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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF

US\$420 MILLION

TO THE

REPUBLIC OF INDIA

FOR A

MAHARASHTRA PROJECT ON CLIMATE RESILIENT AGRICULTURE

FEBRUARY 3, 2018

Agriculture Global Practice
South Asia Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2017)

Currency Unit = INR

63.87 INR = US\$1

FISCAL YEAR

April 1 - March 31

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ABBREVIATIONS AND ACRONYMS

AAP	Annual Action Plans	EX-ACT	Ex-Ante Carbon Balance Tool
ATMA	Agriculture Technology Management Agency	FAO	Food & Agriculture Organisation
BEAMS	Budget Estimation Allocation & Monitoring System	FFS	Farmer Field School
CDC	Capacity Development & Coaching	FIG	Farmer Interest Group
CDD	Community Driven Development	FPC	Farmer Producer Company
CDP	Cluster Development and Investment Plans	FPO	Farmer Producer Organization
CENA	Capacity Enhancement Needs Assessment	GAP	Good Agricultural Practices
CGWB	Central Ground Water Board	GCF	Green Climate Fund
CHC	Community Health Center	GDP	Gross Domestic Product
CIC	Climate Innovation Center	GHG	Green House Gas
CPF	Country Partnership Framework	GIPE	Gokhale Institute of Politics & Economics
CRI	Corporate Results Indicator	GIS	Geographic Information System
CRIDA	Central Research Institute for Development & Agriculture	GoI	Government of India
CTP	Climate Technology Program	GoM	Government of Maharashtra
C&AG	Comptroller & Auditor General of India	GRM	Grievance Redressal Mechanism
CCAP	Climate Change Action Plan	GRS	Grievance Redressal Service
DBT	Direct Beneficiary Transfer	GSDA	Geo Survey & Development Agency
DoA	Department of Agriculture	ICAR	Indian Council of Agricultural Research
DPC	District Project Committee	ICRISAT	International Crops Research Institute for Semi-Arid Tropics
DPMU	Divisional Project Management Unit	ICT	Information & Communications Technology
DSAO	District Superintendent Agriculture Officer	IEC	Information, Education & Communication
EC	Executive Committee	IITB	Indian Institute of Technology Bombay
EMF	Environment Management Framework	IISC	Indian Institute of Science
ERR	Economic Rate of Return	INDC	Integrated Nationally Determined Contributions
IPCC	Integrated Panel on Climate Change	PDO	Project Development Objective

IPM	Integrated Pest Management	PIP	Project Implementation Plan
IRR	Internal Rate of Return	PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
IWMP	Integrated Watershed Management Program	PMU	Project Management Unit
JSA	Jalyukt Shivir Abhiyan	PPSD	Project Procurement Strategy for Development
KPI	Key Performance Indicators	PSC	Project Steering Committee
KVK	Krishi Vigyan Kendra	RFQs	Request for Quotations
MACP	Maharashtra Agricultural Competitiveness Project	RKVY	Rashtriya Krishi Vikas Yojana
MAR	Managed Aquifer Recharge	SA	Social Assessment
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme	SAU	State Agriculture Universities
MIS	Management Information System	SCD	Systematic Country Diagnostic
MOEF	Ministry of Environment & Forest	SDAO	Subdivisional Agriculture Officer
MPKV	Mahatma Phule Krishi Vidyapeeth	SMEs	Small & Medium Agro-Entrepreneurs
MSAAPCC	Maharashtra State Adaptation Action Plan on Climate Change	SMF	Social Management Framework
M&E	Monitoring & Evaluation	SREP	Strategic Research and Extension Plans
NAPCC	National Action Plan to Climate Change	STEP	Systematic Tracking of Exchanges in Procurement
NGMIP	National Groundwater Management Improvement Program	TPPF	Tribal People Planning Framework
NGO	Non-Government Organization	VCRMC	Village Climate Resilient Management Committee
NICRA	National Institute for Climate Resilient Agriculture	WB	World Bank
NPV	Net Present Value	YASHADA	Yashwant Rao Chavan Academy of Development Administration
PAC	Project Advisory Committee		



BASIC INFORMATION

Is this a regionally tagged project? No	Country(ies)	Financing Instrument Investment Project Financing
<input type="checkbox"/> Situations of Urgent Need of Assistance or Capacity Constraints <input type="checkbox"/> Financial Intermediaries <input type="checkbox"/> Series of Projects		
Approval Date 27-Feb-2018	Closing Date 30-Jun-2024	Environmental Assessment Category B - Partial Assessment
Bank/IFC Collaboration Yes	Joint Level Complementary or Interdependent project requiring active coordination	

Proposed Development Objective(s)

To enhance climate-resilience and profitability of smallholder farming systems in selected districts of Maharashtra.

Components

Component Name	Cost (US\$, millions)
Comp. A: Promoting Climate-resilient Agricultural Systems	452.10
Comp. B: Post-harvest Management and Value Chain Promotion	56.60
Comp. C: Institutional Development, Knowledge and Policies for a Climate-resilient Agriculture	33.70
Comp. D: Project Management	56.10

Organizations

Borrower : Republic of India



Implementing Agency : Department of Agriculture, Government of Maharashtra

PROJECT FINANCING DATA (US\$, Millions)

<input checked="" type="checkbox"/> Counterpart Funding	<input checked="" type="checkbox"/> IBRD	<input type="checkbox"/> IDA Credit	<input type="checkbox"/> IDA Grant	<input type="checkbox"/> Trust Funds	<input type="checkbox"/> Parallel Financing
Total Project Cost: 599.55		Total Financing: 599.55		Financing Gap: 0.00	
		Of Which Bank Financing (IBRD/IDA): 420.00			

Financing (in US\$, millions)

Financing Source	Amount
Borrower	179.55
IBRD-88290	420.00
Total	599.55

Expected Disbursements (in US\$, millions)

Fiscal Year	2018	2019	2020	2021	2022	2023	2024
Annual	25.90	54.30	105.20	102.30	81.70	50.60	0.00
Cumulative	25.90	80.20	185.40	287.70	369.40	420.00	420.00

INSTITUTIONAL DATA

Practice Area (Lead)

Agriculture



Contributing Practice Areas

Climate Change
Water

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	● Low
2. Macroeconomic	● Low
3. Sector Strategies and Policies	● Moderate
4. Technical Design of Project or Program	● Moderate
5. Institutional Capacity for Implementation and Sustainability	● Substantial
6. Fiduciary	● Substantial
7. Environment and Social	● Moderate
8. Stakeholders	● Moderate
9. Other	● Low
10. Overall	● Moderate



COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

Yes No

Does the project require any waivers of Bank policies?

Yes No

Safeguard Policies Triggered by the Project

Yes

No

Environmental Assessment OP/BP 4.01

✓

Natural Habitats OP/BP 4.04

✓

Forests OP/BP 4.36

✓

Pest Management OP 4.09

✓

Physical Cultural Resources OP/BP 4.11

✓

Indigenous Peoples OP/BP 4.10

✓

Involuntary Resettlement OP/BP 4.12

✓

Safety of Dams OP/BP 4.37

✓

Projects on International Waterways OP/BP 7.50

✓

Projects in Disputed Areas OP/BP 7.60

✓

Legal Covenants

Sections and Description

Name: Project Steering Committee

Description: Maharashtra shall maintain a high-level Project Steering Committee, with functions, composition and responsibilities acceptable to the Bank, including the provision of conceptual, strategic and policy guidance on overall project implementation, endorsement of the annual work plan and budget.

Recurrent.

Frequency: throughout implementation

Sections and Description

Name: Project Advisory Committee

Description: Maharashtra shall maintain a Project Advisory Committee, with functions, composition and



responsibilities acceptable to the Bank, including technical advice on the implementation of components and project activities.

Recurrent.

Frequency: throughout implementation

Sections and Description

Name: Project Management Unit

Description: Maharashtra shall maintain a Project Management Unit under its Department of Agriculture (DOA), assisted by adequate professional and administrative staff, with powers, budget and functions as required to, inter-alia: oversee day-to-day implementation of Project activities, ensure smooth coordination with other departments and agencies and ensure proper fiduciary management and compliance with safeguards requirements.

Recurrent.

Frequency: throughout implementation

Sections and Description

Name: District Project Committee

Description: Maharashtra shall maintain, at the district level, a District Project Committee, with functions, composition and responsibilities acceptable to the Bank; including facilitating coordination among agencies at the district level, in particular Office of District Superintendent Agriculture Officer (DSAO) and Agriculture Technology Management Agency (ATMA).

Recurrent

Frequency: throughout implementation

Sections and Description

Name: Office of District Superintendent Agriculture Officer (DSAO)

Description: Maharashtra shall maintain, at the district level, the Office of District Superintendent Agriculture Officer (DSAO), with functions, composition and responsibilities acceptable to the Bank, including implementation of annual work plans, fiduciary oversight, and monitoring of activities.

Recurrent

Frequency: throughout implementation

Sections and Description

Name: Agriculture Technology Management Agency (ATMA)

Description: Maharashtra shall maintain, at the district level, the Agriculture Technology Management Agency (ATMA), with functions, composition and responsibilities acceptable to the Bank, including training for farmers and farmer producer organizations (FPOs) and technology dissemination.

Recurrent



Frequency: throughout implementation

Sections and Description

Name: Divisional Project Management Unit (DPMU)

Description: Maharashtra shall maintain, at the division level, Divisional Project Management Units (DPMUs), with functions, composition and responsibilities acceptable to the Bank, including institutional coordination with the districts in their respective jurisdiction.

Recurrent

Frequency: throughout implementation

Sections and Description

Name: Village Climate Resilient Agriculture Management Committee (VCRMC)

Description: Maharashtra shall maintain, at the village level, a Village Climate Resilient Agriculture Management Committee (VCRMC), with functions, composition and responsibilities acceptable to the Bank, including preparation of participatory mini watershed plans, selection of beneficiaries for Individual Farmers Matching Grants, and execution of community works.

Recurrent

Frequency: throughout implementation

Sections and Description

Name: Safeguards

Description: Maharashtra shall ensure that the Project is carried out in accordance with the Environmental and Social Management Framework (ESMF), the Tribal People Planning Framework (TPPF), and any other instruments to be prepared pursuant to the appropriate screening of grant applications, sub-project proposals, bids for civil works, or expressions of interest for technical services.

Recurrent

Frequency: throughout implementation

Sections and Description

Name: Individual Farmers Matching Grants

Description: Maharashtra shall ensure that Individual Farmers Matching Grants are made exclusively to individual farmers to adopt demonstrated technologies and agronomic practices, in accordance with the eligibility criteria and procedures detailed in the Project Implementation Plan and the Financial Management Manual.

Recurrent

Frequency: throughout implementation

Sections and Description

Name: FPO Matching Grants

Description: Maharashtra shall ensure that FPO Matching Grants are made available to FPOs pursuant to the



eligibility criteria and procedures detailed in the Project Implementation Plan and the FM Manual.

Recurrent

Frequency: throughout implementation

Sections and Description

Name: Retroactive financing

Description: No withdrawal shall be made for payments made prior to the date of signing of the Loan Agreement, except for withdrawals up to USD 84,000,000 may be made for payments made within 12 months prior to this date, for eligible expenditures under the Project (except for Individual Farmers Matching Grants and FPO Matching Grants under the Project).

Recurrent

Frequency: throughout implementation

Conditions

Type

Disbursement

Description

No withdrawal shall be made or payments under Category (3), FPO Matching Grants, in the Withdrawal of Loan Proceeds table, unless the State of Maharashtra has submitted evidence to the Bank confirming that the FPO Matching Grant Agreement format has been finalized and approved, under terms and conditions satisfactory to the Bank.

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
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INDIA
MAHARASHTRA PROJECT ON CLIMATE RESILIENT AGRICULTURE

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I. STRATEGIC CONTEXT

A. Country Context

1. **India continues to be one of the world's fastest growing large economies.** Despite facing some temporary disruptions in recent months, the Indian economy continues to register rapid growth – rising gradually from 5.5 percent in 2012-13 to 8 percent in 2015-16. This was supported by robust private consumption, a resilient services sector, and some revival in industrial activity. In recent months, temporary disruptions from demonetization and uncertainty surrounding GST slowed India's economic momentum and real GDP growth declined to 7.1 percent in 2016-17 and further to 5.7 percent in Q1 FY17/18. Private investments have remained subdued. However, the economy has bottomed out, and GDP growth rose to 6.3 percent during Q2 FY17/18. Economic activity is expected to stabilize further during 2017-18 and growth will resume gradual acceleration in the near term. Since the 2000s, India has made remarkable progress in reducing absolute poverty. Between 2004 and 2011, poverty declined sharply from 38.9 to 21.6 percent at the international poverty line (\$1.90 PPP/day). With over a 100 million people escaping poverty, the pace of poverty reduction in India exceeded that of the developing world as well as that of Middle Income Countries (MICs) in this period. High economic growth, rapid rise in rural wages, greater rural-urban integration and increase in non-farm activity, especially construction, were the key drivers of poverty reduction. Since 2011, robust economic growth may have aided further reduction in poverty. However, trends in the construction sector and rural wages suggest that the pace of poverty reduction may have moderated

2. **Climate change is impeding socioeconomic development within India** and increasing investment in adaptation measures to reduce vulnerability is essential to maintaining economic growth. India's rapid growth has increased its prominence on the global stage and drawn attention to its climate mitigation and adaptation efforts. The country has shown leadership in global efforts to limit climate change and is among the early countries to have ratified the Paris Agreement on Climate Change (in October 2016). 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 degrees Celsius by the 2030s), coupled with an overall increase in monsoon rainfall (with an increase in geographic variability) and extreme precipitation events (with an increase in rainfall intensity)¹. India shows an increasing trend in its per capita emission of GHGs, though current per capita levels are still among the lowest in the world (2.44 tCO₂ equivalent per capita in 2012, against global average of 5.5 tCO₂ equivalent). In absolute terms, India remains one of the largest GHG emitters, with its agriculture sector the second largest contributor (around 18 percent of the country's total GHG emissions).

3. **Agriculture sector growth is essential in achieving India's development goals:** the sector currently accounts for nearly 18 percent of national GDP and is a source of livelihood for more than half of the population. More than two thirds of the country's poor live in rural areas, and their chance of getting out of poverty directly depends on the performance of agriculture and allied rural

¹ Details of historical climate trends and future climate scenarios for India can be found on the World Bank's Climate Change Knowledge Portal at: <http://sdwebx.worldbank.org/climateportal/countryprofile/home.cfm>



sectors. The success of ongoing massive rural-urban transformation will also depend on improved connectivity of rural areas to cities, enhanced agriculture productivity and value chains for agricultural products and off-farm job creation in rural areas, which would temper current massive migrations to urban areas. The agriculture sector also has a major potential for reducing GHG emissions and improving environmental management through enhanced soil and water conservation and climate-resilient farm management practices.

4. **Over the past two decades, the agriculture sector has performed below its potential** and has not yet met the envisaged growth targets. In the 1990s and 2000s, the annual agriculture growth rate was around 3.0 to 3.5 percent, and dropped to 2.6 percent per annum during 2013-15, due to low productivity, growing water and land scarcity, rising labor costs, and declining international commodity prices, exacerbated by the late onset of monsoon rainfall and increase rainfall intensity. While overall rainfall is projected to increase, its distribution over time and space is likely to become much more erratic, thereby leading to increasingly frequent droughts and floods. Unless significant efforts to capitalize on the projected increase in rainfall are made to improve water conservation and soil moisture management, water scarcity at farm level will remain a key impediment to achieving higher levels of crop and water productivity.

5. **Going forward, five inter-related and strategic shifts are required to achieve the 4 percent annual growth target set by GoI for agriculture** and transform the sector into a modern food system: (i) a shift away from food grain production targets towards diversification into high-value horticulture and livestock products; (ii) a shift away from pure focus on physical productivity (yields) towards resilience and stability of agriculture to deal with the effects of climate change and short-term weather anomalies; (iii) a shift away from a focus on on-farm production towards value addition in the post-harvest segments of the food value chains; (iv) a shift away from a calorie focused production structure towards nutrition sensitive agriculture, and (v) a shift away from increasing irrigation water supply towards improved water use efficiency. The proposed project is designed to directly contribute to this structural transformation process by supporting several of those strategic shifts with a focus on building climate resilience in the agriculture sector in the districts of the State of Maharashtra that are most vulnerable to climate change.

B. Sectoral and Institutional Context

6. **The State of Maharashtra is one of the economic growth engines of the country:** it is the top-ranked state in terms of contribution to the national GDP (five-year average of 14.6 percent) and has witnessed an average economic growth rate of 8 percent per annum over the last decade (2005-06 to 2015-16). With 9.2 percent of country's population and 9.4 percent of the country's geographic area, Maharashtra is also the second largest state in India. Structurally, Maharashtra is more urbanized and industrialized compared to the rest of the country and economic contributions of the industries and of the services sectors are much larger than that of agriculture and allied sectors (which account for only approximately 10 percent). However, the agriculture sector remains central to Maharashtra's economic and political landscape, and growth in the sector is critical for the state as over 50 percent of its population depends on agriculture.

7. **In Maharashtra, agriculture has grown at an annual average of 3.5 percent 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 4,000 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 for Maharashtra.

8. **Maharashtra’s agriculture is dominated by small and marginal farmers with an average farm size of 1.44 ha.** Most of the agricultural production is rain-fed, with less than 20 percent of the arable land under irrigation. Farmers’ annual production covers two seasons: *kharif* crops planted at the onset of the monsoon rainfall and *rabi* crops planted at the beginning of the winter season. Crop production is dominated by food grains, i.e. cereals (mostly rice, sorghum or *jowar*, maize) and pulses (chickpea or *gram*, pigeon pea or *tur*). For oilseed crops, soybean remains by far the most important commodity. Since 2000, the area under cultivation for cereals (particularly sorghum) has declined and a shift from food grains towards cash crops has been observed, notably cotton and sugar cane whose production is relatively water-intensive. In the last decade, a production diversification towards high-value horticulture crops has been observed, and today, the State of Maharashtra has emerged as one of the country largest producers of fruits (mango, citrus, grapes, pomegranate) and vegetables (onion, tomato).

9. **Overall, crop productivity has increased over time but remains at relatively low levels.** In 2013-14 (non-drought year), yields for major crops were as follows: sorghum 814 kg/ha; soybean 1,214 kg/ha; cotton 361 kg/ha. Yield gaps for several key crops are still significant, reflecting the need for a mix of sector policies and investments to promote research on climate-adapted varieties, irrigation for a more efficient on-farm use of water, and extension services for the adoption of climate-resilient agronomic practices and technologies – i.e. for building climate resilience in Maharashtra’s farming systems.

10. **In 2008, GoI released the National Action Plan on Climate Change (NAPCC)**, and directed the States to develop State Action Plans on Climate Change guided by and consistent with the structure and strategies of the NAPCC. The GoM took a pioneering step towards formulating the Maharashtra State Adaptation Action Plan on Climate Change (MSAAPCC) by commissioning a comprehensive vulnerability assessment study which included the task of generating model-based climate projections specific to the State’s geography². The MSAAPCC seeks to address the urgent need to integrate climate change concerns into the State’s overall development strategy, thus assisting in building long term climate resilience and enabling adaptation to the likelihood of risks arising from climate change.

² The Energy Resources Institute, TERI (2014): *Assessing Climate Change Vulnerability and Adaptation Strategies for Maharashtra: Maharashtra State Adaptation Action Plan on Climate Change (MSAAPCC)*. Department of Environment, GoM.



11. **The MSAAPCC climate modelling results show that the annual mean temperature in the project area to increase by around 1.3 to 1.5 degree Celsius by the 2030s;** the projected increase in monsoon rainfall by the 2030s ranges from 13 to 30 percent across the project area, but distributed over a shorter number of rain days. The analysis of weather and production data in Maharashtra reveals that a rise in mean temperature in the range of 1.0 to 2.3 degree Celsius results in a 6.3 to 17.5 percent decline in sorghum yield; while an increase of 1.0 to 4.0 degree Celsius results in a reduction in soybean yield of 11 to 36 percent. Given that most of the agriculture in the project area is rainfed, crop production is highly correlated with rainfall: in 2013-2014, when annual rainfall was 25 percent above the annual average, total crop production across the state reached 23.8 million mt; in the drought year 2015, when precipitation was more than 40 percent below annual average, crop production collapsed to 10.0 million mt. These analytical findings from the MSAAPCC are consistent with the findings of the Fifth Assessment Report of the IPCC. The effects of these longer-term climate trends on sectors like agriculture or water, effectively signaling a shift in climatic conditions, will be further aggravated by the projected increase in the frequency of extreme climate events (droughts, hailstorms, floods, delays in the onset of monsoons, higher rainfall intensity).

12. **The project will be implemented in about 4,000 villages highly vulnerable to climate variability, and another 1,000 villages additionally affected by high levels of soil salinity.** Most of the 15 project districts (totaling over 18,700 villages, covering a geographic area of over 12.5 million ha, and home of 25.5 million people) are within the Marathwada and the Vidarbha Division located in the central part of the state (see Annex 11 for a map of the project area). The villages in the saline tract of the Purna river basin are located in the northern part of the project area. Agricultural production in the project area is largely smallholder-based, rainfed and highly vulnerable to climate variability: in 2014 and 2015 (severe drought years), Marathwada Division received over 40 percent less rain compared to its long term historic annual average. The selection of the villages has been finalized by the GoM during preparation; it is based on a rigorous multi-criteria analysis and takes into account the climate change vulnerability approach adopted by the Central Research Institute for Dryland Agriculture (CRIDA) a National Research Institute under the Indian Council of Agricultural Research (ICAR). Under this approach endorsed by the Intergovernmental Panel on Climate Change (IPCC), climate vulnerability is defined as a function of exposure, sensitivity and adaptive capacity.

13. **The GoI has designed a number of policy initiatives and programs** aligned with the recommendations from the NAPCC program and the state-level action plans, including the National Initiative on Climate Resilient Agriculture (NICRA) to promote the development of climate-resilient villages; the *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY) Program to promote efficient irrigation practices and improve water use efficiency; the *Jalyukt Shivar Abhiyan* (JSA) Program on watershed and drought management; the Integrated Watershed Management Program (IWMP) on natural resources conservation; as well as India's Intended Nationally Determined Contribution (INDC) as presented to the COP21 in Paris to address the adverse effects of climate change. Against this background, the GoM is committed to further support and implement those policies in Maharashtra and sees the proposed project as an opportunity to contribute to the implementation of policies in support of the climate agenda.

14. **The Government of Maharashtra has recently embraced a new paradigm for the agricultural sector** which now needs to be mainstreamed across institutions and stakeholders. It is



built around the recognition and understanding of climate change and climate variability as the “new normal”; this in turn, requires a structural shift in the approach to sustainable agriculture growth based on longer-term adaptive interventions (reforms, investments, capacity development) to build climate-resilience in agriculture – in addition to focusing primarily on shorter-term emergency responses to recurring natural disasters. The World Bank Group is very well placed to provide value-added support to the GoM in establishing this new paradigm through its global experience with climate-resilient agriculture, its capacity to work multi-sectorally, and to apply cutting-edge knowledge at scale in support of changes in policies and strategies to promote climate adaptation and mitigation, and generate climate co-benefits.

15. **Aligned with this new paradigm, the PoCRA project seeks to enhance the capacity of farming systems in the most climate vulnerable districts of Maharashtra to better cope with the impact of extreme climatic events.** In recent years, climate variability has seriously affected agriculture in Maharashtra, where farming is dominated by smallholders and characterized by low crop productivity and a high dependence on rainfall. Short term emergency responses by the GoM to the severe droughts that occurred in the past few years have had a limited impact on agriculture performance increase, and could not prevent a further deterioration of the social fabric in rural areas (outmigration to urban centers, high rate of farmer suicide). Following consecutive drought years, GoM’s has further expanded its crop insurance program and compensated almost 2.7 million farmers whose crops was damaged due to hailstorm and unseasonal rains in the 2015-16 *rabi* season.

16. Against this background, the project will promote short and longer term solutions for farming systems, commodity value chains and rural institutions, that reduce the negative effect of climate disturbances on various stakeholders and strengthen their capacity to recover from such climatic events. The technology packages, agronomic practices, and targeted investments promoted by the project to improve climate resilience in agriculture, will help enhance water productivity and water-use efficiency, increase soil health and carbon sequestration, and improve crop productivity. The short and longer term solutions proposed under this project are expected to contribute to the GoM and GoI stated priorities of “drought-proofing” agriculture in Maharashtra and doubling farmer income.

C. Higher Level Objectives to which the Project Contributes

17. **The project is fully aligned with the main findings of the India 2017 Systematic Country Diagnostic (SCD) under preparation which lays the foundation for the next Country Partnership Framework (CPF).** The SCD advocates that to sustain its growth across generations and become one of the world’s largest middle class economies, the country’s growth strategy will need to fully internalize the enormous constraints faced with availability of natural resources (in particular land and water), and shift to a more resource-efficient growth path. Moreover, growth will need to be inclusive to avoid a widening urban-rural gap. The project will be implemented in rural areas where a significant proportion of the poor live, and whose livelihood is largely dependent upon rainfed agriculture; project activities, while strengthening resilience against adverse climate events, will directly contribute to an increase in the income of these smallholder farmers. The climate-resilient technologies promoted by the project will directly contribute to a more efficient use of scarce water resources (e.g. through scaling up micro irrigation systems, expanding surface water storage, facilitating managed aquifer recharge). Through the dissemination of agronomic



practices (e.g. climate-resilient seed varieties, protective cultivation, contour cultivation, bunding and mulching), the project will help achieve improved soil quality, higher and more stable yields, and higher farmland productivity.

18. **The project is fully aligned with the Bank's Climate Change Action Plan (CCAP)** which explicitly highlights climate-resilient agriculture and water management as key priorities for climate adaptation in the South Asia Region (SAR). The project will directly contribute to WBG's commitment to increase the climate-related share of its portfolio from 21 to 28 percent by 2020 in response to client demand: the Climate Change Group in the Bank has assigned a 94 percent climate co-benefits share of total financing for this project

19. **The project will contribute to the country's international commitment to the global climate agenda.** The country has shown leadership in global efforts to limit climate change and is among the early countries to have ratified the Paris Agreement on Climate Change (in October 2016). Climate change may impede socioeconomic development within India and increasing investments in adaptation measures to reduce vulnerability, as scaled-up under the project, will be essential for maintaining economic growth. In absolute terms, the country remains one of the largest GHG emitters, with its agriculture sector the second largest contributor (around 18 percent of the country's total GHG emissions). Climate-resilient agricultural technologies and agronomic practices to be disseminated under the project will contribute to carbon sequestration, thereby reducing the GHG emissions of the farming systems in the project area.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

20. **PoCRA's project development objective** is: *to enhance climate-resilience and profitability of smallholder farming systems in selected districts of Maharashtra.*

21. **Sustainable pathways to resilience.** 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.

22. 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).

B. Project Beneficiaries

23. **The primary project beneficiaries are smallholder farmers, defined as producers with up to 2.0 ha of farm land.** Smallholder farmers will gain from knowledge and technology transfer,



and access to assets to enhance climate resilience on their farms, as well as increased revenue from crop diversification and participation in emerging value chains. Farmer producer companies (FPCs) and small and medium agro-entrepreneurs (SMEs) will also benefit from the project through climate-resilient investments in value chain development, support with the promotion of backward and forward linkages, and access to business development and incubation services from the Climate Innovation Center (CIC). The project will also directly benefit local institutions and agencies (e.g. agricultural research and extension, technical advisory services) through capacity development on climate resilience. State Agriculture Universities (SAU), various line departments, government agencies and other institutions at district and sub district level will also benefit through a strategic partnership with the project for mainstreaming climate resilience in agriculture.

C. PDO-Level Results Indicators

24. The following Key Performance Indicators (KPI) are proposed for measuring the core outcomes of the project, two of which are Corporate Results Indicators (CRIS); all KPIs are explained in the glossary of project indicators in Annex 9):

- (a) KPI #1 - Increased water productivity at farm-level
- (b) KPI #2 - Improved yield stability (i.e. across time and space)
- (c) KPI #3 - Net greenhouse gas emissions [CRI]
- (d) KPI #4 - Farm income, by gender
- (e) KPI #5 - Farmers reached with agricultural assets or services, by gender [CRI]

III. PROJECT DESCRIPTION

25. **Project rationale.** In support of the state government's shift towards a new paradigm that puts climate resilience at the core of agriculture growth and rural development in Maharashtra, the project seeks to: (i) introduce transformational changes in the agriculture sector by promoting short-term solutions at farm and catchment level, (ii) and provide longer term solutions at institutional and policy level to ensure the sustainability of the outcomes generated in the field. This two-tier approach is reflected in the project design; it ensures that investments promoted by the project and efforts to reduce stakeholders' climate vulnerability (specifically their capacity to mitigate the impact of adverse climate events and/or to recover from climate disturbances), contribute to both dimensions of the PDO, i.e. increasing climate resilience in agriculture while ensuring that smallholder farming remains a financially viable activity.

26. **Project overview.** To enhance the adaptive capacity of farming systems, the project promotes the transfer of already proven and field-tested agricultural technologies and agronomic practices that enhance climate resilience at farm and catchment level (shorter term solutions). To increase the absorptive capacity of commodity value chains for crops relevant to the climate agenda, the project strengthens Farmer Producer Companies (FPCs) and supports the seed supply chain for climate-resilient crop varieties. Finally, to improve the transformative capacity of institutions in rural areas, the project supports the mainstreaming of climate resilience in rural institutions as well as the generation and transfer of cutting-edge knowledge on climate change and its impact on key sectors (e.g. agriculture, water) in order to provide strong analytical underpinnings for strategies and policies on climate adaptation and mitigation (longer term solutions).



27. **Achieving climate resilience at farm level through triple-win solutions.** Based on India’s experience with other initiatives supporting agriculture adaptation to the changing climate, and the Bank’s global experience with climate resilience in agriculture, the project, as represented in Figure 1 below, is built around a comprehensive, multi sector approach that focuses on building resilience in agricultural production systems, while generating the following interdependent triple win solutions:

- (a) *enhanced water security at farm level* - through the adoption of technologies for a more productive and efficient use of water for agriculture, and the increase in water storage capacity (surface and sub-surface) and improvement in water distribution structures to address on-farm water availability and reduce the risks associated with intra- and inter seasonal climate variability;
- (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 smallholder FPCs in emerging value-chains.

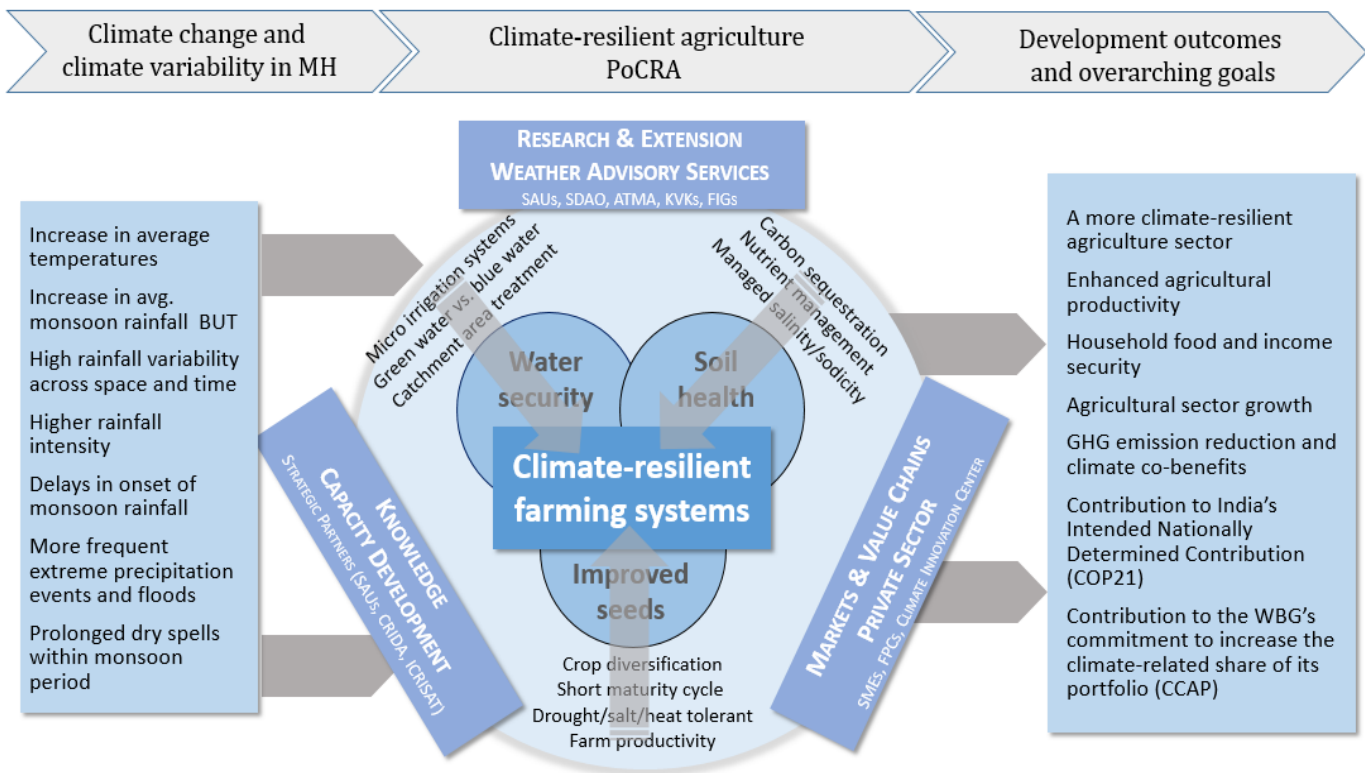


Fig. 1: PoCRA: Strategic overview, thematic linkages and expected achievements



A. Project Components

28. This section provides an overview of the project components and main activities supported by the project. A detailed description of the project components is provided in Annex 1 and further information can be found in the Bank-approved Project Implementation Plan (PIP) prepared by the GoM.

29. **Component A – Promoting Climate-resilient Agricultural Systems** (IBRD: US\$ 316.47 million): The objective of this component is to strengthen the **adaptive capacity of smallholder farmers** to adjust and modify their production systems to moderate potential future impacts from climate events. The component builds climate-resilience in agricultural production systems through a series of activities at farm level, complemented by interventions in drainage line and catchment areas. A Mini Watershed Plan will be developed for each cluster of villages during early stages of implementation and form the basis for a Cluster Development and Investment Plan that provides a roadmap for the implementation of project activities and investment priorities in the field.

30. This component focuses on: (i) scaling-up the adoption by farmers of climate-resilient agricultural technologies and farming practices aimed at improving soil health, water-use efficiency and crop productivity, including in the areas affected by high salinity levels; and (ii) drainage line and catchment area treatment to promote a more efficient use of surface water for agriculture, complemented with a more sustainable use of groundwater, and ultimately improve the availability and quality of water at farm level. This component contributes directly to the PDO by promoting the transfer of climate resilient technologies and agronomic practices aimed at: improving water-use efficiency and water productivity at farm level (KPI #1); reducing climate vulnerability in crop production (KPI #2); and scaling up the adoption by farmers of agronomic practices and agricultural technologies proven to enhance climate resilience in farming³ (KPI #5).

31. This component provides the foundation for the project contribution to “drought-proofing” agriculture in Maharashtra by scaling up technology transfer and promoting skills development for smallholders to increase: (i) their capacity to adapt to adverse climatic events and reduce impacts on their livelihoods, and (ii) their adoption of agronomic practices designed to improve *in situ* moisture conservation and enhance soil health (leading to carbon sequestration). The Farmer Field School (FFS) approach, well-established in Maharashtra, and the project’s comprehensive ICT-based knowledge and information system are the main vehicle for technology demonstration and diffusion. Under this component, eligible farmers can apply for an Individual Farmers Matching Grant for eligible activities. This component uses matching grants as an incentive to accelerate the adoption by individual farmers of the demonstrated technologies and agronomic practices, based on government modalities and norms implemented in other agricultural programs and projects in Maharashtra.

32. To complement these on-farm activities, this component also supports investments in catchment areas to prioritize the use of surface water and improve the sustainable management of groundwater resources for agriculture. On-farm activities and catchment area treatment will be derived from priorities identified in a participatory, science-based, village-level micro planning

³ See Annex 5 for a sample listing of climate-resilient agricultural technologies and agronomic practices promoted by the project at farm level.



process with rigorous water budgeting and aggregated into a Mini Watershed Plan for each of the 670 PoCRA village clusters⁴. Subsequent investments to enhance climate-resilience in agriculture are captured in the corresponding Cluster Development and Investment plan.

33. **Component B – Post-harvest Management and Value Chain Promotion** (IBRD: US\$ 39.65 million): The objective of this component is to support the participation of smallholder farmers in Farmer Producer Organizations (FPOs)⁵ and integration of these FPOs in value chains for crops relevant to the climate agenda, and to strengthen the supply chain for climate-resilient crop varieties in the project area. The component will develop the **absorptive capacity of stakeholders in selected commodity value-chains** to prepare for and help recover from negative impacts of climate events. The component supports activities that enhance climate resilience beyond farm gate and provide end-to-end solutions in value chains for agricultural commodities selected for their contribution to climate-resilient farming.

34. In line with GoM priorities, this component focuses on FPOs as major drivers of change in the agri-food system. An increase in farm income remains the key determinant of change and a pre-requirement for the adoption of the climate-resilient technologies and good agronomic practices promoted under Component A. Thus, this component directly contributes to the PDO by creating opportunities for increasing the revenue of smallholder farmers (KP #4) through crop diversification and their participation through FPOs in selected value chains. To ensure successful crop diversification, the component helps: (i) develop smallholder-inclusive value chains for climate-resilient commodities, and (ii) overcome constraints in the seed supply chain and address shortages in the availability of stress-resistant seed varieties.

35. Activities under this component help build the capacity of some of over 430 registered Farmer Producer Companies (FPCs) in the project districts to upgrade from the current business model of “aggregators” (for the sale of most common, high-volume low-return, staple food commodities, as well as the bulk purchase of agricultural inputs) to growth-oriented agri-business entrepreneurs with bankable proposals. This is expected to be achieved through a comprehensive program of business skills development and coaching. The component focuses on the FPCs engaged in the emerging value chains for commodities that have a potential for contributing to climate-resilience in agriculture (e.g. pulses and oilseeds for improved water management; fruits and vegetables for the diversification agenda). The component will use matching grants to complement the FPC’s own financial resources for the financing of a bankable proposal (e.g. storage, primary processing, marketing) to access commercial loans, in line with GoM modalities for FPC support implemented in other government-supported programs. Other growth-oriented FPOs engaged in eligible income-generating activities may also be supported under this component through an FPO Matching Grant and capacity development activities.

36. The component also seeks to help key players overcome bottlenecks to improve the performance of the seed supply chain in the project area, and addresses constraints with the volume,

⁴ See Annex 8 for a technical note on the mini watershed development process.

⁵ FPOs include among others: Farmer Producer Companies (FPC), Farmer Interest Groups (FIG), Self-help Groups (SHG), and Women Groups; see details in: NABARD (2015): National Bank for Agriculture and Rural Development, Mumbai: *Farmer Producer Organisations - Frequently Asked Questions (FAQs)*



quality, availability, affordability and access of seed varieties with climate-resilient features (e.g. short duration cycle, drought-, salinity- or heat-tolerant). This is expected to be achieved under this component through institutional strengthening of the key players in the seed value chain for high-volume low-return commodities like pulses, through limited investments (e.g. in the development of seed hubs), as well as matching grants for individual farmers and FPOs engaged in the production and processing of climate-resilient seeds.

37. **Component C – Institutional Development, Knowledge and Policies for a Climate-resilient Agriculture** (IBRD: US\$ 23.56 million): The objective of this component is to enhance the **transformative capacity of institutions and stakeholders** to promote and pursue a more climate-resilient agriculture, with sector strategies and policies based on strong analytical underpinnings and cutting-edge climate, water and crop modelling. This component will ensure sustainability in the approach proposed for building climate resilience through a transformative management of agriculture, soil and water resources, by: (i) strengthening the capacity of existing institutions to design and deliver agro-technical and climate advisory services, (ii) establishing a Climate Innovation Center, and (iii) promoting an evidence-based policy dialogue on climate resilience. Successful implementation of the activities in this component will contribute to achieving the PDO by increasing the outreach of institutions and agencies promoting climate-resilient agriculture in the project area (KPI #5) and generating spillover effects to farming communities from other villages not covered by project activities.

38. This component provides the foundation for the sustainability of the activities and investments carried out under the project. The component supports the mainstreaming of climate-resilience in the district-level Strategic Research and Extension Plans (SREP); SREPs are multi-year strategy documents for the dissemination of innovations and the coordinated interaction in the field between State Agricultural Universities (SAU), *Krishi Vigyan Kendras* (KVK), district-level agricultural extension services (ATMA) and the farming community. Similarly, under this component the project supports the update of district-level climate contingency plans for agriculture production, building on the knowledge generated with the development of the Mini Watershed Plans under Component A. This component will also finance the development of a state-of-the-art ICT platform that will integrate several project operational modules (e.g. agri-met services, agronomic advisory services, M&E, beneficiary feedback, etc.) and support access to knowledge for and service delivery to stakeholders.

39. A Climate Innovation Center (the first of its kind in India) will be established as part of the Bank supported global network of CICs to provide a range of short and longer term business services (including incubation, coaching, business development) to growth-oriented FPOs and SMEs seeking opportunities to scale up their economic activities and climate solutions (including in the agriculture, water and energy sectors). This component seeks to develop long-term strategic partnerships at the state, national and international level for collaborative evidence-based work to provide the analytical underpinnings in support of the design of policies on climate-resilient agriculture.

40. **Component D – Project Management** (IBRD: US\$ 39.27 million): This component covers the activities of the Project Management Unit (PMU) set up by the GoM during the project preparation phase. The PMU, led by the Project Director appointed by the GoM, ensures that all PoCRA activities are carried out in line with the provisions of the project Financing Agreement, the



Bank-approved project documents (including the Project Implementation Plan, PIP), the procurement regulations stipulated in the World Bank Procurement for IPF Borrowers (2016, revised November 2017), and the guidelines applicable to the project. The PMU is responsible for the day-to-day operations of the project, for the project liaison with the Bank and the GoM, as well as for the institutional coordination among the various agencies implementing project activities at local level. Under this component, a range of fiduciary activities will be carried out, including overall financial management, accounting, reporting and auditing, implementation of the Project Procurement Strategy for Development (PPSD) and Bank-approved procurement plan; and monitoring of environmental and social safeguards compliance.

41. This component will further cover the overall project Monitoring and Impact Evaluation (M&IE) and reporting activities, including the project impact evaluation; and the coordination with a human resources agency to be hired for filling the project's technical positions in the field. Finally, under this component, the PMU will implement all activities related to communication, public awareness and outreach, including setting up and maintaining a comprehensive project website that also accommodates an open space for lodging stakeholders' complaints as part of the project's Grievance Redress Mechanism (GRM). All project incremental operating costs are covered under this component.

B. Project Cost and Financing

42. **The project will contribute towards the costs of “drought-proofing” 5,142 villages in Maharashtra with US\$420 million from IBRD and US\$179.55 million from GoI/GoM.** As represented in Table 1 below, the overall budget for the project is US\$599.55 million. This represents an average nominal envelope of less than US\$20,000 per year for each village for the implementation of activities identified in the Cluster Development and Investment Plans. Project beneficiaries will contribute towards the costs of the technologies adopted and assets acquired, as per the cost-sharing norms implemented by the GoM in other matching grant schemes. Activities implemented by individual farmers and FPOs and supported with a project matching grant are exclusively demand-driven. For calculations purposes, the aggregate contribution by farmers for the adoption of climate-resilient agricultural technologies was estimated at US\$75 million; while that of FPOs for supporting their growth agenda was estimated at US\$20 million.

43. **Leveraging resources to scale up results.** The total costs for the GoM's objective to “drought-proof” 5,142 project villages (and ultimately the entire state) in a saturation mode, with catchment treatment, and with the adoption at scale of climate-resilient on-farm technologies, have been estimated at over US\$2 billion. Several other government schemes seeking to bring about similar transformational changes to the agricultural sector and to contribute to “drought-proofing” agriculture in Maharashtra are currently under implementation. These include: *Jal Yukt Shivar* program for a drought-free state of Maharashtra; Integrated Watershed Management Program (IWMP promotes, among other, rainwater harvesting and recharging of the ground water table); Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS prioritizes activities related to water harvesting, groundwater recharge, drought-proofing, and flood protection); the national agriculture development program *Rashtriya Krishi Vikas Yojana* (RKVY); and the recently launched Prime Minister program *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY seeks to extend the coverage of irrigation and improve water use efficiency, i.e “More crop per drop”).



44. Convergence between PoCRA and those programs requires to strategically prioritize PoCRA interventions planned in each cluster, select results-based investments to be financed, and phase-in activities to be implemented in each cluster in close coordination with investments planned in other programs. In line with the GoM priority on convergence, the project will exploit wherever feasible, synergies on the ground with other GoM programs. In that context, PoCRA’s Cluster Development and Investment Plans may also serve as a blueprint for complementary interventions that could be funded from different sources; for example, in a given cluster, PoCRA could finance on-farm climate-resilient agricultural technologies (e.g micro irrigation system), while another program with activities in that same district could finance catchment area treatment or improved groundwater management activities (e.g. aquifer recharge structure).

45. **The GoM is seeking to leverage its own resources and the IBRD funding for PoCRA with complementary funding from the Green Climate Fund (GCF).** IFC’s 2030 Water Resources Group, in close collaboration with the Bank team and counterparts, has been supporting the GoM’s efforts to access GCF funding to scale up climate adaptation in Maharashtra rain-fed agriculture. A comprehensive GCF proposal has been developed and the GoM will submit it GCF Secretariat through the Ministry of Environment and Forest (MoEF), once the proposal has been reviewed by MoEF.

46. Similarly, based on the Bank’s global experience with Climate Innovation Centers (CIC) set up under its Climate Technology Program, the Maharashtra CIC is expected to leverage funding (including from the private sector) to support the growth agenda of SMEs with climate solutions for agriculture, water or energy Maharashtra and beyond. As in other CICs, the funding acquired could be used to finance, among others, proof-of-concept grants or seed capital investments

Table 1: Project Costs, IBRD and Counterpart funding

Project Components / Sub components	(US\$ Million)			% of Project Cost
	Govt	Bank	Total	
A. Promoting Climate-Resilient Agricultural Systems	135.63	316.47	452.10	75.4
B. Post harvest management and value chain promotion	16.99	39.65	56.64	9.4
C. Institutional Development, Knowledge and Policies	10.10	23.56	33.65	5.6
D. Project Management	16.83	39.27	56.10	9.4
Total	179.55	418.90	598.50	99.8
Front-end fees		1.05	1.05	0.2
Total Project Cost	179.55	420.0	599.55	100.0

C. Lessons Learned and Reflected in the Project Design

47. **The project results from a recognition by the GoM that Maharashtra’s agriculture sector needs a comprehensive, systematic approach to managing and coping with climate change** and variability, that combines interventions with short and longer term impact. Short-term solutions are addressed are farm and catchment area level scaling up proven climate-resilient agricultural technologies and agronomic practices, as well as investments in the catchment areas, that contribute to the “drought-proofing” of 5,142 villages in Maharashtra. Longer term solutions focus on strengthening the capacity of key stakeholders (FPOs, local institutions) and the enabling



environment (sector strategies and policies, rural institutions) to internalize climate resilience in efforts to promote agricultural growth and farmer income increase.

48. Component A is designed around those short-term solutions and focuses on promoting the demonstration and diffusion of agricultural technologies and agronomic practices that have been developed and tested by various Indian Council of Agricultural Research (ICAR) agencies as well as International Center for Research in Semi-Arid Tropics (ICRISAT) in India, and have been validated by the farming communities in other government-supported programs. In particular, a number of agronomic practices to enhance in-situ water conservation and improve soil health (e.g. through carbon sequestration) have successfully been piloted in various villages in India, including in Maharashtra, under the National Initiative for Climate Resilient Agriculture (NICRA) and under ICRISAT's Improving Rural Livelihoods through Integrated Watershed Management project in the state of Karnataka (see Annex 5 for a description of the main agronomic practices to be scaled up under PoCRA).

49. Lessons learned from the long-standing partnership between the Bank and the GoI around watershed development have helped shaping the design, activity selection and implementation arrangements under Component A. Projects like the Neeranchal National Watershed Project (P132739) or the Himachal Pradesh Watershed Management Project (P104901) have provided valuable insights on successful integration of water source, distribution and use, on improving on-farm water-use efficiency, and on increasing the productive potential of natural resources (e.g. soil, water) while ensuring their sustainable management through a community-based approach.

50. The project has benefitted considerably from the lessons learned under the Maharashtra Agricultural Competitiveness Project, MACP (P120836), particularly in the design of Component B. MACP's end-to-end approach has supported the promotion of agricultural diversification and the transfer of agricultural technologies to smallholder farmers to improve farm productivity. The design of PoCRA's Component B and the efforts to better integrate smallholder farmers in agricultural value chains through the promotion of FPOs build directly on the MACP's institutional support with the set up and registration of FPCs. Many of the FPCs whose entrepreneurial and climate-resilient capacity will be further enhanced under PoCRA have been recently established under MACP. Moreover, the analytical underpinnings for PoCRA interventions in the seed supply chain, have been generated under MACP.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

51. **The project is fully integrated in the GoM administration and implementation is designed to capitalize on existing GoM agencies at state, districts, sub-districts and village level.** Overall project implementation is the responsibility of the Department of Agriculture, DoA (GoM). Where institutional capacity is limited and special skills are required, the project will acquire outside expertise, including consulting services. The project implementation agency DoA through its Project Management Unit (PMU) will engage with other Government Departments/Technical Agencies that can provide specific knowledge and skills to support selected project activities at central level as well as in the field. Table A2.3 in Annex 2 provides an overview of the Government Departments/Technical Agencies engaged in the project and their technical area of contribution to project activities.



52. **Overall project oversight is the responsibility of the Project Steering Committee (PSC).** The PSC has already been established during preparation and is chaired by the Chief Secretary (GoM). The main responsibility of the PSC is to provide strategic guidance for the implementation of the project and to act as the interface between the project and the GoM. The PSC also approves the annual work program and budget for the project, endorses the proposed renewal of MoUs/contracts with Strategic Partners, and is briefed by the Bank (and the Project Director) on the outcomes of implementation support and review missions carried out with the Bank team at least biannually.

53. **The day-to-day management and operation of the project is the responsibility of the Project Management Unit (PMU).** The PMU is headed by a Project Director appointed by GoM and is already fully operational. Given the transformative nature of the project, institutional coordination across the relevant sectors is emerging as a critical task for the PMU in developing an effective project implementation mechanism to achieve convergence with other GoI/GoM programs. The PMU is responsible for ensuring that: (i) all project activities are planned, financed and implemented as per the approved project annual work program and budget, (ii) project implementation is in line with operational guidelines of the Project Implementation Plan, (iii) project procurement and financial management activities are carried out in timely manner as per the World Bank's Procurement Guidelines for IPF Borrowers (2016), the project fiduciary manuals and the Procurement Plan, and (iv) social and environmental safeguards applicable to the project are fully complied with. The PMU is also responsible for monitoring project activities, preparing the semi-annual and annual project progress reports, and ensuring that all reports (including financial reports) are submitted to the Bank in a timely manner.

54. **Implementation arrangements are designed to take full advantage of the decentralized nature of the public administration system.** At the regional level, a Divisional PMU is set up in Amravati, Latur and Aurangabad, and is headed by a Divisional Joint Director who acts as nodal officer for the project. At the district level, project implementation is supported by technical and fiduciary specialists supervised by the District Superintending Agriculture Officer (DSAO) and the Director for ATMA. In each district covered by the project, a District Steering Committee is established, headed by a Collector (who also chairs the District Disaster Management Committee); the PMU, as nodal implementing agency, and the associated line departments involved with the project are represented on the District Steering Committee. At sub-divisional level, project implementation is supported by specialists from the Sub-division Agriculture Office (SDAO). Project activities at cluster level are coordinated by a Cluster Assistant supported by the local contact farmers ("farmer's friends") and technical specialists from other departments. Initial implementation arrangements have been rolled out during project preparation and will be fully operational at project launch.

55. Finally, at the village level, the Village Climate Resilient Management Committee (VCRMC) plays a key role in planning, community procurement, monitoring and coordinating project implementation (e.g. watershed plans) and anchoring climate interventions at community level. To that effect, the VCRMC liaises closely with the community institutions associated with the implementation of project activities, e.g. the Water User Associations, Watershed Development Committees, as well as Producer Organizations (incl. Farmer/Common Interest Groups). VCRMCs will be set up as part of the mobilization process for the development of the mini watershed plans, following the phased roll-out of the development of mini watershed plans. VCRMCs are headed by



the Head of *Gram Panchayat (Sarpanch)*. The other 12 members of the VCRMC are selected by the *Gram Sabha* and shall represent various stakeholders at the village level, including vulnerable groups. The composition and specific roles of the VCRMC are detailed in the Bank-endorsed PIP.

56. **To meet the project needs for highly specialized knowledge and technical skills, the PMU has reached out to Strategic Partners.** These are public institutions that have already assisted the PMU and other stakeholders during project preparation. Such technical partnerships can be extended to the project implementation phase and technical support may be formalized with a non-procurement MoU by the PMU, as required. An MoU with a Strategic Partner shall be treated as a contract for all practical purposes (i.e. to be added to the Procurement Plan, to be reviewed by the Bank, etc.) irrespective of the nomenclature of the document as MoU. When a MoU is treated as a contract, it will be allowed only for small value assignment, i.e. up to US\$ 300,000. If a MoU is proposed to be used for an assignment having value greater than this threshold, it will be treated as non-standard procurement document and Bank prior clearance irrespective of the threshold is required before use.

57. Table A2.3 in Annex 2 provides an overview of institutions already identified by the PMU as Strategic Partners. As new needs may emerge during project implementation, the PMU may invite other Strategic Partners to support project activities, duly following procedures mentioned in the previous paragraphs. However, none of the Strategic Partners shall engage in carrying out procurement under the project. Only the PMU at State level, its district offices at District level, and selected communities at village level, will carry out procurement under the project.

B. Results Monitoring and Evaluation

58. **The project design includes a results-based M&E system aimed at measuring progress towards the PDO to allow for timely course corrections and evidence-based decision-making.** PoCRA's M&E system follows the Bank's operational guidance for M&E in climate and disaster resilience-building operations, and draws from emerging good practices⁶. The system includes the following core elements: (i) a comprehensive beneficiary/stakeholders analysis covering a randomized selection of villages (this analysis includes a baseline survey for the impact evaluation work); (ii) a rigorous impact evaluation with baseline, midline and endline household and community surveys allowing for adjustments during implementation; (iii) an ICT-based project management information system that allows for digitized data collection in the field and availability of data at the PMU level in real-time; and (iv) an ICT-based reporting system with semi-annual and annual project progress reports.

59. **The M&E system reflects the multisector nature of the project and the dual dimension of the PDO.** Most PDO and Intermediate Outcomes indicators in the Results Framework aim at measuring climate resilience in agriculture, and specifically inform about the triple-win solutions to be achieved at farm level with the adoption of climate-resilient agricultural technologies and agronomic practices: higher crop productivity, improved water productivity and enhanced soil health. The M&E system is also designed to report specifically on the impact of project activities on beneficiaries (i.e. by reporting among others on beneficiary participation and civic engagement, on

⁶ World Bank (2017): *World Bank Resilience M&E (ReM&E) – Good Practice Case Studies*. GFDRR, WBG.



adoption by farmers of climate-resilient agricultural technologies and agronomic practices, and on household income). Whenever applicable, indicators are disaggregated by gender.

60. **The PMU has the overall operational responsibility for planning and coordinating M&E activities** to be implemented by a hired M&E consulting firm. The firm's M&E specialists will be deployed in the field at project launch to: (i) monitor and report on all project activities implemented at district, cluster and village level; and (ii) build the M&E capacity of technical staff in the local agencies. Information on the implementation arrangements for the project's M&E system is provided in the Annex 2 and in the Bank-approved PIP.

61. **Citizen Engagement.** The project has made provisions for regular consultations with stakeholders to ensure feedback from citizens. In addition, the project's ICT-platform will include a module for citizen engagement. As part of the project's M&E system, the PMU will monitor the reporting on the Citizen Engagement indicator in the project's Results Framework (see Indicator #14 on Participatory Mini Watershed Plans). It is expected that beneficiary feedback will enable citizen to participate during activity planning and implementation and integrate their voice in development of the Cluster Development and Investment Plans. Citizen feedback mechanism in the project is solicited through: (i) outreach program for the beneficiaries on project performance with a focus on inclusion, participation and transparency; (ii) project website for citizen to register their suggestions; and (iii) the mobile phone-supported module for citizen engagement in the project's ICT-platform.

C. Sustainability

62. **The project full alignment with GoI/GoM development priorities, its synergies with other programs, and its implementation arrangements provide a strong basis for project sustainability.** The project fully responds to the GoM request for supporting a shift in paradigm on addressing the vulnerability of the state's mostly rainfed agriculture to increasingly frequent climate events through longer-term resilience building, rather than repeated short-term emergency responses. By scaling up climate-resilient technologies and agronomic practices that increase farm productivity, improve water-use efficiency and enhance soil health, the project lays the foundation for a longer-term process of strengthening the adaptive capacity of farming systems and absorptive capacity of selected value chains to sustain the adverse impacts of recurring climate events. Consequently, while the initial impact of the activities implemented and investments made under this project will become evident shortly afterwards, it is expected that in many cases, full impact will only be reached after the lifetime of the project – if adequately followed up upon by DOA and other GoM departments, as well as local institutions and the communities.

63. **The project is designed to contribute to the GoM priority to achieving “drought-proof” agriculture in Maharashtra,** including in 5,142 villages of the 15 project districts. Several other flagship programs from the GoI and GoM are being implemented across the state to help achieve this priority objective, including in the PoCRA districts. Hence, leveraging other programs to maximize impact on the ground while judiciously allocating the resources from different initiatives across participating villages based on priority and complementarity criteria, is a key factor for the sustainability of PoCRA interventions.

64. Given the strong commitment demonstrated throughout the project preparation, it can be expected that with a successful early implementation of PoCRA activities, the GoM will continue to



support activities introduced by the project and synergies with other programs throughout the project implementation and beyond, in order to achieve the stated goal of “drought-proofing” agriculture and contribute to India’s commitments with regards to the Intended Nationally Determined Contribution under COP21.

65. **The institutional arrangements for the implementation of the project are a key determinant of the project’s sustainability** (see detailed arrangements in Annex 2). Project implementation is coordinated by DOA and the PMU and maximizes the targeted support provided by other Government Departments/Technical Agencies; other public agencies provide specific technical assistance to the PMU as Strategic Partners. Coordination, technical oversight and, where applicable, field activities, are carried out by the corresponding public institutions at divisional, district, sub district, as well as those already existing at village-level, in close consultation with the PMU. Thus, the project is fully embedded in the administration of the GoM, which is expected to result in high levels of ownership and commitment to achieving project outcomes and ensuring sustainability.

66. In addition, a substantial portion of the project is dedicated to knowledge and technology transfer to scale up the adoption of agricultural technologies and agronomic practices that help build resilience at farm level. Hence, given the tools used for the demonstration (i.e. Farmer Field Schools, ICT) and diffusion (i.e. Individual Farmers Matching Grant) of these technologies and practices, a spillover effect to non-PoCRA villages can be expected, further accelerating the scaling up of climate-resilient agriculture in Maharashtra and consolidating the sustainability of the project investments and activities.

67. **The establishment of India’s first Climate Innovation Center (CIC) is an essential building block for the sustainability of the project.** The CIC set up under the project operates as a center of excellence and seeks to build the capacity of the private sector to innovate local solutions in selected climate sectors (e.g. agriculture, water, energy). It is built on the CIC model developed and implemented globally with the TA from the World Bank’s InfoDev Group and Climate Technology Program (CTP). The CIC in Maharashtra is based on good practices from the global network of CICs established under the World Bank’s CTP, and on strong analytical underpinnings⁷. The CIC is expected carry out multiple functions ranging from: (i) business development services and training for growth-oriented agribusiness SMEs and FPOs; (ii) coaching and incubation services for SMEs seeking to scale up climate solutions for the agriculture or water sector in Maharashtra and beyond; (iii) facilitating access to capital for growth-oriented SMEs with climate solutions; as well as (iv) policy advisory services on climate resilience in agriculture and other sectors of the economy.

68. The CIC is established with the aim to continue operating after project implementation time, and ultimately, generate sufficient resources to cover its operating costs in a sustainable way. Its unique position in the institutional landscape of Maharashtra as a platform for promoting SMEs with climate solutions, with while nurturing international linkages through the global CTP network of CICs, and supporting the GoM climate agenda, should easily help overcome any sustainability constraints. In addition, given India’s national global commitment to the climate agenda, this CIC is

⁷ World Bank Group (2010): *India Climate Innovation Center: a business plan for the financing and implementation of a CIC in India*. Prepared by InfoDev for UK AID. In addition, a feasibility study and detailed business plan for the CIC Maharashtra will be carried out under the PoCRA project during early project implementation.



expected to have enormous potential for being replicated to other states in India to further promote private sector-led adaptation and mitigation to climate change.

D. Role of Partners

69. The project is not financed by any other international agency (including bilateral donors).

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

70. **The overall risk rating of the project is Moderate** as the rankings in Table 2 below indicate. The most critical risks associated with project implementation are on Fiduciary aspects (Substantial) and on Institutional Capacity (Substantial). These risks and the proposed mitigating measures are summarized below.

71. *Fiduciary risks and mitigation measures.* The overall Fiduciary risk is rated as Substantial. With respect to Financial Management, this relates to the inherent risks due to the large number of implementing entities/offices, and use of variable systems of accounting and payments. Mitigation measures include, among others, adequate staffing with technical specialists at various levels, the use of Direct Beneficiary Transfer for matching grants with installments in the beneficiary’s bank account, the project’s full integration in the Budget Estimation, Allocation and Monitoring System (BEAMS) system, and the use of the state’s Treasury systems for most budget allocations to the accounting centers. With respect to Procurement, the rating is due to inherent risk associated with highly decentralized project activities. Implementation at multiple levels present efficiency and compliance risks, as well as risks associated with weak internal controls, staffing and limited capacity at decentralized level. Mitigation measures for Procurement are detailed in the summary of the PPSD found in Annex 2 on Implementation Arrangements.

Table 2: Systematic Operations Risk-rating Tool (SORT) – Summary of Risk Ratings

RISK CATEGORY	RATING
1. Political and Governance	Low
2. Macroeconomic	Low
3. Sector Strategies and Policies	Moderate
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	Low
OVERALL	Moderate

72. *Institutional risk and mitigation measures.* Contributing to the “drought proofing” in 5,142 villages through the transfer of technologies and agronomic practices that aim to enhance resilience



to climate variability in agriculture is a challenging task. The multi sector nature of climate solutions at farm, mini watershed level and value chain level requires the participation of multiple stakeholders and agencies on the ground. Key to a successful implementation of the project activities is a clear coordination mechanism among participating stakeholders and agencies from different departments with just-in-time access to information, knowledge and resources. To that effect, several risk-mitigating measures have been introduced and reflected in the implementation arrangements, project governance and the project design:

- a. Institutional coordination is secured through the governance structure of the project which accounts for the multi sector nature of climate resilience: the high-level Project Steering Committee (chaired by the Chief Secretary and regrouping all Departments associated to the project), the Project Advisory Committee (headed by the Principal Secretary, Agriculture) and the PMU (led by a GoM-appointed Project Director) ensure the full ownership of the project at highest levels and the coordinated involvement in project implementation of the concerned technical departments. The PMU and its Project Director play a pivotal role in the coordination among agencies and stakeholders on the ground. To further facilitate institutional coordination on the ground, 3 DPMU are set up at the division level, along with a District Project Committee in each of the 15 districts.
- b. To build climate resilience in the farming systems of the selected districts, the project is designed to focus on scaling up agricultural technologies and agronomic practices that have already been developed, piloted and validated, among others under the leadership of ICAR agencies in other programs (e.g. NICRA), including in the state of Maharashtra. In addition, to accelerate adoption, the project uses the well-established approach of FFS coupled with matching grants applied based on prevailing GoM/GoI norms. Consequently, the agencies providing technical assistance on the ground for technology transfer to producers are well versed with the methodology for demonstration, diffusion, and adoption at farm and village level.
- c. The PMU has the overall responsibility for project implementation; it is supported by Government Departments/Technical Agencies and Strategic Partners who provide technical skills and knowledge on a needs basis. Institutional capacity strengthening based on a needs assessment is an integral part of the project (Component C) to address any capacity gaps that could delay the implementation of project activities. Where required, the project will address specific staffing needs of the agencies engaged in project activities in the field (see Table A2.2 in Annex 2 for details).

B. Climate Risk Screening

73. **The project has been screened for climate risk using the WBG's Climate and Disaster Risk Screening Project Level Tool⁸.** The Climate and Disaster Risk Screening Tool provides high-level screening to help consider short- and long-term climate and disaster risks at an early stage of project design. The tool applies an Exposure–Impact–Adaptive capacity framework to characterize risks. Potential risks are identified by connecting information on climate and geophysical hazards with the Bank team and the PMU's expertise of project components and understanding of the broader sector and development context. The outcomes of the screening were used to strengthen

⁸ The tool is available here: <http://climatescreeningtools.worldbank.org/>



the climate considerations in the project design, including the physical aspects (e.g., farm irrigation, water storage) and soft components (e.g., capacity building of farmers, institutional strengthening).

74. **The outcomes of the screening indicate that historic and future exposure to climate and geophysical hazards is significant for the project location.** Regarding extreme temperature, analyses of historic climate data at the country level provide evidence that the "heat is on": an increase by 1.7-2.0°C in mean annual temperature between 1901 and 2007 has been measured across the country. Annual mean temperature is expected to increase by 1.8°C to 2.1°C for 2050s in the project regions of Vidarbha and Marathwada relative to 1971-2000 baseline. Increase in maximum temperature values is projected to be higher in those 2 project regions than in the rest of the state. The projections clearly indicate an increase in extreme temperature in future decades (Vidarbha region shows the highest increase in maximum and minimum temperatures for 2070s).

75. Regarding extreme precipitation and flooding, the review of historic data shows that seasonal mean rainfall has decreased while extreme rainfall event has become more frequent. Rainfall projections for 2030s show increase in rainfall magnitude. Extreme rainfalls are projected to increase by 2030s more in the northern part of the project area, while the number of low rainfall days is projected to decrease more in the southern part. Trend analyses indicate that the onset of the monsoon rains becomes less predictable and that in-season withdrawal with extended periods of drought will become more frequent. With regards to drought, 3 out of the 5 years preceding the project preparation saw the state of Maharashtra affected by severe droughts. Frequency and duration of droughts are expected to increase based on observed trends.

76. **The project's focus on enhancing climate resilience in agriculture is expected to lower the impact of the sector's exposure to projected extreme temperature, extreme precipitation and flooding, and drought.** The scaling-up under the project of climate-resilient technologies and agronomic practices is projected to moderate the impact on the project's investments in key areas, i.e. irrigation and drainage, crops and land management, and post-harvest management. Similarly, it is expected that the project's emphasis on capacity enhancement of agricultural service delivery institutions, skills development of local stakeholders including farmers, and support for the development of evidence-based climate-sensitive sector policies and programs, will significantly strengthen the adaptive capacity of stakeholders.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

77. **Project benefits.** The main project benefits for the targeted smallholder farmers are expected to come from: (i) improved *stability* in agricultural output and increased *productivity* of traditional crops through farmers' adoption of climate-resilient agriculture technologies and agronomic practices – such as short-duration or stress-tolerant varieties, and better management of soil and water resources at the farm and watershed levels (see Annex 5 for yield improvement of CRA interventions); (ii) *diversification* into new, suitably adapted, higher-value, climate resilient agriculture; and (iii) improved *post-harvest value-addition*.

78. Most benefits will be derived from farm output stability and increased productivity (of at least 20 percent above baseline) due to project interventions on rain-fed land which represents about 80 percent of the 2.9 million hectares that constitute the project area. The remaining 20



percent of the land will benefit from drip and sprinkler irrigation, alongside the project's suite of interventions, with a projected impact on productivity of at least 50 percent (see Annex 7 for a detailed breakdown of main project interventions by area). The cropping intensity in the project area is projected to stabilize at about 120 percent.

79. **Economic and Financial Analysis.** A series of crop and farm budgets were developed for "With-Project" and "Without-Project" scenarios. The opportunity cost of capital is assumed at 6 percent (also used in other projects in India). An investment horizon of 15 years is used in the analysis. In order to derive economic prices from financial prices, fertilizer prices were adjusted to remove subsidies, commodity prices were adjusted to remove protective import duties where applicable, and a standard conversion factor of 0.9 was used on non-tradable goods.

80. The project's internal rate of return (IRR) is estimated at 24 percent, with a corresponding net present value (NPV) of US\$ 470 million. The project's economic rate of return (ERR) is estimated at 27 percent, with a corresponding NPV of US\$ 517 million. A series of sensitivity analyses were performed to assess the impact of a possible 30 percent shortfall in expected benefits, a possible 30 percent cost overrun, or a combination of both. Results show that the return on the project's investment would remain above the opportunity cost of capital in the simulated scenarios. Details of the Economic and Financial Analysis can be found in Annex 7.

81. An analysis was also conducted incorporating the social value of carbon. On the basis of a net balance of -1.9 tCO₂-eq per hectare and a social value of carbon starting at US\$ 34.4 in 2018, the ERR was estimated at 170 percent⁹. Taking into account the sensitivity scenarios from the GHG accounting, the ERR reduces to 148 percent and 128 percent when the net GHG balance drops to -1.7 and -1.5 tCO₂-eq/ha/year respectively. Annex 6 provides the detailed GHG calculations for the project.

B. Technical

82. The technical aspects of the project reflected in the design and core activities under the components build on the Bank's global knowledge and experience with agriculture adaptation to climate change and the lessons learned from India's recent efforts towards the development of climate-resilient villages. The rationale for the technical design and approach selected for this project builds directly on these experiences, thus ensuring appropriateness to the GoM needs expressed and conformity with local, national and international core principles, best practices and achievements on climate-resilient agriculture.

83. **Building climate resilience in agriculture requires a multi sector approach.** This multi sector dimension is reflected in the watershed planning process that provides the basis for cluster development and investment plans. These plans propose a range of interventions at both farm and catchment level to enhance the climate resilience of the farming systems through triple win solutions: enhanced water use-efficiency and productivity, improved soil health and increased crop productivity. Much of the project's climate resilience agenda is at the interface between the agriculture and the water sectors. A particular focus of the project's climate resilience agenda is on

⁹ In order to account for greenhouse gas emissions in economic analyses, the World Bank Group uses a carbon price, or social value of carbon, starting at US\$30 per ton in 2015 and rising to US\$80 by 2050. This corresponds to US\$34.2 per ton equivalent in 2018.



increasing the use of surface water for agriculture while promoting a more sustainable management of groundwater resources. To respond to the request from GoM for an end-to-end approach on building resilience, project activities have also been developed to enhance the capacity of selected commodity value chains to reduce the effects of climate disturbances and recover from these.

84. **Building climate resilience in agriculture requires a two-pronged approach, with short term interventions complemented by longer term activities.** The project directly supports the shift in paradigm on adverse climate events and agriculture, away from sole short-term emergency responses and embracing instead a more longer term strengthening of the agricultural systems' capacity to cope and recover from climate disturbances. As a result, the project combines the promotion of agricultural technologies and agronomic practices proven to enhance climate resilience, as well as investments in the catchment areas, for short term results, with longer term capacity development activities for local institutions and other stakeholders or the set-up of a CIC to bring on board growth-oriented SMEs with climate solutions.

85. **Building climate resilience in agriculture requires up-to-date analytical evidence to generate transformational changes in the enabling environment.** The experience with the Bank's global support to the climate agenda highlights the need for a science-based approach when designing interventions and selecting activities expected to contribute to climate resilience in agriculture. In particular, this implies taking into account a broad range of climate data, both historic trends and modelled projections to determine potential implications on climate vulnerability and impacts on the agriculture sector in the project area. Through the collaborative association with ICAR agencies and international institutions (e.g ICRISAT), the project is designed to support the generation of new climate-resilient agricultural technologies and make extensive use of science-based modelling (e.g. for Managed Aquifer Recharge). Scientific evidence is paramount to provide the analytical underpinning for developing and implementing sector strategies and policies that fully internalize climate change and support the sustainability of activities and investments carried out under the project.

C. Financial Management

86. **The project's Financial Management arrangements are considered to be adequate** to account for and report on the project expenditure, as well as satisfy the fiduciary requirements in the context of an agreed financial management framework. The key features of this framework are as follows:

- a. *Budgeting and Planning.* Funds of the Project will be routed through the Budget of GoM. Annual Action Plans (AAP) will be prepared by DoA following a bottom-up approach for project activities. The online computerized Budget Estimation, Allocation and Monitoring System (BEAMS) system will be used to facilitate budget estimation, allocation of grants and for authorization of expenditure. Consolidated AAP will be approved by the Project Steering Committee (PSC) and budget will be forwarded by PMU to Secretary, DoA for including in estimates of the department.
- b. *Funds Flow/ Accounting.* The existing treasury systems will be followed for effecting payments; this is seamlessly connected to the BEAMS system. Allocations to all accounting centers will be made through BEAMS except for ATMAs and Village Climate Resilient Management Committees (VCRMCS), for which funds will be transferred through banking



- channels. There will be 67 accounts centers, which include: (a) PMU at State level – 1; (b) DSAO at District level – 15; (c) ATMAs at District level – 15; (d) Sub-divisional offices – 36.
- c. *Financial Management Guidelines and Staffing.* The Financial Management (FM) framework is documented in detail in an FM Manual. The FM Manual will help standardize the procedures, and reporting formats to be followed by all implementing agencies. The FM supervision of the project will be led by a Finance Specialist on deputation (to the PMU) from the State Finance and Accounts Services. S/He will be assisted by Accounts Officer and Assistant Accounts Officers, who will be on deputation.
- d. *External/Internal Audit.* The Comptroller and Auditor General of India (C&AG) through its offices in Mumbai and Nagpur will be the external auditor for the project. The audit report will be submitted to the Bank within nine months of the close of each financial year. The project will also appoint a firm of Chartered Accountants as internal auditors as per terms of reference and selection criteria agreed with the Bank. The Project Audit Review Committee chaired by the Project Director at PMU and DSAO at District-level will consider key issues pointed out by the auditors and ensure timely resolution of observations by project management.
- e. *Disbursement Arrangements.* The Bank will finance 70% of the project costs subject to a limit of USD 420 million. Funds from the Bank will be made available to GoM (through the GoI) under the standard arrangements between GoI and the States. Disbursements will be made on a quarterly basis, based on submission of Interim Unaudited Financial Reports. Up to 20% of the World Bank loan will be available for financing eligible project expenditures incurred in the one year before the likely date of Loan Agreement Signing.

D. Procurement

87. **Procurement for the proposed project will be carried out in accordance with the 'World Bank Procurement Regulations for Borrowers under Investment Project Financing', dated July 1, 2016, revised November 2017,** hereafter referred to as 'Procurement Regulations'. The project is subject to the World Bank's Anticorruption Guidelines, dated July 1, 2016, revised November 2017. A short form of Project Procurement Strategy for Development (PPSD) has been prepared by the GoM. The PPSD describes the overall project operational context, market situations, implementing agencies capacity and possible procurement risks. The Procurement Plan sets out the procurement selection method, as well as prior and post review thresholds to be followed by the Borrower during project implementation in the procurement of Goods, Works, and Non-consulting and Consulting services. A Procurement Manual has been prepared to help the PMU and Communities to carry out the project procurement in accordance with the Bank Procurement Regulations (July 2016). A Community Procurement chapter¹⁰ in the Procurement Manual shall be translated to local vernacular to help various communities understand and articulate the community procurement procedures. Procurement under this project is carried out by the PMU at central level, DSAO and ATMA at district, and SDAO sub-division level, and the community (VCRMC, beneficiaries) at local level.

¹⁰ The Bank reviews the translated version and accords no objection.



88. **The project includes several features of a highly-decentralized community demand-driven project.** The project is primarily demand driven and activities to be taken up at the community level and by the selected beneficiaries shall be as per the approved Cluster Development and Investment Plans (CDP). The threshold of procurement activity at community level is expected not to exceed Request for Quotations (RFQ) threshold. Community-level procurement shall follow Community Driven Development (CDD) arrangements as per the Bank Procurement Regulations and Project Procurement Manual.

89. The procurement profile of the project is a mix of small-value at community level and high-value at PMU level. A large share of the project funds is meant to finance the implementation of the approved CDPs, along with the Individual Farmers matching grants and the FPO matching grants awarded to selected beneficiaries. Given the limitation of funds and other ongoing programs, the activities to be funded under the CDPs shall be identified upfront to avoid any double dipping; these investments will require very close monitoring and oversight at PMU level. A dedicated PMU has been set up and will take up all procurement activities at the State level. The PMU is staffed with a Procurement Specialist having prior experience in implementation of Bank financed projects. Further details regarding Procurement in the project are provided in Annex 2.

E. Social (including Safeguards)

90. **Social dimensions.** A key part of the project is to scale up climate-resilient technologies to the farming community. While some of the technologies are individual-farmer oriented, a majority of them demand a collective approach as well as establishing links with the external research, development and marketing agencies. At the same time, the project recognizes that the prospective beneficiary profile is quite diverse and comprises several sub-groups identifiable on the basis of differentials in endowment, gender, ethnicity, as well as economic and other regional features. The challenge thus lies in identifying the requirements of all the sub-groups, with special attention towards the rural and tribal poor and other normally socially excluded groups, and subsequently, provide an institutional platform for their participation and ensure that they can derive the maximum benefits from project interventions.

91. In this context, GoM had conducted a social assessment (SA) during the project preparation which included: a beneficiary assessment, a stakeholder analysis, a social impact assessments, an institutional assessment and a risks analysis. This subsequently led to the compilation of the project's Social Management Framework (SMF). Extensive consultations were held with a variety of stakeholders at state, district and village levels, which led to the identification of key social issues and a management framework to address these. Key social development issues and principles that underpin the project's strategy and implementation relate to: (i) participation, (ii) inclusion, (iii) poverty, (iv) gender, (v) human and institutional development and (vi) Information, Education and Communication (IEC) campaign (essentially to create a demand pull on the project).

92. **Social Safeguards: the project is not expected to have significant adverse social impacts.** Given that the interventions essentially relate to climate-resilient agricultural technology transfer, the impacts are expected to be mostly positive. The project recognizes that there are tribal communities living in the project area. Maharashtra is unique and distinct in having a well-defined Fifth Schedule/Tribal Area wherein tribals have some special constitutional safeguards. Given this, the Operational Policy on **Indigenous Peoples (OP 4.10)** is triggered to ensure that the project



fully reaches out to the tribals, for inclusion and equity. Following a detailed examination of the interventions planned, the Social Assessment concludes that there is no need to acquire lands involuntarily for project implementation. Hence, the Operational Policy on Resettlement (OP 4.12) is not triggered. Further, as project activity implementation is phased in over time, local level institutions (who help identify the specific activities) are required to prepare a Tribal People Planning Framework (TPPF). The framework will be adopted as and when a tribal area is taken up, and a Tribal People Plan (TPP) will be prepared and implemented.

93. **Gender.** The project promotes a gender-sensitive approach to the adoption of climate-resilient agricultural technologies and agronomic practices (Component A); it also actively supports the participation of women in the local planning and decision-making process (through participatory micro planning process) as well as in the emerging value chains for climate-resilient commodities (through support to entrepreneurial women groups). Women play a key role in the socio-economic dynamics of rural livelihoods across the State of Maharashtra. Women contribute to the smallholder agriculture sector both as *landholders* and *female cultivators*. They also make up for a significant portion of the agricultural (seasonal) labor force and they remain a key contributor to farming operations in many parts of the State. Yet, women commonly face gender specific constraints that limit their access to productive inputs, assets and services. Gender gaps are observed for land, livestock, farm labor, education, extension services, financial services and technology. While Agriculture Census data highlight that the share of female landholders has increased over the years, the average landholding size for women remains below that of men.

94. Notwithstanding the considerable efforts made in the past to address the gender gap, the project will, as a part of preparing the mini watershed plans, assess the multi-faceted dimensions of the gender gap and incorporate measures to address these in the Cluster Development and Investment Plans. Strategic design and operational efforts to address some of the specific issues pertaining to women in the project area will be implemented and progress reported quantitatively in the Results Framework through selected gender-disaggregated indicators (see also Annex 9). To that effect, the project design accounts for two-fold interventions: (i) internalizing at planning stage all gender dimensions and risk associated with knowledge and technology dissemination, and (ii) promoting during implementation specific capacity building by sensitizing and building the capacity of project implementers, and women practicing agriculture at the village level. These points are further detailed in the project's Gender Action Plan (GAP) developed as part of the project SMF (see also Annex 2).

F. Environment (including Safeguards)

95. **PoCRA is classified as a Category B project; the Operational Policy for Environmental Assessment (OP 4.01) has been triggered.** An Environmental Assessment (EA) of the proposed project has been undertaken by GoM as per the requirements of Category B project defined under OP 4.01. The project will be implemented in areas that have been most affected by the recurrent monsoon failures of recent years, and are also characterized by a high climate-vulnerability index and low HDI; the project area includes villages in the Purna river basin characterized by very high levels of soil salinity and sodicity. To guide investment planning and implementation in these environmentally sensitive areas and ensure compliance with the safeguards policies triggered, an Environmental Management Framework (EMF) has been prepared by GoM. The EMF sets out the procedures to be applied by stakeholders in the implementation of the Cluster Development and



Investment Plans and corresponding value chain infrastructure activities so that project-financed activities, particularly under Component A and B do not result in any adverse impacts on the environment.

96. **The Operational Policy for Pest Management (OP 4.09) has been triggered.** Project interventions supported through individual farmers/producer organizations may impact on the application of pesticides. With better value chain infrastructure and marketing opportunities in close proximity, farmers may seek to increase crop yields and diversify cropping pattern and intensity through application of fertilizers, pesticides and other agro-chemicals. Therefore, Pest Management (OP 4.09) is triggered. The EMF includes an integrated pest management (IPM) plan for main crops to mitigate adverse impacts arising from use of pesticides. The project strategy for the introduction and scaling-up of IPM includes guidance on trainings and demonstrations, safe-handling, storage and application of pesticides.

97. **Potential environmental impacts: activities proposed under this project are not expected to have significant adverse environmental impacts.** By design, the project promotes better natural resource and environmental quality management. The potential environmental issues that could arise if project financed investments are not implemented appropriately, include soil degradation, over-extraction of groundwater, build-up of pest resistance, pollution of the eco-system with agro-chemicals, and other pesticide-related safety issues. Activities for post-harvest management and value chain creation for product aggregation, handling, and marketing could have impacts associated with general civil works construction. The mitigation includes appropriate site selection for creating new infrastructure and reducing impacts of construction related activities like debris disposal, dust and solid wastes.

98. **Stakeholder and public consultations.** Several stakeholder consultations have been held at village, district, and state level with farmers, technical institutes, agricultural university, local NGOs, government officials, women, farmers' producer companies and other stakeholders. Overall, the response to the project components and activities has been positive. The advanced draft of the EMF was discussed and presented at the division head offices in Amravati, Aurangabad and Nagpur, (with representation from 5 or 6 clusters per division) and stakeholder workshops were conducted in September 2017.

99. **Safeguards documents disclosure.** The EMF, SMF and TPPF have been publicly disclosed by GoM on the website of DOA¹¹ and by the World Bank's Infoshop on November 30, 2017. GoM will further arrange for the translation of the EMF executive summary into the local language (Marathi), which will be displayed in all project district libraries in Maharashtra. The disclosure was preceded by a workshop attended by the public and representatives from government departments, NGOs, and research/ academic agencies; where applicable, comments received to the draft were incorporated prior to disclosure of the final document.

G. Other Safeguard Policies (if applicable)

100. Not applicable.

¹¹ <http://www.krishi.maharashtra.gov.in/1260/PoCRA>



H. World Bank Grievance Redress

101. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate GRS, please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, visit www.inspectionpanel.org.



VII. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY : India

Maharashtra Project on Climate Resilient Agriculture

Project Development Objectives

To enhance climate-resilience and profitability of smallholder farming systems in selected districts of Maharashtra.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: 1. Climate resilient agriculture: Increase in water productivity at farm level		Percentage	0.00	20.00	Annual (from Y3 onwards)	POCRA MIS, GSDA	PMU and M&IE specialized firm

Description: 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 evapotranspiration (in m3). It is measured from Year 3 onwards and for kharif season only. It is expressed as percentage change relative to a baseline value of 0.23 kg per cubic meter.

Agricultural production data refers to the crop production output and is compiled from the yields for the main kharif crops: cotton, soybean, pigeon pea, green gram, and black gram. The yield data can be sourced from production estimates for the selected crops through the crop cut method on beneficiaries' fields. Evapotranspiration (ET) is used as a proxy for consumptive water use. ET data can be estimated at taluka level for the cropping period chosen using the water balance and/or the energy balance tools developed for the project. All the data is collected and generated by the project's M&E firm and shared with the PMU's M&E specialist.



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: 2. Climate resilient agriculture: Improved yield uniformity and stability		Percentage	0.00	0.00			
Spatial yield variability for oilseeds (soybean) - coefficient of variability		Percentage	30.00	23.00	Spatial variability is measured at mid term and at the end of the project implementation.	PoCRA MIS	PMU and M&IE specialized firm
Temporal yield variability for oilseeds (soybean) - coefficient of variability		Percentage	52.00	38.00	Temporal variability is measured at the end of the project implementation	PoCRA MIS	PMU and M&IE specialized firm
Spatial yield variability for pulses (pigeon pea) - coefficient of variability		Percentage	39.00	30.00			
Temporal yield variability for pulses (pigeon pea) - coefficient of variability		Percentage	44.00	36.00			



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
<p>Description: 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).</p> <p>The CV for crop yields indicates the variability – and hence the climate vulnerability – of farmers growing that particular crop. The lower the CV, the lower is the yield variability and climate vulnerability. Project interventions are expected to bring down the yield variability, thus giving stability in the crop production and hence reducing climate vulnerability. CV is defined as standard deviation divided by mean. In addition to the baseline values generated, CV-S is reported at project mid-term and at the end of project implementation, while CV-T is reported at the end of the project implementation only. The yield data is sourced from field surveys designed and carried out by the M&E firm and can be vetted against the official agriculture statistics at taluka level.</p>							
Name: Net greenhouse gas emissions	✓	Tones/year	-232398.00	-4789515.00	End of project only	EX-ACT model	PMU and M&IE specialized firm
<p>Description:</p>							
Name: Annual farm income		Number	1.00	1.50	Mid-term and end-of-project	PoCRA MIS	PMU and M&IE specialized firm
Farm income (ratio of farm income for women-headed HH with/without PoCRA)		Number	1.00	1.50	At mid-term and end-of-project implementation.	PoCRA MIS	PMU and M&IE specialized firm
<p>Description: This indicator tracks the annual farm income of 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.</p>							



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
<p>The indicator is reported for the total sample surveyed (T), for male landholders only (M) and for female landholders only (F). The indicator is reported at mid-term and at the end of the project implementation. A ratio of 1.20 means that the average income of project beneficiaries is 20% higher than that of comparable landholders outside of the project area. The official definition of farm income applies for this indicator. The data is sourced from field surveys designed and carried out by the M&E firm and can be vetted against the official agriculture income statistics available.</p>							

Name: Farmers reached with agricultural assets or services	✓	Number	0.00	1320000.00	Semi annual	PoCRA MIS	PMU and M&IE specialized firm
Farmers reached with agricultural assets or services - Female	✓	Number	0.00	462000.00	Semi annual	PoCRA MIS	PMU and M&IE specialized firm

Description:

Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Farmers adopting improved agricultural technology	✓	Number	0.00	1272800.00	Annually	PoCRA MIS	PMU and M&IE specialized firm
Farmers adopting improved agricultural	✓	Number	0.00	446000.00	Annually	PoCRA MIS	PMU and M&IE specialized firm



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
technology - Female							
Description:							
Name: Area provided with new/improved irrigation or drainage services	✓	Hectare(Ha)	0.00	624000.00	Annually	PoCRA MIS	PMU and M&IE specialized firm
Description:							
Name: Climate resilient agriculture: Improved availability of surface water for agriculture (from new farm ponds)		Cubic Meter(m3)	0.00	83900000.00	Semi annually	PoCRA MIS	PMU and M&IE specialized firm
<p>Description: This indicator measures the surface water storage capacity created with to project supported farm and community ponds.</p> <p>Typically, a farm pond of size 30*30*3m has the capacity to store some 1,970 m3 as per PDKV observations. The indicator is reported in 1,000 m3 on a semi-annual basis (cumulative). The information for this indicator is sourced from the project MIS based on the data collected and entered by the Cluster Assistant who is responsible for local monitoring of the works.</p>							
Name: Climate resilient agriculture: Area with GAPs for improved management of saline and sodic soils		Hectare(Ha)	0.00	127600.00	Semi annually	PoCRA MIS	PMU and M&IE specialized firm



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
(enhanced soil health)							
<p>Description: 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.</p> <p>There are 932 project villages in the saline tract of the Purna river basin. Project interventions include subsurface soil drainage, application of soil amendments/ameliorates, improved agronomic practices, farm ponds, water lifting devices and micro irrigation systems. This indicator is reported in ha on an semi-annual basis (cumulative). The information for this indicator is sourced from the project MIS based on data collected and entered by the Cluster Assistant.</p>							
Name: Share of crop production area (pulses and oilseeds) under cultivation with climate-resilient varieties		Percentage	30.00	35.00	Annually	PoCRA MIS, MSSC	PMU and M&IE specialized firm
<p>Description: This indicator measures the share of production area in the project with oilseeds and pulses, that is cultivated using certified seeds of improved varieties.</p> <p>The project promotes the use of certified seeds of climate resilient varieties. This indicator tracks the progress made on the use of these climate-resilient varieties, specifically for soybean (oilseeds), and pigeon pea and chick pea (pulses). This indicator is reported in percentage of the total area grown for these 3 crops. An indicator of 50% means that in the project villages, half of the farm area grown with soybean, chickpea and pigeon pea, is cultivated with certified seeds of stress-tolerant varieties. This indicator is reported in percentage on an annual basis. The information for this indicator is sourced from the project MIS based on the data entered by the Cluster Assistant who is responsible for the primary data collection on the sale of certified seeds reported by input dealers.</p>							
Name: Project-supported Farmer Producer Companies with growth in annual profits		Number	0.00	200.00	Annually	Audited financial statements from FPCs	PMU and M&IE specialized firm



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
<p>Description: This indicator reports the number of project-supported Farmer Producer Companies with growth in annual profit.</p> <p>This indicator reports on the growth and sustainability of FPCs that receive project support. This indicator is reported as an absolute number (cumulative) on an annual basis. The data is collected by the M&E firm through the FPC survey designed and implemented and validated against the annual audited statements of project supported FPCs.</p>							
Name: Strategic Research and Extension Programs (SREP) with internalized climate resilience agenda		Number	0.00	15.00	Annual from Y2 onwards	ATMA	PMU and M&IE specialized firm
<p>Description: This indicator reports on the number of district-level, multi-year, Strategic Research and Extension Plan (SREP) that have mainstreamed climate-resilience.</p> <p>All 15 project districts have DPMU technically supported by KVKs and SAUs. The project supports the review and update of the current SREPs with the aim to mainstream climate vulnerability and its impact on farming in that district. This indicator is reported as an absolute number (cumulative) for year 2 and year 3 of project implementation. Revised, validated SREPs are sent by PD ATMA to PMU where the information is recorded by the M&E Specialist.</p>							
Name: Clients receiving services from the MH Climate Innovation Center		Number	0.00	200.00	Annually from Y4 onwards	CIC annual report	PMU and M&IE specialized firm
<p>Description: This indicator tracks the number of clients (Farmer Producer Organizations, SMEs, ...) that receive services from the CIC.</p> <p>The CIC established by the project provides a broad range of services (e.g. business development, coaching, incubation, etc.) to growth-oriented private sector companies seeking to scale up their climate solutions in the project area and beyond. This indicator is reported as an absolute number (cumulative) from year 4 onwards. The information is sourced from the annual reports prepared by the CICs and submitted to the PMU where it is recorded by the M&E specialist.</p>							



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Beneficiary participation and civic engagement: approved participatory mini watershed plans implemented or under implementation		Number	0.00	790.00	Semi annually	PoCRA MIS	PMU and M&IE specialized firm
<p>Description: Number of approved participatory mini watershed plans implemented / under implementation</p> <p>Participatory planning of mini watershed-based clusters includes active involvement of farmers, village functionaries, local representatives and other community stakeholders who contribute to the actionable plan. This indicator is monitored on a semi-annual basis (cumulative). It is reported as an absolute number of participatory mini watershed plans approved by Gramsabha. The information is collected by the microplanning agencies from the offices of the SDAOs. The microplanning agencies submit the validated mini-watershed plans to the PMU where the data is recorded by the M&E specialist</p>							



Target Values

Project Development Objective Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
1. Climate resilient agriculture: Increase in water productivity at farm level	0.00				10.00	15.00	20.00	20.00
2. Climate resilient agriculture: Improved yield uniformity and stability	0.00							0.00
Spatial yield variability for oilseeds (soybean) - coefficient of variability	30.00			25.00				23.00
Temporal yield variability for oilseeds (soybean) - coefficient of variability	52.00							38.00
Spatial yield variability for pulses (pigeon pea) - coefficient of variability	39.00			33.00				30.00
Temporal yield variability for pulses (pigeon pea) - coefficient of variability	44.00							36.00
Net greenhouse gas emissions	-232398.00							-4789515.00
Annual farm income	1.00			1.20				1.50
Farm income (ratio of farm income for women-headed HH with/without	1.00			1.20				1.50



Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
PoCRA)								
Farmers reached with agricultural assets or services	0.00	9800.00	309800.00	719800.00	1156800.00	1255800.00		1320000.00
Farmers reached with agricultural assets or services - Female	0.00	2400.00	100000.00	168000.00	240000.00	330000.00		462000.00

Intermediate Results Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Farmers adopting improved agricultural technology	0.00	9800.00	309800.00	719800.00	1156800.00	1255800.00	1272800.00
Farmers adopting improved agricultural technology - Female	0.00	2000.00	77000.00	201000.00	347000.00	414000.00	446000.00
Area provided with new/improved irrigation or drainage services	0.00	7000.00	50000.00	200000.00	470000.00	600000.00	624000.00
Climate resilient agriculture: Improved availability of surface water for agriculture (from new farm ponds)	0.00	5200000.00	24700000.00	56000000.00	78300000.00	83900000.00	83900000.00
Climate resilient agriculture: Area with GAPs for improved management of saline and sodic soils (enhanced soil health)	0.00	3000.00	26000.00	66000.00	106000.00	116000.00	127600.00



Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Share of crop production area (pulses and oilseeds) under cultivation with climate-resilient varieties	30.00	30.00	30.00	32.00	32.00	35.00	35.00
Project-supported Farmer Producer Companies with growth in annual profits	0.00						200.00
Strategic Research and Extension Programs (SREP) with internalized climate resilience agenda	0.00		7.00	15.00	15.00	15.00	15.00
Clients receiving services from the MH Climate Innovation Center	0.00				100.00	150.00	200.00
Beneficiary participation and civic engagement: approved participatory mini watershed plans implemented or under implementation	0.00	130.00	480.00	670.00	670.00	670.00	790.00



ANNEX 1: DETAILED PROJECT DESCRIPTION

COUNTRY : India

Maharashtra Project on Climate Resilient Agriculture

Project area

1. The proposed project will be implemented in the 15 districts of the Marathwada and Vidarbha regions that have been most affected by the recurrent monsoon failures of recent years. These districts account for a total population of 25.5 million people and a project area of around 3.5 million ha. Out of a total of over 18,000 villages in the districts selected, the project will cover up to 5,142 villages characterized by a high climate-vulnerability index and low HDI; this includes about 1,000 villages located in the Purna river basin tract with historically high levels of soil salinity and sodicity. Managed spill-over effects are expected for a range of project activities and outputs to villages not covered by the project. Most of the project area is in Maharashtra's semi-arid agro climatic zones. The list of the 5,142 villages covered by the project was approved by the GoM in June 2017 and is annexed to the Bank-approved PIP.

2. The clear majority of rural households in the project districts are small and marginal farmers whose livelihood depends for more than 90 percent on rainfed agriculture. Cropping patterns in the selected districts are dominated by cereals (mostly sorghum and millet), pulses and oilseeds (soybean). While cotton remains the main cash crop, more and more farmers are growing fruit trees and vegetable crops to secure their farm income. Unlike in some other parts of Maharashtra where groundwater shortage has become an acute problem, in the project area only 55 percent of the total groundwater potential has been harnessed. However, unsustainable use of groundwater, inefficient management of surface water and lack of *in situ* water conservation in the project area have aggravated the impact on agriculture from the severe consecutive droughts that have hit Maharashtra in the past couple of years.

Component A: Promoting Climate-resilient Agricultural Systems

Component A.1: Participatory development of mini watershed plans.

3. The objective of this component is to **develop evidence-based mini watershed plans and cluster development plans** to guide the design and implementation of multi-sector project interventions aimed at enhancing climate-resilience in the local agricultural systems. The component builds on lessons learned from the country's long tradition and expertise with watershed management for rural development. Under this component, the project will cover the costs for: (i) mobilizing farmers/communities and training them on participatory planning processes, (ii) preparing the watershed plans (with water budgeting), as well as the cluster development plans, through collaboration with strategic partners and local agencies, and the hiring of specialized consulting firms, and (iii) the quality review and technical sanction of the mini watershed plans by the local agencies.

4. During project preparation, the GoM, with support from the PMU, completed the selection of the villages to be covered during project implementation based on a rigorous, science-based approach. GIS tools were used for the mapping of 1,794 village clusters demarcated on the basis of prevailing watersheds in the 15 project districts. Following a multi-criteria assessment, the clusters



were then ranked according to their climate vulnerability (exposure, sensitivity and adaptive capacity)¹². Subsequently, 670 clusters were selected for PoCRA implementation, covering 4,210 most climate vulnerable villages and 932 who in addition are affected by high level of soil salinity and sodicity. Under this component, one mini watershed plan will be developed for each cluster, covering 5 to 10 villages and an area of around 5,000 ha.

5. The mini watershed plans developed under this component consolidate information and data from participatory village-level microplanning process. This process is coordinated by the existing Village Climate Resilience Management Committee (VCRMC) through participatory processes with the farming communities and other local stakeholders; village-level microplans are subsequently aggregated at the cluster level to form a mini watershed plan. The mini watershed plan provides a detailed resource map for a given cluster of 5 to 10 villages, generated through a comprehensive assessment of the prevailing social, economic, agricultural, ecological, hydrologic and climatic features.

6. A comprehensive **water budgeting** exercise complements the development of the micro watershed plan. It captures updated information and modelled data on current groundwater and surface water availability and projected requirements in each village. During the preparation phase, the importance of seamless integration between the surface and groundwater assessment was recognized and water framework toolkits were developed and endorsed to further facilitate the analyses. Furthermore, the water budgeting exercise at micro watershed level will include hydrological analyses and crop evaporation calculation of prevailing cropping pattern using village level information, in addition to other sector water needs.

7. Water budgeting is an integral part of the mini-watershed plan. An important aspect of the water budgeting tool is that it considers both spatial and temporal variations. In other words, the framework takes cognizance of different land use patterns, slopes, soil types, and soil depth in a given village, and accounts for these differences instead of an aggregated balance for the entire village. Additionally, it conducts a seasonal water balance, separating *kharif* season balance from *rabi* season balance. The project will prepare groundwater maps needed for a realistic assessment of dependable withdrawal potential in each cluster of villages in project area.

8. The project will adopt a systematic approach on withdrawal of ground water with adequate attention to sustainability, and improvement in water efficiency and conjunctive water use (both ground and surface run off). The available water (ground and surface) in project districts is influenced by the flow from upstream, small-scale community-based irrigation systems, existing farm ponds, run off, water conservation recharge structures and most importantly the optimal groundwater withdrawal potential in an area. Keeping these factors in mind, water distribution in project areas needs to be considered in its entirety, which will enable more efficient and equitable water use than an individual farm pond approach. This approach will be supported by institutional strengthening and capacity building and by run off in-flow hydrology management. These comprehensive engagements are captured in a PDO-level indicator for water productivity¹³,

¹² The multi-criteria analysis for the selection of villages included 15 indicators, among others: annual rainfall and dry spells over 14 days (for exposure to climate vulnerability); drought proneness and groundwater development stage (for sensitivity); and number of distress families and proportion of ST and SC families in the village (for adaptive capacity).

¹³ The formulation for this indicator is derived from: S. Scheierling et al (2014): *How to Assess Agricultural Water Productivity?* Policy Research Working Paper 6982, World Bank; and Bharat Sharma et al (2015): *Water use efficiency in agriculture: Measurement, current situation and trends*. In: *Managing Water and Fertilizer for sustainable Agricultural Intensification*, IMWI.



justifying the resilience and the balance maintained in groundwater consumption in the project area due to project interventions (see also Annex 9).

9. The centerpiece of the mini watershed plan is a **Cluster Development and Investment Plan** that provides an evidence-based road map for prioritized and sequenced investments and capacity building activities aimed at strengthening climate-resilience in the local agriculture systems, while contributing to the triple-wins solutions pursued by the project (enhanced agriculture productivity, improved soil health, and increased water-use efficiency). Mini watershed plans are subject to a rigorous quality review and validation process by Division-level PMUs headed by Division Superintendent Agriculture Office (DSAO) before being submitted to the central-level PMU for funding clearance. Their cluster investment plans are backed up by a technical sanction from the local authorities (Superintendent District Agriculture Officer, SDAO and *Gram Sabha*, sub-district administration) and once approved, can be (co-)financed by PoCRA.

10. During project preparation, the PMU commissioned the preparation of several mini watershed plans in partnership with state-level agencies under the leadership of YASHADA (Yashwantrao Chavan Academy of Development Administration, Pune) and in collaboration with the Indian Institute of Technology (IITB, Mumbai), Groundwater Surveys and Development Agency (GSDA, Pune) and the MPKV Agricultural University (MPKV, Rahuri). Those mini watershed plans were prepared as a pilot and laid the ground for a phased roll-out for the bulk of the PoCRA clusters (see Annex 10 for the guiding principles for the development of mini watershed plans). Under this component, the project will complete the preparation of 130 mini-watershed plans in Year 1 of project implementation, 350 plans in Year 2 and 190 plans in Year 3. A rapid assessment of the methodology and process will be carried out prior to each phase and the approach will be further fine-tuned based on lessons learned from the pilots and the initial phase.

Component A.2: On-farm climate-resilient technologies and agronomic practices.

11. The objective of this component is to **promote the transfer of on-farm technologies and agronomic practices that enhance climate-resilience** in the agricultural systems prevailing in the project area while contributing to triple-win on-farm solutions (enhanced agriculture productivity, improved soil health, and increased water-use efficiency) – and to an increase in farm income. The activities implemented under this component are derived directly from the investment plans included in the mini watershed plans prepared under Component A.1.

12. Under this component, the project will finance the design and implementation of Farmer Field Schools to promote the demonstration of climate-resilient varieties of field crops as well as of productivity-enhancing agronomic practices. The project will also provide matching grants to eligible individual farmers to: (i) support the adoption of climate-resilient varieties and farming practices, (ii) promote carbon sequestration through fruit tree cultivation and enhanced crop residue management, (iii) encourage crop diversification by supporting protected cultivation for horticulture, (iv) enhance on-farm water-use efficiency through micro irrigation and farm ponds, and (v) promote small-scale income-generating livestock activities for women and other selected beneficiaries identified in the PoCRA Social Assessment carried out during the project preparation phase.

13. This component significantly contributes to **climate co-benefits** by promoting a range of agricultural technologies and agronomic practices that:



- a. enhance the **adaptation capacity** of the various farming systems in the project area. This is achieved through: (i) the development of micro-irrigation systems and construction of farm ponds, for enhanced water-use efficiency, (ii) the adoption by farmers of climate-resilient (drought and salinity tolerant) crop varieties, (iii) crop diversification (increased production of higher value horticulture products), and (iv) agronomic practices that improve soil health (increased organic soil content, reduced salinity and sodicity, integrated nutrient management) and/or *in-situ* water conservation;
- b. **mitigate GHG emissions** through carbon sequestration by: (i) planting trees in upper catchment areas and on contour lines (afforestation), (ii) growing fruit trees on small orchards, (iii) incorporating crop residues (biomass) into the soil, and (iv) adopting practices for conservation agriculture.

14. For the technology transfer under PoCRA, the Farmer Field Schools (FFS) approach is used in this component for the **demonstration** of climate-resilient agricultural technologies and agronomic practices. FFS is a participatory and interactive on site learning approach that emphasizes problem-solving and discovery-based learning; it is a well-established extension approach in Maharashtra. FFS aims to build farmers' capacity to analyze their production systems, identify problems, test possible solutions, and eventually encourage participants to adopt the technologies and practices most suitable to their farming systems. FFS activities are set up in the fields of selected "lead" farmers. FFS is operationalized at village level under the coordination of the VCRMC and with the technical backstopping of ATMA extension staff and the KVK scientists.

15. To complement the FFS approach and build climate resilience in agriculture at the intended scale, this component will capitalize on the project's comprehensive **ICT-based knowledge and information system** for climate-resilient agriculture (see also Component C). To that effect, the PMU developed an ICT strategy for the project during the preparation phase; the strategy centers around a common integrated platform that includes several modules on climate-resilient agricultural technologies and agronomic practices with a two-way operating modus for end-users (e.g. farmers, ATMA extension staff, KVK researchers).

16. To scale-up and accelerate the **adoption** of the climate-resilient technologies and agronomic practices demonstrated in the PoCRA clusters, the project will provide financial assistance to eligible individual farmers through **Individual Farmers Matching Grants**. In line with GoI directives implemented by the states under various schemes since 2013, matching grant allocation and flow of funds to individual farmers will follow the GoI's Direct Beneficiary Transfer mechanism (DBT). Maharashtra is one of the pioneer states in adopting DBT and several state-sponsored programs implemented by the Department of Agriculture (GoM) have adopted the DBT mechanism to provide financial assistance to farmers. Under this component, Individual Farmers Matching Grants are used to co-finance proposals for eligible activities vetted by the VCRMC and SDAO that respond to priority gaps identified in the mini watershed plans. Basic selection criteria for grant recipients include: (i) being listed as individual farmer in a PoCRA village; (ii) meet the criteria for DBT; (iii) application for grant support endorsed by VCRMC; and (iv) grant support sought for climate resilient on-farm activities that are aligned with the corresponding Cluster Development and Investment Plan.

17. The Individual Farmers Matching Grants can be used to finance works (e.g. farm ponds) and goods (e.g. micro irrigation systems, construction or planting material, equipment). With DBT, the grant is transferred in the selected beneficiary's bank account upon verification that the works or



the goods have been procured from a registered, pre-qualified contractor/supplier, installed and operate as per the selected application submitted by the beneficiary. The beneficiary pays the full costs for the works and/or goods for his/her activities and upon satisfactory completion of the same, the project disburses in one installment the grant into the beneficiary's bank account. To ensure **social inclusion**, Individual Farmers Matching Grants include a provision that gives the VCRMC the possibility to request advance installments on the matching grant for beneficiaries with no resources or assets, or no access to regular financial services. Cost sharing norms and DBT process for Individual Farmers Matching Grants are detailed in the Bank-approved PIP and project Financial Management (FM) manual and are in line with the norms and guidelines applied in other programs implemented by GoM agencies. If required, these parameters may be revised during project implementation following a regular assessment of technology adoption by targeted PoCRA beneficiaries; the PIP and FM manual will then be updated accordingly (GoM and Bank approval required). Annex 10 provides an overview of the guiding principles and processes for the project's Individual Farmers Matching Grant.

18. To promote the transfer of climate-resilient agricultural technologies and agronomic practices in other villages within the project districts as well as other parts of the State, the project supports interactions between VCRMCs from the PoCRA area and those outside of project boundaries. Learning trips to PoCRA VCRMCs can greatly encourage the replication of FFS and the adoption of innovative technologies promoted by the project in non-PoCRA villages, with funding from other programs and initiatives. Similarly, the project's ICT-based knowledge and information platform is openly accessible to multiple stakeholders for in the project area and beyond (e.g. extension and research agencies, ATMA, KVK). Such **spillover effects** are expected to greatly increase the impact of the project in the state of Maharashtra by further scaling up climate-resilient agriculture, thereby contributing to the "drought-proofing" of agriculture as sought by the GoM.

19. The farm-level technologies and agronomic practices promoted under this component have been developed by ICAR agencies (including the State Agricultural Universities) and a few other institutions, and successfully implemented under other programs sponsored by the GoI (e.g. National Initiative for Climate Resilient Agriculture, NICRA; Climate Resilient Villages, ICRISAT). A list of the climate-resilient agricultural technologies and agronomic practices promoted by PoCRA under this component can be found in Annex 5.

Component A.3: Climate-resilient development of catchment areas

20. The objective of this component is to **enhance the management of surface water and groundwater resources** in the catchment areas of the project's mini watersheds; this in turn will help improve the performance of dryland farming by reducing agriculture's vulnerability to extended in-season dry spells and lower than normal annual rainfalls. Improved water management is a core ingredient of the GoM strategy to "drought-proof" agriculture and is essential to achieve increased water security, water-use efficiency (more crop per drop), enhanced farm productivity, more stable year-to-year yields, and ultimately, higher farm income. The activities implemented under this component are derived directly from the Cluster Development and Investment Plans prepared under Component A.1. They are implemented in the watershed catchment areas and provide the foundation for the measures adopted in Component A.2 for improved on-farm availability (surface water harvesting structures), use (micro irrigation systems) and quality of water for agriculture.



21. During project preparation, a preliminary technical review of the status of hydrology and hydrogeology in all 15 PoCRA districts was carried out by the Indian Institute of Sciences (IISc, Bangalore) in collaboration with the Groundwater Survey Development Agency (GSDA). The review highlights that in 2013-14, only 33 out of 612 sub-watersheds in the project districts that were assessed for their dynamic groundwater resources had been classified as “overexploited” or “critical” (see Annex 4 for details). In conjunction with the development of the watershed plans in Component A.1, a village level assessment of current water availability and projected water needs will be carried out as a basis for determining investments towards **increased surface water storage capacity** and **sustainable use of groundwater resources**, including for enhancing the climate-resilient capacity of farming systems through appropriate structures for groundwater recharging.

22. Under this component, the project will finance the planning, technical design and development of common and individual assets for longer term impact on climate-resilience in the project area through improved surface and groundwater management. Investments to be carried out under this component include, but are not necessarily limited to: treatment of catchment area (e.g. Continuous Contour Trenches, CCT), treatment of drainage lines (e.g. earthen/cement check dams and tanks), construction of new water harvesting structures (e.g. community ponds), rejuvenation of existing harvesting structures (including desilting), and aquifer recharge structures. The technical specifications for most of the structures to be financed under this component can be found in the GoM and Bank-approved PIP.

23. All investments in structures that will ultimately facilitate water availability for farming activities are subject to the comprehensive water budgeting exercise carried out at village with the micro watershed plans; recommendations for building new or increasing the capacity of existing structures are subject to the net withdrawal potential in a given area, as estimated by GSDA. Activities under this component will be coordinated by the VCRMCs, in collaboration with the relevant technical agencies. Communities benefiting directly from these structures are expected to contribute with their labor. For eligible individual assets, individual farmers in the selected villages can apply for financial support from the project (Individual Farmers Matching Grant), implemented using GoM cost-sharing norms and DBT.

24. Investments needs for water infrastructure identified in the watershed planning process will require close coordination and convergence with other GoM programs whose coverage may overlap with PoCRA. The project will adopt the principle of complementarity rather than duplication and synergies will be actively pursued with programs such as PMKSY, IWMP and the IBRD co-funded National Groundwater Management Improvement Program (NGMIP). NGMIP is designed to help states improve planning and implementation of investments and groundwater management actions to arrest the decline of groundwater levels, and to strengthen groundwater institutions at all levels. NGMIP aims to rebalance the approach to groundwater management by incentivizing demand-side measures. The Program incentivizes the convergence across government programs and schemes for more coordinated interventions related to groundwater.

25. This component contributes to **climate co-benefits** by enabling the scaling up of physical structures that improve the adaptive capacity of communities and reduce their vulnerability to inter-annual and intra-seasonal shortages in the availability of water for agriculture.



Component B: Post-harvest Management and Value Chain Promotion

Component B.1: Promoting Farmer Producer Companies.

26. The main objective of this component is to **strengthen the capacity of FPOs** to: (i) develop and successfully implement bankable proposals linked to climate-resilient agrifood systems and to be funded by financing institutions, (ii) operate as agribusiness entrepreneurs (Farmer Producer Companies, FPC) that generate a sustainable profit for their members; and (iii) successfully perform a range of primary processing activities for climate-resilient commodities promoted by the project, using green technologies where appropriate. Under this component, the project will finance: (i) the development of a Capacity Enhancement Needs Assessment (CENA), and (ii) the implementation of a Capacity Development and Coaching program (CDC) to meet the needs identified in the CENA.

27. As per the GoM definition, FPOs include FPCs as well as other organizations at the sub-district or village level, such as Farmer Interest Groups (FIG), Farmers Self Help Groups (SHG), Women Groups and the like. FPCs are key stakeholders in GoI's strategy for agricultural growth and rural development. FPCs are organizations whose members are primary producers and usually result from the federation at village cluster level of FIGs, SHGs and other farmer groups. FPCs are FPOs registered as producer companies under India's amended Companies Act, 1956, with a minimum share capital of Rs. 500,000 (around US\$7,700); they are run by their members/shareholders and managed by an elected Board of Directors. FPC members (i.e. farmers) enjoy the profits of the FPC in the form of dividends. In Maharashtra, DoA has been promoting FPCs through primarily National Bank for Agriculture and Rural Development (NABARD), the Small Farmer Agribusiness Consortium (SFAC) and development projects such as the IBRD-funded Maharashtra Agriculture Competitiveness Project (MACP).

28. During project preparation, the PMU carried out a rapid on-line FPC assessment to develop a preliminary profile of the 434 FPCs registered in the 15 districts covered by the project. Most of those FPCs have been established only in the last couple of years. They operate primarily as aggregators, seeking economies of scale to generate a profit from buying agricultural inputs for their members and selling members' production output. The rapid assessment highlighted that most FPCs in the project area: (i) have difficulty in accessing finance, both long-term and working capital, (ii) are lacking storage (particularly temperature controlled) and processing facilities (particularly for secondary processing), (iii) have trouble accessing markets and building strategic long-term partnership with buyers, and (iv) lack the capacity to develop and implement sustainable long-term business strategies and models.

29. Within the first 6 months of implementation, the PMU will consolidate the information obtained from its FPC rapid assessment with the in-depth needs analysis of FPCs established under MACP, into an FPC **Capacity Enhancement Needs Assessment (CENA)** to inform about: (i) current FPC business plans and status of affairs; (ii) management capacity at FPCs and learning needs; and (iii) technical evaluation of FPCs' processing facilities. The CENA will include a comprehensive diagnostic as well as a capacity development program to be implemented under PoCRA. The capacity development will be based on a training-of-trainers approach and a coaching program for FPCs. For the development of the CENA and the implementation of the capacity development activities (including raising awareness of FPC members on climate-resilient agriculture), the PMU



is expected to use the knowledge sharing and learning tools and modalities already developed and tested extensively under the MACP by service providers led by Grant Thornton. Around 300 existing FPCs are expected to participate in the project's **Capacity Development and Coaching (CDC) program**. Other FPOs (e.g. FIGs, SHGs, Women Groups, etc.) may also be eligible for capacity development activities offered under this component

Component B.2: Strengthening emerging value-chains for climate-resilient commodities.

30. The main objective of this component is to promote the participation of FPOs in emerging value chains for climate-resilient commodities. Under this component, the project will provide co-financing (under the FPO Matching Grant scheme): (i) to implement growth-oriented sub-project proposals from eligible FPCs (and where applicable, other FPOs as well) in the selected value chains; and (ii) to establish FPO-run custom-hiring centers (CHC) for agricultural machinery. This component contributes to **climate co-benefits** by focusing on value chains for climate-resilient commodities, by promoting green technologies in primary processing (use of solar energy, including for storage), and by encouraging the selection of fuel efficient (less energy) and technology efficient (loss reducing) farm machinery and equipment.

31. The component focuses on the following commodity value chains: (i) **major staple food crops** produced under rainfed conditions by the majority of farmers such as pulses (chick peas, pigeon peas), oilseeds (soybean) and cereals (sorghum); the SAU and Maharashtra Seed Supply Company (MSSC) have recently been developing and promoting crop varieties better suited to the evolving climatic conditions (e.g. drought tolerant, salt tolerant, short maturity cycle); and (ii) **fruits and vegetables** (including pomegranate, banana, citrus, custard apple, tomato and onions), increasingly grown in the project area for agricultural diversification (to mitigate risks from climate variability and enhance farmers' income security). Project support under this component extends to: (i) the construction of collection centers (with cleaning, sorting and packing facilities for F&V) and storage facilities; cooling facilities should be considered for FPCs targeting F&V export markets as well as supply to retail chains; and (ii) the set-up of secondary processing units (e.g. flour milling, dal production, oil extraction; juice production, frozen pulp production), where a financially viable and sustainable business case exists.

32. Under this component, FPOs that have successfully graduated from the CDC or have demonstrated agribusiness entrepreneurial capacity, are eligible for financial support from the project through an **FPO Matching Grant**. Other basic selection criteria include being registered as an FPO a project district with the relevant authority and operating a bank account in the FPO's name. Eligible FPOs are required to develop a financially viable proposal for an agribusiness sub-project (related to the value chains promoted or to set up a CHC) and submit the proposal for funding to a financing institution (e.g. their commercial bank). The financing institution will carry out the due diligence and determine whether or not the proposal is eligible for loan financing. If the FPO loan application is sanctioned by the financing institution, a loan agreement will be signed between the financing institution and the FPO, on banking terms and conditions of that financing institution. The project will carry out a technical review of the proposal and if validated, agree to support the sub-project with an FPO matching grant – on the basis of a grant agreement signed between the FPO and the project. The matching grant is equivalent to a maximum of 50 percent of the eligible expenditures in the sub-project proposal and is capped at INR5 million (around US\$77,000 equivalent). The project will transfer the FPO matching grant into the FPO's loan account upon completion by the FPO and verification by the project of the activities from the selected proposal.



Co-financing modalities by the project are fully aligned with existing GoM programs to support FPOs (and other rural stakeholder groups). Under these modalities, there is no legal binding between the project and the financing institution that provide the loan financing to the FPO.

33. During Appraisal, the Bank reviewed the modalities for the FPO Matching Grant and concluded that: (i) the modalities proposed have already been implemented in other GoM programs with subsidies for FPOs; (ii) the mechanism is designed to reduce risks of inappropriate use of project funds since grant disbursement occurs only after field verification by the project of completed activity listed in the sub-project proposal; (iii) the risk for the project is further reduced and transferred by requiring FPOs to effectively “pre-finance” their sub-project with their equity and a commercial loan; and (iv) the mechanism has the marked advantage to facilitate FPOs access to financial services and mobilize loan financing from commercial banks. Corresponding details of the FPO Matching Grant are provided in the Financial Management manual approved by the Bank. The PMU will closely monitor the efficiency and efficacy of the modalities for financial assistance to FPOs, amend these if necessary, and update the FM manual accordingly, subject to prior approval by the Bank. Annex 10 provides an overview of the guiding principles and processes for FPO Matching Grants.

Component B.3: Improving the performance of the supply chain for climate-resilient seeds.

34. The main objective of this component is to **improve the supply of seed varieties** (volume, quality, availability, affordability and access) with short duration cycle, drought-, salinity- or heat-tolerant features, for crops produced by small and marginal farmers in the project area. Under this component, the project will: (i) undertake an assessment of the SAU’s breeder seeds programs and a gap analysis of the demand and supply of seed varieties in the project area; (ii) finance the set-up of seed hubs; (iii) strengthen the capacity of key stakeholders in the seed supply chain, and (iv) provide support to selected players in the seed supply chain through matching grants. This component contributes to **climate co-benefits** by enhancing the availability in the project area of climate-resilient seed varieties.

35. The seed industry in Maharashtra is largely segmented, with private seed companies mainly focusing on the high value, low volume seeds (e.g. cotton, sugar cane, genetically-modified and hybrid varieties), while Maharashtra State Seed Corporation dominates the market for low value, high volume seeds (e.g. cereals, pulses and oilseeds). Breeder seeds are developed exclusively by the SAUs. In collaboration with PoCRA strategic partners from research and academia (among others: SAUs, ICAR, KVKs, ICRISAT) and key stakeholders in the seed supply chain such as MSSC, this component will identify and analyze the bottlenecks in the SAU’s breeder seeds programs and develop sustainable solutions aimed at overcoming these constraints.

36. In line with the recommendations of the recent seed supply chain analysis in Maharashtra¹⁴, PoCRA will establish in strategic locations a limited number of seed hubs for the production, processing, certification and short-term storage of climate-resilient seeds. To that effect, the project will promote business-oriented partnerships between MSSC, KVKs, FPCs, and other private operators for the development and sustainable operation of the seed hubs and finance the corresponding set-up costs (among others, facilities, equipment and initial working capital). To encourage the participation of smallholders in the seed supply chain, the project will strengthen the capacity of selected individual farmers and FPOs to engage in seed production and seed

¹⁴ Gran Thornton India (2016): Strategy Document – *Seed processing Hub in Jalna region, Maharashtra*; MACP.



multiplication in a sustainable and financially viable way; to that effect, the project will support eligible beneficiaries with Individual Farmers Matching Grants and FPO Matching Grants

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

Component C.1: Sustainability and institutional capacity development.

37. The objective of this component is to **strengthen the institutions** associated with the project from central to local level through capacity development, to: (i) safeguard the sustainability of the project interventions beyond project lifetime, (ii) promote spill-over impacts to villages and districts not covered by PoCRA, and (iii) mainstream climate-resilience in the agenda of institutions supporting agricultural growth and rural development in Maharashtra. Under this component, the project will finance: (i) the preparation of crop production contingency plans; (ii) the revision of Strategic Research and Extension Plans (SREP); (iii) the implementation of an annual Knowledge Sharing and Learning Plan; and (iv) the design and implementation of a comprehensive ICT platform for the project.

38. **Crop production contingency plans:** while such plans have been developed in the past at district-level by Central Research Institute for Dryland Agriculture (CRIDA), a contingency plan for each PoCRA cluster of villages will be developed under PoCRA. The plans shall provide technical guidance to producers and recommended actions (from choice of crop varieties to agronomic practices) when an adverse climate event occurs, such as a significant delay in the onset of monsoon. The development of cluster-level contingency plans will be led by the SAUs with support from KVKs and other ICAR institutions.

39. **Strategic Research and Extension Plans:** under PoCRA, all SREPs will be revised and updated for each of the 15 project districts to explicitly take into account the solutions proposed at local level to enhance climate-resilience in agriculture. SREPs are developed under the leadership of the District Extension Services (ATMA), whose responsibility it is to bring together researchers, extension staff, farmers and other stakeholders (including NGOs, and corporate and private sectors) to make, on the basis of joint diagnostic studies, district extension plan and recommendations for expanded adaptive research to introduce innovations in technology dissemination to cater to local needs and situations

40. **Knowledge Sharing and Learning Plan:** based on a rapid learning need assessment of the stakeholder institutions associated with the project implementation, the PMU will develop an annual knowledge sharing and learning plan for all out-of-state and international training activities to be funded by the project. These include all skills development, knowledge sharing and learning activities as well as exposure visits and study tours for stakeholder institutions and their staff, including the PMU. The annual plan will be submitted for approval by the Project Steering Committee and the Bank, and include only activities relevant to the project objectives or the institutions' corporate mandate.

41. **ICT system for the project:** the project promotes the intensive use of ICT across components. To that effect, this component will finance both ICT goods and specialized consultant services. The consultant will be tasked with the design and implementation of a comprehensive, integrated ICT platform with various modules, including M&E, weather advisory, and knowledge and information system for climate-resilient agriculture, with direct access and two-way operating modus for project stakeholders – including for beneficiary feedback.



Component C.2: Maharashtra Climate Innovation Center.

42. The main objective of this component is to **establish a Climate Innovation Center (CIC)** to support local private sector capacity to scale-up technologies for a climate-resilient agri-food system in Maharashtra. Under this component, the project will finance the development phase (feasibility study and business plan, set-up costs, equipment, facilities) and the early stages of implementation of the CIC (working capital). This component contributes to **climate co-benefits** by promoting the development of private sector-led technologies that support the adaptation of agriculture production and output processing to climate variability, as well as a reduction in GHG emissions and an increase in carbon sequestration.

43. The Bank's Climate Technology Program (CTP, Trade and Competitiveness Global Practice) has established a growing global network of CICs. With support from the project, Maharashtra would host the first CIC in India. CICs are autonomous entities who support local private sector capacity – with focus on entrepreneurs and SMEs – to commercialize and deploy emerging technologies and business models in growing climate sectors (e.g., climate-smart agriculture, water supply and renewable energy). CICs offer services tailored to local needs and conditions among a suite of tools which includes: access to latest technology information and market intelligence, business advisory and other incubation support services, policy advice, and tailored financing to prove and scale early-stage firms and concepts.

44. During the early phase of project implementation, the PMU will commission a comprehensive feasibility study and the development of a multi-year business plan for a CIC in Maharashtra. Subject to the approval of the business plan by the Project Steering Committee and the Bank, the PMU will cover the establishment costs of the CIC (among others set-up fees, equipment, facilities). The PMU will recruit an entity to manage the day-to-day activities and operationalize the various business lines of the CIC (e.g. advisory services, incubation and coaching). As per the business plan to be approved by the Bank and the PSC, the CIC will be expected to generate revenues from the services it provides and should become financially self-sustained within a few years; until then, the project will provide the working capital for the CIC operations. The Bank, through its CTP, will provide technical assistance to the PMU and the CIC management throughout the development phase and the early stages of operations; this will include promoting knowledge sharing and learning with other established CICs from CTP's global CIC network.

Component C.3: Knowledge and policies.

45. The main objective of this component is to: (i) **generate and disseminate cutting-edge knowledge** on a range of issues related to climate-resilient agriculture, and (ii) **provide analytical underpinnings** to improve the policy and strategy framework required to further enhance resilience in the agri-food system in Maharashtra (and beyond). Under this component, the project will finance the development of analytical sector studies and the dissemination of their results. These include, among others, the development of state-of-the art climate and agro-hydrological model that help: (i) determine the level of sustainable withdrawal of surface and groundwater in a given watershed under various climate and land use scenarios, and (ii) generate suitability maps for Managed Aquifer Recharge (MAR), and (iii) assess the magnitude of MAR in the project area. In addition, the project will finance efforts towards a multi stakeholder dialogue on policies promoting climate resilience in agriculture, as well as direct payments to farmers for environmental services (e.g. soil carbon sequestration, groundwater conservation). This component will also look at reliable



ways to quantify potential mitigation benefits from activities promoted by the project and aim at providing a pathway to carbon financing in the project area.

Component D: Project Management

46. The objective of this component is to **ensure the efficient and effective overall management** of the project through a PMU set up by the Department of Agriculture (GoM). The PMU is headed by a Project Director assigned by the GoM who will ensure that the core positions in the PMU are adequately staffed with technical specialists throughout implementation period. The main task of the PMU is to ensure smooth coordination of activity implementation by various agencies and strategic partners. The PMU ensures that all project activities are implemented in line with the provisions in the official project documents (Financing Agreement, PAD and PIP, as well as ESMF, FM Manual, PPSD, Procurement Plan and Procurement Manual). The PMU is responsible for project monitoring and impact evaluation. The PMU will compile an annual activity plan and work program, and develop the corresponding budget proposal to be submitted for approval by the Project Steering Committee and the Bank.

47. Under this component, the project will finance: (i) costs of operation, rent and maintenance of offices, communication costs, incremental staff salaries (including government staff on deputation to the Project), training, and travel allowances of project beneficiaries and project staff related to project implementation, coordination, and monitoring but excluding the salaries of civil servants of the Borrower; and all other incremental operating costs as defined in the signed Legal Agreement pertaining to this project, including the day to day operational costs related to vehicle hiring, printing, and others, are also supported; and (ii) eligible expenditures related to project communication, public awareness and outreach, including the development and maintenance of a comprehensive project web site. The project will also finance the services of specialized consultant firms to develop and implement a comprehensive project impact evaluation (including all surveys).



ANNEX 2: IMPLEMENTATION ARRANGEMENTS

COUNTRY : India

Maharashtra Project on Climate Resilient Agriculture

Project Institutional and Implementation Arrangements

1. **The project implementation framework is based on tight convergence with GoM Departments and reflects the project’s full integration at various levels of the administration,** avoiding the need to create any parallel structures. To meet the project needs for highly specialized technical skills, project implementation will be supported by Strategic Partners. These are public institutions that have been providing technical assistance to the PMU as early as during the preparation phase; as additional needs emerge during implementation; the PMU may extend such MoU-based partnership arrangements to other agencies. The following diagram provides an overview of the overall project implementation structure. The table further below summarizes the main roles and responsibilities of the key players involved at various project implementation levels.

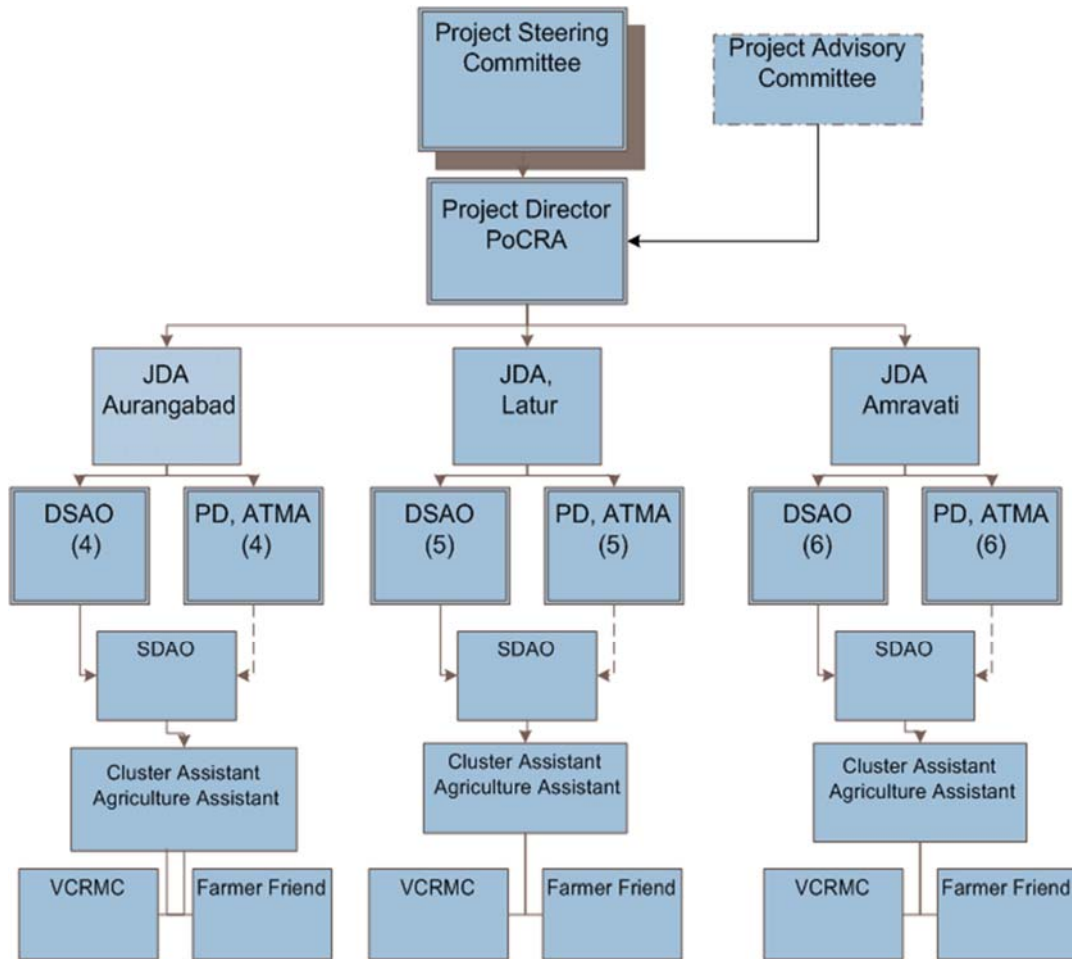


Figure A2.1: Overall project implementation structure

Table A2.2: Implementation framework and main roles and responsibilities at various levels

Operational Level	Organ/Agency	Key Roles and Responsibilities	Human Resources
Central level	Project Steering Committee (PSC)	<p>Provides conceptual, strategic and policy guidance on overall project implementation.</p> <p>Reviews and endorses Annual Work Plan and Budget and ensures adequate budget provision for activity implementation.</p> <p>Guides inter-departmental convergence and coordination.</p>	<p>Chaired by Chief Secretary.</p> <p>Includes all Secretaries of the associated departments (GoM)</p> <p>Commissioner Agriculture</p> <p>PoCRA Project Director.</p>
	Project Advisory Committee (PAC)	<p>Gives technical advice on the implementation of components and project activities approved in the Annual Work Plan and Budget.</p>	<p>Chaired by Principal Secretary, Agriculture.</p> <p>Includes Project Director (PoCRA), Commissioner Agriculture, the Directors of the agencies and selected strategic partners associated to PoCRA, and 2 non-government members.</p>
	Project Management Unit (PMU)	<p>Oversees day-to-day implementation of project activities.</p> <p>Ensures smooth coordination of activity implementation by various agencies and strategic partners.</p> <p>Responsible for fiduciary management and compliance as per legal agreement.</p> <p>Ensure safeguards compliance.</p> <p>Ensures that all project activities are implemented in line with the provisions in the official project documents.</p> <p>Responsible for project monitoring and impact evaluation, as well as project communication.</p> <p>Compiles annual activity plan and work program, and develop the corresponding budget proposal.</p>	<p>Project Director (GoM)</p> <p>Deputy Project Director (GoM)</p> <p>Assistant Project Director</p> <p>Finance Specialist (GoM)</p> <p>Procurement Specialist</p> <p>Agronomist</p> <p>Hydrologist/Geologist</p> <p>Soil Scientist</p> <p>Sociologist</p> <p>Agriculture Engineer</p> <p>Agribusiness Specialist</p> <p>GIS Specialist</p>

Operational Level	Organ/Agency	Key Roles and Responsibilities	Human Resources
Division level (3 Divisions)	Divisional Project Management Units (DPMU)	Institutional coordination with the districts in their respective jurisdiction. Procure consultants on a needs basis	Divisional Joint Director (GoM) Deputy Director (GoM) IT/MIS technician
District level (15 Districts)	District Project Coordination Committee (DPCC)	Facilitates coordination of project activities among agencies represented at district level, including DSAO and ATMA	District Collector (GoM)
	Office of District Superintendent Agriculture Officer (DSAO)	Administrative head at the district level. Responsible for the implementation of annual work plan and agreed procurement plan for the district, regular fiduciary oversight and monitoring of project activities. Acts as drawing and disbursing officer at district level. Coordinates with line departments at cluster and district level, and with ATMA. Provides technical guidance Ensures formulation of mini watershed plans. Reviews and appraises Cluster Development Plans Resolve conflicts and grievances.	District Superintendent Agriculture Officer (GoM) Project specialist Agriculture Project specialist Procurement Accounts personnel IT/MIS technician
	Agriculture extension services (ATMA)	Liaises with State Nodal Officer and State Agricultural Management & Extension Training Institute (SAMETI) at state level. Facilitates farmer/FPO training and technology dissemination between departments, including KVKs, PRI, planning sector and planning units at district level. Assesses training needs and prepares annual training calendar for farmers, FFS, FPOs and other groups at community level. Resolves conflicts and grievances	Project Director ATMA (GoM) Agribusiness specialist Communication/Capacity development specialist Accounts personnel

Operational Level	Organ/Agency	Key Roles and Responsibilities	Human Resources
Sub-division level (36 Sub-divisions)	Office of the Sub-division Agriculture Office (SDAO)	<p>Administrative head at the sub-division level.</p> <p>Responsible for the implementation of annual work plan in the sub-division, and regular monitoring of activities implemented in the sub-division.</p> <p>Acts as drawing and disbursing officer at sub-division level.</p> <p>Coordinates with line departments at cluster and block level, and with ATMA.</p> <p>Provides technical guidance and approves the works as needed.</p> <p>Ensures formulation of mini watershed plans (cluster level).</p> <p>Carries out procurement of goods, works and services, as required, in consultation with Cluster Assistant.</p>	<p>Technical officers from DoA (GoM)</p> <p>Technical officers from associated Departments (GoM)</p> <p>Accounts Officer</p> <p>Accounts Assistant</p> <p>Agriculture Officer (<i>taluka</i> level) (GoM)</p>
Cluster level (670 Clusters)	Office of the Cluster Assistant	<p>Focal point for all project related activities and the community.</p> <p>Facilitates the process for preparation of Cluster Development Plans.</p> <p>Coordinates with Farmer's Friend for community mobilization and extension support.</p> <p>Execution of project activities and maintenance of records and accounts</p>	<p>Cluster Assistant</p> <p>Agriculture supervisor</p> <p>Agriculture Assistant</p>

Operational Level	Organ/Agency	Key Roles and Responsibilities	Human Resources
Village level (5,142 villages)	Village Climate Resilient Agriculture Management Committee (VCRMC)	<p>Endorses participatory mini watershed plans to be approved by <i>Gram Sabha</i>.</p> <p>Selects beneficiaries for individual beneficiary activities.</p> <p>Ensures beneficiary contribution to matching grants, and assistance from commercial banks.</p> <p>Carries out planning and execution of community works as per approved annual action plan and Procurement Plan (simplified format).</p> <p>Maintains assets created through PoCRA assistance on community lands.</p> <p>Prepares contingency plans with support from technical experts and ensure its implementation during contingency situations.</p>	<p>Chaired by the <i>Sarpanch</i>, Head of <i>Gram Panchayat</i>.</p> <p>Includes 13 members representing the village assembly.</p>

Table A2.3: Overview of Government Departments/Technical Agencies and Strategic Partners engaged with PMU

Government Departments and Technical Agencies	Main area of engagement with PoCRA
Water Conservation Department	Improving soil health; enhancing soil-moisture regime and water holding capacity; promoting harvesting of surface run-off/rain water for protective and productive purposes
Department of Water Supply and Sanitation	Sustainable groundwater resources management, including groundwater balance estimates and modelling for managed aquifer recharge; water quality monitoring
Forest Department	Afforestation in catchment areas and on contour ridges; supply of seedlings and other planting material
Department of Marketing and Cooperation	Value chain development
Department of Animal Husbandry, Dairy and Fish	Community level support of most disadvantaged households through small livestock-based income generating activities
Yashwantrao Chavan Academy of Development Administration (YASHADA)	Preparation of participatory in micro plans in selected PoCRA clusters.
Krishi Vigyan Kendra (KVK - Regional Research Centers)	Preparation of SREPs, District Contingency Plans and FFS.
Strategic Partners	Main area of technical assistance to PoCRA
Gokhale Institute of Politics and Economics (GIPE)	FPC assessment, M&E quality review and cost analysis of selected water interventions
Groundwater Survey and Development Agency (GSDA)	Sustainable groundwater resources management, incl. groundwater balance estimations and modelling managed aquifer recharge
State Agriculture Universities (affiliated to ICAR)	Support in seed supply chain; knowledge generation and transfer of agricultural climate-resilient technologies and agronomic practices
Indian Institute of Technology Bombay (IITB)	Development of the framework for the water balance assessment in the PoCRA mini watersheds
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	Development of climate resilient seed varieties and CRA technologies.

Government Departments/Technical Agencies and Strategic Partners shall be engaged to provide support to enhance the knowledge and technical capacity of the PMU. They are not engaged in carrying out any procurement activities under PoCRA. The Strategic Partners who meet the Eligibility and Direct Selection requirement shall be included in the Procurement Plan and hired by the PMU contractually.



Financial Management

2. **The Bank has had an active portfolio on Investment Lending in the state of Maharashtra.** Key lessons learned from implementation of these projects include: (a) due to implementation challenges, disbursements have been low in the initial years; (b) various aspects of internal controls like reconciliations, controls over payments, physical verification of assets, adequacy of financial management supervision have required capacity strengthening; and (c) at times, there have been delays in the provision of funds to the implementing agencies. These lessons have been considered in the design of the fiduciary systems for PoCRA.

3. The guiding principles for FM under this project are twofold: (i) follow the State/Country systems in meeting the essential fiduciary requirements; and (ii) add additional requirements where needed, e.g. reporting through Interim Unaudited Financial Reports (IUFRRs)/internal audit. The effectiveness and timeliness of FM arrangements is critical to successful implementation of the project.

4. **Overall, FM arrangements proposed for the project are considered to be adequate** to account for and report on the project expenditure as well as satisfy the fiduciary requirements of the Bank. The project will be implemented by DoA (GoM); in case other departments are required to join as additional Implementing Agency the project at a later date, a separate fiduciary assessment will be carried out. DoA will set up a PMU at the state level. The project will be implemented in 15 districts comprising of 36 sub-divisional offices. District PMUs will be set up for project management and co-ordination at the district level and sub-district level. The 15 districts which are within the project scope fall under three divisions (Aurangabad, Latur and Amravati). Other key features of the FM framework are outlined below.

5. **Budget and Planning.** Project funds will be routed through the State Budget of GoM. A separate budget code for the project has already been notified by GoM; for the State share it is 2401-115-(00)(03)-33 with scheme code 2401 A655 and for the EAP it is 2401-115-(00)(02)-33 with scheme code 2401 A646.

6. **Annual Action Plans (AAP)** will be prepared by PMU following a bottom-up approach for project activities which will increase the ownership and accountability of participants. GoM has an online computerized Budget Estimation, Allocation and Monitoring System (BEAMS) to facilitate budget estimation, allocation of grants and authorize expenditure. The project FM Manual includes relevant formats for preparation for AAP and budget. Consolidated AAP and budget will be approved by the Project Steering Committee (PSC) and after due approval by the Project Director (PD), they will be forwarded to Secretary, DoA, for including in estimates of the Department. Budget for the project will be allocated as part of the budget of DoA.

7. **Flow of funds.** The existing treasury system prevalent in the state will be followed for making payments. BEAMS facilitates allocation, distribution, re-appropriation, withdrawal, surrender of grants at various levels. Allocations to all accounting centers will be made through this system except for ATMA and VCRMCs which are outside the BEAMS. Funds to these agencies will be transferred electronically through banking channels. Funds releases will be made to the VCRMC in accordance with the payment schedule and conditions specified in the grants. The VCRMC will maintain appropriate supporting documentation evidencing the actual expenditure and provide necessary Utilization Certificates to the DSAOs. The flow of funds is depicted graphically in the figure



below.

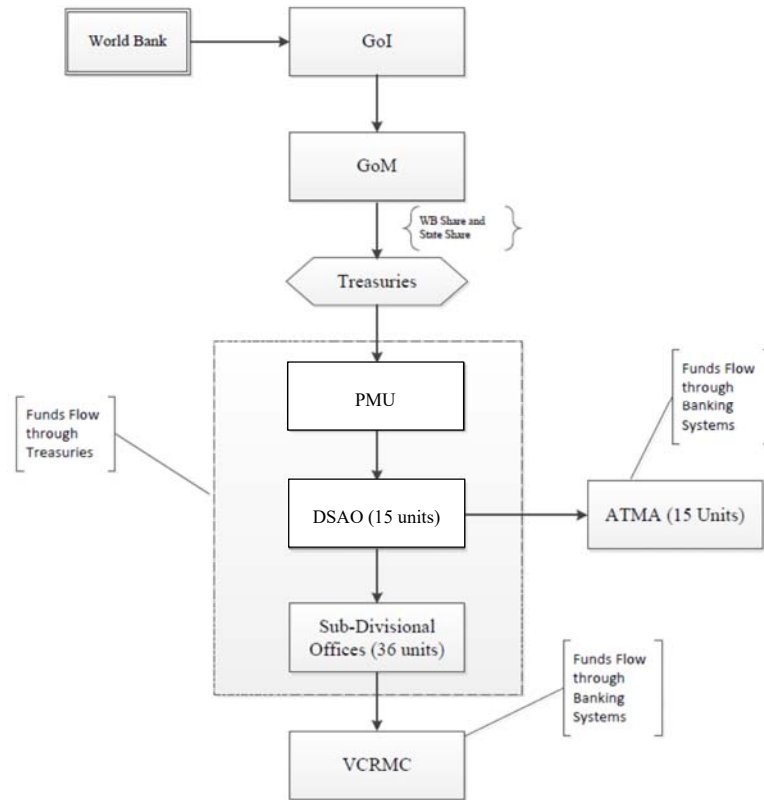


Figure A2.4: Flow of funds arrangements

8. **Accounting Centers.** Accounting centers have been identified based on the implementation arrangements and expenditure proposed to be incurred on various components. The project has proposed 65 accounts centers, which include: (a) PMU at State Level – 1; (b) DSAO at District Level – 15; (c) ATMAs at Districts – 15; (d) Sub-divisional offices – 36. Inclusion of ATMAs as accounting centers is considered necessary as these will carry out training and capacity building activities. Sub-divisional offices have been made accounting centers as these will release subsidies to farmers.

9. **Funds disbursed to VCRMC.** The amount of project funds disbursed to the VCRMC will be determined based on the investment plans that emerge from the mini-watershed development plans. As per the Bank guidelines, any releases to community groups (i.e. VCRMCs) can be considered eligible for reimbursements. However, various monitoring mechanisms need to be exercised to ensure that the funds are spend for intended purposes. The mechanism that has been established is: (a) release of funds to be made in installments after confirmation of progress by DSAOs and SDAOs who will monitor implementation progress; (b) funds to be transferred to VCRMC electronically and be subject to audit by a firm of Chartered Accountants (to be appointed by PMU); and (c) VCRMC to be required to maintain separate books of accounts of the project funds establishing clear linkage with the project expenditure.



10. **Managing program convergence.** The project is covering over 5,100 villages and is not the only source of public financing for the sector in that area. The GoM also provides resources for similar activities under several state schemes and through specific GoI programs. It is possible that an individual applies for matching grant or subsidy under more than one scheme. However, the following framework will ensure that the risk of an individual obtaining unfair (more than once) benefit from the scheme is negligible: (a) Cluster Development and Investment Plans are prepared for specific villages, and vetted by the VCRMC including the *Sarpanch*, and Agriculture Assistant ensures adequate scrutiny of proposals at the local level; (b) development of an ICT-based application portal for PoCRA; (c) a Direct Beneficiary Portal is under development by the GoM for the entire state and which is expected to be implemented by 2018, this will ensure ‘*aadhar*’ based releases and public disclosure of list of beneficiaries; (d) the DSAO has a single point responsibility for approval and monitoring of all schemes in the district, including PoCRA; and (e) requirement for a self-declaration by each applicant.

11. **FM Staffing.** The Finance function of the project will be led by a Finance Specialist on deputation from the State Finance and Accounts Services (GoM). He will be assisted by an Accounts Officer and Assistant Accounts Officers, on deputation as well. The need for FM Staff at each accounting center has been assessed based on the activities at each level and depicted in the table below. No separate FM Staff will be provided to the VCRMC. The FM Staff at SDAO will assist VCRMC in their FM functions.

Table A2.5: Financial Management staffing requirements at various levels

Accounting Center	No. of Accounting Centers	No. of FM Staff at each level	Detailed staffing	Total No. of Staff
PMU	1	14	Finance Specialist – 1, Accounts Officer – 1, Assistant Accounts Officer – 2, Deputy Accountant – 4, Accounts Clerk – 6 (all staff on deputation from Maharashtra Accounts and Finance Services)	14
DSAO	15	1	Project Accounts Assistant – 1 Accounts Officer of DoA with additional charge for FM functions (all staff on deputation from Maharashtra Accounts and Finance Services)	15 15
ATMA	15	1	Project Accounts Assistant – 1 (on contractual basis)	15
SDAO	36	3	Accounts Officer – 1 (on deputation), Accounts Assistant – 2 (on contractual basis).	108
Total				167



12. **Financial Management Manual.** All FM arrangements are documented in a Financial Management Manual that has been developed by the project, and found to be acceptable by the Bank. The FM Manual helps standardize procedures and reporting formats to be followed by all implementing agencies. It covers budgeting, accounting, funds flow, payment systems, delegation of powers, and audit requirements. The FM Manual will be reviewed periodically to ensure that it remains valid and adequate during project implementation and may be amended from time to time. Every subsequent modification to the FM Manual must be approved by the Project Director, the Finance Specialist (PMU) and the Bank. The project will provide training to finance staff at the PMU, DSAO, ATMA and SDAO. Ongoing training will be conducted to maintain appropriate books and records in the Computerized Accounting System and undertake other FM functions as envisaged in the PIP.

13. **Other fiduciary aspects:** (a) Detailed norms for cost sharing are provided in the PIP and the FM Manual. These norms apply to existing GoI/State schemes and apply equally to PoCRA. Grants/Subsidies are provided to individual farmers and FPOs based on these guidelines; (b) Key implementing agency for the project is the Department of Agriculture (DoA). The project will also include participation of Strategic Partners which operate through MoUs in the nature of Consultancy Agreements with specific and measurable deliverables. Further certain operational expenditure will also be incurred by 'Government Departments/Technical Agencies'. The roles of Strategic Partners and Associated Departments is captured in Figure A2.3.

14. **Internal Audit.** The project will appoint a firm of Chartered Accountants (CA) as Internal Auditors as per terms of reference and selection criteria agreed to with the Bank. Internal audit will strengthen the internal control framework and assist the management in identifying and addressing control weaknesses periodically. The audit will check compliance of procurement transactions at all the levels of the project with the Procurement Regulations and Procurement Manual on sample basis. It will also cover all accounting centers and VCRMCs, including the review of community procurement on sample basis. Audit will be conducted on half yearly basis for all accounting centers (including 100 percent coverage of ATMA) and on annual basis for a sample of VCRMCs. The Project Audit Review Committee chaired by the Project Director at PMU and the DSAO at District level will consider key issues pointed out by the auditors and ensure timely resolution of audit observations by project management.

15. **External Audit.** The Comptroller and Auditor General of India (C&AG) through its offices in Mumbai and Nagpur will be the external auditor for the project. The C&AG's office will conduct an annual audit of the financial statements of the project covering all sources of funds (GoI and the Bank). The audit report will be submitted to the Bank within nine (9) months of the close of each financial year.

16. **Disbursement Arrangements.** The Bank will finance 70% of the project costs, subject to a limit of USD 420 million. Funds from the Bank will be made available to GoM (through the GoI) under the standard arrangements between GoI and the States. Up to 20% of the Loan will be available for financing eligible project expenditures incurred up to one year prior to the likely date of Loan Agreement Signing.

Procurement

17. **A procurement capacity and risk assessment has been carried out by the World Bank.** It recognizes that DoA has implemented Bank-funded projects earlier and is familiar with Bank



procurement procedures. The PMU is the nodal agency for PoCRA which is newly constituted and has deployed a Procurement Specialist with prior experience in Bank funded Projects. PoCRA is a highly decentralized and demand driven project with large number of simple procurement activities carried out by the selected Beneficiary and selected Community at village level. In view of the size and scope of the project, the multiple levels of implementation, the multitude of procurement activities, the staff with procurement proficiency to be deployed at levels at district, the weak procurement capacity at the community level¹⁵, and the PMU's limited prior experience in procuring and managing Bank procurement through the New Procurement Framework, the procurement mitigated risk is rated as 'Substantial'. Procurement is envisaged to be carried out at the central level (PMU), district level (DSAO/ATMA), and sub-division level (SDAO) and community level and shall be in accordance with the Bank Procurement Regulation (July 2016, revised November 2017).

18. Procurement at community level: Goods and Works procured or carried out at community level shall follow CDD arrangements, as per Bank Procurement Regulations and further amplified in the project Procurement Manual. The procurement activities envisaged at community level are large number but small-value procurement activities not exceeding RFQ threshold. The project is primarily driven by the microplanning process at village level whose outcomes are aggregated into Cluster Development and Investment Plans (CDP). The CDP shall define the approved activities, Works and Goods to be procured at the community level or to be purchased by the selected Beneficiary as per the following arrangements:

- a. *Activity at Beneficiary level:* The project is primarily demand driven and implemented by the selected beneficiaries and the community. As per the approved micro plan at village level, the selected beneficiaries shall purchase Goods and Equipment from the open market as per the technical specifications prescribed. Upon technical and physical inspection by the Cluster Assistant appointed by the PMU, the Beneficiary shall be reimbursed eligible matching grant thru DBT as determined by the GoM based on its cost sharing norms. The matching grants for beneficiaries to carry out activities as per approved micro plan makes up for a sizeable share of the project. Given the size and span of the engagement of Beneficiaries, their activities being carried out as per the arrangements mentioned above shall be reviewed by the internal audit as per agreed ToR to ensure due compliance with the agreed process and quality aspects
- b. *Procurement at Community level:* Community includes VCRM, FPO and other groups under the project. The threshold of procurement activity at selected community level is expected not to exceed RFQ threshold. Procurement activities at the community level are not complex but small value and large number of activities at highly decentralized level is challenging. As per the outcomes of the micro planning process, selected communities may also undertake interventions like the construction of water conservation and water harvesting structures, soil and salinity management, micro-irrigation, plantation, production technology, mechanization, agribusiness infrastructure, FPO strengthening and more. A simplified Procurement Plan is prepared along with an Annual Action Plan and included in the CDP. The procurement/purchase committee shall be constituted at the community level and shall ensure compliance with the agreed procedures. To build the

¹⁵ VCRMCs are yet to be formed with mandate of managing procurement activities by the Purchase Committee (subcommittee within the VCRM).



capacity of the procurement committees, the PMU field offices will carry out training for the committee members.

19. **Procurement at PMU level:** A dedicated PMU has been set up and takes up all procurement activities at the State level. The PMU is deployed with a Procurement Specialist having prior experience in implementation of Bank financed projects. While DoA has been engaged in various Bank funded projects, the PMU is newly constituted and is also responsible for procuring major IT and consultancy services. These consultancies include: the preparation of the micro watershed plans in phased manner, the procurement of a human resources agency for deploying required staff at various levels, of an M&E agency, of a specialized company to develop an integrated ICT system for the project. For high value and complex consultancy contracts and ICT implementation, the PMU mainly depends on the experience of personnel deputed from the DoA or hired from the open market. The PMU also monitors and provides guidance and oversight regarding the community level procurement with the support of a customized MIS. The PMU being the nodal agency will monitor the contractual performance of major procurement activities, including contract management at the State level, and monitor the procurement and contractual performance with the support of a customized MIS. The PMU will also build the capacity of its field offices and provide overall guidance in regard to procurement processes and procedures; the PMU will be overall responsible for ensuring compliance at all levels.

20. **Strategic partners:** To meet the project needs for highly specialized knowledge and technical skills, the PMU has reached out to Strategic Partners (see Table A2.3). These are public institutions that have been providing technical assistance to the PMU and other project stakeholders during project preparation. These technical and knowledge partnerships can be extended to the implementation phase and technical support may be formalized by PMU with these institutions through a non-procurement MoU, as required (in addition to these Strategic Partners, the PMU may also access specific knowledge and skills through Government Departments/Technical Agencies). An MoU with a Strategic Partner has all the elements of a contract (offer and acceptance, consideration, binding on both parties, enforceability), shall be treated as a contract for all practical purposes (viz. added to procurement plan, reviewed by procurement team, etc.) irrespective of the nomenclature of the document as MoU. When an MoU is treated as a contract, it is allowed only for small value assignments viz. up to US\$ 300,000. If MoU is proposed to be used for an assignment with a value greater than this threshold, it will be treated as non-standard procurement document and Bank prior clearance irrespective of the threshold will be required before it use. None of the Strategic Partners (or Government Departments/Technical Agencies) shall engage in carrying out procurement under the project. Only the PMU at central level, DSAO/ATMA at District and SDAO at Sub-Division level, as well as selected communities (as per the approved Cluster Development and Investment Plan) at Village level, shall be authorized to carry out procurement under the project.

21. **Procurement manual:** A project Procurement Manual has been prepared to provide guidance at both State and decentralized level. For decentralized procurement, the relevant part of the manual shall be published in local vernacular and provided for ease of understanding at the Community level.

22. **Staffing and Capacity Building:** Staff with procurement proficiency at State and District level in Bank-funded project shall be appointed. Once appointed, selected officials shall undergo procurement training at ASCI, Hyderabad or NIFM, Faridabad. Alternatively, the project may conduct customized procurement trainings periodically. At the community level, appropriate



handholding and capacity building of the Purchase Committee in regard to procurement processes and procedures, record keeping, procurement audit and review aspects, shall be carried out under the oversight of the PMU.

23. **Systematic Tracking of Exchanges in Procurement (STEP):** the project will use STEP, a planning and tracking system, which will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance. The first 18-months Procurement Plan (PP) shall be reviewed and cleared by the Bank thru STEP. This PP shall be updated at least annually. All procurement to be carried out under the project shall be included in the PP and prior cleared by the Bank.

24. **Operating Costs:** Operating costs are defined in the Appendix to the Legal Agreement pertaining to this project and may include, among others: costs of operation, rent and maintenance of offices, communication costs, incremental staff salaries (including government staff on deputation to the Project), training, and travel allowances of project beneficiaries and project staff related to project implementation, coordination, and monitoring but excluding the salaries of civil servants of the Borrower. The day to day operational costs related to vehicle hiring, printing, among others, would also be supported. These items are to be procured using the Borrower's national procurement and administrative procedures acceptable to the Bank.

25. **Record keeping.** All records pertaining to award of tenders, including bid notification, register pertaining to sale and receipt of bids, bid opening minutes, bid evaluation reports and all correspondence pertaining to bid evaluation, communication sent to/with the World Bank in the process, bid securities, and approval of invitation/evaluation of bids will be retained by respective agencies and uploaded in STEP. For contracts awarded by the community, a review shall be carried out independently on sample basis or include as part of the ToR for Internal Audit (which will include the physical verification of community infrastructure/goods procured, process followed, record keeping and appropriate sign off as per the process laid down for the Beneficiary).

26. **Disclosure of procurement information.** The following documents shall be disclosed on the project website under DoA: (a) a Procurement Plan and updates; (b) an invitation for bids for goods and works for all contracts; (c) Request for Expression of Interest for selection/hiring of consulting services; and (d) contract awards of goods, works, and non-consulting and consulting services.

27. **Complaints Handling.** For the procurement-related complaints, the project will follow the procedure prescribed in the Procurement Regulations (Para 3.26 and 3.31). In order to deal with the complaints from bidders, contractors, suppliers, consultants and general public at large, a complaint handling mechanism will be set up at the state level and the detailed procedure is prescribed in the Procurement Manual. The community will be required to establish systems and mechanisms for addressing and escalating their grievances and complaints as outlined in the Procurement manual/PIP.

28. **Fiduciary oversight and Procurement Review by the World Bank.** The World Bank shall prior review contracts according to prior review thresholds set in the Procurement Plan. All contracts not covered under prior review by the World Bank shall be subject to post review during implementation support missions and/or special post review missions, including missions by consultants hired by the World Bank. The PMU shall be responsible for providing the consolidated list of contracts for carrying out the annual procurement post review. For contracts at the PMU level, procurement post review shall be carried out by the Bank's Procurement Specialist or a Bank-



appointed consultant. For procurement at community level, the annual post review shall be carried out as per the sample defined in ToR of a procurement consultant to be hired under the project for carrying out the procurement review or included as part of the ToR of the internal auditor. The sample size shall be specified in the ToR. World Bank may conduct, at any time, independent procurement reviews of all the contracts financed under the loan.

29. Contract management capability. The major consultancy contracts are awarded by the PMU. The PMU being the nodal agency remains overall responsible for the compliance to the agreed procurement procedures and processes, and shall monitor the contractual performance including contract management issues, if any.

30. Project Procurement Strategy for Development (PPSD). The PPSD for PoCRA has been prepared by GoM during the project preparation and is summarized in the box below.

Box A2.7: Summary of the Project Procurement Strategy for Development (PPSD) for PoCRA

The project is a highly decentralized, demand driven and implemented by selected the community at Village level. The project procurement profile is a mix of small value procurement activities at community and large value procurement transactions at PMU level.

The procurement activities envisaged through the project are based on the mini watershed plans at cluster level which lead to Custer Development and Investment Plans (CDP). The procurement activities are not complex but small value and large number of activities at highly decentralized level can pose a challenge. The procurement activities will be undertaken by the selected Community, including beneficiaries. A substantial portion of the project allocation is spent for the implementation of the Custer Development and Investment Plans by beneficiaries and the community organizations.

The PMU is newly constituted and responsible for the procurement of high value and complex consultancy contracts and ICT implementation. The envisaged high value and complex consultancy contracts include the following: preparation of the Mini Watershed Plans in phased manner, procurement of a human resources agency for deploying required staff at various levels (including Procurement Specialists at District level), the hiring of a Monitoring and Evaluation agency, and the procurement of a specialized firm for the design and development of the project's ICT System.

The PMU mainly depends on the experience of few personnel, who are deputed from the Department of Agriculture (DoA) or recruited from open market. PMU staff requires orientation to use the Bank Procurement Procedure and Processes.

The PMU is mapped to DoA with office in Mumbai. The PMU and DSAO/ATMA will be in charge of overall procurement activities at State and District level respectively, supported by staff with expertise in managing project procurement. At the village level, for the approved CDPs, the procurement shall be carried out by selected community (VCRMC, FPO, individual farmers).

There are few selected Associate Departments/Technical Agencies and Strategic Partners identified under the project and mentioned in PIP for providing knowledge and technical support. These are not Implementing Agencies and will not undertake any procurement under the project. However, the Strategic Partners meeting the Bank's Eligibility and Direct Selection criteria shall be hired contractually and will be included in the Procurement Plan. The community/beneficiaries are involved in community procurement and they are guided by the Procurement Manual (Community Procurement Chapter). The decision making in procurement process is formalized and described in Procurement Manual and Project Implementation Plan (PIP).

The legal framework for procurement and contracting is based on the GoI GFR 2015 and GoM Procurement Policy for Goods via GR dated 1 Dec 2016 for all the state government departments, undertakings and local bodies. This policy is also applicable for elected local bodies (ZP and PS at Taluka and GP). The State Procurement policy is for procurement of Goods only, it allows negotiation with the L1 and exempts the submission of bid security to few providers based on their classification. The staff engaged in project procurement activities may be familiar with the Government



procurement procedure needs orientation to Bank Procurement Regulations and Procurement Manual.

At PMU, a Procurement Specialist with experience in implementation of Bank financed projects has been deployed and supports PMU to manage project procurement activities. District level offices to be established will be staffed with Procurement Specialists with proficiency in procurement in Bank financed projects. The staffing for procurement and the procurement capacity at the cluster and village level will need to be strengthened. The PMU also monitors and provides guidance and oversight to the community level procurement with the support of a customized MIS (to be developed). The PMU being the nodal agency will monitor the contractual performance of major procurements including contract management at the State level.

The DoA (GoM) has implemented several projects co-funded by multilateral and bilateral donors, including the Bank. The list also includes several central and state government assisted schemes for crop development and food security programs, soil and water conservation works, irrigation and drainage which involves construction of village-level small civil works. The PMU is expected to develop institutional memory/expertise based on the learnings from various programs of GoM (related to the project) and coordinate with various departments/stakeholders to implement envisaged component-wise activities. The project will be the first in the state to follow the Bank’s procurement regulations in its implementation (New Procurement Framework).

The project related requirements Goods, Works, Services, and Non-consultancy services can be procured from the domestic market. There are adequate number of potential providers to supply Goods / Equipment, construct required Works, and provide Consultancy services.

Activities under the project will be duly complimented by experiments in use of innovative ICT through Customized MIS for capturing real time data at all levels. The project also uses the NIC developed procurement Platform for their procurement above INR 300,000 and use the Bank Prescribed Procurement Documents and procedures as per the agreed Procurement Regulations and Procurement Manual. Government eMarket Place [(GeM) <https://gem.gov.in/>] is an online end to end procurement portal that may be used to procure Project’s requirements up to RFQ threshold USD 100,000 equivalent by following procedure outlined in the Procurement Manual.

The procurement capacity, especially at the community level, may result in implementation delays and fiduciary noncompliance, hence the need for capacity enhancement and regular oversight using monitoring agencies, centralized MIS with geospatial tagging, and periodic audits carried out by an Independent Agency. The project envisages creating a customized MIS which can capture details about all the activities at different implementation level. The project proposed to include the review of procurement procedure to the ToR for Internal Audit on sample basis including the physical verification of community infrastructure created and Goods/Equipment procured.

Appropriate and proportional market approach have been identified in the PPSD and the initial procurement plan has been prepared for those activities that are identified at the project negotiation stage. The underlying Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity. The proposed project will use Systematic Tracking of Exchanges in Procurement (STEP), a planning and tracking system that will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance.

An overview of procurement risks for the project and mitigation measures outlined in the PPSD are depicted below:

Risk Description	Description of Mitigation	Risk Owner
Difference in GoM procurement policy and Bank procurement framework	The project will follow the Bank procurement regulation for IPF Borrowers July 2016, revised November 2017.	PMU, DSAO, and Community (Procurement committee)
	At the community level, Goods and Works procurement shall not exceed RFQ threshold and shall be in accordance with the CDD arrangements provided in the Bank Procurement Regulations. Procurement committee at the community level shall be responsible for carrying out procurement and shall be guided by	



	<p>procurement manual which shall help in ensuring compliance and consistency across board.</p> <p>The standard template for RFQ (goods and works) developed by PMU shall be agreed with Bank and shared with the community to ensure consistency.</p> <p>All other project procurement shall use Bank SBD.</p>	
Highly decentralized level activities to be carried out by beneficiaries at community level.	Standard specifications and BIS for Goods defined by GoM which will be the basis for Beneficiary purchasing goods from the open market. As part of due diligence, appropriate authority assigned by PMU shall sign off to ensure compliance by the Beneficiary in purchasing as per the defined specification from open market for Goods and technical compliance in regard to works and ensuring its physical inspection prior to release of matching grant.	PMU and DSAO
The project will be the first in the state to follow the Bank's new procurement framework (NPF) in its implementation	Deployment of procurement specialist at PMU (in place) and at the project districts. Provide orientation on NPF to key project functionaries at PMU and at the district level; Need based refresher courses in procurement may be conducted at regular intervals.	PMU and DSAO
Three levels of implementation, many players, multiple type of activities. The procurement profile is mix of small value at community and high value at PMU.	PMU being the nodal agency will monitor the contractual performance of major procurements including contract management at the State level. The PMU also monitors and provides guidance and oversight regarding community level procurement with the support of a customized MIS.	PMU, DSAO and VCRMC
Efficient purchase of goods, equipment and small work at community level.	Capacity building of the community for CDD procurement. The PMU shall carry out training of trainers and ensure appropriate availability of resources for carrying out capacity building of the purchase committee who are responsible for procurement at the community level. The trainers will ensure wide dissemination of the mechanism to be followed by the selected Beneficiary in their purchases to ensure open competition and transparency.	VCRMC, PMU
Ensure delivery of quality goods and proper after sales service and use of the goods purchased.	Guideline issued by GoM for purchase of only BIS (Bureau of Indian standard) certified goods and equipment's with standard warranty and guarantee and after sales service followed by technical and physical verification by cluster assistance. The Community may be sensitized through capacity development. Wherever BIS standards are not available, GoM standards/specifications shall apply.	VCRMC
Procedural delays for beneficiary/FPO selection,	It is proposed to monitor and track the community procurement and overall implementation status under	PMU, District Level



verification of installations and disbursement of the grants may affect the achievement under the targets planned under the projects.	the scheme through robust management information system. Deploying competent staff (preferably with prior experience in the Bank funded projects) for hand holding support and monitoring after initiating the project	
Oversight of procurement carried out at decentralized level	The ToR for Internal Audit include review of the compliance with agreed procurement procedures as per the Bank Procurement Regulations and Procurement Manual. The ToR also includes physical verification of infrastructure/goods procured by beneficiary/community on sample basis. Alternatively, this may be carried out through an independent procurement consultant hired under the project.	PMU, District Level

Environmental and Social (including safeguards)

31. **Environment.** The EMF details the institutional arrangements for effective management of the potential environmental issues through appropriate mitigation measures. The Environment Specialist at the PMU will provide oversight and management of safeguards provisions, monitoring, training and capacity building, reporting and documentation. S/he will develop bi-annual monitoring reports on overall EMF and IPMP provisions, trainings, and outreach activities through the farmers field schools approach. Additional human resources may emerge during project implementation to meet new specific technical and/or operational requirement.

32. At the district level, the Project Specialist Agriculture will ensure the integration of safeguard requirements into all project activities as well as with the EMF implementation, and work in close coordination with the Environment Specialist at the PMU. All technical staff dealing with environmental aspects at PMU and District level will undergo technical training to support their work on all aspects of safeguards compliance relevant to the project. In addition, the Project Specialist Agriculture will also be responsible for facilitating and reviewing the implementation of the EMPs for civil works.

33. The EMF comprises a set of procedures for: (i) screening through a list of non-permissible activities and a regulatory requirements list to provide approval to activities that do not contravene the relevant national and state regulations and the triggered Bank safeguard policies; the Environmental Screening Checklists are to be filled during the preparation of the cluster level mini-watershed plans and the FPO sub project proposals; (ii) provisions for identification of impacts on the basis of scale and probability of occurrence associated with the activities selected in the mini watershed plans; (iii) intervention/activity wise key environmental issues and mitigation measures, best practices, and environment-friendly technologies; (iv) EMP checklists for all civil works to ensure that specific entities implementing the civil works are provided with the mitigation and monitoring guidance for specific stages of the project activity cycle. The EMF also contains institutional arrangements for supervision and reporting, training and capacity building plan. The project will monitor the EMF provisions as an integral part of each of the project components through MIS system and periodic monitoring and evaluation process.

34. **Social.** The Social Assessment undertaken during project preparation has identified the following key issues: (i) participation, (ii) inclusion, (iii) decentralization, (iv) gender, (v) human



and institutional development, and (vi) Information, Education and Communication (IEC) campaign. The GoM has prepared a Social Management Framework (SMF) which comprises measures to address these issues as well as the required implementation mechanisms. The implementation strategy comprises mobilizing farming communities for group action and strengthening the existing stakeholders and institutions at local level (or where necessary, assist with setting up new ones). At the local level, the key institutions for the project are the Village Climate Risk Agriculture Management Committee (VCRMC) and the FPOs.

35. VCRMC are set up as a sub-committee of the *Gram Panchayat* (local self-government) headed by its president, the *Sarpanch*. VCRMC shall comprise several representatives of different sections including women, Scheduled Castes, Scheduled Tribes, poor farmers and agribusiness micro and small entrepreneurs. The VCRMC shall shoulder responsibility for all decision making related to overall activity preparation and implementation at the village level. Technical agencies associated to the project will be deployed to build the capacity of, and provide technical, institutional and social support to the local institutions and grassroot-level organizations. The PMU's Social Expert will work closely with the project units at district level, the strategic partners and technical agencies associated with the project. S/he will ensure that the project interventions are consistent with the agreed strategies and framework outlined in the project's social safeguards documents.

36. **Tribal Peoples Planning Framework (TPPF)**. A TPPF has been prepared to ensure inclusion and equity for the tribal communities in all project activities. As and when the tribal interface surfaces, the TPPF will be adopted and a Tribal Peoples Plan (TPP) which focuses on the needs of the tribal populations will be prepared by the project. These TPP will be similar to the micro watershed plans developed under the project for other locations, but will include the following additional key elements: (i) Due representation for tribals are provided in the VCRMC and its chairperson will invariably be a tribal person; (ii) In accordance with the Provisions of the Panchayats (Extension to Scheduled Areas) Act, all decisions will be taken by the tribal *Gram Sabha*; (iii) The project will ensure dissemination of information on different schemes and programs and other relevant IEC material which are implemented in the State for tribal development; (iv) Experiences and expertise emanating from tribal development initiatives made elsewhere within and outside the state will be drawn upon and fed into developing the individual and institutional capacity of tribals; and (v) FFS approach will underpin the intervention strategy in the tribal areas, ensuring integrating all facets of livelihoods, crops, trees and livestock; this may entail dovetailing with other projects or schemes, all of which will be reflected in the micro watershed plans. The project will take all necessary measures to ensure that the above elements are adequately addressed throughout implementation.

37. **Gender Action Plan (GAP)**. Key gender issues for the project relate to: (i) women active participation in the local decision making process; (ii) occupational health hazards, due to prolonged duration of engagement during farm activities and/or post-harvest activities (iii) drudgery due to no/limited usage of improved farm equipment; (iv) low awareness on agricultural technologies as a result of poor access to extension services and institutional facilities; and (v) wage labor, with women earning less wage for the same duration of work.

38. Measures to address these issues have been listed as a part of the project's GAP (which forms an integral part of the SMF). As per the GAP, women are ensured representation in all project specific institutions. Special efforts are made to include interventions specific to women in the Cluster Development and Investment Plans (for poor and vulnerable households, and Scheduled



Casts and Scheduled Tribes as well). The project will build the gender capacity of local stakeholders and promote an adequate representation of women in the VCRMC and the Board of Directors of FPOs. Focal attention will also be made on strengthening women producer groups and facilitate their integration in FPOs. Exclusive capacity building measures for women shall be developed for the implementation of the cluster plans. Custom Hiring Centers will be established which would make available gender-sensitive farm machinery and equipment that will reduce drudgery for women. The project will reach out to SAUs, KVKs and the National Research Centre for Women in Agriculture (NRCWA) for collating and disseminating women-friendly technologies that enhance climate-resilience in agriculture. In addition, the project will facilitate the design and implementation of gender sensitization programs for staff from institutions and agencies associated with the project at various level.

39. The PMU will closely monitor the impact of project activities on women. In particular, when monitoring overall project performance, the PMU will track two PDO indicators (#4 on farm income, #5 on direct beneficiaries) and one Intermediate Outcome indicator (#6 on technology adoption) that have been disaggregated to report separately for women (see also Annex 9).

Monitoring and Evaluation

40. Implementation arrangements for the project's M&E have been made at various levels. Although the overall responsibility for project monitoring, reporting and evaluation lays with the PMU, the project is designed so that day-to-day M&E activities are carried out by a third party. For technical backstopping on M&E, the PMU is supported by one of its strategic partners, the Ghokale Institute of Politics and Economics, which already assisted the PMU during the preparation phase with the Results Framework. In addition to the M&E technicians to be deployed by the 3rd party M&E firm, the PMU is strengthening project teams at Division and District level with a staff providing IT and MIS support.

41. For activity monitoring, data evaluation, and progress reporting, the PMU has hired the services of a specialized consulting firm that will accompany project implementation throughout the project life time. This firm will also carry out the stakeholders analysis and baseline surveys, as well as the mid-term and endline surveys required for the end-of-project evaluation. A comprehensive impact evaluation (IE) will be carried out for the PMU by the 3rd party M&E firm; the PMU will liaise with the Bank's Development Impact Evaluation initiative (DIME) for technical assistance on state-of-the-art IE.

42. The project's M&E system will be fully embedded in the project's integrated ICT platform. The ICT platform will include a module for M&E that will be designed to allow real-time progress monitoring by entering project data in the field on a handheld device (e.g. tablet or smartphone) connected to the M&E module, and which can then directly be accessed in real-time by the PMU.



ANNEX 3: IMPLEMENTATION SUPPORT PLAN

COUNTRY : India

Maharashtra Project on Climate Resilient Agriculture

Strategy and Approach for Implementation Support

1. The implementation support strategy involves a concerted plan of technical, fiduciary, and safeguards support needed to ensure due diligence over the course of project implementation. The approach includes: (i) continuous and regular review of project implementation activities to assess progress and identify potential bottlenecks in implementation, (ii) timely advice and guidance, and (iii) monitoring timely submission of financial and progress reports.

Implementation Support Plan and Resource Requirements

2. The Implementation Support Plan comprises a number of critical and effective review mechanisms to assess progress toward achieving the PDO, overall implementation progress, and to effectively respond to issues and challenges as they arise. Such reviews include, among others: (i) on-site implementation support reviews conducted by the Bank in consultation with the PMU semi-annually; (ii) short desk reviews at regular intervals; and (iii) a mid-term review that includes a comprehensive assessment of the progress achieved at the mid-point of project implementation and serves as a platform for revisiting project design issues and identifying where adjustments might be needed.

3. During the implementation support reviews, the Bank visits randomly selected project sites to assess and physically verify the work financed by the project. These site visits also involve interaction with project beneficiaries including farmers, FPCs, entrepreneurs, as well as strategic partners and government agencies associated to the project implementation. Areas to be visited take into account the following criteria: (i) random selection of project sites under the project; and (ii) special emphasis on those project sites identified by the complaint handling system.

4. Regular feedback will be obtained on project performance through project reports prepared by the PMU and the regular monitoring reports prepared by the 3rd party M&E firm. Key issues identified in these reports will be followed up, including through short visits to the state authorities, as necessary. Integrated fiduciary reviews during implementation review will include, post reviews of a random sample of contracts, and spot checks of accounting records and financial reporting systems at the state, district and project site level. Reports of the auditors will be reviewed and meetings held with them to gain additional perspective. Issues identified will be recorded in aide memoires and followed up after the mission.

5. To address the risk associated with the technical design of the project due to its comprehensive scope and need for institutional coordination, the Bank team will assemble the appropriate technical skills mix and experience needed to support implementation that will include appropriate level of advisory support for all key technical areas of the project. The Bank team will include participation of staff from other global practices and units with the World Bank Group involved in assisting with the preparation of the project (i.e. Water, Trade and Competitiveness, Climate Change).



6. A particular emphasis of the Bank’s support to project implementation will address areas with where the residual risk remains important (i.e. the risk after implementation of mitigation measures); these areas include: financial management and procurement, as well as safeguards and monitoring and impact evaluation.

7. The various activities needed for implementation support would require the following resources outlined in the table below.

Table A3.1: Implementation Support Plan and Skills Mix Required

Time	Focus	Skills Needed
First 12 months	<ul style="list-style-type: none"> • Completion of procurement for key contracts including review of ToRs and designs, and initiation of selected procurements and studies • Undertaking the baseline survey • Completion of the 1st cohort of mini watershed plans • Mobilization of project beneficiaries and their capacity building • Roll out of activities in selected clusters (including FFS for climate resilient agricultural technologies and agronomic practices) 	<ul style="list-style-type: none"> • Project management • Finance and investment • Procurement • FM/ Accounting • Environmental specialist • Water for Agriculture specialist/Agrohydrologist • Social and institution development specialist • Agriculturist • Agri business/value chain specialist • M&E and MIS • Agricultural technology transfer • Climate change specialist
12–60 months	<ul style="list-style-type: none"> • Operational support in first phase of intensive investments in project locations, assist with gathering lessons learned, and ensure this information is used to support broader scaling up in the latter years of the project • Procurement of contracts for components identified for later phases • Review and finalization of designs • Project Management • Monitoring and impact evaluation • Environmental and Social Safeguards compliance • Modelling 	In addition to all of the above skills in Year 1, technical experts for climate resilience, value chain development, Climate Innovation Center, and MIS/GIS specialist.



Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Project Management (TTLs)	20 weeks per year	4-6 trips per year	Field and DC based
Procurement	6 weeks per year	2-4 trips per year	Field and DC based
Financial Management	6 weeks per year	2-4 trips per year	Field based
Environmental Safeguards	4 weeks per year	2 trips per year	Field based
Social Safeguards	4 weeks per year	2 trips per year	Field based
Climate change and climate resilience Expert	6 weeks per year	3 trips per year	Field based
Agribusiness SME and Value Chain Expert	4 weeks per year	3 trips per year	Field based
Climate Innovation Center Expert	3 weeks per year	2 trips per year	Field and DC based
Agriculturist	4 weeks per year	2 trips per year	Field based
Soil Scientist	3 weeks per year	2 trips per year	Field based
Water for Agriculture Expert/Agrohydrologist	6 weeks per year	3 trips per year	Field based
Monitoring and Impact Evaluation Expert	3 weeks per year	2 trips per year	Field and DC based



ANNEX 4: TECHNICAL NOTE ON GROUNDWATER RESOURCES IN THE PROJECT AREA

Context

- PoCRA can significantly contribute to a paradigm shift in groundwater management in the state of Maharashtra.** The project is well positioned to provide a platform for bringing the Central Ground Water Board (CGWB) and the Department of Agriculture (MoA) together. For lack of attention to governance and resource conservation, groundwater has reached critical levels of exploitation in few pockets of the state. Despite having a Groundwater Act for the Maharashtra state, groundwater regulation has the least compliance in the state. An assessment of the status of groundwater in the PoCRA district was carried out during project preparation in close collaboration with GSDA (GoM). The assessment highlights that none of the project districts have reported overexploited groundwater. Nevertheless, in view of climate variability across the state, a “business as usual” approach with respect to farming and natural resources exploitation cannot be pursued: instead, PoCRA implementation focuses on increasing the use of surface water (relative to groundwater), increasing rainfall harvesting capacity, a more efficient use of soil moisture, higher productivity of water for agriculture, and the recharge of groundwater aquifers.
- This analysis of the groundwater status based on comprehensive monitoring data available at GSDA reinforces the need for additional assessments** to provide strong analytical underpinning for the design of climate-sensitive sector strategies and policies by the GoM for water and agriculture. Under Component C of the project, more analyses on evolving groundwater availability will be carried out with the support of state-of-the-art modelling that accounts from projected climate (temperature and precipitation trends), various land-use scenarios including the CRA practices scaled up by the project, as well as increased surface water storage and groundwater recharge capacity interventions supported by the project. The project will also undertake a realistic assessment of dependable withdrawal potential in each cluster of villages in project area preparing a local aquifer map of 1:10,000 scale of groundwater map that will allow each cluster mini-watershed plan to have a realistic understanding of likely groundwater potential available in their respective cluster
- Given the fact that sustaining productivity on small and marginal landholdings of less than two hectare per household, which constitute more than 85 per cent of the total farmland in the project area, agriculture activities is poised for significant transformation in land-use change and in its growth trajectory over the project period. The significance of groundwater for drought-proofing agriculture and for acting as a cushion against climate fluctuations and for its contribution to ‘base flows’ to rivers and streams, can hardly be over-emphasized. With a rainfall in the project area ranging from 600-1,200mm, one of the key challenges for the project is to mainstream sustainable management of groundwater in the targeted villages.

Hydrological & Hydrogeological setting

- The 15 districts covered by PoCRA are Akola, Amaravati, Aurangabad, Beed, Buldhana, Hingoli, Jalna, Jalgaon, Latur, Nanded, Osmanabad, Parbhani, Wardha, Washim, Yavatmal. The mean annual rainfall map of these districts is shown in Fig. A4.1 where PoCRA districts are circled. Five districts (i.e. Hingoli, Nanded, Washim, Wardha and Yavatmal) have relatively higher mean annual rainfall (800-1200 mm). Seven districts (i.e. Akola, Amaravati, Buldhana, Jalgaon, Latur, Osmanabad and



Parbhani) have moderate mean annual rainfall (650-800 mm). Three districts (i.e. Aurangabad, Beed and Jalna) have a relatively lower mean annual rainfall (500-650 mm).

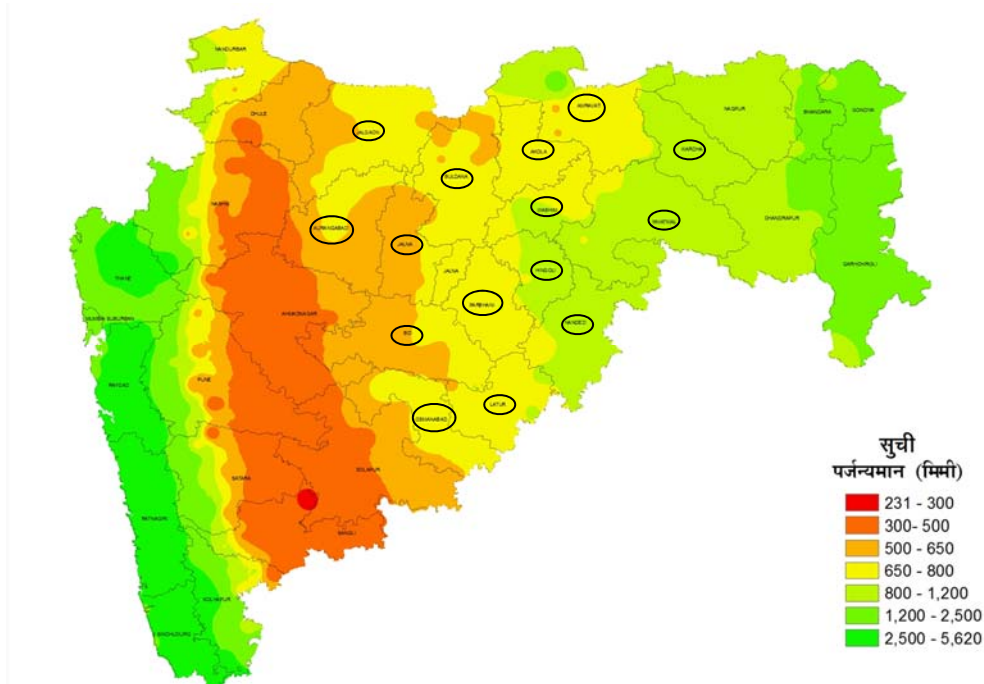


Figure A4.1: Rainfall distribution in the project districts (shown with circles)

5. The groundwater levels in these 15 districts are monitored rigorously by GSDA and CGWB. There are approximately 666 sub-watersheds in these 15 project districts and the corresponding recharge and groundwater draft are assessed using the GEC (1997) norms by these agencies. Table A4.2 presents the distribution of sub-watersheds in these 15 districts. The table also highlights the irrigation wells that were recorded in the survey in 2008 in these districts along with wells per km². Among the low rainfall districts the Aurangabad and Jalgaon have relatively higher density of irrigation wells (>7.5 wells/km²). In moderate rainfall districts Latur and Osmanabad record also relatively higher density of irrigation wells (~ 9.0 wells/km²). Apart from these four districts, the other eleven districts have relatively lower density of irrigation wells.

6. At state level, Irrigation is the major groundwater draft component, with over 93 percent, against the Domestic component with less than 6.7 percent, and the Industrial component with less than 1 percent.



Table A4.2: Details of watershed in the POCRA districts

	District	Number of sub-watersheds	Area (km ²)	Number of irrigation wells (in 2008)	Number of irrigation wells (per km ²)	Mean annual rainfall (mm)
1	Akola	27	5,109	16,010	3.1	650-800
2	Amaravati	59	12,579	74,607	5.9	650-800
3	Aurangabad	55	10,154	83,286	8.2	500-650
4	Beed	50	10,917	65,898	6.0	500-650
5	Buldhana	55	9,948	57,453	5.8	650-800
6	Hingoli	23	4,812	40,832	8.5	800-1,200
7	Jalana	43	7,629	55,490	7.3	650-800
8	Jalgaon	66	11,539	87,779	7.6	500-650
9	Latur	36	7,121	63,931	9.0	650-800
10	Nanded	47	10,977	37,526	3.4	800-1200
11	Osmanabad	38	7,272	65,923	9.0	650-800
12	Parbhani	31	6,281	27,367	4.4	650-800
13	Wardha	39	6,328	39,525	6.2	800-1,200
14	Washim	35	5,361	26,602	5.0	800-1,200
15	Yavatmal	62	13,363	34,956	2.6	800-1,200

7. Deeper groundwater levels greater than 20 m are observed in around 2 percent of the wells area of 4,450 km² in the districts of Jalgaon, Buldhana, Akola and Amaravati. Shallow water tables (5-10m) are observed in 50 percent of the wells in an area covering around 191,000 km² in several districts (including Wardha, Yavatmal, Akola, Washim, Nanded, Hingoli, Beed project districts). About 17 percent of the wells fall in the category of 10-20m and are in the northern part of Maharashtra, in the Tapi and Purna river basins (i.e. Jalgaon, Buldhana, Akola and Amravati districts). Table A4.3 presents the number of CGWB monitoring wells as of 2015. The mean depth to groundwater for pre-monsoon season is also presented in the Table 2 for 2014-2015 along with the coefficient of variation of water levels, which presents the spatial variability.

8. Large parts of the state of Maharashtra (about 85 percent) is covered by hard rock, including Deccan basalts/Deccan traps or the basalts of western India. Groundwater occurrence in the Deccan traps is in phreatic condition in the weathered zone above the hard rock, and in semi-confined condition in the inter-trapped areas within the hard rock. These rocks have poor groundwater yielding capacity (specific yield ranges from 1 to 3 percent), thus restricting the groundwater availability. This being the reason dug wells, dug-cum-bored wells, and boreholes or bore wells are commonly used for obtaining groundwater. Recently, due to the ever-increasing number of dug wells and deep bore wells, the water table has been falling in several watersheds, especially in those lying in the semi-arid region, reinforcing the need to shift the emphasis from development to sustainable management.



Table A4.3: Groundwater level monitoring and mean depth to groundwater

	District	Number of sub-watersheds	Number of CGWB monitoring wells (dug wells in brackets)	Mean depth of groundwater level (m)	Coefficient of variation (%)
1	Akola	27	41 (32)	13.0	70
2	Amaravati	59	101 (82)	9.3	70
3	Aurangabad	55	38 (35)	11.3	45
4	Beed	50	42 (39)	9.8	45
5	Buldhana	55	65 (52)	9.2	51
6	Hingoli	23	26 (26)	10.4	37
7	Jalana	43	42 (35)	9.9	37
8	Jalgaon	66	56 (50)	11.9	110
9	Latur	36	44 (37)	12.8	101
10	Nanded	47	57 (55)	9.5	49
11	Osmanabad	38	41 (38)	10.3	40
12	Parbhani	31	36 (33)	11.4	52
13	Wardha	39	66 (50)	7.4	33
14	Washim	35	43 (35)	7.6	37
15	Yavatmal	62	83 (59)	7.7	48

9. The estimated groundwater recharge in the state is represented in Figure A4.4, along with the assessed total groundwater draft in billion cubic meters (BCM) for the year 2013. The stage of development is approximately 54%. Figure A4.5 depicts the temporal changes in the groundwater draft between 1998-2013 and indicates that the groundwater draft has been increasing over the years, reinforcing the need for PoCRA to focus on sustainable management of aquifers, including through Managed Aquifer Recharge.

10. The groundwater availability in the POCRA districts is presented in Table A4.6, computed based on assessments in 2013-2014 by GSDA. The overall stage of development in the 15 districts is about 54%. The table presents the stage of development in each of the project districts. Amaravati, Aurangabad, Buldhana, Jalagaon, and Latur indicate relatively higher stage of development i.e greater than 70%. The table also presents the categorization of sub-watersheds in the POCRA districts based on GEC (1997) norms. It is observed that among the 612 sub-watersheds assessed 80 (or around 13 percent) are categorized as semi-critical and overexploited.

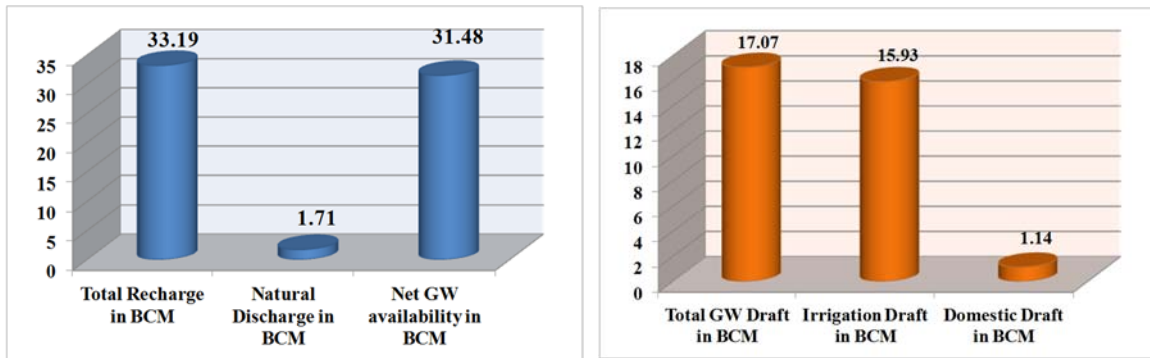


Figure A4.4: Groundwater recharge and groundwater draft for the Maharashtra state

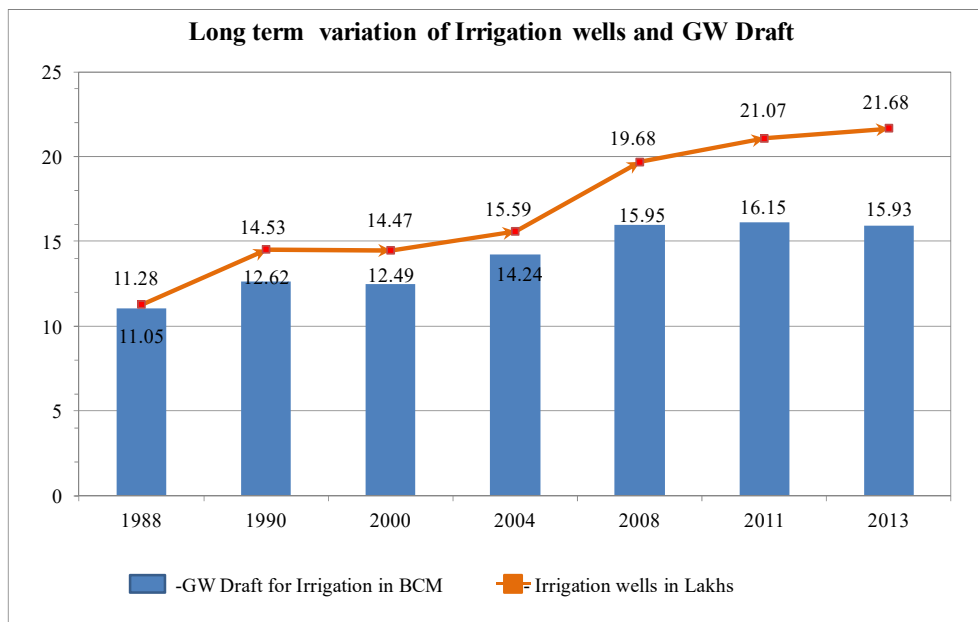


Figure A4.5: Temporal changes (1998-2013) in groundwater draft

11. The 8-day evapotranspiration in all the 666 watersheds of the POCRA districts was estimated for 2001-2014 using the approaches (energy balance method and remote sensing) developed at IISc. Using these estimates, the annual evapotranspiration for each year was computed in all the watersheds and for all the POCRA districts. Figure A4.8 presents the temporal changes in the ratio of evapotranspiration over mean annual rainfall (ET/P) during 2001-2009 and 2010-2014 periods for the POCRA districts. Clearly, in all the districts the ET/P increased in the present decade relative to the previous decade and this is consistent with the observed increase in irrigated area in Figure A4.5.



Table A4.6 Dynamic groundwater assessment for 2013-14 by GSDA for POCRA districts

ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES OF THE MAHARASHTRA - 2013-2014								
Unit-District		(in MCM)						
Sr No.	District	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses (11+12)	Provision for domestic and industrial requirement supply to next 25 years	Net Ground Water Availability for future irrigation development (10-11-14)	Stage of Ground Water Development (13/10 * 100)%
1	Akola	404.28	161.47	14.14	175.60	28.20	214.61	43.44
2	Amravati	965.24	674.96	28.71	703.66	51.21	302.29	72.90
3	Aurangabad	1062.20	773.57	32.89	806.46	64.27	232.75	75.92
4	Beed	1302.28	654.54	48.96	703.50	97.93	549.81	54.02
5	Buldhana	944.48	642.79	35.66	678.45	68.42	245.55	71.83
6	Hingoli	898.70	362.51	20.63	383.14	41.25	494.94	42.63
7	Jalgaon	1395.55	1020.10	48.82	1068.92	86.71	325.55	76.60
8	Jalna	844.64	437.71	13.61	451.31	27.22	379.72	53.43
9	Latur	679.82	511.12	22.49	533.62	40.86	149.81	78.49
10	Nanded	1338.84	347.25	33.10	380.35	66.19	925.40	28.41
11	Osmanabad	922.13	547.52	23.06	570.58	44.47	332.27	61.88
12	Parbhani	823.15	354.14	20.15	374.29	40.10	428.91	45.47
13	Wardha	828.25	373.07	37.56	410.62	75.11	380.07	49.58
14	Washim	570.53	201.74	16.15	217.89	32.31	336.49	38.19
15	Yeotmal	1337.43	215.54	57.53	273.07	115.05	1006.83	20.42
	TOTAL	14317.52	7278.03	453.44	7731.47	879.28	6305.01	54.21

Table A4.7 Categorization of sub-watersheds in the POCRA districts

ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES OF THE MAHARASHTRA						
SUMMARY OF ASSESSMENT UNIT-WISE CATEGORIZATION - 2013-2014						
No.	District	Assessment Unit (Watershed)				
		Over-exploited	Critical	Semi-critical	Safe	Poor Quality
1	2	3	4	5	6	7
	Akola	0	0	1	36	1
	Amravati	7	1	4	48	3
	Aurangabad	1	0	3	48	0
	Beed	0	0	1	47	0
	Buldhana	2	0	9	46	0
	Hingoli	0	0	0	23	0
	Jalgaon	10	2	12	42	0
	Jalna	0	0	12	40	0
	Latur	7	0	3	29	0
	Nanded	0	0	0	49	0
	Osmanabad	3	0	5	33	0
	Parbhani	0	0	0	33	0
	Wardha	0	0	0	39	0
	Washim	0	0	0	35	0
	Yeotmal	0	0	0	64	0
	Total	30	3	50	612	4

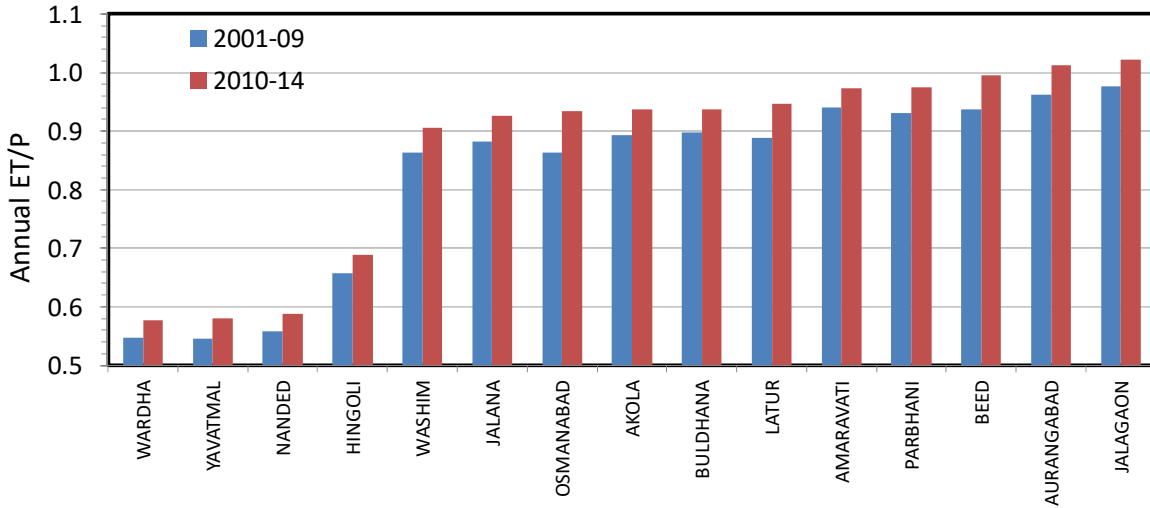


Figure A4.8: Ratio of annual evapotranspiration over precipitation over the past and current decade

12. The districts of Wardha, Yavatmal, Nanded and Hingoli show relatively lower ET/P ratios (<0.6 or ~0.7) as they are in the higher rainfall regimes, while Amaravati, Parbhani, Beed, Aurangabad, Latur and Jalagaon show relatively higher ET/P ratios (greater than 0.9). Among these four, Aurangabad, Beed and Jalagaon have relatively lower mean annual rainfall i.e 500-650 mm and hence the higher ET/P ratios. Amaravati, Latur and Parbhani are showing higher ET/P ratios even though in moderate rainfall regimes. The stage of groundwater development and the groundwater levels (Table A4.2) in Amaravati and Latur showed this effect distinctly.

13. The extensive data sets and investigations pertaining to groundwater use and monitoring of groundwater levels by GSDA and CGWB suggest that a carefully planned development in POCRA watersheds is feasible without further deteriorating the prevailing conditions of stage of development. The extensive computation of ET each 8-day for the last 15 years (2001-14) at a granularity of 5kmx5km in these watersheds provides an opportunity to assess the temporal changes and mean levels to identify higher groundwater use zones and develop good water budget for improved management plans. Such approaches would be very much desired in the already existing watersheds for careful planning without causing distress to groundwater conditions while bringing irrigation to rainfed lands and buffering the adverse climatic anomalies such as droughts.



**ANNEX 5: MAIN CLIMATE-RESILIENT AGRICULTURAL TECHNOLOGIES
AND AGRONOMIC PRACTICES PROMOTED BY THE PROJECT**

Agric. Technology Agron. Practice	Main resilience feature and contribution to the climate agenda	Main agronomic benefits expected	Potential triple-win impact under PoCRA	Yield improvement due to climate resilient intervention ^{16 17}
Improved seed varieties	Adaptation to adverse climate conditions through use of climate-smart seed varieties (short maturity duration, stress-tolerant)	Reduces risk of major crop losses due to adverse weather. Helps preserve crop mix even with late onset of monsoon.	Increased crop productivity Improved water use efficiency	In Aurangabad (<750mm rain): short-duration and drought-tolerant varieties pigeon pea: +30 to 40% soybean: +15 to 20%
Contour furrow/bunds cultivation	Enhanced capacity to manage water run-off and surface drainage to protect against soil erosion following high intensity precipitation	Collects run-off from the catchment to improve soil moisture on the cropped area. Encourages controlled surface drainage. Reduces soil erosion and nutrient losses.	Increased crop productivity Enhanced soil health Improved water security	In Akola (500-1,000mm rain): Conservation furrow Soybean: +17% In Aurangabad (500-1,000mm rain): Conservation furrow Pigeon pea: +15% In Amravati (500-1,000mm rain): Bunding Soybean: +32%
Broad Bed and Furrow (BBF) cultivation	<i>In situ</i> water conservation practice that strengthens the farming system's capacity to cope with dry spells during rainy season	Encourages moisture storage in the soil profile. Disposes safely of surplus surface run-off without causing erosion. Provides a better drained and more easily cultivated soil in the bed Possibility to re-use run-off water stored in small tanks	Increased crop productivity Enhanced soil health Improved water security	In Amravati (500-1,000mm rain): Soybean: +22 to 43%

¹⁶ Ch. Srinivasa Rao, K.A. Gopinath, J.V.N.S. Prasad, Prasannakumar, A.K. Singh (2016): *Climate Resilient Villages for Sustainable Food Security in Tropical India: Concept, Process, Technologies, Institutions, and Impacts*. In: *Advances in Agronomy*, Vol.140, by Donald L. Sparks, ed. (2016)

¹⁷ Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad (2015): *Technology Demonstrations – Enhancing resilience and adaptive capacity of farmers to climate variability*. NRM and Agricultural Extension Divisions. ICAR.



Agric. Technology Agron. Practice	Main resilience feature and contribution to the climate agenda	Main agronomic benefits expected	Potential triple-win impact under PoCRA	Yield improvement due to climate resilient intervention ^{16 17}
Intercropping	Climate-risk management strategy to help farmer cope with adverse climate events that may have a different impact on 2 crops grown simultaneously on the same plot	Reduces likelihood of total crop failure due to adverse weather. Crop diversification benefits (biological, financial) Ensures optimum use of soil moisture and nutrients. Helps with effective pest management.	Increased crop productivity Enhanced soil health Improved water security	In Aurangabad: (<750mm rain) Pigeon pea + pearl millet (3:3) Eq. yield of intercropping system: 2.0 t/ha Yield of sole crops: 1.6 t/ha In Akola: (>750mm rain) Pigeon pea + sorghum (1:2) Eq. yield of intercropping system: 1.3 t/ha Yield of sole crops: 0.8 t/ha
Integrated Pest and Nutrient Management	Enhanced absorptive capacity of the farming system to manage pest infestations and soil nutrient deficiency induced by high levels of humidity (pests) or prolonged droughts (nutrient deficiency).	Reduces nutrient deficiencies. Mitigates soil salinity. Reduces infestations. Reduces crop losses. Reduces use of chemical pesticides. Improves crop quality.	Increased crop productivity Enhanced soil health	
Mulching	Enhanced adaptive capacity of the farming system to cope with extreme temperature and high intensity rainfalls Improved in-situ soil moisture content. Carbon sequestration through decomposition of organic mulch	Reduces evaporation and increases soil water retention Insulates soil by providing a buffer from heat. Provides valuable nutrients and organic matter as the mulch breaks down. Inhibits the germination of weed seeds.	Increased crop productivity Improved water use efficiency Enhanced soil health	In Jehanabad (500-1,000mm rain) – not a PoCRA district Okra: +51% In Bengaluru (500-1,000mm rain) – not a PoCRA district Chili: +75%
Conservation tillage	Improved farming system’s adaptive capacity to cope with moisture stress, soil and nutrient losses. Carbon sequestration through incorporation of crop residues into the soil	Improves soil organic matter content and carbon sequestration. Reduces soil erosion Slows down water runoff and improves water availability	Enhanced soil health Improved water security	In Kushinagar (av. 1,200mm rain) not a PoCRA district Wheat: +21%
Protected cultivation	Enhanced transformative capacity of farmers to cope with climate variability through their partial or total control of micro climate	Cultivation of high-value crops in controlled environment More efficient use of inputs (including water) Effective control of pests and diseases Higher seed germination rate	Increased crop productivity Improved water use efficiency	In Pune (av. 720mm rain) Capsicum: +250%



Agric. Technology Agron. Practice	Main resilience feature and contribution to the climate agenda	Main agronomic benefits expected	Potential triple-win impact under PoCRA	Yield improvement due to climate resilient intervention ^{16 17}
Micro irrigation systems (drip, sprinkler) and farm ponds	Just-in-time on-farm water availability through enhanced storage capacity of surface water to cope with late monsoon rains and/or dry spells; increased water productivity and 'more crop per drop'	Increases rainwater harvesting and optimum use of harvested water Helps overcome moisture stress during critical stages through supplemental irrigation.	Improved water use efficiency Increased crop productivity	In Amravati (500-1,000mm rain): Farm pond + sprinkler Cotton, chickpea, wheat: +40% In Aurangabad (>1,000mm rain): Paddy, wheat, lentil: +78%



ANNEX 6: GREENHOUSE GAS ACCOUNTING

Context

1. The World Bank Environment Strategy (2012) adopted a corporate mandate to account for the greenhouse gas (GHG) emissions in investment lending. The quantification of GHG emissions is an important step in managing and ultimately reducing emissions, as it provides an understanding of the project's GHG mitigation potential. Further, the COP21 Paris Agreement also mandates the reporting of assumptions and methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions to achieve the goals in Article 2 of the Agreement.
2. The agriculture sector is one of the dominant sectors contributing to GHG emissions in India and at a global scale. The agriculture sector provides opportunities for reducing GHG emissions and in particular enhancing carbon stocks. Enhancing carbon stocks in semi-arid soils will have a positive co-benefit on crop yields and also in building resilience to moisture stress. Thus, synergies between enhancing carbon stocks and climate resilient agriculture development are likely.
3. To strengthen the capacity of smallholder farming systems prevailing in the project area to cope with adverse climate events, PoCRA will scale-up improved agronomic, water and soil nutrient management practices to build resilience in agriculture, while reducing the GHG emissions and enhancing carbon stock
4. The project will be implemented in 15 districts in Maharashtra, covering 4,210 villages affected by droughts, and 932 villages affected by saline and sodic soils. The total area expected to be covered by project interventions is approximately 2.9 million ha.

Accounting methodology

5. The Ex-Ante Carbon-balance Tool (EX-ACT), developed by FAO in 2010, is used to estimate the impact of agricultural investment lending on GHG emissions and carbon sequestration in the project area. EX-ACT is a land-based appraisal system that allows the assessment of a project's net carbon-balance, defined as the net balance of CO₂ equivalent GHG that are emitted or sequestered because of project implementation compared to a no project or without project scenario. EX-ACT captures project activities in the following five modules: land use change, crop production, livestock and grassland, land degradation, inputs and investment.

Project activities relevant for the analysis

6. Under PoCRA, several interventions are proposed to promote climate resilience on approximately 2.9 million ha arable land in the 15 districts of Marathwada and Vidarbha regions. Most of the practices or interventions are likely to have implications for carbon stocks. Table A6.1 provides an overview of project activities and related assumptions for the 'With' and 'Without' project scenarios. Tier-1 coefficients are used throughout, and linear dynamic of change is assumed. It is assumed that the Without-project situation is the same as the 'Start' project, unless otherwise indicated under Tier-1.
7. The relevant climate resilient agricultural technologies and agronomic practices proposed under the project and considered for GHG accounting, considering the EX-ACT modules, include: no till



and residue retention, nutrient management, improved agronomic practices, water management, manure application and crop residue management.

Results of the GHG Balance Analysis

8. Agriculture development and natural resource management projects are normally expected to contribute to net GHG (in particular CO₂) benefit, as a co-benefit to the resilience building objectives. Table A6.1 presents the impact of the project activities on GHG balance including emissions from inputs in the form of fertilizers, pesticides and energy use (electricity and diesel consumption). The *ex-ante* estimation of the GHG balance using Tier 1 for the CRA project is shown to be negative, which means **project implementation will lead to a net carbon sequestration co-benefit**. The main sources of GHG emissions are the inputs such as pesticides, electricity, and diesel and livestock rearing. All other interventions are projected to contribute to increasing carbon stocks in soil and tree biomass. Achieving an increase in carbon sequestration is an important co-benefit of the CRA project. The results indicate a negative **GHG balance of -113,250,881 tCO₂eq over a period of 20 years**. The mean annual GHG balance for the project is estimated to be -5,502,523 tCO₂eq/year. The **net GHG benefit on a per hectare basis for the project area is estimated to be -1.9 tCO₂/ha/year**. The negative GHG balance estimated using EX-ACT shows that the CRA project interventions will lead to net GHG emission reductions or net CO₂ sequestration, over the baseline or 'Without' project scenario. Hence, project will contribute to climate change mitigation. The details of the assumptions and scenarios for the sensitivity analysis are presented at the end of this annex.

Table A6.1: Greenhouse gas accounting for PoCRA (EX-ACT methodology)

Project activities	GHG balance over 20-year period (tCO ₂ eq)			GHG balance per year (tCO ₂ eq/yr)		
	w/o project scenario	with project scenario	net carbon balance	w/o project scenario	with project scenario	net carbon balance
AGRICULTURE						
Annual	-4,665,977	-103,638,688	98,972,711	-232,398	-5,021,913	-4,789,515
Perennial	--	-156,519	-156,519	--	-7,826	-7,826
LAND USE CHANGE						
Afforestation		-14,191,485	-14,191,485		-709,574	-709,574
LIVESTOCK						
Goats, Poultry		49,279	49,279	--	2,464	2,464
INPUTS AND INVESTMENTS						
Fertilizer						
Pesticides	69,090,103	69,128,667	38,564	3,454,505	3,456,433	1,928
Energy						
AGGREGATE						
Net Total (tCO ₂ eq)			-113,232,872			-5,502,523
Per hectare (tCO ₂ eq/ha)			-39.2			-1.9



Notes for Table A6.1:

1. Negative values indicate Net GHG benefits i.e. CO₂ sequestration; positive values indicate Net GHG losses, i.e. CO₂ emission
2. Estimates include proposed interventions for both *Kharif* (monsoon) and *Rabi* seasons
3. Tier 1 method is adopted due to lack of data on emission and sequestration coefficients for all the crops and resilience interventions, However, the monitoring phase could adopt Tier 2 method of EX-ACT.
4. The area under 'Start' scenario and 'Without' project scenario is assumed to be the same, since the area under different crops especially under rainfed agriculture varies from year to year, depending on the monsoon rainfall, which is highly variable. There is therefore no clear year to year trend that can be observed in the area under different crops.

Sensitivity Analysis

9. In addition to the original project scenario, two other scenarios with lower levels of adoption rates for different improved management practices are considered to assess the implications on the GHG balance. The details of scenarios and the associated adoption rates of improved practices are given in Table A6.3, and the estimates are provided in Table A6.2.

- (a) Under the Project Scenario 1, the total net GHG balance over a period of 20-years for the total project area is estimated to be -113 million tCO₂-eq. This leads to a per hectare net GHG benefit of 1.9 tCO₂-eq/year
- (b) Under Sensitivity Scenario 2, the total net GHG balance is estimated to decline to -98 MtCO₂-eq. This leads to a per hectare net GHG benefit of 1.7 tCO₂-eq/year
- (c) Under Sensitivity Scenario 3, the total net GHG balance is estimated to be -88 MtCO₂-eq. This leads to a per hectare net GHG benefit of 1.5 tCO₂-eq/year.

Table A6.2: Sensitivity analysis for PoCRA greenhouse gas accounting (using EX-ACT methodology)

	Net GHG Balance under Project Scenario		Net GHG Balance under Sensitivity Scenarios	
	<i>Scenario 1</i>	<i>Scenario 2</i>	<i>Scenario 2</i>	<i>Scenario 3</i>
Net Total (tCO ₂ -eq)	-113,250,881	-98,335,444	-98,335,444	-88,080,366
Per hectare (tCO ₂ -eq/ha)	-39.2	-34.03	-34.03	-30.47
Per hectare/year (tCO ₂ -eq/ha/year)	-1.9	-1.7	-1.7	-1.5

Assumptions and details of Sensitivity Analysis

10. The following assumptions, based on information provided by the PMU, were made to the GHG calculations and sensitivity analysis:

- a. **Accounting Period** for GHG balance is 6 years of project implementation period and 14-years of capitalisation period, where project benefits continue to accrue, totalling 20 years period.



- b. **Land Use Change** was considered for afforestation (degraded land to tropical forest) to the tune of 35,000 ha.
- c. **Climate-resilient technology adoption:** it is expected that management interventions such as improved agronomic practices, water-use efficiency (through micro irrigation systems), improved nutrient management, and manure application will be adopted under the project scenario. The rates of adoption of different improved practices are presented in Table A6.3.
- d. **Horticultural fruit trees or perennial crops** are proposed under the project for an area of 27,900 ha.
- e. **Livestock and Grassland:** livestock population is expected to increase in the project scenario by about 10,000 goats and 500 poultry. No other intervention under management of livestock and management of grassland or grazing land has been accounted for.
- f. **Fertilizer:** it is assumed that the current rate of consumption of chemical fertilizers would continue under the project, despite increase in the area to be brought under irrigated crops, due to adoption of integrated nutrient management practices. Thus, no net emissions are accounted for.
- g. **Pesticide:** it is assumed that pesticide use will decrease by 15% under the project scenario, due to adoption of IPN management practices, despite increase in area under irrigated crops.
- h. **Electricity:** it is assumed that electricity consumption will increase by 10% under the project scenario, due to increased area under irrigation.
- i. **Diesel:** It is assumed that diesel consumption will increase by 5% under the project scenario due to increased processing and mechanization.

11. The Sensitivity Analysis is carried out for the three scenarios presented in Table A6.3. The Sensitivity Analysis is carried out only for the annual crops, since they dominate the GHG balance estimates.

Table A6.3: Adoption rates of climate-resilient technologies and agronomic practices under various scenarios for Sensitivity Analysis

Climate-Resilient Agriculture (CRA) interventions	Adoption rate of CRA interventions under various scenarios			
	w/o Scenario (i.e. current baseline)	Scenario 1	Scenario 2	Scenario 3
Nutrient Management	0	70%	60%	50%
Agronomic Practices	15%	70%	60%	50%
Water Management	15%	70%	60%	50%
Manure Application	20%	30%	25%	20%



ANNEX 7: ECONOMIC AND FINANCIAL ANALYSIS

Summary of project description

1. The project's goal is to develop and/or promote agricultural production systems that are able to cope with changing climatic conditions, while enhancing farm productivity and facilitating the participation of small and marginal farmers in agricultural value chains.
2. The project will be implemented in 15 districts in Maharashtra, covering 4,210 villages affected by droughts, and some 932 villages affected by saline and sodic soils. The total area expected to be covered by project interventions is approximately 2.2 million hectares. Direct project beneficiaries, estimated at 1.7 million, are primarily small and marginal farmers (households with up to 2.0 ha of farm land) whose livelihood is impacted by the changing climatic conditions and growing climatic uncertainties. They will be provided access to knowledge, to on-farm climate-smart agricultural technologies and practices, and to input and output markets.

Source of project benefits

3. The main project benefits for the targeted smallholder farmers are expected to come from: (a) improved *stability* in agricultural output and increased *productivity* of traditional crops through farmers' adoption of climate-resilient agriculture technologies and agronomic practices – such as short-duration or drought-tolerant varieties, intercropping, and better management of soil and water resources at the farm and watershed levels (see Annex 5 for yield improvement of CRA interventions); (b) *diversification* into new, suitably adapted, higher-value, climate resilient agriculture; and (c) improved *post-harvest value-addition*.

Improved output stability and increased crop productivity

4. **Adoption of short-duration and drought-tolerant varieties.** There are a number of short-duration and drought-tolerant varieties for soybean, green gram, finger millet, pigeon pea, and other crops promoted in the project area, all which are suitable for generating higher agricultural yields when adequately managed by the farmer.

5. Adoption of improved cultural practices

- (a) Intercropping. Judicious combinations of crops have demonstrated greater productivity than sole cropping. Intercropping has potential to minimize risk by ensuring reasonable returns from at least one of the intercrops during the years of low rainfall while maximizing returns during the years of favorable rainfall.
- (b) In-Situ moisture conservation measures. In situ water harvesting using simple technologies enables greater water infiltration and promotes healthier crop growth. In-situ measures include conservation furrows, bunding, land leveling, compartmental bunding, sowing across the slope, ridge and furrow, trench cum bunding, contour farming, and others.
- (c) Treating Salt-Affected Lands. Maharashtra has about 607,000ha of salt affected lands, some of which are in the project area. The project intends to restore the productivity of 127,000ha.
- (d) Supplemental Irrigation. The project will support rainwater harvesting in farm ponds, check dams, percolation tanks, recharge pits, and wells with recharging structures to enable the collection of excess runoff during high intensity rains, and thus provide an opportunity to



farmers to undertake supplemental irrigation during deficient monsoon seasons. This will also facilitate double cropping depending upon water availability. This water will be utilized using water-saving sprinkler and drip irrigation systems to be supported under the Project.

6. The above project interventions will be carried out on the 2,198,522 ha as reported in Table A7.1 below.

Table A7.1: Distribution of planned PoCRA interventions at farm and watershed level

Area (ha)	Current Practice	Main CRA interventions under the project
1,879,522	Traditional rainfed agriculture with no irrigation	Climate-resilient agricultural practices (with no irrigation) Adoption of CRA practices: adoption of short maturity and stress-tolerant varieties, in-situ moisture conservation, and improved soil health practices.
126,000	Traditional rainfed agriculture with no irrigation	Climate-resilient agriculture with new irrigation and access to water Adoption of CRA practices as above, including for the restoration of saline/sodic soils; Introduction of micro irrigation systems (drip, sprinkler) with farm/community ponds, or check dams, dug wells, etc.
133,000	Traditional rainfed irrigation with conventional irrigation	Climate-resilient agriculture with improved irrigation and access to water Adoption of CRA practices as above; Introduction of micro irrigation systems (drip, sprinkler) with farm/community ponds for 88,000ha, and 45,000ha with improved structures such as check dams, dug wells, etc., to improve water-use efficiency relative to existing irrigation practices
60,000	Degraded land	Agroforestry and community-based forests in catchment areas

7. Increase in agricultural productivity as a result of adopting the recommended seed and agronomic practices highlighted above is projected at 20 percent under rain-fed conditions, whereas the increase in agricultural productivity as the result of drip irrigation is projected at 50 percent, to allow for variability in the available water over time (in years of consecutive severe drought, the available irrigation water decreases).

Diversification

8. **Protected Cultivation.** The project plans to facilitate 17,200 project beneficiaries to acquire protected cultivation structures for a combined total of 869ha. These will include shade net houses (9,350 shade net units of 500m² each), open ventilation poly-houses (350 units of 1,000m² each), and poly-tunnels (7,500 units, of 200m² each). Yield under protected conditions, with irrigation, is 1.5 to 3 times higher, compared to rain-fed outdoor cultivation, depending upon the type of crop and structure. Under the project, vegetables (tomatoes, capsicum, cucumber) and flowers (carnation, gerbera, and roses) are expected to be the principal crops cultivated under protected conditions.

9. **Tree Crops.** The project will support the development of agroforestry in catchment areas (for an aggregate area of 60,000ha) as well as fruit tree cultivation on farmland (9,300 ha), e.g *amla*



(Indian gooseberry), citrus, custard apple, guava, mango, and pomegranate. Farmers are expected to establish these trees on currently fallow or unproductive crop land.

10. **Livelihood activities** for resource poor community members. The project has also envisaged livelihood activities for 10,300 resource poor families in the project area. These include distributing goats and chicken, as well as supporting sericulture and apiculture.

Improved post-harvest management and value-addition

11. The project is supporting post-harvest infrastructure, including storage, handling, and processing facilities. These facilities will be part of the support for Farmer Producer Companies and will facilitate about 100,000 farmers to increase their share of the wholesale price received as well as save on inputs.

Other Project Benefits

12. Apart from benefits to farmers, project benefits will include a reduction in GHG emissions through on-farm carbon sequestration and the adoption of green technologies in agri-food processing.

Financial and Economic Analysis

13. Based on the above background information, and other requisite data (such as input requirements, tree-crop gestation periods, output levels, and market prices), a series of crop and farm budgets were developed for “With-Project” and “Without-Project” scenarios. A number of assumptions were made with respect to cropping patterns, cropping intensity, and input use. Adjustments were made to financial prices in order to derive prices for use in the economic analysis.

14. **Cropping Pattern and Cropping Intensity of Principal Crops.** The current *cropping pattern* among the traditional crops which dominate the cropping system in the Project Area is not projected to change significantly and was retained in the analysis (Table A7.2 below). Historically, the *cropping intensity* in the Project Area has varied widely depending upon moisture availability, especially during the Rabi season. It is projected to stabilize at around 120 percent due to project interventions.

Table A7.2. The Cropping Pattern of Traditional Crops in the Project Area

Khalif		Proportion
1	Cotton	39.5%
2	Oil Crops (predominantly Soybean)	27.6%
3	Pigeon Pea	10.5%
4	Khalif Jowar (Sorghum)	7.9%
5	Khalif Maize	3.9%
6	Green gram	3.9%
7	Black gram	3.9%
8	Pearl Millet	2.8%
Rabi		
1	Rabi Jowar (Sorghum)	41.0%
2	Chickpea	37.0%
3	Wheat	22.0%



15. **Input use.** The project will promote integrated pest management and optimal input use. Therefore, the use of fertilizer and pesticides is not expected to increase in the Project Area. However, labor use is assumed to increase by about 20 percent as most of the promoted field practices are labor intensive. Similarly, the use of machine and bullock labor is also expected to increase by about 20 percent.

16. **Other assumptions.** The projected incremental production in the project area is considered modest relative to the overall market size because of India’s commodity market integration, and is therefore not expected to adversely influence prevailing prices. Inflation is assumed to affect inputs and outputs equally over the project’s investment horizon. The opportunity cost of capital is assumed at 6 percent (also used in other projects in India). An investment horizon of 15 years is used in the analysis.

17. **Adjustments to Financial Value to Derive Economic Values.** Fertilizer prices were adjusted to remove subsidies. Where applicable, commodity prices were adjusted to remove protective import duties. A standard conversion factor of 0.9 was used on non-tradable goods.

18. **Project Internal Rate of Return (IRR) and Net Present Value (NPV).** Based on the above background and assumptions, the project’s IRR is estimated at 23 percent, with a corresponding NPV of US\$ 461 million.

19. **Economic Rate of Return (ERR).** The project’s ERR (before integrating benefits from carbon sequestration) is estimated at 22 percent, with a corresponding NPV of US\$ 415 million.

Sensitivity Analysis

20. A series of sensitivity analyses were performed to assess the impact of a possible 30 percent shortfall in expected benefits, a possible 30 percent cost overrun, or a combination of both. Results show that the return on the project’s investment would remain above the opportunity cost of capital in the simulated scenarios.

Table A7.3: Sensitivity analysis for the economic and financial analysis assessment of PoCRA

	Benefits down by 30 percent	Investment costs up by 30 percent	Benefits down and Investment costs up by 30 percent each
IRR	13%	16%	7%
NPV US\$ mill.	184	322	45
ERR	12%	14%	6%
NPV US\$ mill.	152	276	413

Greenhouse Gas Accounting

21. An analysis was conducted incorporating the social value of carbon. On the basis of a net balance of -1.9 tCO₂-eq per hectare and a social value of carbon starting at US\$ 34.4 in 2018, the ERR



was estimated at 85 percent¹⁸. This reduces to 76 percent and 68 percent when the net GHG balance drops to -1.7 and -1.5 tCO₂-eq/ha/year respectively (Table A7.4).

Table A7.4: ERR including outcomes of greenhouse gas accounting

	Net GHG Balance under Project Scenario	Net GHG Balance under Sensitivity Scenarios	
	<i>Scenario 1</i>	<i>Scenario 2</i>	<i>Scenario 3</i>
Per hectare/year (tCO ₂ -eq/ha/year)	-1.9	-1.7	-1.5
ERR	85%	76%	68%

¹⁸ In order to account for greenhouse gas emissions in economic analyses, the World Bank Group uses a carbon price, or social value of carbon, starting at US\$30 per ton in 2015 and rising to US\$80 by 2050. This corresponds to US\$ 34.2 per ton equivalent in 2018.



ANNEX 8: MINI WATERSHED PLANNING AND WATER BUDGETING

1. **Context.** The watershed planning process under the PoCRA project is conducted at the mini-watershed level. The project area is divided into 670 clusters covering 5142 villages. Each mini-watershed boundary conforms to a cluster boundary and to that particular local hydrological boundary. A mini-watershed cluster consists of about 5 to10 villages covering a total of approximately 5,000 hectares. Under the project, 670 mini-watershed plans are expected to be prepared in three phases: it is planned that 130, 350 and 190 mini watershed plans will be completed in Year 1, Year 2 and Year 3 of PoCRA implementation.

2. As part of the watershed planning, participatory micro planning exercises are conducted in each village. The development of micro watershed plans (at village level) is guided by a water budgeting exercise that takes into account both supply side (surface water, soil moisture and groundwater) as well as demand side components (crop requirement).

3. **Hydrological Framework.** An important aspect of the water balance tool is that it considers both spatial and temporal variations. In other words, the framework takes cognizance of different land use pattern in the village, slopes, soil types, soil depth, and accounts for these differences instead of an aggregated balance for the entire village. Additionally, it conducts a seasonal water balance, separating *kharif* season balance from *rabi* season balance. Fig.A8.1 shows the spatial and temporal variation of both ground and surface water in project areas. It also reflects a perspective framework for water budgeting for both Kharif and Rabi seasons

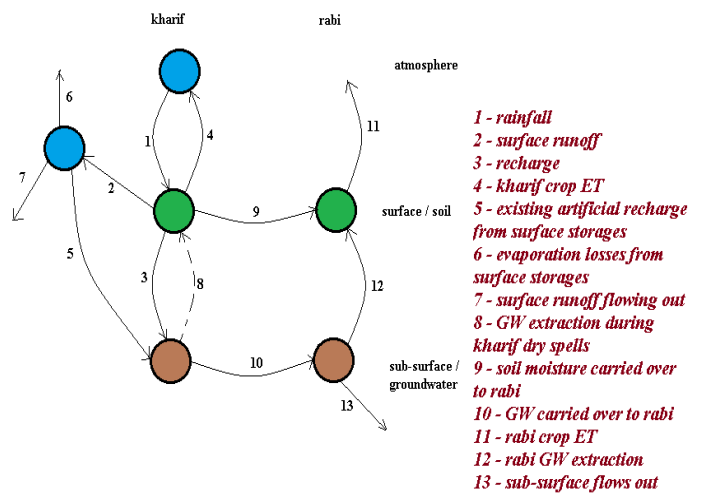


Fig. A8.1: Various stocks and flows of the water balance

4. The key outputs of the hydrological framework are: (i) identification of Kharif dry spell vulnerable zones, (ii) computation of available run-off for stress mitigation and preferred zones for creation of new structures, and (iii) computation of Rabi ground water availability.

5. **Kharif Season Water Balance.** Fig. A8.2 shows the main components of the water balance for Kharif season. The hydrological tool identifies Kharif stress zones within the agricultural farmland and computes the extent of crop stress as defined by the difference between its potential evapotranspiration load and the actual evapotranspiration (PET minus AET). This

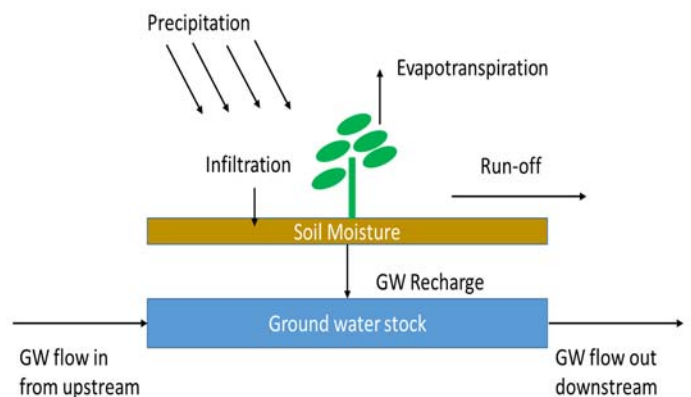


Fig. A8.2: Components of Kharif balance



exercise will help identify which zone within the village are most impacted during Kharif dry spells and the estimated extent of protective irrigation that may be required depending on the rainfall pattern. The second aspect of Kharif balance is to compute the cumulative run-off in different zones (supply side) and compare it with the Kharif deficit (demand side) to see which zones may be able to meet the Kharif protective irrigation demand by impounding run-off through existing or new structures. This analysis is done by computing the cumulative run-off at key points in the cluster in each Kharif deficit zone and comparing with the Kharif deficit. The cumulative run-off passing through these points is compared with the amount of Kharif protective irrigation required in that zone. This helps the field team identify zones which are most likely to benefit from line treatment with respect to Kharif dry spell mitigation and to propose suitable structures.

6. Figure A8.3 shows a sample output for the Hingoli pilot cluster. The graph shows circle rainfall (black bars), PET (yellow envelope) and calculated AET (blue). The gap between the yellow envelope and the blue envelope is the Kharif stress which is indicated by the solid colour. The second picture shows the spread of Kharif stress zones within Gondala cluster for year 2016. The darker the pixel, the higher is the vulnerability of the farms in the area. The vulnerable zone map overlaid with farm survey numbers is a key output of the hydrological framework.

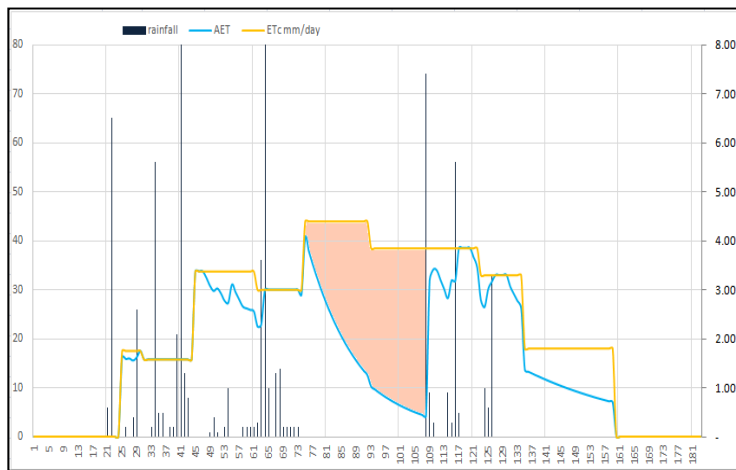
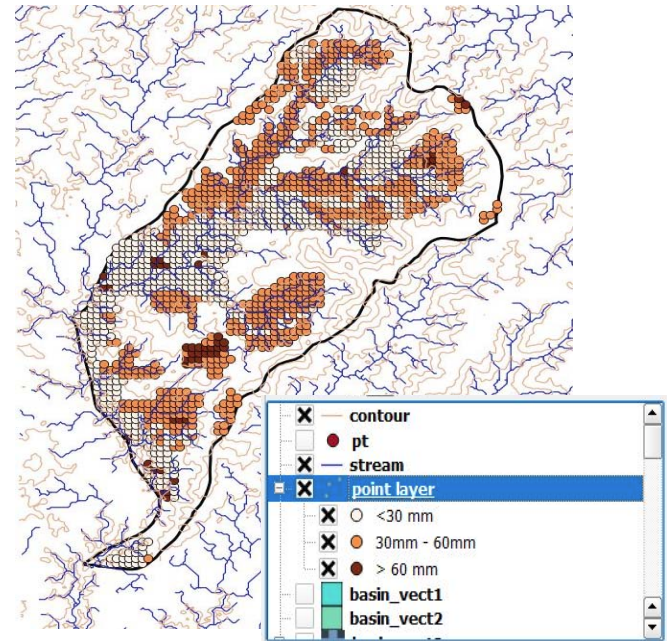


Fig. A8.3: Daily PET, AET for a location and Gondala cluster vulnerability map



7. A sample output for the run-off analysis is presented in Fig. A8.4. The daily circle level rainfall and the cumulative run-off is indicated. The map shows run-off calculations for two points of interest on the drainage line in Jamdaya village. These points are on two important streams that meet in the village. The map shows the watershed (or catchment area) of each of the two points and computes the total run-off as well as peak run-off that will pass through these points for a given rainfall. This is an important output of the hydrological model which will be useful to estimate the potential to impound water beyond existing structures in different streams especially at points that may be close to Kharif stress zones.

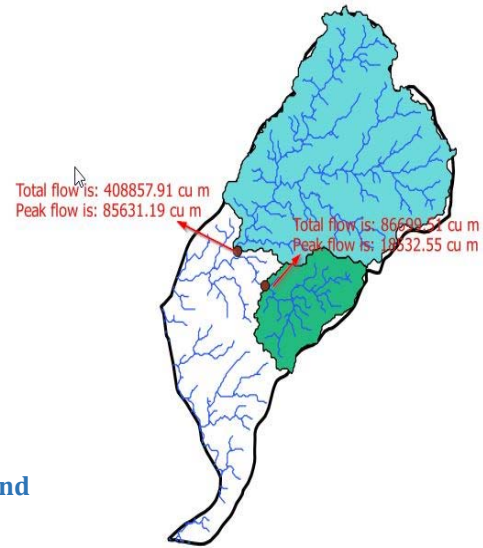
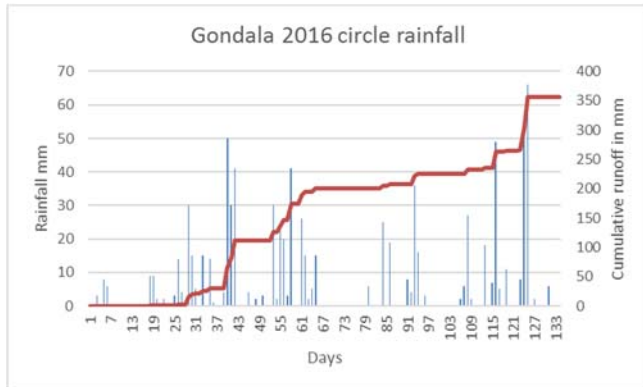


Fig. A8.4: Daily Rainfall, cumulative run-off and Total and Maximum daily run-off and key locations.

8. **Rabi Season Water Balance.** The third component of the hydrological balance in the Rabi groundwater computation. Fig.A8.5 shows the components of the Rabi water balance. Groundwater (GW) stock, which is built through recharge during the monsoon, plays a major role in Rabi. This stock varies depending on the geo-morphology and aquifer characteristics and the soil cover. Moreover, there is a base-flow, i.e., seepage of GW into streams (baseflow), GW flow in from upstream villages and flow out to downstream villages. This module is used to compute the total groundwater stock available in different regions (a) at the end of Kharif season and (b) possibly, monthly thereafter. This, when compared with the evapotranspiration load of the cropping pattern will determine zones where there is over-extraction and zones which are net positive in terms of contribution to groundwater.

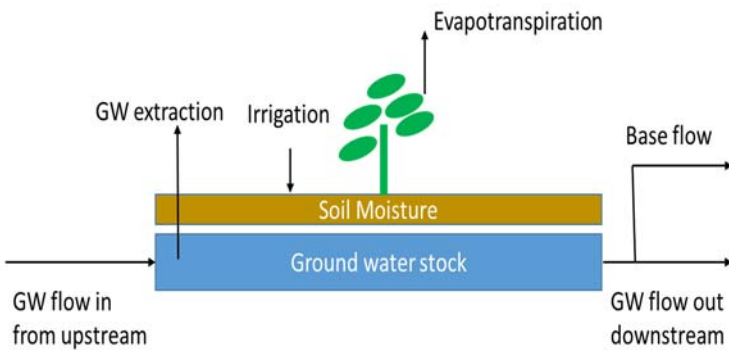


Fig.A8.5: Components of Rabi water balance

9. **Microplanning process and integration with hydrological assessment.** The microplanning and mapping of existing natural resources is an integral part of the mini-watershed planning process, and is to be conducted at the village level in each cluster and is guided by the hydrological framework. It does not only identify and map natural resources (arable land, none arable land, forest land, water bodies, grazing pressures points and drainage line within that defined catchments) but also prioritizes the interventions needed for enhancing the productive potential of those resources. This will be done in three phases:

- a. *Preparation phase of microplanning* includes identification of clusters and villages,



establishing stakeholder connections, preparation of resource material and orientation of field officials and facilitators.

- b. *The participatory microplanning process* is conducted at village level over seven days. It begins with the introduction of the project and its objectives, formation of the village resource group and mobilization activities. The microplanning activities include activities such as social mapping, seasonality *analysis*, timeline analysis of climate change and natural resources, resource mapping, transect walk, targeted group discussions and value chain analysis. The key component of the resource mapping is the water balance assessment and identification of vulnerable zones. The field teams will be equipped with maps that are the output of the hydrological model generated on the basis of secondary data. The microplanning teams will compute the demand for water considering the area under different crops, human and livestock population, to arrive at the total water requirement of the cluster. The PMU will provide supply side data (rainfall, runoff, soil moisture, deficit and ground water for different crops) with maps showing stream orders, soil details, land utility, habitats and land details to the microplanning team. This data will be used to compute the water balance of the cluster. The framework will generate current status (deficit/surplus) and scope for impounding more water. Based on computed water budget and the upper limit for runoff, management decision on quantity of additional engineering intervention structures (area treatment, drainage line treatment, farm ponds) in the cluster will be taken. Further the advisory for crop planning for next season in terms of additional area that can be brought under cultivation of Rabi/ Summer crops and perennial/horticulture crops will be made.
- c. Integrated cluster plans are developed based on stakeholder needs and are approved by the community through a *gram sabha* and women *gram sabha* on the final day of the process. The Village Climate Resilient Agriculture Management Committee (VCRMC) is formed and the completion of the process certified by the *Gram Panchayat*.
- d. *The post-microplanning process* comprises of a technical vetting process in which the plans approved in the *gram sabha* are vetted by a team of technical experts. The water balance computed using the hydrological model is useful in the technical vetting. Based on these technically vetted plans, a detailed Cluster Development and Investment Plan (CDP) will be developed which serves as the basic unit of planning for this project. The CDP and the Annual Action Plan are approved by the PMU after recommendation by the District Coordination Committee.



ANNEX 9: PROJECT M&E MATRIX AND GLOSSARY OF INDICATORS

Item	WB CRIS	Baseline Value (Year 0)	Value	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 (end of project)	Frequency of data collection	Data source	Comments (to be filled at time of reporting)
PDO Level Indicators												
1. Climate resilient agriculture: Increased water productivity												
Water productivity in kg.m ⁻³ : ag. production / water consumption (change relative to baseline: %)	No	0.23 kg.m ⁻³ (0%)	Target	--	--	0.253 (+10%)	0.253 (+10%)	0.265 (+15%)	0.276 (+20%)	Annual	PoCRA MIS	
			Actual									
2. Climate resilient agriculture: Improved yield uniformity and stability												
Spatial and temporal yield variability for oilseeds (soybean) (coefficient of variation CV crop yield)	No	CV-Space: 30%	Target	--	--	CV-S: 25%	--	--	CV-S: 23% CV-T: 38%	Mid-term End-of-project	PoCRA MIS	
		CV-Time: 52%	Actual	--	--	--	--	--				
Spatial and temporal yield variability for pulses (pigeon pea) (coefficient of variation CV in crop yield)	No	CV-Space: 39%	Target	--	--	CV-S: 33%	--	--	CV-S: 30% CV-T: 36%	Mid-term End-of-project	PoCRA MIS	
		CV-Time: 44%	Actual	--	--	--	--	--				
3. GHG Accounting: Carbon sequestration and Greenhouse Gas emissions reduced												
Net GHG emissions (in '000 tCO ₂ eq/year)	Yes	-233	Target	--	--	--	--	--	-4,789	End of project	EX-ACT model (PMU)	
			Actual	--	--	--	--	--				



Item	WB CRIS	Baseline Value (Year 0)	Value	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 (end of project)	Frequency of data collection	Data source	Comments (to be filled at time of reporting)
4. Annual farm income												
Farm income comparator (total; male & fem. landholders) (as ratio with/without project)	No	1.00	Target	--	--	T: 1.20 M: 1.20 F: 1.20	--	--	T: 1.50 M: 1.50 F: 1.50	Mid-term End of project	PoCRA MIS	
			Actual	--	--		--	--				
5. Direct project beneficiaries												
Number of farmers reached with agricultural assets or services (% of female)	Yes	0 (0%)	Target	12,000 (20%)	400,000 (25%)	600,000 (28%)	800,000 (30%)	1,000,000 (33%)	1,320,000 (35%)	Semi annual	PoCRA MIS	
			Actual									
Intermediate Outcome Indicators - Component A: Promoting Climate-resilient Agricultural Systems												
6. Climate resilient agriculture: Farmers adopting improved agricultural technology												
Farmers adopting improved agricultural technology promoted (% of female)	Yes	0 (0%)	Target	9,800 (20%)	309,800 (25%)	719,800 (28%)	1,156,800 (30%)	1,255,800 (33%)	1,272,800 (35%)	Annual	PoCRA MIS	
			Actual									
7. Climate resilient agriculture: Improved water-use efficiency at farm level												
Area provided with new/improved irrigation or drainage services (in ha)	Yes	0	Target	7,000	50,000	200,000	470,000	600,000	624,000	Annual	PoCRA MIS	
			Actual									



Item	WB CRIS	Baseline Value (Year 0)	Value	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 (end of project)	Frequency of data collection	Data source	Comments (to be filled at time of reporting)
8. Climate resilient agriculture: Improved availability of surface water for agriculture												
Surface water storage capacity from new farm and community ponds (in 1,000 m ³)	No	0	Target	5,200	24,700	56,000	78,300	83,900	83,900	Semi annual	PoCRA MIS	
			Actual									
9. Climate resilient agriculture: Enhanced soil health at farm level												
Area with GAPS for improved management of saline and sodic soils (in ha)	No	0	Target	3,000	26,000	66,000	106,000	116,000	127,000	Semi annual	PoCRA MIS	
			Actual									
Intermediate Outcome Indicators - Component B: Climate-smart Post-harvest Management and Value-chain Promotion												
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 %)	No	28	Target	30	30	32	32	35	35	Annual	PoCRA MIS MSSC	
			Actual									
11. Farmer Producer Companies: Strengthened and financially sustainable FPCs												
Number of project-supported FPCs with growth in annual profits	No	0	Target	--	20	55	115	165	200	Annual	Audited financial statements	
			Actual									



Item	WB CRIS	Baseline Value (Year 0)	Value	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 (end of project)	Frequency of data collection	Data source	Comments (to be filled at time of reporting)
Intermediate Outcome Indicators - Component C: Institutional Development, Service Delivery and Knowledge for Climate-resilient Agriculture												
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 15)	No	0	Target	--	7	15	15	15	15	Annual	ATMA	
			Actual									
13. Climate Innovation Center: Private sector participation												
Number of clients (FPOs, SMEs, ...) receiving services from the CIC	No	0	Target	--	--	--	100	150	200	Annual	CIC	
			Actual									
Cross-cutting Indicators												
14. Beneficiary Participation and Civic Engagement												
Number of approved participatory mini watershed plans implemented / under implementation	No	0	Target	130	480	670	670	670	670	Semi annual	PoCRA MIS	
			Actual									



GLOSSARY OF PROJECT INDICATORS

PDO Level Indicators

1. Climate resilient agriculture: Improved water productivity

Definition

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). It is measured from Year 3 onwards and for *kharif* season only.

Details

Agricultural production data refers to the crop production output and is compiled from the yields for the main *kharif* crops: cotton, soybean, pigeon pea, green gram, and black gram. The yield data can be sourced from production estimates for the selected crops through the crop cut method on beneficiaries' fields. Evapotranspiration (ET) is used as a proxy for consumptive water use. ET data can be estimated at *taluka* level for the cropping period chosen using the water balance and/or the energy balance tools developed for the project. All the data is collected and generated by the project's M&E firm and shared with the PMU's M&E specialist.

2. Climate resilient agriculture: improved yield uniformity and stability

Definition

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).

Details

The CV for crop yields indicates the variability – and hence the climate vulnerability – of farmers growing that particular crop. The lower the CV, the lower is the yield variability and climate vulnerability. Project interventions are expected to bring down the yield variability, thus giving stability in the crop production and hence reducing climate vulnerability. CV is defined as standard deviation divided by mean. In addition to the baseline values generated, CV-S is reported at project mid-term and at the end of project implementation, while CV-T is reported at the end of the project implementation only. The yield data is sourced from field surveys designed and carried out by the M&E firm and can be vetted against the official agriculture statistics at taluka level.

3. GHG Accounting: Carbon sequestration and Greenhouse Gas emissions reduced

Definition (corporate results indicator)

This indicator reports on the GHG emissions reduced as a result of climate-resilient agricultural technologies and agronomic practices introduced by the project.

Details

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. The indicator value is negative if the project is reducing emissions, and positive if the project is increasing emissions. The indicator is based on an ex-ante estimation using GHG accounting methodologies acceptable to the Bank (e.g. FAO's EX-ACT tool). GHG accounting is only done ex-ante. If the project undergoes major restructuring or is subject to additional financing relevant to GHG



accounting, the ex-ante estimation of project net emissions needs to be recalculated at the time of restructuring or processing additional financing.

4. Annual farm income

Definition

This indicator tracks the annual farm income of 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.

Details

The indicator is reported for the total sample surveyed (T), for male landholders only (M) and for female landholders only (F). The indicator is reported at mid-term and at the end of the project implementation.

A ratio of 1.20 means that the average income of project beneficiaries is 20% higher than that of comparable landholders outside of the project area. The official definition of farm income applies for this indicator. The data is sourced from field surveys designed and carried out by the M&E firm and can be vetted against the official agriculture income statistics available.

5. Direct project beneficiaries: number of farmers reached with agricultural assets or services

Definition (corporate results indicator)

This indicator measures the number of farmers who were provided with agricultural assets or services as a result of project support.

Details

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 (e.g. soil & water testing, animal health/veterinary services), phyto-sanitary and food safety services, agricultural marketing support services (e.g. price monitoring, export promotion), access to farm and post-harvest machinery and storage facilities, irrigation and drainage, and finance. This indicator is reported on semi-annual basis; it is expressed in absolute number (cumulative) of total beneficiaries and as a percentage of that total number for the share of female reached. The information for this indicator is sourced from the project MIS and is based on the data entered by the Cluster Assistant.

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

6. Climate resilient agriculture: Farmers adopting improved agricultural technology

Definition (corporate results indicator)

This indicator measures the number of farmers who have adopted an improved agricultural technology promoted by activities supported by the project.

Details

Adoption refers to a change of practice or change in use of a technology that was introduced or promoted by the project. Technology includes a change in practices compared to currently used practices or technologies (seed preparation, planting time, feeding schedule, feeding ingredients, postharvest storage/ processing, etc.). If the project introduces or promotes a technology package in which the benefit depends on the application of the entire package (e.g., a combination of inputs such as a new variety and advice on agronomic practices such as soil preparation, changes in seeding time, fertilizer schedule, plant protection, etc.), this counts as one technology. This indicator is reported on semi-annual basis; it is expressed in absolute number (cumulative) of total adopters and as a percentage



of that total number for the share of female reached. The information for this indicator is sourced from the project MIS and is based on the data entered by the Cluster Assistant.

7. Climate resilient agriculture: Improved water-use efficiency at farm level

Definition (corporate results indicator)

This indicator measures in ha the total area of land provided by the project with new or improved irrigation or drainage services.

Details

This indicator includes: the area provided with new irrigation or drainage services (ha); and the area provided with improved irrigation or drainage services (ha). Irrigation or drainage services refers to the better delivery of water to, and drainage of water from, arable land, including better timing, quantity, quality, and cost-effectiveness for the water users. New irrigation or drainage services refers to the provision of irrigation and drainage services in an area that has not had these services before. The area is not necessarily newly cropped or newly productive land, but is newly provided with irrigation and drainage services, and may have been rain-fed land before. Improved irrigation or drainage services refers to the upgrading, rehabilitation, and/or modernization of irrigation or drainage services in an area with existing irrigation and drainage services. This indicator is reported in ha (cumulative) on annual basis. The information for this indicator is sourced from the project MIS based on the basis of data entered by the Cluster Assistant.

8. Climate resilient agriculture: Improved availability of surface water for agriculture

Definition

This indicator measures the surface water storage capacity created with to project supported farm and community ponds.

Details

Typically, a farm pond of size 30*30*3m has the capacity to store some 1,970 m³ as per PDKV observations. The indicator is reported in 1,000 m³ on a semi-annual basis (cumulative). The information for this indicator is sourced from the project MIS based on the data collected and entered by the Cluster Assistant who is responsible for local monitoring of the works.

9. Climate resilient agriculture: Enhanced soil health at farm level

Definition

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.

Details

There are 932 project villages in the saline tract of the Purna river basin. Project interventions include subsurface soil drainage, application of soil amendments/ameliorates, improved agronomic practices, farm ponds, water lifting devices and micro irrigation systems. This indicator is reported in ha on an semi-annual basis (cumulative). The information for this indicator is sourced from the project MIS based on data collected and entered by the Cluster Assistant.



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

10. Seeds supply: Promotion of climate resilient crop varieties

Definition

This indicator measures the share of production area in the project with oilseeds and pulses, that is cultivated using certified seeds of improved varieties.

Details

The project promotes the use of certified seeds of climate resilient varieties. This indicator tracks the progress made on the use of these climate-resilient varieties, specifically for soybean (oilseeds), and pigeon pea and chick pea (pulses). This indicator is reported in percentage of the total area grown for these 3 crops. An indicator of 50% means that in the project villages, half of the farm area grown with soybean, chickpea and pigeon pea, is cultivated with certified seeds of stress-tolerant varieties. This indicator is reported in percentage on an annual basis. The information for this indicator is sourced from the project MIS based on the data entered by the Cluster Assistant who is responsible for the primary data collection on the sale of certified seeds reported by input dealers.

11. Farmer Producer Companies: Strengthened and financially sustainable FPCs

Definition

This indicator reports the number of project-supported Farmer Producer Companies with growth in annual profit.

Details

This indicator reports on the growth and sustainability of FPCs that receive project support. This indicator is reported as an absolute number (cumulative) on an annual basis. The data is collected by the M&E firm through the FPC survey designed and implemented and validated against the annual audited statements of project supported FPCs.

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

12. Research and Extension: Mainstreaming climate-resilience in agricultural research and technical advisory services

Definition

This indicator reports on the number of district-level, multi-year, Strategic Research and Extension Plan (SREP) that have mainstreamed climate-resilience.

Details

All 15 project districts have DPMU technically supported by KVKs and SAUs. The project supports the review and update of the current SREPs with the aim to mainstream climate vulnerability and its impact on farming in that district. This indicator is reported as an absolute number (cumulative) for year 2 and year 3 of project implementation. Revised, validated SREPs are sent by PD ATMA to PMU where the information is recorded by the M&E Specialist.

13. Climate Innovation Center: Private sector participation

Definition



This indicator tracks the number of clients (Farmer Producer Organizations, SMEs, ...) that receive services from the CIC.

Details

The CIC established by the project provides a broad range of services (e.g. business development, coaching, incubation, etc.) to growth-oriented private sector companies seeking to scale up their climate solutions in the project area and beyond. This indicator is reported as an absolute number (cumulative) from year 4 onwards. The information is sourced from the annual reports prepared by the CICs and submitted to the PMU where it is recorded by the M&E specialist.

Cross-cutting Indicators

14. Beneficiary Participation and Civic Engagement

Definitions

Number of approved participatory mini watershed plans implemented / under implementation

Details

Participatory planning of mini watershed-based clusters includes active involvement of farmers, village functionaries, local representatives and other community stakeholders who contribute to the actionable plan. This indicator is monitored on a semi-annual basis (cumulative). It is reported as an absolute number of participatory mini watershed plans approved by *Gramsabha*. The information is collected by the microplanning agencies from the offices of the SDAOs. The microplanning agencies submit the validated mini-watershed plans to the PMU where the data is recorded by the M&E specialist.

**ANNEX 10: GUIDING PRINCIPLES FOR THE MATCHING GRANT SCHEMES**

FARMER PRODUCER ORGANIZATION (FPO) MATCHING GRANTS		
	Core Activity	Standard Processing
1	Proposal for eligible sub-project is submitted online by the FPO to the DPMU for technical review.	Sub-project proposal with financial business plan to be prepared by FPO (with possible support from technical assistance provider). Online submission by FPO to DPMU using template provided by the project. Submission to include all documents required by PoCRA.
2	DPMU to carry-out technical review of the proposal. DPMU to recommend for pre-approval, additional information, or rejection.	DPMU to send Pre-Approval Letter to FPO, with copy to the FPO's financial institution (FI). Format of Pre-Approval Letter developed by PoCRA. The Letter confirms PoCRA's intention to support the sub-project proposal with a matching grant, provided FI agrees to financing with a loan for the FPO's sub-project proposal. PoCRA Pre-Approval Letter includes information on preliminary matching grant amount, as per applicable GoM cost-sharing norms for financial support to FPOs; as well as other key terms and conditions for final matching grant award and instalment procedures.
3	Pre-approved sub-project proposal to be forwarded by FPO to its FI for financial review.	FPO sends Pre-Approval Letter from PoCRA along with sub-project proposal (incl. financial business plan) to its FI for financial review
4	FI carries out due diligence for the sub-project proposal. FI agrees to sanction the FPO sub-project proposal with a loan; or requests additional information from FPO; or declines to provide loan financing for the sub-project.	FI review focuses on financial viability and sustainability of the proposed sub-project. FI informs FPO in writing about the outcome of its review of the sub-project proposal, with copy to the DPMU. If FI intends to finance the FPO sub-project through a loan, FI sends a written invitation to the FPO, with copy to the DPMU, to negotiate the Loan Agreement.
5	FI and FPO negotiate the Loan Agreement.	Loan Agreement covers all terms and conditions of the FI loan financing for the FPO's sub-project, and stipulates all legal and financial obligations of both parties contractually bound to the Agreement.
6	FI and FPO sign the Loan Agreement.	The FPO sends a copy of the signed Loan Agreement to the DPMU. After signing of the Loan Agreement, a loan account is opened with the FI in the name of the FPO.
7	FPO completes transaction with vendor/supplier/contractor	FPO instructs the FI to make a payment to the vendor/supplier for goods required for implementation of the sub-project. For works, payment is made to the contractor as per modalities spelled out in the contract between FPO and contractor.



8	Sub-project is completed and operational.	Completion and operationalization of the sub-project is to be confirmed through a joint inspection by DPMU and FI. Notification of project completion to be co-signed by FPO, FI and DPMU.
9	PoCRA matching grant is released into the FPO's loan account with the FI.	DPMU notifies PoCRA of sub-project completion, shares signed completion note. PoCRA releases matching grant amount in the loan account of the FPO. FI adjusts the balance of the outstanding loan to reflect partial reimbursement of the loan with the matching grant.
INDIVIDUAL FARMERS MATCHING GRANTS		
	Core Activity	Standard Processing (as per Gol/GoM Direct Beneficiary Payment)
1	VCRMCM identification of individual farmers.	VCRMCM recommends individual farmers and needs identified through the micro planning process and activities recommended in the Cluster Development Plan (CDP).
2	Application for eligible activities is submitted by the individual farmer.	Farmer submits application for activities to VCRMCM for preliminary review on eligibility and alignment with the CDP. Applications are sent by VCRMCM to PD-ATMA or SDAO for further review, depending on the nature of the activities (as per project guidelines).
3	Technical review of the application Pre-sanction of the application.	PD-ATMA/SDAO review the application on technical feasibility and provide recommendation to DSAO. If applicable, DSAO pre-sanctions the application within 1 month of submission by VCRMCM. A pre-sanctioned application shall be signed by the farmer and the relevant authority, and a copy sent to PMU and entered in the project MIS.
4	Activity implementation by the individual farmer.	The farmer executes the activities as per the specifications provided in the application (e.g. works, purchase of goods and equipment, etc.)
5	Farmer requests for instalment of matching grant.	Upon completion of the activities in the sanctioned application, the farmer requests in writing to the VCRMCM to initiate the field verification procedure that triggers the matching grant instalment.
6	Field verification: site inspection and validation of completed activities	Site inspection is carried out by Agriculture Assistant for the village who compiles a report, and sends it to SDAO who, if applicable, recommends release of the matching grant. SDAO sends report and recommendation to DSAO the matching grant releasing authority.
7	Approval and release of matching grant	Upon review of the report, the concerned authority shall approve and release in a single instalment the corresponding amount of the matching grant.



ANNEX 11: MAP OF THE PROJECT AREA

