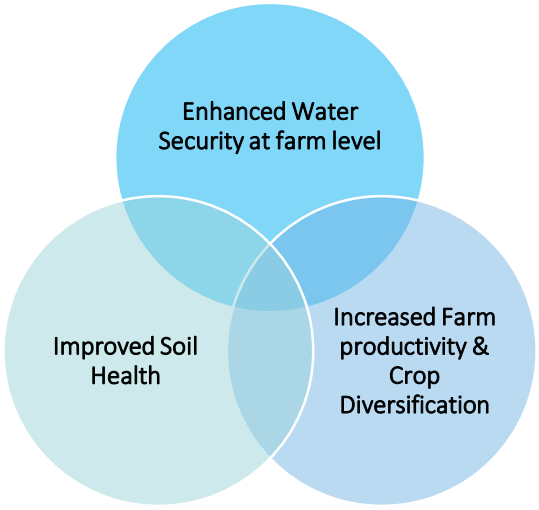

Figure 2: PoCRA Project Development Objective (Source: PAD)

PoCRA is built around a comprehensive multi-sector approach that focuses specifically on building climate resilience in agriculture through scaling up tested technologies and practices, while generating the interdependent solutions shown in figure 2 above.

1.4. Project Objective

The Project Development Objective (PDO) is to enhance climate-resilience and profitability of smallholder farming systems in selected districts of Maharashtra. PoCRA is built around a comprehensive, multi sector approach that focuses specifically on building climate resilience in

agriculture through scaling up tested technologies and practices, while generating the following interdependent triple win solutions:

a. **Enhanced water security at farm level** - through the adoption of technologies for a more efficient use of water for agriculture, the increase in water storage capacity (surface and sub-surface) and the improvement in water distribution structures to address on-farm water
b. **Improved soil health** - through the adoption of good agricultural practices to improve soil fertility, soil nutrient management, and promote soil carbon sequestration; and
c. **Increased farm productivity and crop diversification** - through the adoption of climate-resilient seed varieties (short maturity, drought and heat resistant, salt tolerant) and market-oriented crops with a clear potential for income security derived from the integration of farmers in corresponding value-chains.

1.5. Project Components

The project is designed for implementation through the following components and subcomponents:

Comp A: Promoting Climate-resilient Agricultural Systems

- A.1: Participatory development of mini watershed plans.
- A.2: On-farm climate-resilient technologies and agronomic practices.
- A.3: Climate-resilient development of catchment areas

Comp B: Climate-smart Post-harvest Management and Value Chain Promotion

- B.1: Promoting Farmer Producer Companies
- B.2: Strengthening emerging value-chains for climate-resilient commodities
- B.3: Improving the performance of the supply chain for climate-resilient seeds

Comp C: Institutional Development, Knowledge and Policies for a Climate-resilient Agriculture

- C.1: Sustainability and institutional capacity development
- C.2: Maharashtra Climate Innovation Centre
- C.3: Knowledge and policies

1.6. M&E for PoCRA

Aim of the assignment: Designing a results-based M&E system aimed at measuring progress towards the PDO for evidence-based decision making and timely course corrections.

Objectives of the assignment (as per RFP):

1. To help the PMU in measuring and assessing the outputs, outcomes and impacts generated by the project activity qualitatively and quantitatively over the duration of the project.
2. To assess input delivery mechanisms addressing quality, quantity and appropriate timings of such supply
3. To assess whether the activities are reaching to the intended beneficiaries and providing recommendation (information) for improving targets as well as service delivery mechanism.
4. To promote accountability in allocation and utilization of resources across the project area and activities so as to keep the activities and project implementation in the decided mode of participatory and transparent mechanisms
5. To bring out the gaps, if any, in the implementation of activities and components, so that PMU can create strategies and design tools for effective implementation of the same
6. To encapsulate the experiences and contribute to learning, document best practices, practices and promote policy dialogue

	Monitoring	**Evaluation**
Definition	Regular collection and reporting of information to track whether actual results are being achieved as planned. Focuses on inputs and outputs.	Analytical efforts to answer specific questions (Why & How?) about performance of program activities
Purpose (intended to answer?)	Gathering of evidence to show what progress has been made in the implementation of programs.	Measuring changes in outcomes and evaluating the impact of specific interventions on those outcomes.
Parameters	• Periodically collect data on the indicators and compare actual results with targets • Tracking implementation progress • Measuring efficiency • To identify bottle-necks and red flags (time-lags, fund flows)	• Ex-post assessment of effectiveness & impact • Analyses why intended results were or were not achieved • Measuring Impacts • Explores unintended results • Provides lessons learned and recommendations for improvement

The number of districts and villages covered under the project for Rest of Project Area:

Region	**No of Districts**	**No of Villages**
Rest of Project Area	7	2514

1.7. Scope of Work

Monitoring and evaluation of all the project activities shall be conducted such that it creates insights on output and outcome indicators suggested within the Results Framework of the Project as well as carrying out an impact assessment.

Baseline Survey: The M&E Agency will carry out a Baseline Survey to record the data values of relevant variables at the start of the intervention.

Mid Term Assessment: The Mid-term Assessment will focus on implementation processes and recommend adjustments in the project design and/or implementation arrangements to overcome identified bottlenecks. The assessment will include socio-economic and environmental impacts of the project. This will also include GHG assessment for the project.

End Term Assessment: End term assessment will focus on understanding the outcomes of project interventions and effect of the same on the target population. It is expected that the End term assessment will compare the value of relevant variables with the baseline values. This assessment will also undertake analysis of issues relating to sustainability of project outcomes and impacts. This will also include GHG assessment at the end of the project.

Concurrent Monitoring: Field level process implementation will be independently monitored by NABCONS. The review shall focus on understanding the critical processes as well as the progress of performance indicators. Field visits will also include random verification of the information of progress reports generated by MIS.

ESMF Audit: The environmental and social impacts of the project shall be assessed towards the end of the project intervention. This will be done in accordance with the Environment and Social Management Framework detailed in the PIP.

Deliverables

The following are the detailed assigned deliverables under this engagement. The exact dates of submission of the deliverables will be finalized by the PMU prior to commencing each of the assessments.

i. Inception Report
ii. Baseline Report and Relevant Datasets
iii. Mid-term Assessment Reports and Relevant Datasets
iv. End-term Assessment Reports and Relevant Datasets

v. Assessment Reports for each Concurrent Progress Monitoring with the Relevant Datasets vi. ESMF Report

vi. Concurrent progress monitoring shall be carried out at half yearly intervals. The Concurrent Progress Monitoring shall focus on process monitoring for all components and sub-components of PoCRA.

2. Area Profile

2.1. Geographical distribution

The project area is the eastern region of Maharashtra and consists of three revenue divisions- Amravati division which includes five districts (Amravati, Akola, Buldana, Yavatmal & Washim), and Nagpur Division with one district (i.e Wardha,) and one district from Nashik division (i.e Jalgoan Khandesh). The project area occupies an area of about 63.89 lakh hectares, and forest area of 9.23 lakh hectares, which is around one third of the state area under forest.

This project area is classified under Agro-ecological sub-region characterized as moist semi-arid ecological sub region with medium deep clayey black soils (shallow loamy to clayey black soils as inclusion), medium to high AWC and LGP of 120-150 days (K5Dm4). As per the planning commission, the domain districts of the project area viz., Akola, Washim, Buldana, Amravati, Wardha and Yavatmal falls under agroclimatic zone i.e. western plateau and hills region. As per the NARP agroclimatic zone classification, the project area is classified under Central Vidarbha (AZ- 97). The Jalgaon district falls under Western Plateau and Hills Region (IX) with agroecological sub region of Deccan plateau, hot semi-arid eco-region (6.3) Western Maharashtra plateau, and hot moist semi-arid eco- sub region. Jalgon district comes under Nashik division of the Maharashtra State. It was initially known as 'East Khandesh' This district is situated in Mid-basin of Tapi River & surrounded by the basins of sbriver-Girna, Waghur, Agnawati, Bori, Anajani & Mor. The district is surrounded by Satpuda hills form North side and Ajantha hills on south & south-west side. The Jalgaon district is located at 20 North Latitude & Longitude of 74.55 to 76.55 East with an altitude of 175 to 325 mt. From mean sea level. (MSL).

2.2. Population, Religion and Language

The project area has a total population of 16,789,618 according to the 2011 India census. Hinduism is the predominant religion, followed by Buddhism. This is unusual compared to the rest of Maharashtra and most north Indian states where Islam is the second-most-followed religion. Marathi is the predominant language spoken in project area of Maharashtra

Table 2. 1 Population statistics of Vidarbha region and Jalgaon district

District	Male	Female	Total
Akola	936,226	882,391	1,818,617
Amravati	1,482,845	1,404,981	2,887,826
Buldhana	1,342,152	1,245,887	2,588,039
Washim	621,228	575,486	1,196,714
Yavatmal	1,419,965	1,352,383	2,772,348
Wardha	665,925	630,232	1,296,157
Jalgaon	2,197,365	2,032,552	4,229,917
Total	**8,665,706**	**8,123,912**	**16,789,618**

Source: Population census 2011

2.3. Land Utilization Pattern

The land utilization pattern shows that the Yavatmal district is geographically largest among all the districts with land under non-agricultural use, land under miscellaneous tree crops and other fallows under study whereas Washim district is smallest geographical area. The forest area is maximum in Amravati district followed by Yavatmal and Jalgaon districts. In respect of land under permanent pastures and current fallows maximum area is covered by Wardha followed by Yavatmal district. The highest figures for barren and uncultivable were observed in Jalgaon district followed by Buldhana and Yavatmal. The details of land use pattern are presented in table below:

Table 2. 2 Land use pattern of Project districts (00'ha)

Land use pattern of the district (latest statistics)	Geographical Area	Forest area	Land under non agricultural use	Permanent pastu-res	Cultivable waste land	Land under miscellaneous tree crops & groves	Barren & uncultivable land	Current fallows	Other fallows
Akola	5429	301	356	165	30	12	112	104	53
Amravati	12217	3099	449	332	92	62	196	334	144
Buldhana	9671	917	598	380	263	18	480	240	252
Washim	5131	365	277	290	53	4	76	162	89
Yavatmal	13519	2374	617	605	228	116	397	378	258
Wardha	6289	618	480	644	165	96	106	535	204

Jalgaon	11639	1559	162	387	63	28	804	94	49
Total	**63895**	**9233**	**2939**	**2803**	**894**	**336**	**2171**	**1847**	**1049**

Source : Land Utilization statistics (2018), Mahaagri, Department of Agriculture, Govt. of Maharashtra

2.4. Climate and Rainfall

The climatic conditions of the region can be broadly described as semi-arid type on annual basis. The region experiences sub-humid to humid conditions in monsoon season, semi-arid in winter season and arid in summer season. Rains are mostly received from South-West monsoon during June to September. Winter rains during october to January are uncertain. The South-West monsoon sets in during 11-17th June and active monsoon rains commence during 18-25th June. The highest rainfall occurs during July and August. Monsoon ceases by first week of october. The coefficient of variation of monthly rainfall is 40-50 per cent even for the wettest month i.e. July indicating the uncertainty of rains during the season with scarcity and semi scarcity conditions. Critical dry spell occurs across from second week of July, second/last week of August or first week of September with duration of 15-25 days. Generally high intensity agricultural drought occurs once in four years. Domain districts come under assured rainfall to moderate rainfall zone with mean annual rainfall range of 750 to 1250 mm in 45-53 rainy days. Cold wave with moderate intensity at least once or twice is the characteristics of winter. The mean minimum temperature ranges from 12.3 to 27.20c and the mean maximum temperature ranges from 26.2 to 40.80c. The normal mean monthly maximum temperature is 42.50c during the hottest month (May), while the normal mean monthly minimum temperature is 10.60c in the coldest month (December).

The normal rainfall pattern from the year 1981 to 2010 in Vidarbha (presented in graph below) encodes the normal monthly rainfall of the region. From the recent past years, it was observed that the rainfall is prominently characterized with long dry spells, early withdrawals, heavy rainfall events and persistent droughts during critical growth stages of the crop which is major problem faced by the farmers of Vidarbha region. It's very essential to disseminate the weather forecasting among the farmers to provide the climate resilience to them. Also timely

dissemination of the agro-advisories and need based rain fed technologies to encourage and achieve sustainable production and economic stability to the farmers.

Table 2. 3 Monthly Normal Rainfall (mm) for Project Area (1981-2010)

Month	Monthly Normal Rainfall (mm)
January	10.7
February	7.4
March	15.2
April	2.6
May	12.4
June	142.6
July	200.7
August	189.7
September	123.2
October	53.9
November	18.8
December	11.5

Source: All India Co-ordinated Research Project on Agrometeorolgy, Dr. PDKV, Akola

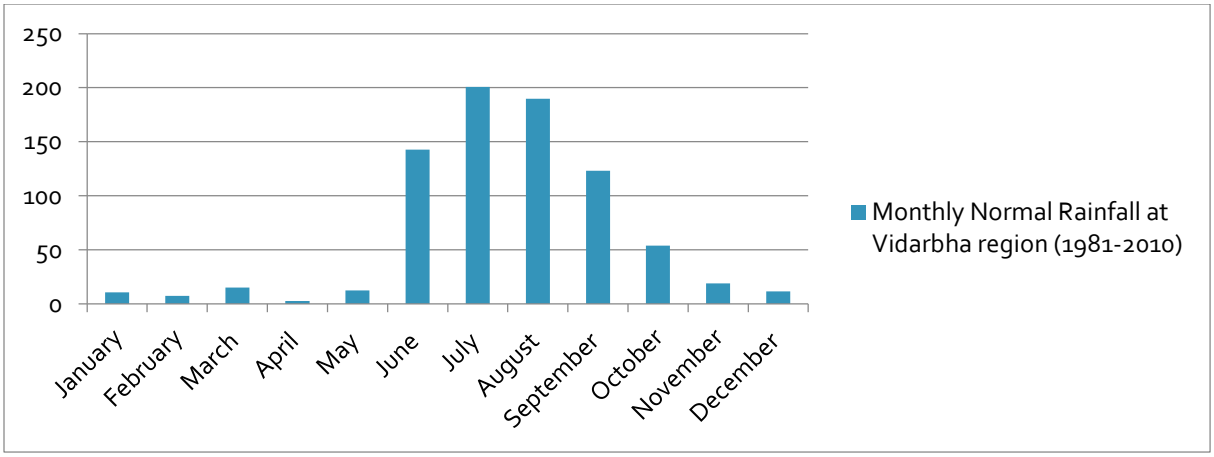

Figure 3: Monthly Normal Rainfall (mm) for Project Area (1981-2010)

The rainfall pattern from the year 2011 to 2019 in Vidarbha encodes the actual monthly rainfall variation as compared to the normal rainfall. It is prominently characterized with long dry spells, early withdrawals, heavy rainfall events and persistent droughts which is

major problem faced by the Vidarbha farmers. It's very essential to disseminate the weather forecasting among the farmers to provide the climate resilience to them. Also timely dissemination of the agro-advisories and need based rain fed technologies to encourage and achieve sustainable production and economic stability to the farmers.

2.5. Soil Resources

The soils of the region are shallow (Entisols) to deep black (Vertisols), neutral to alkaline in reaction, low in available nitrogen and phosphorus and high to very high in available potassium. In few pockets of eastern Vidarbha, Alfisols are also observed. The salt affected soils are observed in Purna valley covering the part of Amravati, Akola and Buldana districts.

Western Vidarbha soils are derived from trap rock and have varying depth depending upon their physiography. Most of the soils are calcareous, highly base saturated, fairly well drained, well supplied with potash, moderate to low in phosphate, but low in organic matter content and slightly alkaline. Soils deeper than 1.5 m and clay in texture pose problem of water logging. Such conditions occur in Purna Valley. Deep soils are poor in infiltration and permeability. At Dryland Research Project, Akola soils are belongs to Vertic Inceptisols.

Soils of the Central Vidarbha are derived from basalt rock, black in colour and having varying depth depending upon their physiography. Inceptisols and Entisols are developed from basalt and they are very shallow to shallow. Inceptisols show vertic characteristics, whereas, the vertisols are developed in basaltic alluvium brought out by rivers. These soils are medium to heavy in texture, high in lime content with high base saturation. Vertisols are predominant in the zone with montmorillonite / smectite clay. Swelling after wetting and shrinkage following drying results in deep and wide cracks.

Eastern Vidarbha soils are chiefly derived from mined rocks like granite, genesis and schists. They are yellowish brown to red in colour and having pH in the range of 6 to 7 .These soils predominantly contain Kaolinite (1:1), non - expending clay mineral. Medium deep black soils are predominant (45 %) followed by coarse shallow (35 %) and deep black soils (20 %).

As regards the Jalgaon dstrict it is a part of Deccan plateau and the soil type is good as Vidharbha deep black cotton soil having a assured rainfall zone which is good for kharif crops.

The soils of scarcity Zone are light to medium soils having less depth. Bajara is crop of major concern here

2.5.1. Salt Affected Soils

These salts affected soils in Vidarbha occurs mainly in Purna valley which covers the part of Amravati, Akola, Buldana & Jalgaon districts on both sides of the river Purna (around 10 to 45 km in width and about 150 km in length affecting 547 villages in 14 tehsils of the region). These soils are very deep (more than 150 cm). The landform is mainly plain with low permeability. The soils are fine textured with imperfect to poor drainage and high water-holding capacity, clay content ranges from 52 to 70 per cent. The pHs, ECe and ESP ranges from 7.7 to 9.4, 0.90 to 5.20 dS m^{-1} and 2.57 to 33.78 respectively. The soils are mostly normal at surface horizons and the problem of salinity / sodicity increases with the depth.

These soils are mainly derived from the basaltic alluvium and are clay textured with smectitic clay mineralogy. They have high swell-shrink potential, low permeability with very low hydraulic conductivity and imperfect to poor drainage conditions. Taxonomically these salts affected soils are classified as Sodic Haplusterts and Sodic Calciusterts.

Table 2. 4 Soil Type Wise Area (ooo' ha) under each district of Vidarbha and Jalgon

District	Coarse shallow	Medium deep black	Deep black
Akola	251.34	53.50	235.15
Amravati	653.7	13.1	501.2
Washim	239.2	50.9	223.8
Buldana	342	80.6	544.3
Yavatmal	469.4	176.1	706.4
Wardha	245.1	102.9	280.9
Jalgaon	213	295	717
Total	**2413.7**	**772.1**	**3208.8**

Source: National Bureau of Soil Survey and Land Use Planning, Nagpur

Table 2. 5 Area (lakh ha) of Salt affected soils in Vidarbha region

District	Salt affected soil
Akola	1.68
Amravati	0.61
Buldana	0.45
Jalgaon	

Source: National Bureau of Soil Survey and Land Use Planning, Nagpur

2.6. Water resources

Vidarbha region is predominantly a rain fed farming region. Western Vidarbha has less than 10 per cent of the gross cropped area covered under irrigation excepting Amravati district. Irrigation is one of the means to assure protection of crop from monsoon aberration.

The state Government has sanctioned number of major, medium and minor irrigation projects to explore the optimum irrigation potential and established Maharashtra Irrigation Commission to streamline and speeding the irrigation development works. Five irrigation development corporations are formulated in the state and for Vidarbha area, Vidarbha Development Corporation is operating.

Surface irrigation is more in Bhandara district and lowest in the Amravati district. It is increasing from west to east. The well irrigated area is more in Amravati district and lowest in Gadchiroli district. Wardha district has the lowest gross area irrigated.

2.7. Agricultural Land Use

As such dryland agriculture forms the major characteristic of the region. The rural economy of Vidarbha is basically a crop economy. Though contributions of other sub-sectors like horticulture, forestry has increased overtime the cropping sector remains the major contributors to the domestic product. As per the agricultural land use statistics the gross cropped area of the Vidarbha region is 54.25 lakh ha which amounts to about 24% of the state's gross cropped area. Percentage of net irrigated area to net sown area is 14.6% and that of gross irrigated area to gross cropped area is 15.8%. Net and gross cropped area is the maximum in Yavatmal district of Vidarbha region followed by Buldhana and Amravati. Net irrigated observed

to be highest in Amravati district followed by Buldhana and Yavatmal. As regards the rainfed area is concerned the maximum area is under Yavatmal followed by Buldhana and Amravati.

Table 2. 6 Details of Agricultural Land Use in Vidarbha region and Jalgaon district

Area(ooo' ha)	**Akola**	**Amravati**	**Buldhana**	**Washim**	**Yavatmal**	**Wardha**	**Jalgaon**	**Total**
Net sown area	447.331	602	570	386	875	375	844.2	**4099.5**
Area sown more than once	37.086	110	180	38	3.64	85	480.6	**934.3**
Gross cropped	484.417	712	750	424	878	460	1324.8	**5033.2**
Net Irrigated area	24.51	51.3	43.45	5.5	35.4	31.58	213	**404.7**
Gross Irrigated area	42.82	63.8	16.56	22.0	39.0	41.80	295	**521.0**
Rainfed area	441.60	540.7	704.12	402.0	839.3	399.71	717	**4044.4**
Cropping intensity (%) **	108.3	118.3	131.6	109.8	100.3	122.7	156.9	-

Source: Maharashtra Agriculture Contingency Plan for District Pub by CRIDA Hyderbad and District social and economic abstract – 2010 Directorate of finance and statistics Govt. of Maharashtra

2.8. Cropping pattern

Cotton (*Gossypium hirsutum*), soybean (*Glycine max*), Sorghum (*Sorghum bicolor*), Pigeonpea (*Cajanas cajan*), Greengram (*Vigna radiata*), Blackgram (*Vigna mungo*) etc. are the major crops of central and western zone during kharif, Chickpea (*Cicer areitinum*) and Wheat (*Triticum durum*) during rabi and Groundnut (*Arachis hypogea*) and Maize (*Zea mays*) in summer whereas Rice (*Oryza sativa*) is a major crop of eastern zone during *kharif* season. Chickpea and wheat are the major *rabi* crops taken throughout the Vidarbha. Linseed and lathyrus are cultivated under uthera condition in eastern Vidarbha zone while safflower and sunflower on a limited area in western zone. *Rabi* crops are cultivated mainly as a rainfed crop on heavy soils but are strengthened in areas where irrigation facilities are available. Cultivation of sugarcane and other perennial or two-seasonal crops is insignificant. The project area region has a larger area under *kharif* crops (49.78 lakh ha, 86.6%) than under *rabi* (7.46 ha, 12.9%) and summer (25600 ha, 0.4%).

The rainfed cropping system consist of sorghum- chickpea , sorghum- wheat, greengram –safflower, soybean–chickpea, soybean + pigeonpea (6:1/5:1), and cotton + pigeonpea intercropping (9:1/7:1) which are dependent upon the residual soil moisture status which is in term, governed by late South West monsoon or uncharacterized winter rains . Agri - horticulture and silvi pasture are in pockets and especially in degraded soils.

As regards horticulture component, the important fruit crops of the region include Kagazi Lime, Sweet oranges, Orange, Custard apple, Guava, Banana, Mango and Pomegranate in small pocktes. However, orange cultivation is dominant is some parts of the Amravati District especially in Warud and Anjangaon tehsils. Similarly, in Jalgaon district there is significant area covered under the Banana cultivation. Vegetable crops are cultivated in small pockets in villages of Vidarbha on a small scale majorly around the peripheries of the district.

2.9. District wise Area, Production and Productivity in Project Area

(Source: Chief Statistician, Office of Commissioner of Agriculture, Pune)

Akola

S. No	Name of the crop	Kharif			Name of the crop	Rabi			Name of the crop	Summer		
		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)
1	Sorghum	122	151	1208	Gram	601.8	757.7	1259	Groundnut	11.7	16.4	1400
2	Pigeonpea	473.4	196	391	Safflower	0.7	0.5	650				
3	Greengram	306.7	32	154	Sunflower	0.3	0.2	700				
4	Blackgram	238.9	20	181								
5	Soybean	1466.8	696	299								
6	Cotton (lint)	1438	1226	142								

Amravati

S. No	Name of the crop	Kharif			Name of the	Rabi			Name of the crop	Summer		
		Area	Production	Productivity (kg/ha)		Area	Production	Productivity (kg/ha)		Area	Production	Productivity (kg/ha)

		('oo ha)	('oo tonnes)		crop	('oo ha)	('oo tonnes)			('oo ha)	('oo tonnes)	
1	Sorghum	163.9	174.5	1064.6	Rabi Jowar	0.8	0.7	824	Groundnut	9.8	9.3	950
2	Pigeon pea	1128.1	1361.7	1207	Gram	863.1	1078.9	1250				
3	Green gram	223.7	97.4	435.6								
4	Black gram	93.7	43.0	459.5								
5	Soybean	2916.4	3429.7	1176								
6	Cotton (lint)	2095.8	6550.5	531.3								

Buldhana

S. No	Name of the crop	Kharif			Name of the crop	Rabi			Name of the crop	Summer		
		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)
1	Sorghum	73.9	84.3	1141.2	Rabi Jowar	86.8	75.8	873	Maize	5.2	7.8	1500
2	Pigeon pea	817.8	404	494	Gram	1127.0	826.1	733	Groundnut	3.0	3.6	1200
3	Green gram	184.9	101.9	551.4	Safflower	0.6	0.4	600				
4	Black gram	206.9	116.8	564.3	Sunflower							
5	Soybean	4015.2	4151.7	1034								
6	Cotton (lint)	1863.7	3357.8	306.3								

Washim

S. No	Name of the crop	Kharif			Name of the crop	Rabi			Name of the crop	Summer		
		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo	Production ('oo tonnes)	Productivity (kg/ha)

						ha)				ha)		
1	Sorghum	29.9	16.5	552.5	Rabi Jowar	1.7	1.5	848	Groundnut	8.9	8.6	970
2	Pigeonpea	462.6	261.3	565	Gram	490	311.6	636.0				
3	Green gram	100.8	59.7	592.0	Safflower	0.2	0.1	380				
4	Black gram	135.0	86.9	644.3								
5	Soybean	2903.4	3992.1	1375.0								
6	Cotton (lint)	266.8	525.8	335.0								

Yavatmal

S. No	Name of the crop	Kharif			Name of the crop	Rabi			Name of the crop	Summer		
		Area ('00 ha)	Production ('00 tonnes)	Productivity (kg/ha)		Area ('00 ha)	Production ('00 tonnes)	Productivity (kg/ha)		Area ('00 ha)	Production ('00 tonnes)	Productivity (kg/ha)
1	Sorghum	144.7	39	269.8	Rabi Jowar	16	12.3	772.5	Groundnut	44	37.6	855
2	Pigeonpea	1303.1	1003.4	770	Gram	991.8	803.4	810				
3	Green gram	86.3	24.1	278.6	Safflower							
4	Black gram	72.3	21.1	292.5	Sunflower							
5	Soybean	2775	3416.1	1231								
6	Cotton (lint)	4595.3	8163.5	302								

Wardha

S. No	Name of the crop	Kharif			Name of the crop	Rabi			Name of the crop	Summer		
		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)		Area ('oo ha)	Production ('oo tonnes)	Productivity (kg/ha)
1	Sorghum	5.5	1.3	232.3	Rabi Jowar	5.4	3.0	549	Maize	4.6	1.6	360

2	Pigeon pea	615.4	719.4	1169.0	Gram	399.8	449.8	1125	Groundnut	3.3	4.1	1230
3	Green gram	3.1	1.3	408.3								
4	Black gram	3.0	1.5	499								
5	Soybean	1237	1482	1198								
6	Cotton (lint)	2290	6148	456.4								

Jalgaon

S. No	**Name of the crop**	**Kharif**			**Name of the crop**	**Rabi**			**Name of the crop**	**Summer**		
		Area ('oo ha)	**Production ('oo tonnes)**	**Productivity (kg/ha)**		**Area ('oo ha)**	**Production ('oo tonnes)**	**Productivity (kg/ha)**		**Area ('oo ha)**	**Production ('oo tonnes)**	**Productivity (kg/ha)**
1	Sorghum	420.5	588.5	1399.7	Rabi Jowar	165.9	150.4	906.5	Maize	29.0	33.4	1150
2	Pigeonpea	141.1	66.9	474.0	Gram	362.0	275.1	760.0				
3	Green gram	261.2	134.8	516.2	Safflower							
4	Black gram	230.9	120.3	521.1	Sunflower							
5	Soybean	209.3	293.4	1402.0								
6	Cotton (lint)											

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3. Approach to Evaluation Study

3.1. Importance of monitoring and evaluation

The objective of any development programme or project is to transform a set of resources (inputs) into desired results or outcomes (outputs). Understanding the nature, objectives and scope of the development project and the responsiveness of target groups is an imperative for development personnel/specialist, economists and policy makers to recommend improvements that will guarantee more food, fodder, fuel and livelihood security for resource poor farmers who form the majority of the farming community and the landless poor. This requires for a systematic feedback of information from the project areas and beneficiaries. To provide the project management with such information, it is essential to understand the results of their activities for which data should be gathered continuously and analysed periodically. A system combining such data collection, analysis and interpretation is called an evaluation system.

It is pertinent to know the reasons for failure / success of the project than what has been done and what has happened in the project. Policy makers look systematically at the elements of success and failure in the project experience to learn how better to plan for the future. Evaluation is not limited only to completed projects. Periodic evaluation of any programme/project is essential in order to measure the progress and to know what had been achieved (Baker, 2000).

The objective of this chapter is to develop approaches and methods for monitoring and evaluation of the ongoing Project on Climate Resilient Agriculture (PoCRA) being implemented at Maharashtra state.

The problem of developing evaluation framework for any development project lies on the following:

- Developing a framework to identify what impacts to assess, where to look for these impacts and selecting appropriate indicators to assess the impacts,
- Developing a framework to look after the indicators together and assessing overall impact of the project.

Evaluation is a periodic assessment of the relevance, performance, efficiency and impact of the project in the context of its stated objectives (Ravindra, 2000). .

3.1.1. Approaches

Evaluation literature suggest that there are three major approaches are being followed by the evaluating agencies. They are economic approaches which emphasize quantification of the impacts and their valuation. The non-economic approaches include Logical Framework Analysis and Multi criteria Analysis are being widely employed.

Economic Evaluation is an attempt to assess the real economic value of projects to society and to individual groups within the project or activity; the intent is to provide a background for making informed decisions on the use of scarce resources available to society. This includes both financial and economic analysis. Multi criteria analysis allows evaluators to rank projects based on different criteria, which can be qualitative ordinal scores. The advantages of MCA lie in its capacity to deal with multiple and conflicting issues.

The Logical Framework Analysis emphasis the objectives of the project, summarizes the assumptions and put forth the strategies adopted to monitor the development project. With the help of the LFA analysis, one can conveniently differentiate between goals, purpose outputs and activities of a project/programme and hence they can be achieved with the help of verifiable indicators.

The most important feature of evaluation is the selection of indicators and collecting information on these indicators. Indicators are markers and they show the progress and help measure changes.

Participatory monitoring and evaluation is often being followed by many development evaluators to carry out monitoring and evaluation of development projects. It flips the traditional top-down approaches to a bottom-up approach, which encourages, supports and strengthens communities existing abilities to identify their own needs, set their own objectives, and monitor and evaluate them.

3.1.2. Framework for monitoring and evaluation of PoCRA

The PoCRA programme influences different aspects like agricultural production system, environment and socio-economic conditions of the project villages. The programs involving the entire community and natural resources influence (i) productivity and production of crops, changes in land use and cropping pattern, adoption of modern technologies, increase in milk production etc., (ii) Attitude of the community towards project activities and their participation in different stages of the project, (iii) Socio-economic conditions of the people such as income, employment, assets, health, education and energy use, (iv) impact on environment, (v) use of land, water, human and livestock resources, (vi) development of institutions for implementation of watershed development activities and (vii) ensuring sustainability of improvements. It is thus clear that development intervention through PoCRA is a key to sustainable production of food, fodder, fuel wood and the meaningfully addressing the social, economic and cultural conditions of the rural community.

The Project Development Objective (PDO) is to enhance climate-resilience and profitability of smallholder farming systems in selected districts of Maharashtra. PoCRA is built around a comprehensive, multi sector approach that focuses specifically on building climate resilience in agriculture through scaling up tested technologies and practices, while generating the following interdependent triple win solutions:

In order to achieve the developmental objectives, different interventions are being implemented. They broadly include (i) promoting climate resilient agricultural system, (ii) Climate –resilient Post –harvest management and value chain Development, and (iii) Institutional Development, Knowledge and Policies for Climate resilient Agriculture.

Thus, in order to effectively capture the impacts of PoCRA development activities, a number of indicators will be developed and estimated. These indicators are the markers of performance and impacts of PoCRA development project.

There are 14 broad indicators have been developed for the purpose and discussed in detail under the section indicators.

3.1.3. Methods

For the purpose of model development, different methodologies and approaches have been followed.

A. Indicators

The most important feature of evaluation is the selection of indicators and collecting information on these indicators. Indicators are ***markers*** and they show the progress and help measure changes (Palanisami and Suresh Kumar, 2006). While selecting indicators, the criteria such as availability, relevance, coverage, quality, efficiency, impact etc will be considered.

B. Simple mean comparison

As our objective is to carry out monitoring and evaluation of different activities under PoCRA programme, simple comparison of key indicators will be done.

C. Approach

Before and after Vs. With and with out

The literature on project analysis unanimously suggests the use of comparison between the `project parameters' with the `non-project control region'. This method automatically incorporates the correction for the impact of technology in the absence of the project. The approach called as **with and without** approach may be used where no thorough benchmark information for the study watersheds available. If we have benchmark information, then we can use the approach called '***before and after***'.

Double difference

The major problem with the above approaches is that the benefits and costs are calculated using either before and after or with and without concept which ignores some of the benefits that are considered as residual which may occur even without the intervention such as watershed development. Hence an approach that considers both with and without as well as before and after situations is important.

The approach of any analysis of impact can be accomplished into two ways. Firstly, `with project' parameters compared to the `pre-project' situation gives the incremental benefits due to the project. But these increments in the parameters intrinsically include the changes due to state of

art of technology. Thus sometimes, the benefits may be exaggerated. Secondly, the literature on project analysis unanimously suggests the use of comparison between the `project parameters' with the `non-project control region'. This method automatically incorporates the correction for the impact of technology in the absence of the project. In order to have better measurement of impacts, the third approach, called double difference i.e. a combination of with and without and before and after is also employed. Here, the information will be collected for the pre and post-project period and compared with the control village as well. Hence, the approach is a combination of both with and without and before and after approaches i.e. double difference method (Palanisami, et al, 2014) (Table.1).

Data at different levels (farm level, watershed level) may be collected from both the treated and control villages. This will enable the use of the double difference method to study the impact of the watershed development program. The framework is adopted from the program evaluation literature (Maluccio and Flores, 2005; Pattanayak, 2009).

Table 3. 1 Double difference method of impact assessment of Watershed Development Programmes

Particulars	PoCRA Treated village	Control Village	Difference across groups
After PoCRA	D1	C1	D1-C1
Before PoCRA	D0	C0	D0-CO
Difference across time	D1-D0	C1-C0	Double difference (D1-C1)- (D0-C0)

The resulting measures can be interpreted as the expected effect of implementing the PoCRA development program. The columns distinguish between groups with and without the program and the rows distinguish between before and after the program. Before the PoCRA development program, one would expect the average yield of different crops be similar for the two groups, so that the quantity (Do-Co) would be close to zero. Once the PoCRA development program has been implemented, however, one would expect differences between the groups as

a result due to the PoCRA development program. The impact of the program, however, would be better assessed considering any pre-existing observable or unobservable differences between the two randomly assigned groups is the double-difference estimate, obtained by subtracting the preexisting differences between the groups, (Do – Co), from the difference after the program has been implemented, (D1 – C1). This is best explained in Figure.1.

Double Difference (DD) methodology is becoming a popular tool for studying the impact analysis using the panel data. It has the advantage to control for the time-invariant characteristics of farmers when comparing adopters and non-adopters of a technology or a development program such as watershed development. In this methodology, the average impact of a watershed development program is computed by the formula

$$\text{Double Difference (DD)} = E\left(Y_1^{\,T} - Y_0^{\,T} \mid T_1 = 1\right) - E\left(Y_1^{\,c} - Y_0^{\,c} \mid T_1 = 0\right) \quad (1)$$

where $Y_t^{\,T}$ and $Y_t^{\,C}$ respectively denote the outcome responses for the PoCRA treated and control villages at period $t(=0,1)$ where the time period t=o corresponds to the period before program implementation and the period t=1 corresponds to after program implementation. Further, T_1=1 means presence of the program at time t=1 and T_1=o means absence of the program. The first term in equation (1) represents the average difference between before-after for the PoCRA treated village and hence it is given by

$$E\left(Y_1^{\,T} - Y_0^{\,T} \mid T_1 = 1\right) = \frac{1}{N_T}\sum_{i \varepsilon T}\left(Y_{i1} - Y_{i0}\right) = \bar{y}_{T1} - \bar{y}_{T0} \quad (2)$$

Similarly, for the control group, the second term is given by

$$E\left(Y_1^{\,c} - Y_0^{\,c} \mid T_1 = 0\right) = \frac{1}{N_c}\sum_{j \varepsilon c}\left(Y_{j1} - Y_{j0}\right) = \bar{y}_{c1} - \bar{y}_{c0} \quad (3)$$

Substituting these values in (1), the impact of the program can be obtained as

$$\text{Impact} = \left(\bar{y}_{T1} - \bar{y}_{T0}\right) - \left(\bar{y}_{c1} - \bar{y}_{c0}\right) \quad (4)$$

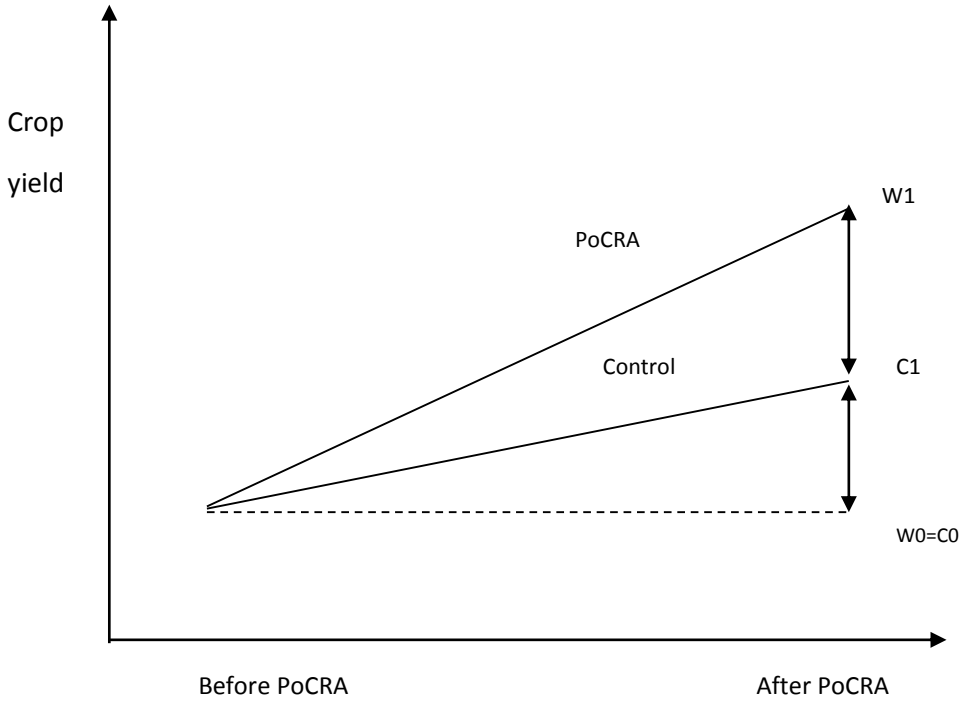


Figure 4: Illustration of impact of PoCRA development program by double difference method

3.1.4. Collection of data and Method of Enquiry

Preliminary information relating to the study area will be collected from the district and village level PoCRA officials comprising of SDAO, TAO and VCRMC. Interview schedules will be formulated and pre-tested. The needed information from the two respondent groups will be gathered personally administering the interview schedule.

3.2. Theory of Change

Theory of Change (ToC) is one of the most essential building blocks for any monitoring and evaluation project. It provides a roadmap of how a program will progress to change outcomes and deliver impact.

A typical model of the ToC is shown in the figure below:

A typical ToC process will look like:

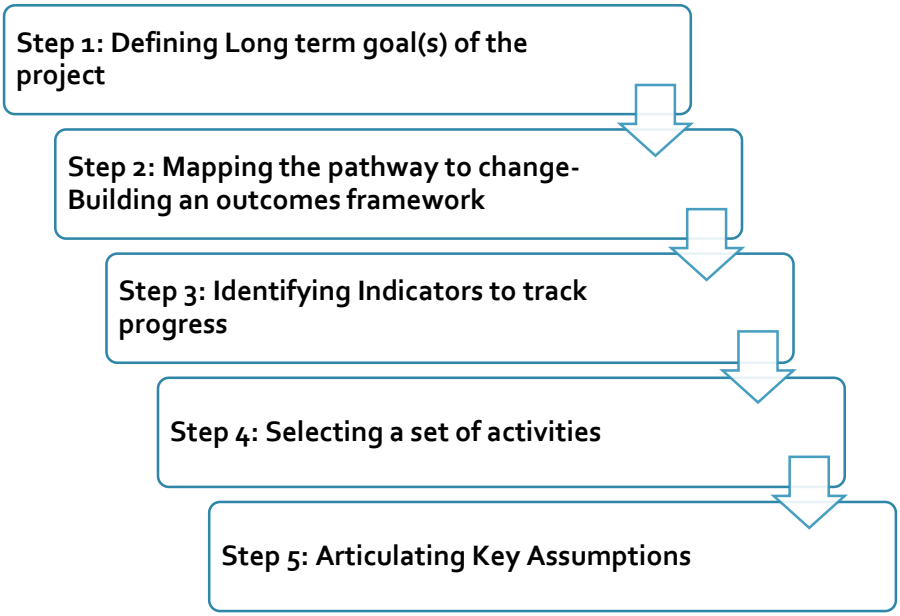
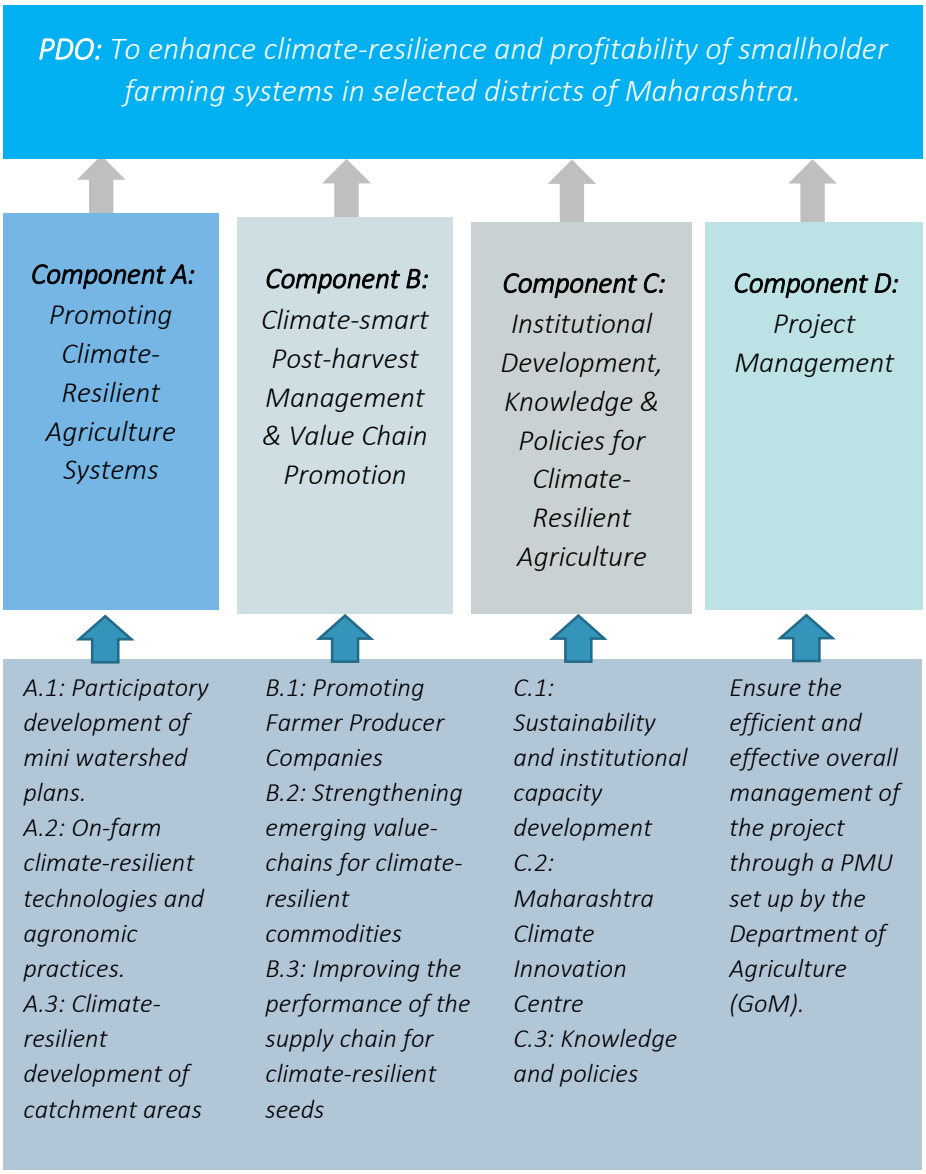


Figure 5: ToC Process

It is understood from the Project Appraisal Document (PAD) of PoCRA and Terms of Reference (ToR) for the current M&E assignment, that a solid ToC model has been developed at the time of project conceptualization.

Step 1 & Step 2 have been well defined in the ToR. A snapshot of the same is given in the figure below.



The results chain for the PoCRA project as per the PAD is illustrated in the figure below. Detailed results framework for each component of the project is also highlighted.

3.2.1. Results Chain- PoCRA

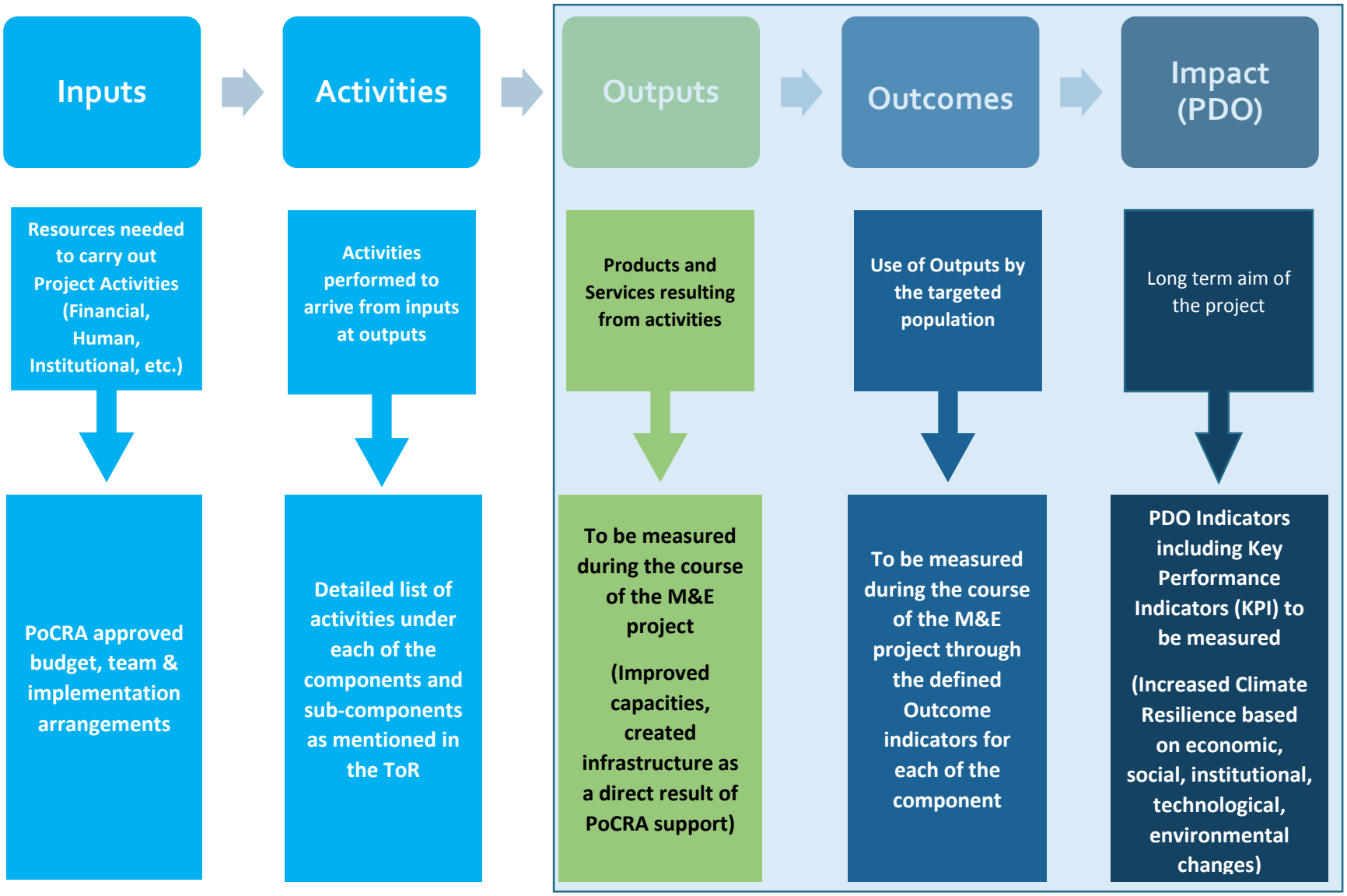


Figure 6: PoCRA Results Chain Framework

Component A: Promoting Climate-resilient Agricultural Systems

Sub-component	Activities	Output	Outcome	Impact
Participatory development of mini watershed plans	Preparation of Cluster Level Plan	No of Cluster Level Plans Prepared	• Farmers adopting improved agricultural Technology • Improved water-use efficiency at farm level • Improved availability of surface water for Agriculture • Enhanced soil health at farm level • Increased Yield	• Increased Resilience to Climate Change • Reduced Vulnerabilities • Improved Water Productivity • Improved Yield Uniformity and Stability • Increased Carbon Sequestration • Green House Gases Reduction
	Mobilization of farmer communities	No of farmers/farmer groups mobilized		
Climate smart agriculture and resilient farming systems	Demo of climate resilient agronomic (CRA) practices	No of FFs conducted		
Enhancement in Carbon Sequestration	Agro-forestry	• Types of plantations taken up • No of plantations taken up		
Improvement of saline and sodic lands	Improvement through sub surface drainage	• Kms of drainage line treatment done • Area in which treatment done (in ha)		
	Demo of Technology for salinity mgmt through FFS	No of FFS conducted		
	Farm pond with inlet & outlet and grass cultivation	No of Farm Ponds Constructed		
	Water pumps	No of water pumps installed		
	Water sprinkler	No of water sprinkler installed		
	Shade-net house (GI/MS pipes)	No of Shade-nets installed		
	Shadenet house (Bamboo)	No of shade nets installed		

Protected Cultivation	Poly-house (open vent)	No of polyhouses installed		• Reduced Farmers Suicide
	Poly tunnels	No of Poly tunnels created		
	Planting material Poly-house/ shade-net house	Planting Material in poly tunnel utilized		
Integrated Farming Systems	Small Ruminants	No of Animals in the farm		
	Backyard Poultry	No of Units created/ supported		
	Sericulture	No of Units created/ supported		
	Apiculture	No of Units created/ supported		
	Inland fisheries	No of Units created/ supported		
	Other agro based livelihoods	No of Units created/ supported		
Soil Health Improvement	Vermi compost and NADEP units	No of Units created/ supported		
	Organic input production unit	No of Units created/ supported		
	Continuous Contour trenches Model 5-8 (0.30 m)	➢ No of trenches created ➢ Area in which trenches created		
	Continuous Contour trenches Model 5-8 (0.45 m)	➢ No of trenches created ➢ Area in which trenches created		
	Deep continuous contour trenches	➢ No of trenches created ➢ Area in which trenches created		

Efficient and sustainable use of water for agriculture	Drainage Line Treatment	➢ No of Loose bolder Structures constructed ➢ No of Gabian Structure Created ➢ No of Earthen Nala Bunds constructed ➢ No of Cement Nala Bunds constructed		
	Construction of new water harvesting structures	➢ No of community farm ponds constructed (with lining - 100X100X3 mtrs) /l ➢ No of community farm ponds (without lining - 100X100X3 mtrs) /m constructed ➢ No of Individual Farm Ponds (without lining) /n constructed ➢ No of Individual Farm ponds (with lining) constructed ➢ No of storage strengthening of farm ponds done ➢ No of Open Dug well		

	Rejuvenation by desilting/repairs of old water harvesting structures	No of old water harvesting structures de-silted/repaired		
	Construction of groundwater recharge structures	No of groundwater recharge structures created		
	On-farm water security (Compartment /graded bunding)	➢ No of Compartment /graded bunding done ➢ Area in which done		
	Micro irrigation systems	➢ No of drip irrigation systems Installed ➢ No of sprinklers Installed		
	Protective Irrigation	➢ No of water pumps installed ➢ No of water carrying pipes installed		

Component B: Post Harvest Management and Value Chain Promotion

Sub-component	Activity	Output	Outcome	Impact
Promoting Farmer Producer companies	Resource Agency Cost for support to existing FIGs/FPOs/FPCs	• No. of FPCs reached in the project area • No. of FPCs supported	Farmer Producer Companies Strengthened and financially sustainable	• Increase in Farm Income • Reduced Vulnerabilities
	Establishment of Custom Hiring Centres	• No. of Custom Hiring Centres established • No. of farmers availing the customer hiring facility		

Strengthening Emerging Value-chains for Climate-resilient Commodities	Support to FIGs/FPOs/FPCs for product aggregation, handling, transformation & marketing	• No. of trainings conducted for FPOs/FPCs for product aggregation, handling, • transformation & marketing • Amount of Financial Support provided to FPCs	Skilling of FPCs for vale chain of climate resilient commodities	• Increased Resilience to Climate Change • Better Access to Markets
Improving the Performance of the Seed Supply Chain	Production of foundation & certified seed of climate resilient varieties	• No. of trainings conducted for FPCs for certified seed distribution • No. of certified seeds distributed of climate resilient varieties	Climate Resilient Crop Varieties Adopted by farmers Improved yield varieties	• Increased Coping capacity to Droughts
	Development of seed hub-infrastructure support	• No. of FPCs reached out • No. of FPCs availing the seed hub-infrastructure support seed hub-infrastructure support		
	Seed processing equipment's for 1000 MT capacity	• No. of trainings/awareness conducted for Seed processing equipment's • No. of Seed Processing equipment's provided to FPCs		
	Seed processing shed/ drying yard for 1000 MT capacity	• No. of trainings/awareness conducted for Seed drying yard facility • No. of Seed drying yard created		
	Seed storage/ godown of 700 sqm (Capacity 1000 MT)	• No. of trainings/awareness conducted for storage godown facility • No. of Seed Storage facility created		
	Skilling of seed producer farmers	• No. of farmers reached out		

		• No. of Trainings conducted for seed producer farmers		
	Strengthening of seed quality testing facility	No. of seed quality testing facility strengthened		

Component C: Institutional Development, Knowledge and Policies

Sub-component	Activity	Output	Outcome	Impact
Updation of SREPs aligned to Climate Resilient Agriculture	Resource Agency Cost	• No. of district-level SREPs updated	Mainstreaming climate-resilience in agricultural research and technical advisory services Capacity Building of PocRA officials Capacity Building of Farmers	• Increased Coping capacity to Droughts & Climate Variability • Increased Capacity at block and district level • Increased Preparedness to Climate Change at village, block and district level • Improved access to agriculture technologies
Agro-met advisory services	Centers for development and disseminations	• No. of Centres developed for agro-met advisory services • No. of farmers having access to agro-met advisory services		
Preparation and Updation of contingency plans	Preparation and Updation of contingency plans	• No. of Contingency plans prepared at district level • No. of existing plans updated		
Preparation of Long term climate change models	Preparation of Long term climate change models	Long term climate change models developed		
Risk Analysis Framework	Developing Risk Analysis Framework	Risk Analysis framework developed		
Maharashtra Climate Innovation Centre	Development of Maharashtra Climate Innovation Centre	Maharashtra Climate Innovation Centre completed		

Analytical studies pertaining to climate resilience	Studies on Climate Resilience to be conducted	• No. of studies on climate resilience conducted • No. of studies/research awarded for climate resilience		
Agricultural Innovations - demonstrations/ testing/consolidation	Demonstration & Testing of Agricultural Innovations	• No. of farmers made aware of agricultural innovations • No. of demonstrations conducted for agricultural innovations		
Strategic Partnership with other institutes	Partnership with other institutes	• No. of institutions reached out to for partnerships • No. of partnerships established		
Capacity Development	Training Need Analysis (TNA), training, designing and module preparation	• Training need analysis conducted • Training module prepared		
	Training of PoCRA Officials	• No. of training conducted for PoCRA officials		
	Training of Farmers' friends & VCRMC	• No. of training conducted for Farmers' friend & VCRMC		
	Training of Farmers	• No. of training conducted for Farmers		
	Exposure Visits	• No. of Exposure Visits Conducted (National/International)		

As part of the results framework, the above outcomes and PDO will be measured through the PoCRA Results Framework Indicators detailed below

3.2.2. PoCRA Results Framework Indicators & Methodology for Measurement

PDO Level Indicators

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
1	**Increased Water productivity** *Water productivity in kg.m-3: ag. production / water consumption (change relative to Baseline: %)*	This indicator measures the annual increase in water productivity at sub district level (taluka); it is expressed as a ratio of agricultural production (in kg) over water consumed (in m3).	**1. Crop Data** • Crop Name • Area under each crop in acres • Location (Lat/Long) • Crop Spacing • Crop Damage (if any- due to animal attack, unseasonal rains, storms etc.) • Photographs • Yield in Kg **2. Water Consumption** • Irrigation Source (Farm Ponds, Wells) • Pump Type • Method of Irrigation (Drip/Sprinkler/Flood) • Spacing • Area irrigated • No. Of irrigations • Flow Rate • Irrigation Time **3. Soil Type & Depth (in foot)**	• **Field Survey Tools (Questionnaire)** (For Crop Type, Yield data estimation, Water Source, Irrigation Information & Soil Information) • **Farm Water App developed by IIT Bombay** $water\ productivity = yield\ (kg) / Total\ water\ taken\ up\ by\ crop\ (Rainfed\ AET + watering\ AET)(m3)$ Where Irrigated AET = Rainfed AET + watering AET	√	√	√	√

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
2	**Improved yield uniformity and stability** *Spatial and temporal yield variability for oilseeds (soybean) & pulses (pigeon pea)* *(coefficient of variation CV crop yield)*	This indicator measures the Coefficient of Variation (CV) for yields of soybean (for oilseeds) and pigeon pea (for pulses) over time (temporal variability: CV-T) and across project districts (spatial variability: CV-S).	**Crop Data** • Crop Name • Area under each crop in acres • Location (Lat/Long) • Crop Spacing • Crop Damage (if any- due to animal attack, unseasonal rains, storms etc.) • Photographs • Yield in Kg	• **Field Survey Tools (Questionnaire)** (For Crop Type, Yield data estimation, Water Source, Irrigation Information & Soil Information) *The coefficient of variation (CV) is defined as the ratio of the standard deviation to the mean:* $Cv = \sigma / \mu$ • The yield data obtained from the Field Survey Tools will be cross verified through Yield data at the Taluk Level from the DSAO.	√	√	√	
3	**GHG Accounting: Carbon sequestration and Greenhouse Gas emissions reduced** *Net GHG emissions (in '000 tCO_2eq/year)*	This indicator reports on the GHG emissions reduced as a result of climate-resilient agricultural technologies and agronomic practices introduced by the project.	• Crop Name and area season wise. • Number of trees planted/ Area under plantation • Whether no-tillage adapted – crop name and area, the height of residue. • Number of animals • Fertilizers Manure applied Quantity, area	• **Field Survey Tools (Questionnaire) will be used to capture data required for GHG calculations based on the FAO's EX-ACT tool** FAO's EX-ACT tool *GHG emissions = (activity*	√	√	√	

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
			• No of tractors, tillers, water lifting pumps, etc.	*data) * (GHG emission factor)* EX-ACT estimates carbon stock changes (emissions or sinks of carbon dioxide, or CO_2) as well as GHG emissions (CO_2, N_2O, CH_4) per unit of land, expressed in equivalent tonnes2 of CO_2 per hectare and year ($tCO_2e/ha/yr$) • Project net greenhouse gas (GHG) emissions are calculated using as an annual average of the difference between project gross (absolute) emissions aggregated over the economic lifetime of the project and the emissions of a baseline (counterfactual) scenario aggregated over the same time horizon				
4	**Annual farm income**	This indicator tracks the annual farm income of project	**Net Income** (Measured as a difference of Income and Expenditure of the Project	**Field Survey Tools (Questionnaire) will be used to capture the**	√	√	√	

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
	Farm income comparator (total; male & fem. landholders) (as ratio with/without project)	beneficiaries. It measures how the income of landholders evolves with project activities, compared to the income of landholders that do not benefit from project interventions.	Beneficiaries)	**Income & Expenditure as a separate section in the Mobile App for both project and control villages.** Exhaustive options have been kept in the tool to enable capture of right data as part of the indicator. **Income Comparator=** Income of Project Beneficiaries (M & F separately)/ Income of control village				
5	**Direct project beneficiaries: number of farmers reached with agricultural assets of services** *Number of farmers reached with agricultural assets or services (% of female)*	This indicator measures the number of farmers who were provided with agricultural assets or services as a result of project support.	• Project Interventions with direct beneficiaries (segregated by Males & Females) • The interventions can include inter alia, assets include all goods and works related to agriculture technology and agronomic practices as well as farm machinery, processing equipment and infrastructure. Services include research, extension, training, ICTs, inputs (e.g., fertilizers, pesticides, labor), production-related services, etc.	**Details from PoCRA PMU based on the details entered by Cluster Assistant**		√	√	√

Intermediate Outcome Indicators - Component A: Promoting Climate-resilient Agricultural Systems

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
6	**Farmers adopting improved agricultural technology** *Farmers adopting improved agricultural technology promoted (% of female)*	This indicator measures the number of farmers who have adopted an improved agricultural technology promoted by activities supported by the project	New Technology adopted for Seed Preparation, Planting Time, Seed Preparation, Feeding Schedule, Post – Harvest Storage/Processing, any other technology adoption • Number of persons adopting new technology • Number of Females adopting new technology	• **Field Survey Tools (Questionnaire)** • **FGDs with farmer's upto 5 ha land (separately for women farmers)** • **FGDs with VCRMC** • **Key Informant Interviews with SDAO/Cluster Assistants** • **Details from PoCRA PMU based on the details entered by Cluster Assistant**	√	√	√	√
7	**Improved water-use efficiency at farm level** Area provided with new/improved irrigation or drainage services (in ha)	This indicator measures in ha the total area of land provided by the project with new or improved irrigation or drainage services	Irrigation Service Newly Introduced/ Improved as part of the project • Name of Crop • Current/Prior Irrigation Source • Area under Crop & Yield • Type of Service Introduced/Improved • Area brought under irrigation (new area or additional area) (ha) • Date of Commencement/ Improvement • Yield Improvement	• **Field Survey Tools (Questionnaire)** • **FGDs with farmer's upto 5 ha land (separately for women farmers)** • **FGDs with VCRMC** • **Key Informant Interviews with SDAO/Cluster Assistants** • **Details from PoCRA PMU based on the details entered by Cluster Assistant**	√	√	√	√

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
8	**Improved availability of surface water for agriculture** *Surface water storage capacity from new farm and community ponds (in 1,000 m3)*	This indicator measures the surface water storage capacity created with to project supported farm and community ponds.	Surface Water Storage Capacity Created • Farm Pond/Community Farm • Number of Ponds Created • Pond Size (LxBxD) • Capacity of Pond (2/3rd Volume) • Date of completion • Seasonal Capacity (50%) • Area bought under irrigation • Type of Crops Grown	• **Field Survey Tools (Questionnaire)** • **FGDs with VCRMC** • **Key Informant Interviews with SDAO/Cluster Assistants** • **Details from PoCRA PMU based on the details entered by Cluster Assistant**	√	√	√	√
9	**Enhanced soil health at farm level** *Area with GAPs for improved management of saline and sodic soils (in ha)*	This indicator tracks the farm production area in ha where Good Agricultural Practices (GAP) are applied by farmers for improving management of saline and sodic soils in project villages.	Good Agricultural Practices Adopted by Farmers • Area of Subsurface Soil Drainage, ha / Date • Area of application of soil amendments, ha / ameliorates / Date • Area of Improved agronomic practices, ha / Date • Area of Farm Ponds, ha / Commencement Date • Area to which water lifting devices cater, ha / Date • Area of Sprinkler Irrigation, ha / Date • Area of Drip Irrigation, ha / Date	• **Field Survey Tools (Questionnaire)** • **FGDs with farmer's upto 5 ha land** • **Key Informant Interviews with SDAO/Cluster Assistants** • **Details from PoCRA PMU based on the details entered by Cluster Assistant**	√	√	√	√

Intermediate Outcome Indicators -Component B: Climate-smart Post-harvest Management and Value-chain Promotion

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
10	**Seeds supply: Promotion of climate resilient crop varieties** *Oilseeds (soybean), Pulses (pigeon, chick pea) production area under cultivation w/ certified seeds of improved varieties (share in %)*	This indicator measures the share of production area in the project with oilseeds and pulses that is cultivated using certified seeds of improved varieties.	Use of Certified Seeds of Stress Tolerant Variety • Total Area under Soybean in the Project Villages, ha • Area under Soybean using certified seeds in project villages, ha • Total Area under Pigeon pea in project villages/control villages, ha • Area under Pigeon Pea using certified seeds in project villages/control villages, ha • Total Area under Check pea in project villages/control villages, ha • Area under Chick Pea in project villages/control villages, ha	• **Field Survey Tools (Questionnaire)** • **FGDs with farmer's upto 5 ha land** • **FGDs with VCRMC** • **Key Informant Interviews with SDAO/Cluster Assistants** • **Details from PoCRA PMU based on the details entered by Cluster Assistant** *Calculated as percentage of the total area grown for the three crops*	√	√	√	√
11	**Farmer Producer Companies: Strengthened and financially sustainable FPCs** *Number of project supported*	This indicator reports the number of project-supported Farmer Producer Companies with growth in annual profit.	Survey of Farmer Producer Companies (FPCs) • Number of FPC's receiving project support • Name of FPC • Type of Service provided • Area • Trend of growth of FPC by	• **FGDs with FPCs** • **FGDs with VCRMC** • **Key Informant Interviews with SDAO/Cluster Assistants** • **Details from PoCRA PMU on the No of FPCs formed**				√

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
	FPCs with growth in annual profits		scrutinizing the annual audited statements of project supported FPC • Feedback of farmers on the comfort level of service provided					

Intermediate Outcome Indicators -Component C: Institution Development, Service Delivery and Knowledge for Climate-Resilient Agriculture

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
12	**Research and Extension: Mainstreaming climate-resilience in agricultural research and technical advisory services** *Number of updated district SREPs with internalized climate resilience agenda (x out of 7)*	This indicator reports on the number of district-level, multi-year, Strategic Research and Extension Plan (SREP) that have mainstreamed climate-resilience.	• No. of SREPs review, updated and validated in the project area • Progress on the review & updation of SREPs	• **Key Informant Interviews with ATMA/DSAO** • **Details from PoCRA PMU**				√

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
13	**Climate Innovation Center: Private sector participation** *Number of clients (FPOs, SMEs, …) receiving services from the CIC*	This indicator tracks the number of clients (Farmer Producer Organizations, SMEs,) that receive services from the CIC	Number of Clients Receiving services from CIC • Name of CIC • Number of Clients of CIC • Name of Clients (FPO, SME,) • Type of Service Utilized • Date • Value of Service	**Details from PoCRA PMU**				√

Cross-Cutting Indicators

S. No	Indicator(s)	Definition	Variables to be Measured	Methodology for Measurement	Measurement Frequency			
					Base line	Mid Line	End Line	Concurrent
14	**Beneficiary Participation and Civic Engagement** *Number of approved participatory mini watershed plans implemented / under implementation*	Number of approved participatory mini watershed plans implemented / under implementation	Participatory mini watershed plans approved by gramsabha • Number of Mini Watershed Plans Approved • Date of Approval	**Details from PoCRA PMU** **In rest of Project Area, there are 320 Clusters. The measurement will be out of 320.**				√

4. Study Design

4.1. Baseline Survey

In the Baseline/Midterm/End line surveys a household means a 'small/marginal farmer-household', which is the target of the project.

4.1.1. Sampling

As specified in the table mentioned below given in the ToR, the baseline survey will be conducted on a sample of 208 of the 320 clusters being covered by the project in the rest of project area. From the 208 sample clusters, 416 treatment villages will be selected at the rate of 2 per cluster. For the control group, 208 out-of-project villages, that are comparable and adjacent to the selected treatment villages, will be selected. Thus, there will be a total of 624 villages for the baseline survey. In each selected village, 5 households having agriculture land up to 2 ha (or 5 acres, or marginal/small farmers) will be covered.

Table 4. 1 Sample Size as per ToR

District	Taluk no	Total Clusters	Clusters chosen for sampling	Total No. of treatment villages chosen for sampling (2 per Cluster)	Control Villages	Total Villages to be surveyed	Total households to be surveyed: 5 per village
Amaravati	14	58	37	74	37	111	555
Buldhana	13	80	44	88	44	132	660
Akola	7	65	40	80	40	120	600
Washim	6	22	19	38	19	57	285
Yavatmal	16	23	19	38	19	57	285
Wardha	8	12	11	22	11	33	165
Jalgaon	15	60	38	76	38	114	570
Rest of Project Area	**79**	**320**	**208**	**416**	**208**	**624**	**3120**

Selection of Districts

The 7 districts mentioned in the table above, will be taken as sample districts for the project. The number of talukas is also specified in the table, which will be taken in the project districts.

Selection of Clusters

- For the selection of clusters, the list of clusters will be obtained from the PMU and the list will be arranged by talukas and district.
- From this sorted list, **a Systematic Random Sample (SRS) of 208 clusters will be drawn**

Selection of Villages

Treatment Villages Selection

- For the selection of sample villages in the project area, the list of treatment villages (with vulnerability index and population size or number of households) by cluster will be obtained from the PMU.
- Then, the villages in each selected cluster will be arranged by vulnerability index and population size/number of households
- Sample of 2 villages per cluster will be selected by applying **probability proportionate to size sampling** method (size being the number of households or population of the village)

Control Villages Selection

- Table 1 gives the number of control villages to be sampled (208)
- For drawing these sample villages from control area, the list of villages in the selected taluks, excluding the project villages, will be considered.
- The list of out-of-project villages with the vulnerability index and population size/number of households will be obtained from the PMU.
- The control village will be selected will be selected based on the vulnerability index of all the villages in the Taluka and from them one village will be selected at random.
- Thus, there will be 208 villages in the control group corresponding to the 208 selected clusters in the project area.

Selection of Households

The following methodology will be adopted for 5 HH selection from each village (project & control)

- Assuming that at least 50 percent of the households in a Village will be having an agricultural landholding of 5ha in the project area, a random sample of 10 households will yield a minimum of 5 target households for our survey. However there is a possibility of a few electorates may be non-traceable, traceable but not available for interview and still some may refuse. **Hence, we propose to select 10+2=12 households randomly from each selected village that will ensure a minimum of 5 completed interviews.**
- **Initially, we will select 12 electorates from the electoral list by applying systematic random sampling method.** The possibility of selecting 2 or more electorates from the same household is very remote as the electorates of the same household is usually written consecutively and we select just 12 electorates from the hundreds of electorates in the village by applying systematic random sampling method. In case this situation arises, we will count only one household from the repetitions. This method will be tested in the pilot survey along with the PMU officials.
- Now we need to find a sampling frame with fairly accurate list of households so as to select 12 households, which is very hard to obtain. Fortunately we have the electorate list that is fairly uniform across villages and towns, accurate, updated from time to time and available for download from the Election Commission's website.
- One limitation of the electoral list is that it gives the list of electorates

As per a study conducted in 2009 in 6 districts namely, Akola, Amravati, Buldana, Washim, Wardha and Yavatmal of Vidarbha region (project districts under the current study) on a representative sample of 6690 households (Rajaretnam, T., Parasuraman, S., and Sunil, R, 2010, Vidarbha Baseline Survey of Agriculture and Rural Livelihoods, Tata institute of Social sciences, Mumbai.), it was found that 39 percent of the households were marginal and small farmers (with up to 2 ha of agricultural landholding) and 56 percent of the households were marginal/small/medium farmers with up to 5ha of agricultural landholding.

(persons age 18 and above) and not the list of households as such. However we can assume that the household of the electorate is the household for our purpose.

- **In the selected households (of electorates), we will administer a brief questionnaire (listing form) to elicit if the household possess any agricultural land and how much? The households that possessed agricultural land below 5 ha will be the target household to administer the detailed questionnaire.**
- Methods like social mapping and/or sequentially adding respondents until 5 households are interviewed, is not a statistical random sampling method as it amounts to purposive sampling method, and the sample so obtained will be a purposive sample.
- Keeping in view that fairly accurate sampling frame (list of households in the villages) is very hard to obtain and even if available it takes time and energy to obtain the list and social mapping/ other methods are not statistical random sampling methods, the electorate-based method is proposed as a better method.
- It is to be noted that this method is successfully applied in many surveys conducted in Maharashtra, Madhya Pradesh and Gujarat by the Statistical Expert of the M & E Agency (see box).

  Thus, the proposed sampling design will ensure that the selected households will adequately represent the project area and control area, besides ensuring coverage of the predetermined 3120 small/marginal-farmer households in the sample.

4.1.2. Study Tools

- **Village Profile:** A village profile will be developed as per the following:
  - A Village Profile form will be evolved that will capture various aspects of village level information and the form will be administered to different categories of functionaries at village level as appropriate.
  - One form will be filled for each selected village. As the required information are to be obtained from different functionaries, first the information will be recorded in a printed form and once all the information is filled, it will be transferred to digitized form and uploaded by the same investigator.
  - The information to be collected in the village questionnaire include

- census-based information such as number of households, population, literates, workers, etc. by sex that are available in the primary census abstract
- infrastructure facilities such as rail, roads and electricity; service facilities such as drinking water, postal and telephone/telephone facilities and transport facilities
- irrigation and agriculture related facilities such as agricultural land, water sources (farm ponds, open wells, tube wells, check dams, etc.)
- major and minor crops grown and accessibility to market
- government schemes already implemented in the village such as Magel Tyala Shet Tale, NHM Schemes, RKVY and Jal Yukta Shivar; farmer Groups such as FIGs, FPOs and FPCs, and their membership, major activities and annual turnover
- Credit/ insurance facilities such as banks, co-operative institutions (eg. PACs) and other informal sources of credit, and the amount of credit extended by the institutions, rate of default, loanee and non-loanee farmers enrolled under PMFBY and farmers enrolled under WBICS

- **Household Listing**: A Household listing form will be used to list the 5 selected households with a brief account of their landholding details by personally visiting them, and the target households (small/marginal farmers) will be identified for the household survey.
- **Household Questionnaire**: A household questionnaire will be administered to the identified marginal/small farmers that will contain the following information:
  - Household identification, socio-economic background, landholding pattern, agricultural implements owned/rented, crops cultivated during 2018-19 seasons, details of method of cultivation, seed, fertilizer, pesticides used, cost of cultivation, crop yield obtained,
  - Support received from PoCRA functionaries and/or other agencies,
  - Membership in organizations such as FIG, FPO and FPC and benefits received
  - Credit/insurance facilities availed from banks, co-operative institutions and other informal sources, and so on
- **Checklist for FGDs with Farmers, SHGs & FPCs:** Along with the HH survey, FGDs will be conducted to capture qualitative information. Three separate checklists have been

developed for farmers, FPCs & SHGs. The checklists will be submitted to PMU for approval before the baseline survey. Once concurrence is given, they will be finalized and translated in Marathi and will be carried out along with the HH survey

4.1.3. Data Collection Methodology

- Detailed questionnaires will be prepared for village profile and household interviews, discussed and finalized within the PMU after the comments and suggestions received have been incorporated.
- In the next step, the questionnaires will be field tested, refined and digitised into a computer assisted personal interview (CAPI) application.
- Simultaneously, required number of field investigators and supervisors with minimum graduate (preferably post-graduate) qualification and belonging to farmer-households in the project area will be appointed.
- The investigators and supervisors will be given 3-4 days training in the project area with adequate field orientation.

4.1.4. Quality Assurance Mechanism

- Continuous monitoring and field checking of the investigators will be done by the supervisors.
- The field supervisor team and the key experts will also be involved in the training of investigators and the field orientation.
- The field supervisor will check field data collection of the field survey and attend at least one review meeting of the investigators and offer their guidance and suggestions.
- The field data will be uploaded every day and Random Sample will be taken periodically to check for coverage, correctness, completeness and consistencies of the information collected.
- Once the survey is completed, the data will be checked for correctness, completeness, consistency and errors if any will be corrected to the extent possible.
- Once the data is checked and cleaned, required tables will be generated in consultation with the subject experts and PMU, and appropriate indices will be derived besides generating final tables and charts.

- Simultaneously, drafting the baseline survey report will be taken-up by the subject experts and a combined report will be finalized and submitted to the PMU on time.

4.2. Concurrent Monitoring

4.2.1. Sampling

Concurrent Monitoring (progress monitoring of activities) will be conducted half-yearly over the entire 5-year period of the project. Sample size is given in the table below.

Table 4. 2 Sample Size of Concurrent Monitoring

Concurrent Progress Monitoring	No. of clusters in which the monitoring is to be conducted	No. of villages for treatment group (1 village per watershed)	No. of villages for control group
Concurrent 1	32	32	16
Concurrent 2	32	32	16
Concurrent 3	32	32	16
Concurrent 4	32	32	16
Concurrent 5	32	32	16
Concurrent 6	32	32	16
Concurrent 7	32	32	16
Concurrent 8	32	32	16
Concurrent 9	32	32	16
Concurrent 10	32	32	16
Total	**320**	**320**	**160**

Thus, there will be a total number of 10 rounds of concurrent progress monitoring activities will be conducted over a period of 5 years.

Selection of Districts

The 7 districts mentioned in the table above, will be taken as sample districts for the project. The number of talukas is also specified in the table, which will be taken in the project districts.

Selection of Clusters

- The Concurrent evaluation will be conducted in 32 treatment clusters in each round and clusters will be selected from among the clusters not covered so far as mentioned in the Table 2.

- Thus, the total 320 clusters will be covered only once during the project period.
- **The sample clusters will be obtained by applying systematic sampling method after arranging the clusters by taluk and district.**

Selection of Villages

Treatment Villages Selection

- In each selected cluster one village will be selected at random and all individual, community/ common activities undertaken in that village will be assessed.
- However, if the number of beneficiaries of any activity is more than 5, then, the assessment will be restricted to only 5 beneficiaries selected on sample basis.
- In case of community or common activities (like check dam), the assessment will be made by interviewing a section of all stakeholders (like farmers, VCRMC members and project functionaries).

Control Villages Selection

- For drawing these sample villages from control area, the list of villages in the selected taluks, excluding the project villages, will be considered.
- The list of out-of-project villages with the vulnerability index and population size/number of households will be obtained from the PMU.
- The control village will be selected will be selected based on the vulnerability index of all the villages in the Taluka and from them one village will be selected at random.

Thus, the proposed sampling design will ensure that the selected households will adequately represent the project area and control area, besides ensuring coverage of the predetermined small/marginal-farmer households in the sample.

4.2.2. Study Tools

- Checklists will be evolved for each activity (common checklist for very similar activities) with pre-coded responses and provision for narrative description.
- The checklists will be pretested and digitised as a CAPI questionnaire.

- **Checklist for Farmer's Friend**: The farmer's friend if any existing in the selected villages will be identified and interviewed regarding their background, training obtained, activities in the field, number of formers benefitted by type of benefit, opinion about cooperation from farmers, opinion about his/her role as Farmers' friend, and so on.
- **Checklist for VCRMC**: Village Climate Resilient Management Committee (VCRMC), if existing in the selected villages, then, the head and a few members will be interviewed to assess their membership, involvement of members, frequency of meeting, activates undertaken including selection and recommendation of beneficiaries for obtaining benefits, and so on.
- Wherever possible, documentations and case study shall be collated.

4.2.3. Data Collection Methodology

- Detailed checklists will be prepared by the subject experts and discussed and finalized with the PMU after their comments and suggestions have been incorporated.
- In the next step, the checklists will be field tested, refined and digitized into a computer assisted personal interview (CAPI) checklist.
- In the meantime, a team of investigators and supervisors with post-graduate qualification (or graduates with a degree in agriculture) and belonging to farmer-households in the project area will be appointed. The investigators and supervisors will be given 3-5 days training in the project area with adequate field orientation.

4.2.4. Quality Assurance Mechanism

- Continuous monitoring and field checking of the investigators will be done by the supervisor.
- The key experts will also be involved in the training of investigators and field orientation.
- At the end of every round of field work, the data will be checked, analyzed by the field supervisor
- The report will then be submitted to the PMU for their consideration and acceptance.

4.3. Midterm Survey

The methodology of the Midterm Survey is like the one mentioned in (I) for Baseline Survey. the selected treatment villages) with a total of 624 villages. Though the number of clusters, villages and households to be selected for the midterm survey will be same as that of the baseline survey, there would be some modifications in the selection process.

- Baseline sample of clusters will be divided into two equal sets by choosing the alternate clusters, and one set of clusters (104 clusters) will be retained as it was for the baseline survey and the other set of clusters (remaining 104 clusters) will be replaced by selecting equal number of clusters afresh from the remaining non-selected clusters in the project area by applying the same procedure as in the baseline survey.
- Further, in respect of the villages being retained, the baseline-interviewed households will also be retained for the midterm survey. For the other set of clusters, the selection of villages will remain same as that of the baseline survey.
- The number of control villages and households for the midterm survey will be the same (208 villages and 5 households per village) and they will be selected afresh as in the baseline survey.
- The survey tools and implementation process for the midterm survey are also the same as that of the baseline survey. However, the survey tools may have additional components and refinements if required and finalized in consultation with the PMU.

4.4. End line Survey

The methodology of End line Survey is like the one mentioned in (I) for Baseline Survey & (II) for Midterm Survey. Though the number of clusters, villages and households to be selected for the midterm survey will be same as that of the baseline survey, there would be some modifications in the selection process.

- As in the midterm survey, the end line survey will also be conducted on a sample of 208 clusters and 416 villages in the project area, out of which 104 clusters and 208 villages (50%) will be the same clusters and villages of the baseline and midterm surveys and the

remaining clusters and villages will be selected afresh from the remaining non-selected clusters by applying the same procedure as in the baseline survey.

- The number of control villages and households for the end line survey will be the same (208 villages and 5 households per village) and they will be selected afresh as in the baseline survey.

The survey tools and implementation process for the end line survey are the same as that of the baseline and midterm surveys. However, the survey tools may have additional components and refinements if required and finalized in consultation with the PMU.

4.5. ESMF Audit

4.5.1. Environment Management Framework

Main objective of the Environment Management Framework (EMF) is to assess the baseline environmental conditions, identify potential environmental impacts of project intervention, and develop mitigation measures to address the impacts associated with the project. It is anticipated that environmental issues and impacts would be minimal since the project's underlying objective is to improve the climate resilience of smallholder farming systems in selected districts of Maharashtra. EMF also calls to ensure that the project interventions lead to environmentally sustainable outcomes. Mainly it would facilitate compliance with the legal and regulatory framework, establish procedures for environmental screening of project activities. Describe the environmental management guidelines and plans for mitigation of the environmental impacts of the project activities. Environmental assessment is objectively designed to prepare EMF of the project, adhering to the World Bank Operational Policies and need of the project. This is a prerequisite to meet World Bank Safeguard Policies which will ensure that the project activities do not cause any adverse environmental impact and follow the applicable national and state regulations. The EMF is developed based on environmental assessment in the identified project locations.

The scope of EMF will be to provide essential baseline data, confirm policies that are triggered, and assess likely impacts of the project interventions. The EMF will propose mitigation measures for any adverse impacts that may be envisaged through the design and construction phases of

various project interventions. The participatory environment assessments will be conducted with due and extensive consultations with all the stakeholders, especially, the poor and vulnerable farming community. Further, the EMF will also outline arrangements for consultations with the stakeholders and disclosures thereof both during preparation as well as implementation phases. Preparation of the ESMF included the following stages:

- Develop environmental baseline
- Stakeholder analysis and consultation
- Legal and policy framework
- Analysis of Key Environmental and Climate Risks and Vulnerabilities
- Potential Mitigation Measures

A. Applicable Environmental Laws and Regulation

Proposed PoCRA would be governed by various Acts, Rules and regulations enforced by Ministry of Environment, Forest and Climate Change (MoEF&CC) at the Central level and other regulatory agencies at the State and local levels. Various environmental standards, specifications and guidelines of Central Pollution Control Board (CPCB) and state level agencies will also be applicable. The various acts/rules/guidelines applicable to the project are as below:

a. National Environment Policy, 2006
b. Environment Protection Act, 1986
c. Plastic Waste Management Rules
d. Hazardous Waste Management Rule, 1989
e. Insecticides Act, 1968
f. Policy for abatement of pollution, 1992
g. National Conservation Strategy & Policy on Environment & Development, 1992
h. State Water Policy, 2003

i. Maharashtra Management of Irrigation Systems by Farmers Act 2005

j. The Maharashtra Water Resources Regulatory Authority (MWRRA) Act

k. Maharashtra Groundwater (Development & Management) Act 2009

B. Environmental Screening and Environmental Management Plan

Every subproject was screened as follows:

- To check if the activity is permissible as per the Government of Maharashtra and World Bank safeguard policies
- To check for legal and regulatory compliance
- To understand the baseline environmental conditions, and,
- To identify the potential environmental impacts.

The following tool/format for screening of the project supported activities has been developed and approved by the World Bank and included in the EMF (Annex 1).

- Environmental Screening Checklist A: to be used for village level watershed plans and mini-watershed/cluster plans
- Environmental Screening Checklist B: to be used for post-harvest management and value chain promotion activities

C. Environmental Monitoring

Most of the activities planned under project have minimal negative impact on environment; it will ensure that during project implementation the mitigation measures are complied with for each activity. It will also be taken care that environment improvement measures adopted wherever these are necessary. Project will monitor all the activities including EMF as integral part of each project components and periodic monitoring and evaluation process. These inputs will be captured for the overall project, and would include details of all the mini-watershed/cluster plans that include filled-in Environmental Screening forms, and that have integrated Environmental Guidelines, and IPMP strategies.

In addition, the project will monitor the number of training programs on integrated pest and nutrient management organized for project staff; FFS and technology demonstrations that include IPMP aspects.

D. Capacity Building Plan

The objective of organizing orientation programme for the officials (operating at different levels) is to equip them well by which they can manage the concerned components of the project effectively and efficiently. As the project objectively looks at promoting climate resilience in agriculture sector, it is expected that the concerned officials are oriented in that direction. The capacity building on environmental aspects would take into account the current environmental issues in the State / project districts, project specific initiatives to adapt to the changes and taking mitigating measures. The project will also take up awareness and sensitization drive at community level (cluster / village level) to educate people on impacts of climate variability on agriculture and measures to be taken. The capacity building plan gives details of the training and IEC (information, education, communication) activities to be organized for the project beneficiaries as well as the project staff.

E. Reporting Plan

During implementation of the project, periodic reports covering environmental aspects as per the environment management framework will be prepared. Environmental concerns and necessary environmental mitigation and improvement measures will be part of project's time-based reporting. All periodic reports of the project will include environmental management compliance status that will provide details on the implementation of environmental management plan and implementation of the integrated pest and nutrient management plans.

4.5.2. Social Management Framework

A. Source of Information for Local Rural Institutional Assessments

For creating the baseline information about the existing local institutions, data will be collected using primary survey and secondary sources. The primary source will include household interviews, Focus Group Discussion, organisational records/ organisational bylaws/constitution, Key (Organisational) informant interviews. The secondary sources include the list of

organisations available with the Rural Development Department (list of watershed committee (WC) and List of Self Help Groups(SHG) and Producer Organisations/Companies (PO/PC)), Department of Agriculture and Department of Horticulture (list of Farmer Producer Organisations/Farmer Producer Companies); Agriculture Marketing department (list of Agriculture Produce Market Committees), Rural Co-operative Department (list of Primary Agriculture Credit Cooperative Societies (PACS), Dairy Co-operative Societies (DCS)) etc.

B. Measurements and Indicators

The following indicators and sub indicators will be deployed in the study.

1. Inclusiveness of local institutions
2. Accountability (downwards) in local institutions
3. Extent of interventions (upward accountability) in functioning of local institutions by external higher-level officials
4. Participation of members in local institutions
5. Adaptability of local institutions to external events like climate change
6. Local institutions having links with other rural institutions
7. Extent of integration of smallholders with factor and output markets
8. Local institutional capacity
9. Extent of resource endowment of local institutions:
10. Contribution of local institutions to enhancement of livelihoods of members
11. Equity of outcomes through Climate Resilience Agriculture Interventions

Organisational & Institutional Indicators, Units and Data Sources

Focus Area	Indicator group	List of Organizational & Institutional Indicators		
		Description of Indicator	**Unit**	**Data source**
Community Participation	Local institutions	**1.Inclusiveness of Local institutions** • No of households belonging to small and marginal landholdings having membership/contact with local institutions	Household	Primary Survey (through Household Questionnaire) / Organizational Records

		• No of households belonging to marginal social categories like OBC, SC,ST and Divyang category having membership/contact with local institutions • No of women having membership/contact with local village institutions	Household Household	Primary Survey (through Household Questionnaire)/ Organizational Records Primary Survey (through Household Questionnaire)/ Organizational Records
		2.Accountability in local institutions • Sharing of information by leaders / managers of organization/institution about strategic activities, finance, personnel changes, decision making and performance of the institution with rank and file members • No of instances of sanctioning (or change) of leaders/managers (decision makers) for inappropriate decisions by superiors. • No of instances of sanctioning (or change) of leaders/managers (decision makers) for inappropriate decisions by members.	Organization / Institution Organization / Institution Organization / Institution	Focus Groups Discussions / Key Informant interviews Using Organizational Questionnaire Focus Group Discussion / Key Informant interviews Using Organizational Questionnaire Focus Group Discussion / Key Informant interviews Using Organizational Questionnaire
		3.Extent of interventions in functioning of local institutions by external higher-level officials • No of organizations having village level, taluka level, district and state level federations. • No of representatives of Central/State Government participating in the decision making of	Taluka/District Taluka/District	Focus Groups Discussions Key Informant interviews Focus Groups Discussions

		village/taluka/district/state federations		Key Informant interviews
		4.Levels of participation of members in local institutions • Actual no of meetings (General Body Meetings) conducted as a proportion of desired GBM meetings • Proportion of members attending General Body Meetings	Organization / Institution Organization / Institution	Organizational Bye Laws/ Constitution/ Organization records & Focus Groups Discussions Organizational Bye Laws/ Constitution/ Organization records & Focus Groups Discussions
		5. Adaptability of local institutions to external events like climate Change • No of local level institutions providing information/advisory services to members on Climate Resilience Agriculture • No of local institutions providing products/service to members for initiatives relating to Climate Resilience Agriculture • Percentage of challenges/opportunities in the following 6 different domains (as a result of climate change) addressed successfully by local institutions. 1. Strategic planning 2. Finance and accounting 3. Operation and maintenance 4. Human resource	Organization Organization Organizational / Institutional	Primary Survey (through Organization Questionnaire) & Focus Group Discussions Primary Survey (through Organization Questionnaire) & Focus Group Discussions Primary Survey (through Organization Questionnaire) & Focus Group Discussions

		5. Marketing and 6. Information management		
		6.Local institutions having Links with other rural institutions • No of local institutions in the taluk per 1000 farm households • Extent of local organizations having horizontal linkages (with other institutions) in the Village/Taluka/district. • Extent of local organizations having vertical linkages within the organization (district and state level federations)	Taluk/District Taluk/District Taluk/District	Secondary Source (from Departments of Rural Development, Agriculture, Horticulture, Co-operation, Irrigation etc.) Focus Groups Discussions Key Informant interviews Focus Groups Discussions Key Informant interviews
		7.Local institutional capacity • No of members from local institutions trained on basics of climate resilience. • No of members from local institutions underwent went exposure visit to outside district on climate resilience • No of local institutions having Trainer of Trainers (ToT) on Basics of Climate Resilience • No of local institutions organizing training programs to members on Basics of Climate Resilience. • No of heads of local institutions trained on (i) strategic planning; (ii) finance and accounting; (iii) operations and maintenance; (iv) human resources; (v) marketing;	Households Households Organization/ Institution Organization / Institution Organization / Institution	Primary Survey (through Household Questionnaire) Primary Survey (through Household Questionnaire) Primary Survey (through Organization Questionnaire) Primary Survey (through Organization Questionnaire) Primary Survey (through Organization Questionnaire)

		(vi) information management. • No of local institutions and their board members trained on (i) strategic planning; (ii) finance and accounting; (iii) operations and maintenance; (iv) human resources; (v) marketing; (vi) information management.		
		8.Extent of integration of smallholders with factor and output markets through local institutions • No of local institutions providing inputs (1-Seeds, 2-Fertilizers, 3-Pesticides, 4-Machinery; 5-Credit; 6-Extension Service; 7-Weather Forecasting Service; 8-Others) • No of local institutions providing services (1-Storage of Produce, 2-Transportation, 3-Purchase of Produce, 4-Others)	Organization / Institution Organization / Institution	Primary Survey (through Household Questionnaire Primary Survey (through Household Questionnaire
		9.Extent of resource endowment of local institutions: • Average amount collected as fees from organization members for the services provided by organization during last 3 years • Average amount received as grants from the state and central government during last 3 years by the organization • Average amount disbursed to members during the last 3 years	Taluka/District Taluka/District Taluka/District	Secondary Source (Department of Irrigation/ Department of agriculture/ Department of Cooperation/Department of Revenue)

		• Average amount spent on activities benefiting members during last 3 years.	Taluka/District	
		10.Contribution of local institutions to enhancement of livelihoods of members • Satisfaction (or feels helpful) by members belonging to BC/SC/ST; Women members; small and marginal landholdings; and divyang about the enhancement of livelihoods due to climate resilience activities undertaken by institutions during last year. • Average no of days of additional employment generated per household during last year due to climate resilient activities undertaken by the local village level institutions. • Average no of days of additional employment generated per hectare during last year due to climate resilience activities undertaken by the local village level institutions.	Households Households Households	Primary Survey (through Household Questionnaire) Primary Survey (through Household Questionnaire) Primary Survey (through Household Questionnaire)
		11. Equity of outcomes through climate resilience interventions • Satisfaction of members of Village Climate Resilience Management Committee (VCRMC) about planning and implementation of climate resilience focused activities taken up in the cluster.	Households/ Individuals Households/ Individuals	Primary Survey (through household Questionnaire) Qualitative Survey / Focus Group Discussion Primary Survey (through household Questionnaire)

		• Satisfaction of members of VCRMC (VCRMC) about Operation & Maintenance undertaken by the institution of activities of structures built in the Village/Cluster/area. • % of households who were happy with climate resilience activities benefiting members during last year.	Households/ Individuals	Qualitative Survey / Focus Group Discussion Primary Survey (through household Questionnaire) Qualitative Survey / Focus Group Discussion

4.6. Roles & Responsibilities of Key Experts

S No	Name	Position	Indicative Roles & Responsibilities
1	Sanjay Shankarrao Dhanphule	M&E Expert (Team Leader)	• Ensure an appropriate Monitoring and Evaluation (M&E) system is in place and is functioning satisfactorily • Steering the M&E Project in sync with PoCRA Outcomes & Objectives • Overall coordination & guidance, ensuring adherence to timelines and quality, liaisoning with the PMU and other PoCRA officials • Coordinate monitoring activities and inputs required from Key Experts • Anticipate, plan and support reporting requirements • Liasioning with district and Taluk level officials for successful implementation of M&E plan at ground level • Selection, Training & Capacity building of Enumerators • Troubleshooting at District/Block/Village level • Regular Interactions with Key Experts and support for field visit/meetings with officials

S No	Name	Position	Indicative Roles & Responsibilities
			• Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring • Any other work related to PoCRA M&E project
2	Ravikiran Shantaram Mali	Agronomy Expert	• Review the M&E needs and plans of the project, and extract relevant indicators to monitor the project outcomes and outputs • Inputs on Research Design & methodology • Questionnaire Preparation pertaining to domain expertise • Data Collection & Analysis • Generating Divisional technical Reports • Liaisoning with ATMA & DSAO officials • Troubleshooting at District/Cluster & Village level • Guiding the Enumerators, their training & capacity building • Pilot testing of questionnaire with the enumerators • Verification of the activities during concurrent monitoring • Critical feedback and analysis for quality M&E • Ensuring smooth processes at the district level • Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring • Any other work related to PoCRA M&E project
3	Basavaraj N. Humbarawadi	Agri-Business Expert	• Review the M&E needs and plans of the project, and extract relevant indicators to monitor the project outcomes and outputs

S No	Name	Position	Indicative Roles & Responsibilities
			• Inputs on Research Design & Methodology • Inputs on Indicators selection and Questionnaire • Critical feedback and analysis for quality M&E • In addition, specific inputs will be required pertaining to M&E for the following activities: o Establishing community owned Agro-processing centres at Farmers' Producers Organizations for primary processing of agricultural produce o Assessment of the agribusiness sector with special focus on value chain to identify constraints and potentials and recommend measures to correct the constraints and to effectively exploit the potentials o Factors influencing comparative and competitive advantage of Value Chains and recommend measures for enhancing competitiveness. • Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring
4	D Suresh Kumar	Agri-Economist	• Review the M&E needs and plans of the project, and extract relevant indicators to monitor the project outcomes and outputs • Inputs on Research Design & Methodology • Inputs on Indicators selection and Questionnaire • Critical feedback and analysis for quality M&E • Economic and financial analyses; carrying out sensitivity and risk analyses wherever required

S No	Name	Position	Indicative Roles & Responsibilities
			• Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring
5	L S Reddy	Social Development Expert	• Inputs on Research Design & Methodology • Inputs on Indicators selection and Questionnaire • Stakeholder's consultations, FGDs with stakeholders, data collection, analysis & report preparation. • Liaisoning with DSAO & ATMA officials at district level • Ensuring adherence to timelines and quality, liaisoning with the PMU and other PoCRA officials. • Monitor the progress of agreed social indicators during project cycle as per the M&E plan and assist to enhance positive impacts. • Assessing social risks as part of the concurrent monitoring activities • Providing analysis, insights and inputs focusing on the cross-sectional themes of gender mainstreaming, inclusion of SC, ST, OBC, Minorities, and Person with disabilities etc. • Training & capacity building of Enumerators. • Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring • Any other work related to PoCRA M&E project
6	T Rajaretnam	Statistical Expert	• Review the M&E needs and plans of the project, and extract relevant indicators to monitor the project outcomes and outputs

S No	Name	Position	Indicative Roles & Responsibilities
			• Providing basic statistical rigor in developing methodology including sampling, questionnaires, data analysis from primary and secondary sources. • Preparing specific data collection methods and tools • Questionnaire Preparation, Data Analysis • Compiling and analysing of the collected data and information for producing related reports • Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring
7	Suraj Pandey	GIS/MIS Expert	• Establish an effective data collection system and reporting forms for capturing quantitative and qualitative information in accordance with PoCRA M&E system • Overseeing the process of IT based set-up • Reviewing and assessing application of IT for M&E • Ensuring IT-based primary data collection, surveys etc. • Providing analysis, insights and inputs focussing on the cross-sectional themes of use of IT/Technology in driving efficiency. • Troubleshooting • Training of the team & enumerators for IT based M&E, etc. • GIS based Monitoring and analysis • Analysis of the data & generating various reports as required by the department • Analyse remote sensing satellite data and carry out change detection based on baseline data.

S No	Name	Position	Indicative Roles & Responsibilities
			• Generation of required GIS maps as part of the reporting system • Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring • Any other work related to PoCRA M&E project
8	Syed Ismail	Agricultural Engg. Expert	• Review the M&E needs and plans of the project, and extract relevant indicators to monitor the project outcomes and outputs • Inputs on Research Design & Methodology • In addition, specific inputs will be required pertaining to M&E for the following activities: o Use of agricultural engineering technologies for improving water conservation & harvesting, water use efficiency, mechanization of farm level activities, introducing community level agro-processing techniques for improving quality of agro-produce o Increasing farm mechanization o Treatment/Reclamation/ management of saline areas • Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring
9	Anand K Ojha	Hydrology Expert	• Review the M&E needs and plans of the project, and extract relevant indicators to monitor the project outcomes and outputs

S No	Name	Position	Indicative Roles & Responsibilities
			• Inputs on Research Design & methodology, Questionnaire Preparation • Physical verification & Monitoring of watershed related works • Collection and analysis of meteorological, hydrological and sedimentation data at watershed / village/ cluster level • In addition, specific inputs will be required pertaining to M&E for the following activities: o Village/ cluster level implementation of soil and water conservation / watershed treatment technologies, e.g. contour trenches and contour bunding, broad-bed furrows, deep furrows, gully plug, cement Nala bunds Earthen Nala bunds, farm ponds, etc. o Large scale up-scaling of use of drip and sprinkler micro irrigation systems for improving farm level water use efficiency • Report Finalization for Baseline, Mid-Line & End-Line Evaluation & Concurrent Monitoring
10	Nutan Gupta	Environment Expert	• Review the M&E needs and plans of the project, and extract relevant indicators to monitor the project outcomes and outputs • Inputs on Research Design & methodology, Questionnaire Preparation • Designing tool for ESMF Audit • Data analysis and generation of ESMF audit reports, critical inputs on ESMF processes

S No	Name	Position	Indicative Roles & Responsibilities
			• Analysis, insights and inputs focusing on the cross-sectional themes of Climate change and sustainability • Based on the relevant indicators/checklist with PMU help design surveys for capturing environmental management framework • Assessing environmental risks as part of the concurrent monitoring activities • Recommending minimization and mitigation measures to address adverse project impacts/negative externalities on people and the environment as part of ESMF audit

4.7. Key Experts Inputs

N	Name	Expert input (in person/month) per each deliverables												Total time-input (in Months)		
		Position		D-1	D-2	D-3	D-4	D-5	D-6					Home	Field	Total
K-1	Sanjay Shankarrao Dhanphule	M&E Expert (Team Leader)	Home	0.5	4.5	30	5	4.5	0.5					45		60
			Field	0	1	12	1	0.5	0.5						15	
K-2	Ravikiran Shantaram Mali	Agronomy Expert	Home	0	0.5	2	0.5	0.5	0					3.5		15
			Field	0	0.5	10	0.5	0.5	0						11.5	
K-3	Basavaraj N. Humbarawadi	Agri-Business Expert	Home	0	0.5	2	0.5	0.5	0					3.5		15
			Field	0	0.5	10	0.5	0.5	0						11.5	
K-4	D Suresh Kumar	Agri-Economist	Home	0	0.5	8	0.5	0.5	0					9.5		12
			Field	0	0.5	1	0.5	0.5	0						2.5	
K-5	L S Reddy		Home	0	0	5	0	0	0					5		20

		Social Development Expert	Field	0.5		1	11	1	1	0.5			15		
K-6	T Rajaretnam	Statistical Expert	Home	0		0.5	8	0.5	1	0		10		10	
			Field	0		0	0	0	0	0			0		
K-7	Suraj Pandey	GIS/MIS Expert	Home	0		0.5	10	0.5	1	0		12		12	
			Field	0		0	0	0	0	0			0		
K-8	Syed Ismail	Agricultural Engg. Expert	Home	0		0.5	1	0.5	0.5	0		2.5		12	
			Field	0		0.5	8	0.5	0.5	0			9.5		
K-9	Anand K Ojha	Hydrology Expert	Home	0		0.5	1	0.5	0.5	0		2.5		12	
			Field	0		0.5	8	0.5	0.5	0			9.5		
K-10	Nutan Gupta	Environment Expert	Home	0		0.5	0.5	0.5	0.5	2		4		10	
			Field	0		0	1	0	0	5			6		
Total for Experts												**97.5**	**80.5**		

4.8. Non-Key Experts Inputs

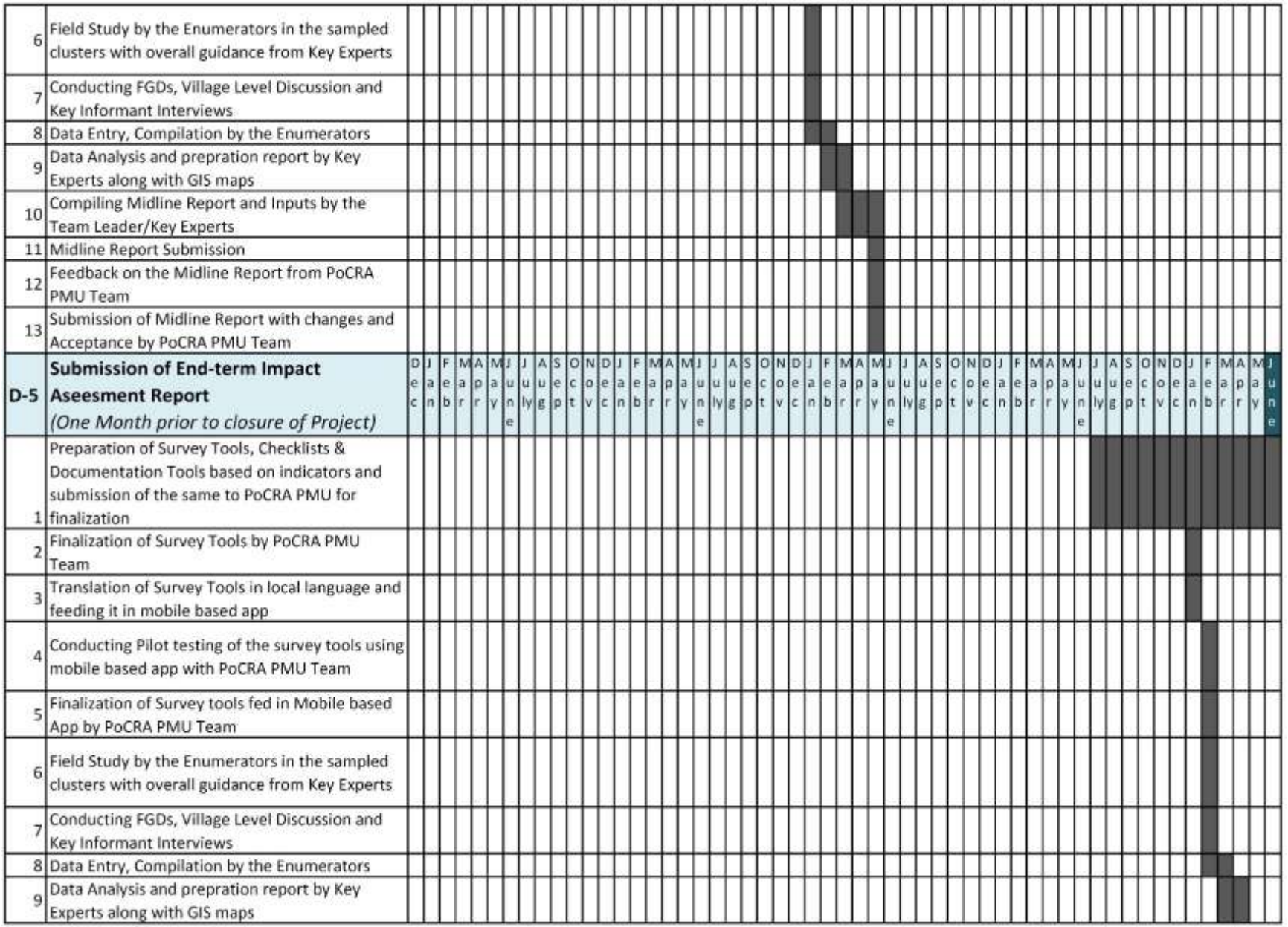
Key	Name of the Person	Number	Position	Total (Man-months)
N-1	Supervisors at district level	7	Supervisors	91
N-2	Field Coordinators	4	Field Level Coordinators	52
N-3	Field Enumerators for HH Survey	30	Enumerators	90
N-4	Field Enumerators for FGDs with Farmers, SHGs & FPCs	15	Enumerators	45
N-5	Field Enumerators for Concurrent Monitoring	15	Enumerators	150
N-6	Mr. Rahul Hiwale	1	Coordinator (Stationed at PoCRA PMU)	5
Continuous Liaison and support from Zonal Office Mumbai NABCONS team throughout the duration of the Project through the following members:				
1	Vice President	1	Vice President	
2	Consultants	2	Consultants	
3	Project Associates	2	Project Associates	

2. Project Work Plan

S No	Deliverables	Year 1												Year 2												Year 3												Year 4												Year 5					
		Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
D-1	**Submission of Inception Report** *(Within 15 days of the signing of the contract)*																																																					
1	Signing of MoU																																																				
2	Inception Meeting of Key experts with PoCRA Project team for discussing the sampling design, approach & methodology and project execution strategy																																																				
3	Preparation of Inception Report covering the sampling design, methodology, Output/Outcome/Impact variables and timelines and submission to PoCRA PMU Team																																																				
4	Receipt of feedback from the PoCRA PMU Team and inorporation of the same by NABCONS Team																																																				
5	Preparation of Draft Inception Report and acceptance of the same																																																				
D-2	**Submission of Baseline Report** *(Within 6 months of signing of the contract)*	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
1	Preparation of Survey Tools, Checklists & Documentation Tools based on indicators and submission of the same to PoCRA PMU for finalization																																																					
2	Identification and engagement of Enumerators and IT Based Agency for preparation of mobile app																																																					
3	Finalization of Survey Tools by PoCRA PMU Team																																																				
4	Translation of Survey Tools in local language and feeding it in mobile based app																																																				
5	Conducting Pilot testing of the survey tools using mobile based app with PoCRA PMU Team																																																				
6	Finalization of Survey tools fed in Mobile based App by PoCRA PMU Team																																																				
7	Field Study by the Enumerators in the sampled clusters with overall guidance from Key Experts																																																				

		Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
8	Conducting FGDs, Village Level Discussion and Key Informant Interviews																																																								
9	Data Entry, Compilation by the Enumerators																																																							
10	Data Analysis and prepration report by Key Experts along with GIS maps																																																								
11	Presentation on Preliminary Findings of the Field Study																																																							
12	Compiling Baseline Report and Inputs by the Team Leader/Key Experts																																																								
13	Baseline Report Submission																																																								
14	Feedback on the Baseline Report from PoCRA PMU Team																																																								
15	Submission of Baseline Report with changes and Acceptance by PoCRA PMU Team																																																								
D-3	**Submission of Concurrent Progress Monitoring Reports** *(Submitted in first month of every six monthly cycle till the end of the Project period)*																																																								
1	Preparation of Survey Tools, Checklists & Documentation Tools based on indicators and submission of the same to PoCRA PMU for finalization																																																								
2	Identification and engagement of Enumerators and IT Based Agency for preparation of mobile app																																																								
3	Finalization of Survey Tools by PoCRA PMU Team																																																								
4	Translation of Survey Tools in local language and feeding it in mobile based app																																																								
5	Conducting Pilot testing of the survey tools using mobile based app with PoCRA PMU Team																																																								
6	Finalization of Survey tools fed in Mobile based App by PoCRA PMU Team																																																								
7	Field Study by the Enumerators in the sampled clusters with overall guidance from Key Experts																																																								

No.	Activity	Timeline
8	Stakeholder Consultations & FGDs with identified stakeholders at Village, Cluster, Taluk & District level (With Beneficiaries, VCRMC, Farmer Friend, Cluster Assistant, SDAO, DSAO, ATMA, etc)	
9	Data Entry, Compilation by the Enumerators	
10	Data Analysis and prepration of Division wise Concurrent Progress Monitoring report by Key Experts	
11	Preparation of Required Maps by the GIS team	
12	Compiling Reports and Inputs by the Team Leader/Key Experts	
13	Presenation of Findings of the Concurrent Monitoring to PMU	
14	Submission of Concurrent Progress Monitoring Reports	
15	Feedback on the Report from PoCRA PMU Team	
16	Submission of the final report by NABCONS after incorporation of the changes in it and	
17	Workshops with PMU officals for Reviewing the progress monitoring and inputs on the Concurrent Progress (yearly)	
D-4	**Submission of Mid-Line Impact Assessment Report** *(Within 6 month of completing Mi-term project implementation)*	Dec Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec Jan Feb Mar Apr May June
1	Preparation of Survey Tools, Checklists & Documentation Tools based on indicators and submission of the same to PoCRA PMU for finalization	
2	Finalization of Survey Tools by PoCRA PMU Team	
3	Translation of Survey Tools in local language and feeding it in mobile based app	
4	Conducting Pilot testing of the survey tools using mobile based app with PoCRA PMU Team	
5	Finalization of Survey tools fed in Mobile based App by PoCRA PMU Team	


6 Field Study by the Enumerators in the sampled clusters with overall guidance from Key Experts
7 Conducting FGDs, Village Level Discussion and Key Informant Interviews
8 Data Entry, Compilation by the Enumerators
9 Data Analysis and prepration report by Key Experts along with GIS maps
10 Compiling Midline Report and Inputs by the Team Leader/Key Experts
11 Midline Report Submission
12 Feedback on the Midline Report from PoCRA PMU Team
13 Submission of Midline Report with changes and Acceptance by PoCRA PMU Team
D-5 Submission of End-term Impact Aseesment Report (One Month prior to closure of Project)
Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June
1 Preparation of Survey Tools, Checklists & Documentation Tools based on indicators and submission of the same to PoCRA PMU for finalization
2 Finalization of Survey Tools by PoCRA PMU Team
3 Translation of Survey Tools in local language and feeding it in mobile based app
4 Conducting Pilot testing of the survey tools using mobile based app with PoCRA PMU Team
5 Finalization of Survey tools fed in Mobile based App by PoCRA PMU Team
6 Field Study by the Enumerators in the sampled clusters with overall guidance from Key Experts
7 Conducting FGDs, Village Level Discussion and Key Informant Interviews
8 Data Entry, Compilation by the Enumerators
9 Data Analysis and prepration report by Key Experts along with GIS maps

		Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
10	Compiling Endline Report and Inputs by the Team Leader/Key Experts																																																								
11	Endline Report Submission																																																								
12	Feedback on the Endline Report from PoCRA PMU Team																																																								
13	Submission of Endline Report with changes and Acceptance by PoCRA PMU Team																																																								
D-6	**Submission of ESMF Audit Report** *(First Report within 6 months of completion of Mid-term project and second report one month prior to project closure)*																																																								
1	Background Work for ESMF (Incorporated in the Concurrent Monitoring Schedule) including Review of the ESMF Documents of PoCRA by Team Leader																																																								
2	Preparation of Draft Action Plan. The checklist will be incorporated in the Concurrent Evaluation Questionnaire. Data collection shall by half-yearly.																																																								
3	Workshop with PoCRA PMU for finalization of action plan and checklist for ESMF audit																																																								
4	Training of Enumerators for Collection of Data for ESMF audit																																																								
5	Data Collection by the Enumerators in the sampled clusters with overall guidance from Key Experts in the selected clusters																																																								
6	FGDs and Consultations with identified stakeholders																																																								
7	Data Entry, Compilation by the Enumerators																																																								
8	Data Analysis and prepration of Division wise Cluster ESMF report by Key Experts along with GIS maps																																																								
9	Compiling ESMF Report and Inputs by the Team Leader/Key Experts. Report shall be compiled based on the data collected during concurrent evaluation.																																																								
10	Presenation of Findings of the ESMF Audit Report																																																								

Key

	Deliverable Month
	Activities leading to Deliverables Months
	Inception Report
	Baseline, Mid-Line & End-Line Asssessments
	Concurrent Monitoring
	ESMF Audit

3. Annexure

Field Visit Report (Daryapur Block Clusters under Achalpur Sub Division, Dist. Amravati Date: 27th & 28th December, 2019)

The inception meeting for the project was held on Dec 24th, 2019 at the PoCRA PMU office, Mumbai. As part of the inception report for the project, NABCONS was instructed to undertake a field visit in one of the seven districts of Rest of Project Area. The visit was organized by PMU and the district selected was Amravati.

The 2-day visit was organized in the project villages of Daryapur block under Achaplur Sub Division, District Amravati on 27th & 28th December, 2019. The visit was undertaken by NABCONS team including Shri. Sanjay Dhanphule (Team Leader) and Mr. Ravikiran Mali (Agronomy Expert) and Mr. Siddharth Bhatia, Consultant, Zonal Office Mumbai.

PoCRA district level officials coordinated the visit including Sh. G.T. Deshmukh (SDAO-Achaplur), Sh. Varun Deshmukh (TAO-Daryapur), Mr. Sanjay Thakare (Agri. Supervisor), Sh. Phundkar (AO), Sh. R.M. Marodkar (Agri. Asstt.), Sh. Jagdhane Jayshiv (PS-HRD), Sh. Akash Tetu (CA), Sh. Bhushan Khandare (CA) & Swati Umbarkar (Krishi Tai).

A brief snapshot of the villages visited is shown in the map below:

Source: PoCRA PAD

Figure 7: Visit to Amravati District

The first day began with initial discussions on the project with Sh. G.T. Deshmukh, SDAO-Achaplur to understand the implementations arrangements at the district level and coordination between the PMU and DPMU.

As per the discussions, the following structure exists at the district level for project implementation:

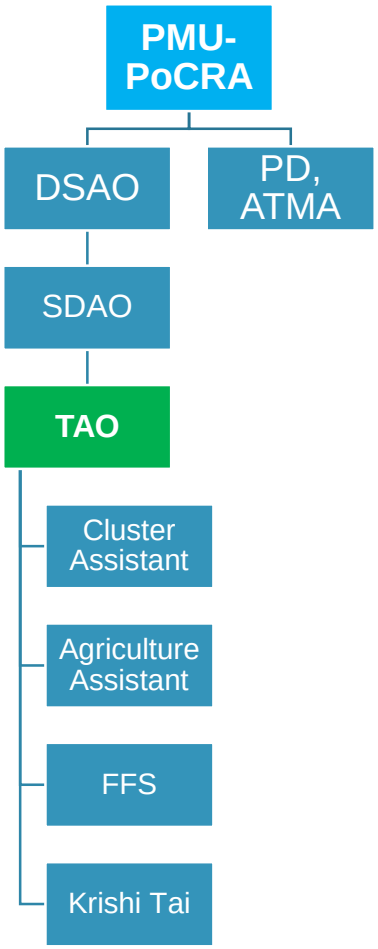


Figure 8: PoCRA Implementation Arrangements

At village level, there is VCRMC plays an integral role for project implementation. The structure includes 13 members out of which 50% are women, to ensure that women representation is adequately incorporated. There are representatives from SC/ST category. The members are: Sarpanch of the Village (President of VCRMC), Deputy Sarpanch of village, progressive farmer in relation to agro-industry, representative from female farmers, members of gram panchayat, member from self-help groups, members from *Mahila Bachat Gat* and members from Farmer Producer Company (FPC). This statutory body is expected to conduct meetings once in a month to resolve the issues and concerns of the beneficiaries selected for the project. Monthly meetings are conducted at the village level and minutes are recorded for each meeting.

Taluka Agriculture Officer (TAO), though not part of the structure in the Project Document, plays an integral role for coordination between Cluster Assistant/Agriculture Assistant and SDAO. Sh. Varun Deshmukh, TAO-Daryapur accompanied us for the visit to the project villages. There is an approval structure for any activity to be undertaken under PoCRA. The approval has to pass through 6 stages called Desks (D1, D2,.....D6). Status of the approvals is presented in Annexure-I & II. The approval process is highlighted below:

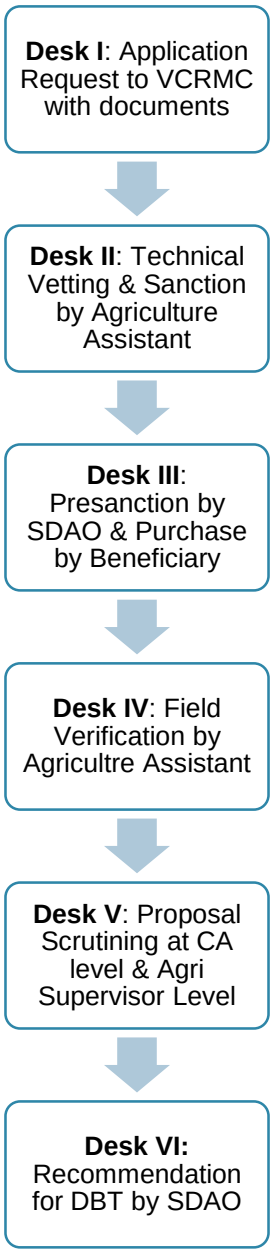


Figure 9: Desk Based Approval of Activities under PoCRA

Details of visit to individual beneficiaries under PoCRA project:

S. N.	Name of Beneficiary	Village	Observations recorded	Benefits derived from PoCRA Project	Consultants/ Staff associated
1.	Shri. Nilesh Gopalrao Ingole	Village- Chandikapur, Ta-Daryapur, Dist- Amravati	▪ Land Holding- 1.42 ha ▪ Crop- Chickpea ▪ Variety- Vijay ▪ Source of seed- Own seed ▪ Date of Sowing- 1 Nov, 2019 ▪ Soil Type: deep black cotton soil ▪ Crop Condition- Good ▪ Stage of Crop- Vegetative ▪ Source of Irrigation- Hired Borewell from adjacent field.	• Sprinkler set with 16 Nozzles and 60 pipes with subsidy received by Mr. Ingole. • Total applications in the village- 60-70. • Beneficiaries benefited in the village till date- 19 • VCRMC established as per guidelines.	• **Cluster Assistant**- Sh. Akash Tetu
2.	Shri. Rumdev Kale	Village- Wadura, Ta-Daryapur, Dist- Amravati	▪ Land Holding- 1.62 ha ▪ Crop- Chickpea ▪ Variety- Vijay ▪ Village level interaction meeting with farmers conducted at Gram Panchyat, Wadura.	• 50 PVC Pipes with subsidy received to Shri Kale.	• **Cluster Assistant**- Sh. Bhushan Khandare • **FFS**-Sh. S. M. Mahulkar • **Krishitai**- Swati Umbarkar • **Sarpanch**-Alkatai Dakhode

3.	Shri. Bhujangrao Akoshi Raibole	Village- Ghodchandi, Ta-Daryapur, Dist- Amravati	• Survival is good • Disease free. 6 kids generated.	• 10 Doe and 1 Buck for livestock rearing costing to Rs. 69000/- and subsidy is received.	Sarpanch Sh. Raibole & other villagers

Summary of Discussions

- Currently, predominantly individual beneficiary support activities are in progress in the project villages visited
- VCRMC of 13 members is formed as per the project guidelines as per the discussions
- The list of activities approved and various stages for their approval as mentioned in Annexure will be critical for NABCONS M&E team for monitoring
- Wadura GP has 691 ha GCA, out of that 464 ha is cultivable area. Out of 172 individual applications 27 beneficiaries are covered under the project till now.
- During discussions with villagers, it was observed that benefits of Farmers' Field School **(**FFS) organized under the project are evident on Cotton and Gram crops
- Support for Turmeric plantation & bore-well is in demand by the farmers
- The goatry unit set up at Ghodchandi village is a successful model to emulate in other project villages.
- NABCONS team had discussions on project implementation with Sh. Anil Kharchan, Dy. Director (Agri.), Amravati. He detailed the activities being carried out and some of the challenges viz. streamlining the approval process, which are being resolved with the active support from PMU.
- Involvement of TAO & Agri. Supervisor is essential for project implementation as revealed during the discussions.
- During the discussions, it was highlighted that some of the farmers are having challenges for upfront payment for sanctioned project activities.

- Awareness among villagers needs to be strengthened for PoCRA benefits and outcomes
- In some cases, it was highlighted that there are challenges for uploading information in field due to network issues

With reference to the inputs from field visit to Amravati district, NABCONS has got clarity in terms of implementation arrangement at field level and structure of VCRMC. This will be helpful in designing the M&E framework. A good rapport with the PMU as well as district level officials is essential for successful implementation of M&E activities. During the visit it was evident that the officials are open for discussions and will help NABCONS in data collection with the overall direction from PMU office.

	
Field visit to beneficiary Shri. Nilesh Ingole field	**Crop chickpea at vegetative stage**
	
Interactive meeting with VCRMC, Farmers and villagers at Wadura.	**Visit to Goat rearing beneficiary Shri. Bhujanrao Raibole at Ghodchandi**
	
TAO explaining the benefits of the Project to Villagers	**Discussions with Sh. Anil Kharchan, Dy. Director (Agri.), Amravati.**

Figure 10: Snapshots of the Field Visit

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