



**Bihar Agricultural Management & Extension Training Institute**  
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Letter No. 89 /2016-17/BAMETI/ 6/6

Dated: 11.05.2017

**From**

**Ganesh Ram**  
**Director**  
**BAMETI, Bihar, Patna**

**To**

**Sri Sushil Kumar**  
**Manager, Climate Change Vertical,**  
**NABARD**

**Sub: - Clarification and revised project proposal for Scaling up Climate Smart Agriculture through main streaming under NAFCC project -reg.**

**Ref: - Your email dated 17.02.2017**

Sir,

With reference to the subject cited above I would like to invite your kind attention that clarification for each observation made by you along with revised project proposal for Scaling up Climate Smart Agriculture through main streaming under NAFCC is herewith submitting for your kind information and necessary action.

Thanking you

**Enclosure :- as above**

Yours Sincerely

*Sub 11/5/17*  
**Director**  
**BAMETI, Patna**



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Copy to - PPS to Principal Secretary, Agriculture, Bihar/ PS to Principal Secretary, Environment and Forest Department, Bihar/ CGM, NABARD, Patna/ Director Agriculture, Bihar/ Director, Environment and Forest, Bihar for kind information.

Sub 11/5/17  
**Director**  
**BAMETI, Patna**

**Clarification for observation made by NABARD for Scaling up Climate Smart Agriculture through main streaming climate smart villages in Bihar**

Observation No.	Details of observation	Clarification
1.	The best practices and framework of the CGIAR with respect to its technologies, policies, institutions and investments made in "Climate Smart Agriculture" implemented in Samastipur (as mentioned in the DPR) may be referred and key learning may be included in the given project interventions as well as same may be made a part of DPR as Annexure.	It has been included in proposal described on Page 27-30 of the project and rectified accordingly.
2.	Detailed break-up for each activity and corresponding funding requirement under table for project component and financing may be elaborated.	It has been elaborated in the project as per queries made by NABARD.
3.	Under project component 1: "Identifying and targeting different climate smart agriculture interventions ...in selected villages in Bihar", purpose of the survey may be clearly defined and the project interventions may be aligned with the findings of the survey.	The purpose of the survey has been given on the page 25 of the project. The main purpose of this survey is to identify the suitable interventions for a specific village based on the information of the socio-economic, climatic and geographical information of the village. This survey will help in developing the village development plan and help in integrating the other government schemes for overall development of the village.
4.	The list of survey equipment to be used under component 1 for survey may be clearly enlisted in the DPR.	The survey equipment will be tablet or android mobile including the GPRS charges for GPS data and other equipments for base line survey.
5.	Under activity 1.1.2 under details of financing, survey equipment are to be given to persons who are involved in survey work. Hence, number of survey equipment need	One surveyor /Facilitator / Skill youth for each two villages has been proposed and rectified accordingly in the project.

	not be equal to number of villages. The number of survey equipment may be restricted equal to number of surveyors engaged for the job.	
6.	Under project component 2: "Enhancing the capacities of stakeholders for ...the climate change adaptation strategies" relevance and rationale for the procurement of the tablets as a part of kits for implementing agricultural practices may be given. Further, details of the equipment's/components to be included as a part of the agricultural kit may be given.	It will be a tablet loading with the package of practices of different climate smart agriculture practices and will also include the field observation software and nutrient expert software for daily use by the field staff.
7.	Under project component 4: "Mainstreaming adaptation strategies, into ...better knowledge management, sharing and publicity", the details about proposed training material and learning modules may be given.	Two days workshop will be organized and module will be prepared as per situation. Details of knowledge product has been given in 4.2 in the project.
8.	Role of FIGs under activity 1.1.3 needs to be elaborated. The well-functioning farmers' collectives like Farmer Producer Organizations (FPOs) may be promoted by federating Farmer Income Groups (FIGs).	As per ATMA norms , FIG is constituted including 22 - 25 members only, where as FPO is constituted for more than 100 families for purchasing inputs collectively and facilitating market avenue to increase the income of farmers. That is why FPO has been proposed for end to end solution.
9.	Under project component 5: "Mainstreaming adaptation strategies, into ...better knowledge management, sharing and publicity", the details about the training material and learning modules proposed may be given.	It is not mentioned in the project component 5 but this query has been omitted in para 7 of the project component 4.
10.	While constructing the community irrigation structures, prevailing SoRs, specifications, rules and procedures of State Government may be followed. Further, various components of community irrigation structures may be elaborated along with cost implications.	The concept of the community irrigation model along with the tentative cost is given on the page no 23 as per the cost norms of Minor irrigation Dept. and Soil and water Conservation , Directorate of state government

11.	Detail about entity/institution which will maintain excellence centre at village level may be elaborated. In this connection, idea of engaging any existing farmers' collective like FPOs, Farmers' Clubs or well-functioning societies may be explored.	The role and responsibility and the corresponding budget is mentioned in the head 4. <u>Details of Project/Programme Components and Financing</u> on page 18 to 20 which has been rectified.
12.	In the forwarded DPR, only two pages of Result Framework is available. Entire result framework may be made part of DPR.	Expected output and out come for each indicator has been included on page no. 45-52.
13.	As per the decision of 9th meeting of the National Steering Committee on Climate Change (NSCCC) following aspects need to be taken into consideration while arriving the cost component under the project:	
13.1.	Project execution costs for adaptation projects under NAFCC should not exceed 2-3 % of the total costs, in addition to the cost of the National Implementing Entity fee of NABARD @3%.	Project execution cost has been proposed @3% and included in the project.
13.2.	Monitoring and Evaluation of activities will be undertaken by NABARD and third party evaluation by MoEF&CC. Therefore, no separate cost for monitoring and evaluation should be included under the project.	The Dept. Of Agriculture will also supervise and monitor regularly for maintaining the quality of the work .
13.3.	Knowledge management component should be part of the project supported by DST under National Mission on Strategic Knowledge. However, states not having such projects, the component on knowledge management may be supported depending on the requirement.	The State has not such project and hence it has been proposed.
13.4.	Subsidy to individual project beneficiaries under the project components should not exceed 50 % or corresponding scheme of the Government in case the same is an income generating component.	Subsidy to individual project beneficiary under the project components will be given as per norms of RKVY/ NFSM/ ATMA/ NHM / PMKSY

13.5.	Duplication with existing programmes, projects and other on-going schemes may be avoided. Separate analysis of this should be made in Appraisal / DPRs.	Separate villages and blocks will be selected to avoid for duplication with existing programmes.
13.6.	Convergence component should be budgeted in the project and source of funding to be indicated explicitly.	It has been clearly mentioned in the project. Budget for convergence component will come from Farm mechanization scheme / SMAM under GOI/ State Plan.

*bat* 11/5/17

**Director  
BAMETI, Bihar, Patna**

**Project Proposal on**  
**Scaling up Climate Smart Agriculture (CSA) through Mainstreaming Climate Smart Villages (CSVs) in Bihar**

Submitted by:  
Department of Agriculture  
Government of Bihar



**Strategic & Technical Support:**  
Borlaug Institute for South Asia (BISA), Pusa, Samastipur, Bihar and  
International Maize and Wheat Improvement Centre (CIMMYT), New Delhi  
CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS),  
CIMMYT-BISA, New Delhi  
**Implemented in collaboration with**  
RAU, BAU and ICAR-RCER

November, 2016

For

National Adaptation Fund for Climate Change (NAFCC),  
Ministry of Environment, Forest and Climate Change, Government of India

## 1. SUMMARY OF THE PROJECT

1. Title of Project/Programme:	Scaling up Climate Smart Agriculture (CSA) through Mainstreaming Climate Smart Villages (CSVs) in Bihar
2. Project/Programme Objective/s:	To improve the adaptive capacity of rural community to cope with climate risks through scaling appropriate climate resilient agriculture interventions in targeted villages of Bihar
3. Project/ Programme Sector:	Agriculture
4. Name of Executing Entities/Department:	Department of Agriculture, Government of Bihar
5. Beneficiaries:	Farming community of Bihar (Approximately, 300 villages will be the target beneficiary, amongst which 30% of the overall beneficiary under the project would be women)
6. Project Duration: Start Date: End Date:	3 years May 2017 (tentative) June, 2020 (tentative)
7. Project Cost :	Rs. 25,00,00,000
<u>Project Location</u> State: District:	Bihar Corridor-1: Darbhanga-Samastipur State Highway route Corridor-2: Nalanda-Shekhpora State Highway route
Total No. of family and villages covered under 04 districts Total Project Area	Total 10000 families in 100 villages 71725 ha
Contact Details of Nodal Officer of the Executing Entity/ies/:	Shri Ganesh Ram, Director, Bihar Agriculture Management and Extension Training Institute (BAMETI), Department of Agriculture, Government of Bihar
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## 2. PROJECT BACKGROUND

### 2.1. Project/ Programme Background and Context:

2.1.1. Provide brief information on the problem the proposed project/programme is aiming to solve

The State of Bihar with a geographical area of 94.2 thousand square km is divided by river Ganges into two parts, the north Bihar with an area of 53.3 thousand square km, and the south Bihar having an area of 40.9 thousand square km. Based on soil characterization, rainfall, temperature and terrain, three main agro-climatic zones in Bihar have been identified. These are: Zone - I (North West Alluvial Plain), Zone - II (North East Alluvial Plain), and Zone-III A & B (South Bihar Alluvial Plain), each with its own potential and prospects. All these zones have Chaur, Maund, Tal and Diara lands, which are submerged during the rainy season. The percentage of population employed in agricultural production system in Bihar is estimated to be 81%, which is much higher than the national average. Nearly 42 per cent of GDP of the state (2004-05) has been from agriculture sector (including forestry and fishing).



Fig. 1. Agro-climatic Zones of Bihar

High population density, largely dependent on agriculture coupled with low yields of the major cereal crops, is main reason for high poverty ratio in the state. Consequently, about 42 %

of the State population is below poverty line as against national average of 26%. As urbanization in the state is still very poor, nearly 90 per cent of the population lives in rural areas. The State of Bihar is also lagging behind the national average On all socio-economic indicators like per capita income, average size of operational holding, per capita cultivated land, percentage of villages electrified, road length per thousand sq km, per capita deposit, per capita bank credit, credit deposit ratio, male-female literacy, and life expectancy etc. Bihar is considered to be at the bottom. The gross and net sown area in the State is estimated at 80.26 lakh ha and 56.38 lakh ha., respectively. The intensity of cropping is 1.42%. The principal crops are paddy, wheat, pulses, maize, potato, sugarcane, oil seeds, tobacco, and jute. Rice, wheat and maize are the major crops. The average yields of rice and wheat are 1.45 and 2.19 t/ha, respectively, as against the production potential (experimental yields at research farm as well as realized in frontline demonstration) of 4.5-5.0 t/ha. Similarly, the average maize yield of the State is about 2.38 t/ha as against its yield potential of 6 t/ha. Winter maize is a success story, where the farmers have realized yield level of 6-8 tonnes/ha. Similarly, Boro Rice (summer rice) has the realization of 6-8 t/ha. Even though the State is rich in soil and water resources, its average yields of Rice, Wheat, Maize and Sugarcane in the state are only about 32, 44, 40 and 38 % of the potential yields, respectively. Sugarcane production and sugar industry hold great potential in Bihar.

Despite several positive factors of fertile soil, adequate rainfall and sufficient ground water, agricultural productivity in the state is very low due to its high vulnerability to natural disasters and climatic extremes due to which northern Bihar is generally a highly flood-prone while southern Bihar is highly drought prone and 17% of the country's flood prone are lies in Bihar alone. In addition to drought and flood, the other major climatic stresses are heat and nutrient stresses. Moreover the abiotic stresses in Bihar are much more complex as vagaries of rainfall, recurrent floods, droughts and heat occur in the same season at same place severally affecting agriculture, livestock & dairy which are the major contributors to the livelihoods of the people in this state.

The problem is further intensified with the inefficient use and mismanagement of production resources, especially water, energy and agro-chemicals. The sharp rise in the cost of energy, diversion of human capital to non-farm sectors, volatility of food prices and climate change-induced vulnerability, pose major challenges to farmers and our society.

The farmers of the state are facing the complexity of challenges which include declining factor productivity, higher production costs, depleting natural resources particularly water and soil health, climate change induced extreme weather conditions and multiple abiotic stresses (for example extreme weather events of kharif 2014, winter 2014-15), poor market access and less income due to which youth in rural areas are reluctant to take up agriculture as a profession.

As the problems in agriculture are complex, the solutions are also not simple. A business as usual approach in terms of 'technology development, refinement and extension' is not likely to result in enhanced production and productivity of food grains and other commodities for sustained livelihood of the people. Hence, there is great need for greater participation of the farming community, particularly the youth and women. We need everyone's support in

technology development, adoption and use of modern tools and techniques. For example, Information Communication Technologies (ICT) such as mobile phones can be used for real-time access to relevant climate and agriculture information and can greatly reduce the climate risks for farmers.

Climate change affects agriculture and food production in complex ways. Climate change mainstreaming is now widely promoted as a more effective approach than stand-alone interventions on climate change adaptation or mitigation. In its broadest sense, climate change mainstreaming entails incorporation of climate change considerations into public policy and practice, at all planning levels, across all sectors and involving public, private and civil society actors.

All this guidance emphasises the importance of engaging stakeholders from the start, including stakeholders in affected communities at local levels, and being responsive to their expressed priorities and needs. The emphasis however is on 'target' communities of the proposed interventions; guidance is lacking on how large-scale mainstreamed programmes might draw on the experience and lessons for policy and practice emerging from non-target communities that are innovating and implementing adaptation actions at local levels. As well as mainstreaming climate change into agriculture, could there be value in finding ways to mainstream learning from community-based approaches into wider approaches to agricultural adaptation?

In principle, mainstreamed climate smart agriculture practices (CSAPs) and programmes do not preclude community-based approaches, but there may be considerable challenges in reaching scale while also assuring local 'ownership' (control over decisions and resources) and the diversity that comes with differing local priorities. Climate smart agriculture starts from local analyses of vulnerability and capacity to design and implement locally-appropriate responses to climate change. Therefore, precisely defined adaptation and risk management practices and strategies for resource poor farmers in a community based approach is critical for future food, livelihood and social security on a sustainable basis.

#### **2.1.2. Outline the economic, social development and climate change in line with the State Action plan on Climate Change and relevant Missions under National Action Plan on Climate Change**

Bihar is on an accelerated growth and development pathway, and in recent years, it has acquired considerable attention throughout the country and even abroad for its remarkable performance in the development front. For a state which had suffered stagnation for long and which had almost resigned to its perpetual backwardness, this was a turning point, leading to new hopes and aspirations. These changes were possible because of the state government's firm commitment to an agenda of development, which is both speedy and inclusive.

To fulfil this agenda, the state government had not only utilised its limited resources most prudently, but had also strengthened its administrative machinery and introduced a number of

institutional reforms. The results clearly show that the past growth process of the state's economy is not a short-term phenomenon, but the beginning of a long-term stable growth process. For the 12th Five Year Plan (FYP) period, the State has adopted the motto – "Growth with Justice." The State's Approach Paper for the 12th FYP targets a 13 percent constant growth rate. The proposed project activities are in line with the interventions of the National Mission on Sustainable Agriculture (NMSA) under National Action Plan on Climate Change. NMSA aims to make Indian agriculture more resilient to climate change through developing new varieties of thermal resistant crops, new credit and insurance mechanisms and improving productivity of rain-fed agriculture. The proposed activity is also highlighted under the Agriculture Chapter of Bihar State Action Plan on Climate Change.

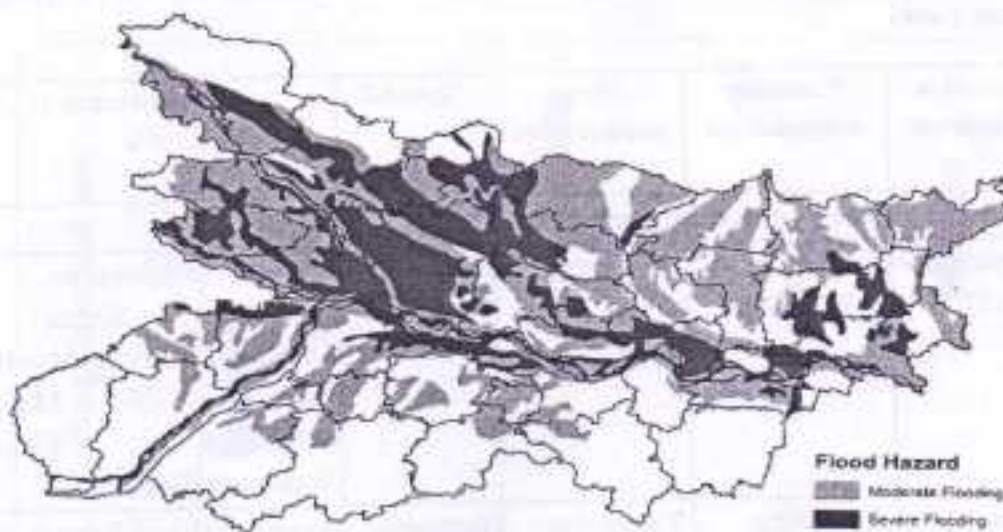
The project proposes for sustainable agriculture practices through adoption of climate change adaptation and mitigation practices such as conservation agriculture (CA) based management practices (zero tillage, direct seeded rice, residue management), cropping system optimization/diversification; decision support (Nutrient Expert) and sensor (Green-Seeker) based nutrient site-specific nutrient management, precision water management (laser levelling, micro-irrigation), stress resilient cultivars, seed and fodder banks powered with value-added weather forecasts; ICT based agro-advisories; capacity building and knowledge & experience dissemination to wider population.

### **2.1.3. Include climate analysis and vulnerability analysis**

Available evidence shows that there is high probability of increase in the frequency and intensity of climate related natural hazards due to climate change and hence increase in potential threat due to climate change related natural disasters in Bihar. It is highly vulnerable to hydro-meteorological natural disasters, with North Bihar in general being highly flood-prone, and South Bihar being highly drought prone. In the (relative) absence of state level climate models and/or vulnerability studies, as well low community awareness, Bihar is potentially more sensitive and vulnerable to the climate change and its impacts. Climate variation affects food grain and non-food grain productivity and both these factors along with other socioeconomic and government policy variables affect food security. Food security and poverty are interlinked with each other as cause and effect and vice versa, particularly, for a largely agrarian economy of Bihar. The impact of projected climate change on crop and livestock in the state will be much more severe in future as is given below-

Trend analysis of 58 years of weather data (Table 1) for a set of climate extreme indices from representative centres falling in different agro-ecological zones of Bihar revealed the signs of climate change induced variability in intensity, frequency and duration of temperature and rainfall events. The region has been clearly warming over the last few decades and extremes of temperature have changed accordingly. Extreme maximum temperature events showed a decreasing trend for all zones except zone IIIB. Number of rainy days showed a significant increasing trend for zone III, however, a decreasing trend for zone I and II (Chhabra and Haris, 2015). Increasing trends of rainfall and minimum temperature in Gangetic plains of Bihar have also been reported (Haris *et al.*, 2010).

There are evidence of negative impacts of changing climate on yield of wheat, rice and other crops with variable magnitude in diverse ecologies of these countries. The composite exposure computed spatially using different indicators of exposure, viz., maximum and minimum temperatures, and the intensity of low and high rainfall during Kharif and Rabi seasons by assigning weightage to each indicator revealed that many districts of Bihar have high exposure which indicates high vulnerability to climate change (Schgal, *et al.*, 2013). The climate projections of Bihar for 2050 further revealed increasing trends in both maximum and minimum temperatures ( $2-4^{\circ}\text{C}$ ) in every month (Figure 4) coupled with much more variability ( $-25$  to  $+30\%$ ) in the monthly rainfall patters (Figure 5) which will have large implications on the agriculture, food security and livelihoods of the rural masses.



**Figure 2. Areas affected with varying degree of flood hazards in Bihar**  
(Source:-Giriraj et al., 2012, NRSC, ISRO, Disaster Management Department, Bihar)



Figure 3: Flood and drought hit areas in Bihar

Table 1. Annual temperature and rainfall trends over Bihar (Based up on 58 years of weather data)

Agro-climatic zone	Maximum temperature	Minimum temperature	Mean temperature	Rainfall	Districts
Rate of increase ( $^{\circ}\text{C}/\text{Year}$ and $\text{mm}/\text{year}$ )					
Zone-I	Decreasing (-0.012)	Increasing (+0.015)	Increasing (+0.002)	Increasing (0.31)	West Champaran, East Champaran, Siwan, Saran, Sitamarhi, Sheohar, Muzaffarpur, Vaishali, Madhubani, Darbhanga, Samastipur, Gopalganj, Begusarai
Zone-II	Increasing (+0.013)	Increasing (+0.068)	Increasing (+0.041)	Decreasing (-4.23)	Purnea, Katihar, Saharsa, Supaul, Madhepura, Khagaria, Araria, Kishanganj.
Zone-IIIA	Decreasing (-0.01)	Increasing b (+0.011)	Decreasing (-0.001)	Increasing (+2.48)	Sheikhpura, Munger, Jamui, Lakhisarai, Bhagalpur & Banka.
Zone-IIIB	Decreasing (-0.003)	Increasing (+0.027)	Increasing (0.012)	Decreasing (-3.89)	Rohtas, Bhojpur, Buxar, Bhabhua, Arwal, Patna, Nalanda, Nawada, Jehanabad, Aurangabad, Gaya.

(Source: BAU, Sabour)

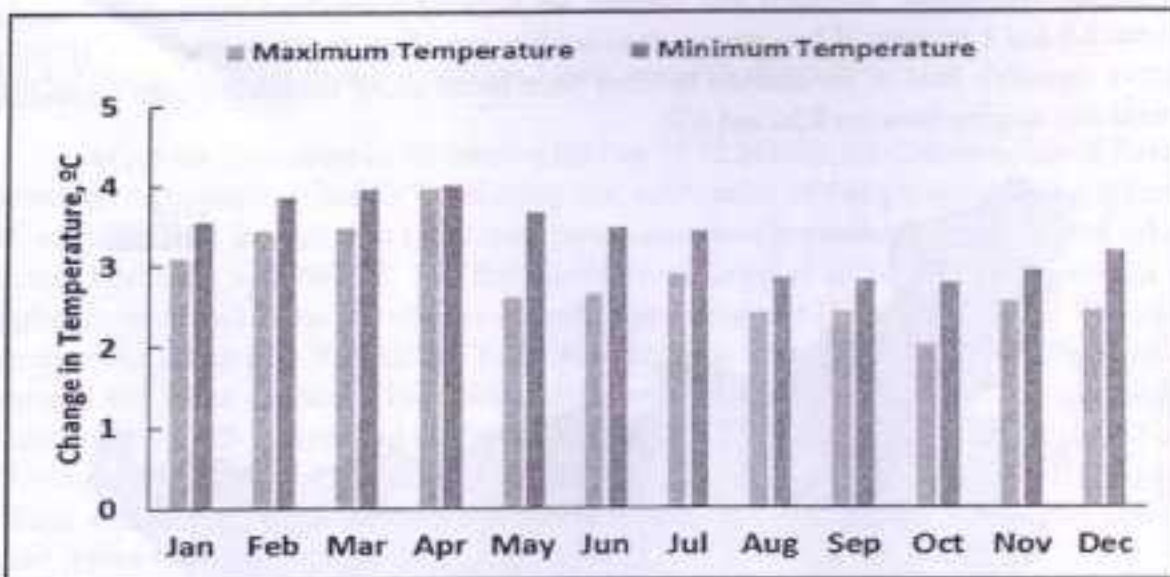


Figure 4. Simulated projections in monthly maximum and minimum temperatures by 2050 in Bihar (Simulated using MarkSim<sup>®</sup> Hadley model for RCP8.5 – 2050s)

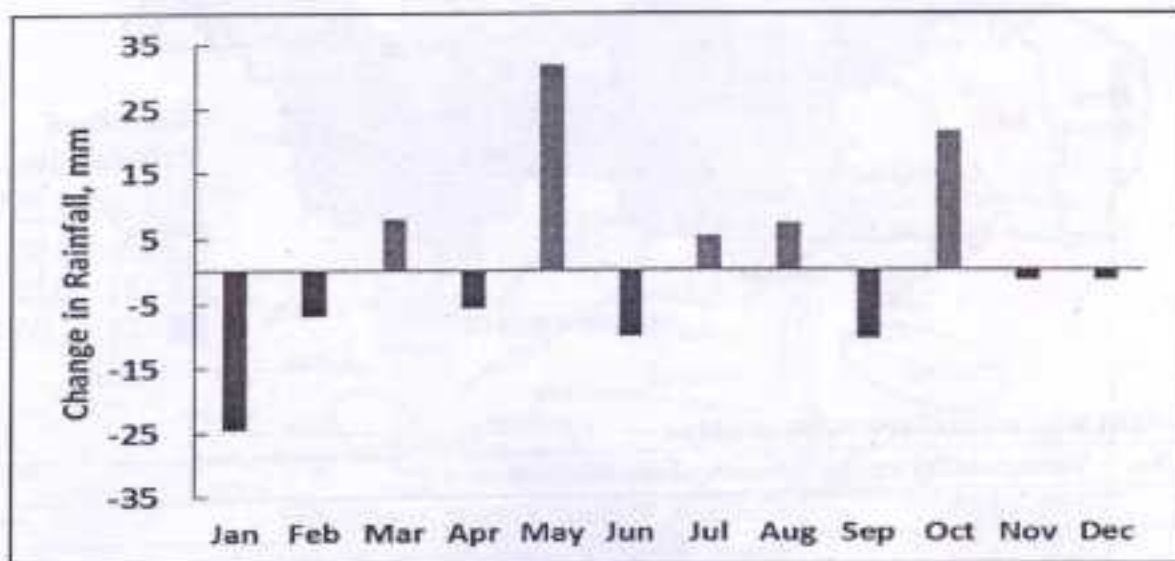


Figure 5. Simulated projections in monthly rainfall by 2050 in Bihar (Simulated using MarkSim<sup>®</sup> Hadley model for RCP8.5 – 2050s)

As per the vulnerability study conducted by Indian Council of Agricultural Research conducted under the aegis of National Innovations in Climate Resilient Agriculture (NICRA) project, Bihar is the most vulnerable state to climate change. Fig. 1 shows the normalized vulnerability rating of districts of Bihar. The southern districts of Kaimur, Rohtas, Aurangabad and Khagaria had less than 0.25 normalized vulnerability index due to comparatively higher productivity and higher human development index (HDI). On the other hand, districts East

Champaran, Madhubani, Sitamarhi and Sheohar are extreme normalized vulnerability ranging between 0.8 and 1 because of low average land-holding size (high sensitivity) and low HDI (low adaptive capacity). Rest of the districts in Bihar were found under moderate to high normalized vulnerability ranging between 0.26 and 0.75.



**District wise normalized vulnerability**

S.No.	Vulnerability range	Name of the District
1.	0.00 – 0.25	Khagaria, Kaimur, Rohtas, Aurangabad
2.	0.26 – 0.50	Siwan, Saran, Vaishali, Buxar, Bhojpur, Patna, Begusarai, Gaya, Sheikhpura, Munger, Bhagalpur
3.	0.51 – 0.75	West Champaran, Gopalganj, Muzaffarpur, Darbhanga, Supaul, Araria, Kishanganj, Madhepura, Samastipur, Saharsa, Purnea, Katihar, Jehanabad, Arawal, Nalanda, Lakhisarai, Nawada, Jamui, Banka
4.	0.76 – 1.00	East Champaran, Sitamarhi, Sheohar, Madhubani

**Fig. 6. Normalized vulnerability of agriculture to climate change in various districts of Bihar**



### 2.1.4. Project Location details – villages, block/ mandal, district.

As per decision taken in the meeting held on 19.12.2016 in the Chairmanship of Principal Secretary, Agriculture, Bihar for considering and sanctioning of this project, as per suggestions 04 corridors each in each Agro Climatic Zone have been approved to promote the relevant climate resilience technologies. The first corridor was selected as Samastipur- Darbhanga state highway which will cover 25 villages of both Samastipur and Darbhanga districts. The second corridor was selected as Biharsharif- Patna state highway which will cover 25 villages of both Nalanda and Patna districts. The third corridor was selected as Bhagalpur- Munger highway which will cover 25 villages and the fourth corridor as Purnea-Katihar highway which will cover 25 villages (Fig 7). A total 100 villages will be covered in four corridors of 8 districts and in each village, a cluster of 100 farmers will be identified to demonstrate the relevant conservation agriculture based climate smart practices.



Fig. 7. Proposal geographical area of the project

### 2.1.5. Project Objectives:

The overall objective of the project is to improve the adaptive capacity of rural community to climate change through enhancing the portfolios of climate resilient agriculture interventions in targeted villages of Bihar. This objective is proposed to be achieved through following activities:

- Identifying and targeting different climate smart agriculture interventions in accordance to farmer's socio economic and bio-physical conditions in selected villages in Bihar
- Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies
- Implementing/Innovating science based suitable climate change adaptation strategies/practices
- Mainstreaming adaptation strategies into policies and programmes through better Knowledge Management and Sharing

#### **Climate Smart Villages (CSVs)**

National Agriculture Research Systems (NARS) and International Institutions like CIMMYT, BISA under the aegis of CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and National Initiative on Climate Resilient Agriculture (NICRA) has introduced the concept of 'Climate Smart Villages (CSVs)' to raise the awareness of farming communities about various technological, institutional and policy options that have a potential to increase their climatic resilience, adaptation, agricultural productivity and income while reducing emissions of greenhouse gases. The interventions related to water, carbon, nutrient, energy, weather and knowledge management are currently being piloted and evaluated by the farming communities in a participatory mode.

- The key focus of the CSVs is to enhance climate literacy of farmers through linking/converging existing Govt schemes and investments and with almost negligible additional financial investment.
- The evidences collected from over 25 CSVs piloted in Vaishali and Samastipur districts of Bihar under the aegis of CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) jointly by CIMMYT, BISA, Department of Agriculture Govt of Bihar in collaboration with IARI-ICAR, RAU (NICRA, KVKs) and farmers cooperatives/groups under the aegis of CCAFS on various climate smart agriculture practices (CSAPs) will be used for scaling CSVs in each block of Bihar. The CSAPs includes conservation agriculture (CA) based management practices (zero tillage, DSR, residue management), cropping system optimization/diversification; decision support (Nutrient Expert) and sensor (Green Seeker) based nutrient site-specific nutrient management, precision water management (laser levelling, micro-irrigation), stress resilient cultivars, seed and fodder banks powered with value-added weather forecasts; ICT based agro-advisories; index based insurance, solar energy etc and capacity development of stakeholders in relevant field
- The demand driven adapted climate smart interventions aimed at improving the adaptive capacity of rural livelihoods to climate change will be identified, targeted, mainstreamed and implemented in the target domains.



*Photo: The Agriculture Minister of Bihar Mr Vijay Chaudhary discussing the climate smart agriculture practices in the Bhagwatpur climate smart village of Samastipur district (left photo) and the farmers with CSV display board at Senduari village in Samastipur district*

### **Conceptual Framework of Climate Smart Villages (CSVs)**

The Climate Smart Villages (CSVs) aim to provide a working model of community-based approaches to better understanding of, and adaptation to climate change at the local scale through synergizing the investments under different schemes by various agencies and ministries for example linking MNREGA for agricultural development. Effective adaptation to climate change will require not only appropriate technological solutions but an enabling social environment. The CSV will adopt an integrated social, biophysical and economic approach for understanding the factors influencing adoption and impact of climate smart interventions. The basic conceptual

### क्लाइमेट स्मार्ट खेती

क्लाइमेट स्मार्ट खेती CGIAR के पर्यावरण परिवर्तन कृषि एवं साधन सुरक्षा (CCAFS) तथा भारतीय कृषि अनुसंधान परिषद (ICAR) के जलवायु अनुकूल कृषि पर राष्ट्रीय पहल (NICRA) अनुसंधान कार्यक्रम की एक अनुभूती शुरुआत है जिसका मुख्य उद्देश्य मौसम की सटीक जानकारी के साथ कृषि की नई तकनीकियों से बदलती परिस्थि (जलवायु परिवर्तन एवं खाद्यान्न सुरक्षा) में उच्च उत्पादकता स्तर को बनाये रखना है।

### मुख्य तकनीकियाँ

<p><b>मौसम स्मार्ट</b></p> <ul style="list-style-type: none"> <li>मौसम का पूर्वानुमान</li> <li>सुपरग्राम आधारित बीज</li> <li>अनुकूलों के अनुकूल बीज</li> <li>समय निर्धारण</li> <li>कृषि तकनीक</li> </ul> 	<p><b>जल स्मार्ट</b></p> <ul style="list-style-type: none"> <li>जल की सटीक सुवाई</li> <li>समय निर्धारित फसल चक्र</li> <li>पेड़ पर फसलों की सुवाई</li> <li>समय के अनुसार कृषि का संचालन</li> <li>जल से कैप्टिविटी का प्रबंधन</li> <li>सूक्ष्म सिंचाई</li> </ul> 	<p><b>कार्बन स्मार्ट</b></p> <ul style="list-style-type: none"> <li>जिवा सुखाई किने फसलों की सुवाई (जीव-दिलेज)</li> <li>समय निर्धारित फसल चक्र</li> <li>कृषि तकनीक</li> </ul> 
<p><b>न्यूट्रिएन्ट स्मार्ट</b></p> <ul style="list-style-type: none"> <li>जल की सटीक मात्रा में फसल का प्रबंधन</li> <li>समय और पैटर्न के लिए न्यूट्रिएन्ट प्रशासन</li> <li>बीज बीज</li> <li>समय निर्धारित फसल चक्र</li> </ul> 	<p><b>ऊर्जा स्मार्ट</b></p> <ul style="list-style-type: none"> <li>जीव-दिलेज</li> <li>समय निर्धारित फसल चक्र</li> <li>जल की सटीक सुवाई</li> </ul> 	<p><b>ज्ञान स्मार्ट</b></p> <ul style="list-style-type: none"> <li>सूक्ष्म एवं प्रसारण तकनीकियाँ</li> <li>सटीक तकनीकियाँ एवं समाज विकास</li> </ul> 

### उद्देश्य

- कृषि दित धारकों की भागीदारी
- सुशासन और सक्षमता की भागीदारी
- सामुदायिक प्रतिष्ठा : किसान सहकारी समितियाँ और कृषि प्रदाता

framework of CSV is given under-

This framework has 6 main smart pillars (1) water, (2) Carbon, (3) nutrient, (4) energy, (5) weather and (6) knowledge and under which there are range of technological options from where relevant options can be chosen relevant to specific need of production systems/farmers/villages/blocks. The summary of broad CSA interventions under each category included but not exclusive to are given in table 1 below.

These interventions are to be implemented in a multi-stakeholder participatory mode considering local adaptation using innovation systems of farmers' cooperatives and service windows and focussed not exclusively but on youth, women and resource poor small and marginal farmers.

Table 1. Climate smart interventions in CSVs

S. No	CS-Category	CS Interventions
1	Water Smart	Direct seeded rice, maize based system, raised beds, precision land levelling, AWD, bunding, micro-irrigation, irrigation scheduling, crop varieties, residue mulching, cropping system optimization
2	Nutrient Smart	SSNM, Nutrient Expert Decision Support tool for maize and wheat, GreenSeeker, Legume integration, LCC,
3	Carbon Smart	No-tillage, Residue management, agroforestry
4	Energy Smart	No-tillage, Residue Management, DSR, cropping system optimization, eliminate puddling in rice
5	Weather Smart	Weather forecast, Index based insurance, seeds for needs, crop diversification
6	Knowledge Smart	ICTs, Gender Empowerment, Capacity development

*\*The focus of the interventions in CSVs will be on (i) Farm typology specific interventions, (ii) defined recommendation domains and (iii) aligned local Govt investments and policies. The approach will be (i) multi-stakeholder and participatory, (ii) youth and women friendly, and (iii) based on innovation systems: farmer cooperatives & service windows*

### 3. Details of Project/ Programme Executing Entity:

3.1 Name, Registration No. & Date, Registered Address, Project Office Address (for the proposed project):

Department of Agriculture  
 Government of Bihar  
 Patna, Bihar 800015

**3.2 The Project/ Programme executing entity is given below;**

Sl. No.	Project Component	Executing Entity
1.	Targeting and identifying different climate smart interventions in targeted climate vulnerable villages in Bihar as per farmer's socio economic and bio-physical conditions	Department of Agriculture
2.	Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies	BISA-CIMMYT-CCAFS/DRPCAU/BAU/ICAR
2.1.	Strengthening the farmer's skill on implementing agronomic measures	BISA-CIMMYT-CCAFS/DRPCAU/BAU/ICAR
2.1.1.	Skill development of youth/ facilitator	BISA-CIMMYT
2.1.2.	Provision of kits for implementing agricultural practices	BISA-CIMMYT/Department of Agriculture
2.1.3.	Honorarium for skill youth/ facilitator	BISA-CIMMYT/Department of Agriculture
2.2.	Capacity building of farmers for implementing climate smart agricultural practices	BISA-CIMMYT-CCAFS/DRPCAU/BAU/ICAR
2.3.	Exposure visits/travelling seminars	BISA-CIMMYT
3.	Implementing/Innovating science based suitable climate change adaptation strategies/ practices	Department of Agriculture
4.	Mainstreaming adaptation strategies into policies and programmes through better Knowledge Management and Sharing	Department of Agriculture, BISA-CIMMYT, BAU, DRPCAU, ICAR
4.1.	Conducting Project Workshops (Inception, mid-term and final)	BAMETI
4.2.	Developing knowledge products	BISA/ DRPCAU /BAU/ICAR
5.	Contingency and Project Management cost including monitoring and evaluation	Department of Agriculture

### 3.3. Expertise and infrastructure available with the institute/organisation for proposed project

#### i. Department of Agriculture, Govt. of Bihar

Sr. No.	Level	Post / Designation	Numbers	Specialization	Nature of Job
1.	State	Additional Director Agriculture	3	M.Sc. / Ph.D in Agriculture	Extension / Mechanization /Implementation of Water Saving Techniques / Miscellaneous
2.	State	Joint Director Agriculture	11	-do-	-do-
3.	Division	Joint Director Agriculture	09	-do-	-do-
4.	State & Division	Deputy Director Agriculture	15	-do-	-do-
5.	District	District Agriculture officer/ Project Director ATMA	58	B.Sc. (Honors Agriculture) / M.Sc. (Agriculture) / Ph.D in Agriculture	-do-
6.	Block	Block Agriculture Officer / Block Technical Manager /Assistant Technical Manager	650	B.Sc. (Honors Agriculture) / B.Sc. (Statistics)	Extension / Mechanization /Implementation of Water Saving Techniques / Miscellaneous
7.	Panchayat	Agriculture Coordinator/ Kisan Salahkar	8500	B.Sc. (Ag)/ I.Sc. (Ag)/ I.Sc./B.Sc./	-do-

#### ii. Borlaug Institute for South Asia(BISA)-CIMMYT:

The Borlaug Institute for South Asia (BISA) has been notified under section 3 of the United Nations (Privileges and immunities) Act, 1947 vide gazette notification S.O. 2815(E) dated December 12, 2011. BISA has its three centres in India (Samastipur, Jabalpur and Ludhiana).

BISA has 153 acres of research farm at Pusa where strategic research on precision conservation agriculture practices, farm mechanization, and development evaluation of climate resilient genotypes of maize, wheat, pigeon pea, etc., has already been initiated. BISA has a team of trained agronomists, agricultural engineers, and plant breeders in place at its research centre. BISA has latest research tools, precision conservation agriculture machinery and Green House Gas (GHG) measurement facility at its research centre in Pusa.

BISA, in collaboration with other national and international organizations as well as large number of farmers, developing and promoting innovative agricultural production technologies for small holders of Bihar.

International Maize and Wheat Improvement Center (CIMMYT) is a global leader in maize and wheat improvement, conservation agriculture based management practices and has been actively engaged in agricultural research for development and scaling climate smart agriculture (CSA) under the aegis of CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). CIMMYT has strong scientific expertise on Climate Smart Agriculture and a long on-ground working experience in Bihar.

#### 4. Details of Project/Programme Components and Financing

For each objective, activity wise project component and corresponding budgets is given below:

S.No.	ACTIVITY	Units	Unit cost (INR)	Total (Rs. in Lakh)	Note	Institution responsible
I	Identifying and targeting different climate smart agriculture interventions in accordance to farmer's socio economic and bio-physical conditions in selected villages in Bihar	Detailed below	Detailed below	46.00	Detailed below	DoA (Lead) in consultation with BISA/ CIMMYT/ DRPCA/ BAU/ ICAR
I.1.	Village Development Plan					
I.1.1	Survey and travel cost	100 villages	6,000	6.00	One survey and village development plan of each village (100) will be done at an average cost of Rs. 6000	DoA
I.1.2	Survey equipment	100 villages	6,000	3.00	Survey equipment kit @5000 for every 02 villages (GPS etc.)	BISA-CIMMYT
I.1.3	Constitution of Farmers Interest Group at a community level	50 groups	10,000	5.00	50 Farmers Interest Groups will be constituted involving 2 villages in each interest group, which will cost Rs. 10,000	DoA
I.2.	Analysis of village survey data, preparation of village development plan and prioritising the activity for each village	100 villages	32,000	32.00	100 families data per village will be analysed and accordingly activities will be prioritised	BISA-CIMMYT



S.No.	ACTIVITY	Units	Unit cost (INR)	Total (Rs. in Lakh)	Note	Institution responsible
2	Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies			230.50		DoA (Lead) in consultation with BISA/ CIMMYT/ ICAR/RAU/ BAU
2.1.	Strengthening the farmer's skill on implementing agronomic measures					
2.1.1.	Skill development of youth/ facilitator	6 trainings	350000 per training	21.00	Each training will be for 07 days for 50 participants @ Rs. 1000 per day per participant (02 training per year).	BISA-CIMMYT/ DRPCAU/ BAU
2.1.2.	Provision of kits for implementing agricultural practices	50 kits	20,000	10.00	Each skilled youth will be provided with kit for implementing agricultural practices. Kit will include a tab, package and practices etc. which will cost approx. Rs.20,000	BISA-CIMMYT/
2.1.3	Honorarium for skill youth/ facilitator	50 youths	8000	144.00	Honorarium Rs. 8000 per month per youth for 03 years.	BISA-CIMMYT/ DRPCAU/ BAU
2.2	Capacity building of farmers for implementing climate smart agricultural practices	300 trainings	12500	37.50	Each training will cover 50 farmers @ Rs. 250 per participant per day	BISA-CIMMYT / DRPCAU/ BAU/ ICAR/ DoA
2.3	Exposure visits/travelling seminars	60 exposure visits	30,000	18.00	Each exposure visit will be for average 02-05 days for 25 farmers @ Rs. 600 per participant per day for the farmers at 3 levels i.e. within the district, within state and inter-state levels	BISA-CIMMYT/ DoA
3	Implementing/Innovating science based suitable climate change adaptation strategies/ practices	Detailed below	Detailed below	182.50		DoA (Lead) in consultation with DRPCAU /BAU and BISA/

S.No.	ACTIVITY	Units	Unit cost (INR)	Total (Rs. in Lakh)	Note	Institution responsible
						<b>CIMMYT/ICAR</b>
3.1	Developing excellence centre (model) at each village					
3.1.1	Providing Happy Seeder	50	1,00,000	25.00	An happy seeder per village will be provided at 50% subsidy but maximum as per norms of farm mechanization scheme/ SMAM.	DoA
3.1.2	Providing Multi-crop planter/raised bed planter	300	80,000	120.00	3 multi-crop / raised bed planter per village will be provided at 50% subsidy but maximum as per norms of farm mechanization scheme/SMAM.	DoA
3.1.3	Providing Laser Land Leveller	30	2,50,000	37.50	Average one Laser land leveller for each 04 villages will be provided at 50% subsidy but maximum as per norms of farm mechanization scheme/SMAM.	DoA
4.	Demonstration proposed for climate resilience practices	71725 acres	As per demons.	2010.22	Details given in table no. 2.	DoA/BISA-CIMMYT/DRPCAU/BAU
5.	Mainstreaming adaptation strategies into policies and programmes through better Knowledge Management, Sharing and Publicity	Detailed below	Detailed below	140.46	Detailed below	DoA (Lead) in consultation with NABARD, DoE, DRPCAU, BAU, CIMMYT-BISA,
5.1	Organizing Workshops (Inception, mid-term and final)	03 workshops	2,50,000	7.50	3 Project workshops will be conducted at inception, mid-term and final levels	DoA/BISA/DRPCAU / BAU/ICAR

S.No.	ACTIVITY	Units	Unit cost (INR)	Total (Rs. in Lakh)	Note	Institution responsible
5.2	Development of knowledge products	--	--	50.00	At least 2 films (bilingual), 4-5 manuals for various project activities, posters for workshops and 6 research papers will be developed	BISA-CIMMYT/ DRPCAU / BAU
5.3.	Organizing field day and crop cutting	900	5000	45.00	Field day and crop cutting will be organized for kharif/rabi/garma for 03 years	DoA/BISA-CIMMYT/ DRPCAU / BAU
5.4.	Publicity	--	--	37.96	Leaflets/pumplets/ others teaching materials, publication and other extension work.	DoA
	<b>Total</b>			<b>2609.68</b>		
	The subsidy of happy seeder/ multi crop planter/ raised bed planter/ laser land leveller in developing excellence center will be provided from Farm Mechanization Scheme/ Sub Mission on Agriculture Mechanization through the State Govt.			<b>(-) 182.50</b>		
	<b>Total 1 to 5 - 3)</b>			<b>2427.18</b>		
6.	Contingency and Project Management cost including monitoring and evaluation (Charges for coordination, facilitation, visits/ meetings, man power etc. during project implementation) @ 3%			72.82	3 % of the total cost	DoA/BISA/ DRPCAU/ BAU/ ICAR
	<b>Grand Total</b>			<b>2500.00</b>		

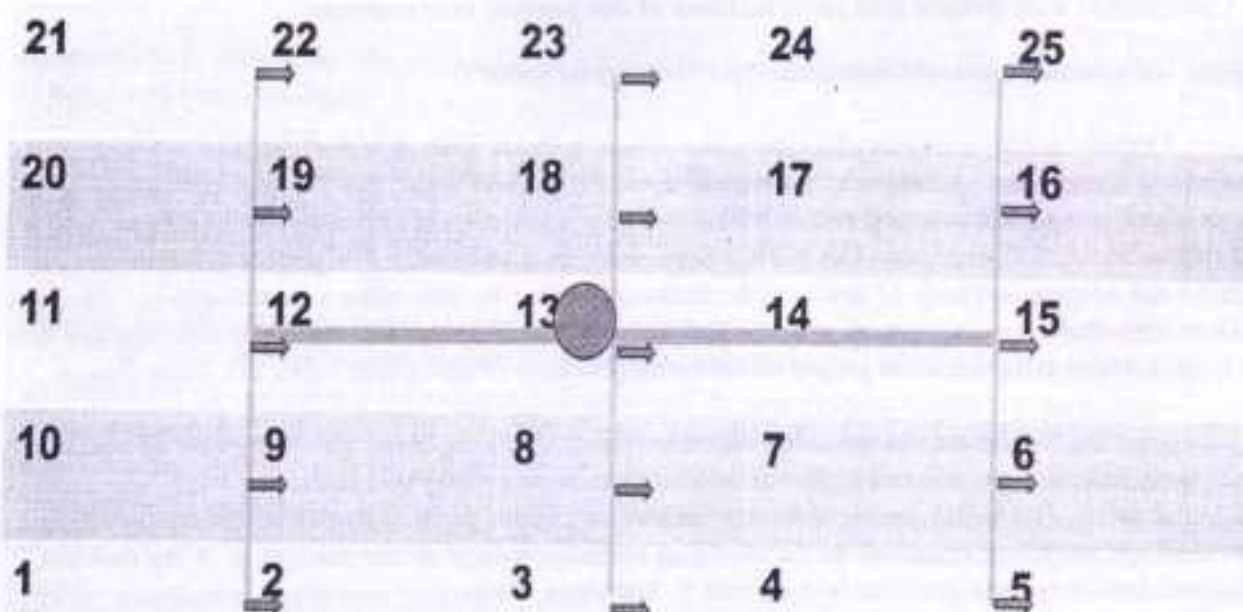
**Table 2. Interventions proposed for climate resilience practices**





S.No.	Proposed Intervention	Duration	Physical Target per Year (acre)				Total in 03 years (acre)	Unit Cost per acre (in Rs.)	Total Cost (In Lakh)
			Kharif	Rabi	Spring	Other			
1.	Laser land levelling	03 years	-	-	-	2000	6000	1200	72.00
2.	Direct Seeded Rice	03 years	5500	-	-	-	16500	2500	412.50
3.	Raised bed planting Arhar	03 years	500	-	-	-	1500	2000	30.00
4.	Maize with Arhar Intercropping	03 years	200	-	-	-	600	2500	15.00
5.	Alternate wetting/ drying irrigation in rice	03 years	500	-	-	-	1500	2500	37.50
6.	Water harvesting and field bunding in rice	03 years	1000	-	-	-	3000	2500	75.00
7.	Raised Bed Planting (Maize)	03 years	2000	620	500	-	9360	2500	234.00
8.	Zero tillage of wheat	03 years	-	4750	-	-	14250	2650	377.62
9.	Raised Bed Planting (Wheat)	03 years	-	1800	-	-	5400	2650	143.1
10.	Zero tillage lentil	03 years	-	1500	-	-	4500	2700	121.50
11.	Zero tillage mung bean	03 years	-	-	2000	-	6000	1700	102.00
12.	Nutrient expert/green seeker based nutrient management	03 years	600	600	-	-	3600	2500	90.00
13.	Community Irrigation 25 Units as per availability of land/ demand	03 years	-	-	-	-	625 (25 unit x 25 acre)	1600000 per unit	300.00
	<b>Total</b>	-	<b>10300</b>	<b>9270</b>	<b>2500</b>	<b>2000</b>	<b>72835</b>		<b>2010.22</b>

**Table 3. Cost estimation for community irrigation system (25 acres)**

S.N.	Item	Cost (Lakh)
1	Underground pipe line	10.0
2	15 HP tube well with electric submersible	4.0
3	Electricity connectivity and other cost	2.0
	<b>Total</b>	<b>16.0</b>

**Tentative Layout of community irrigation systems (25 acre)**



-  Tubewell
-  Main irrigation line (250mm)
-  Sub irrigation line (200mm)
-  Riser

**Community Irrigation System:** 25 community irrigation systems model will be developed for 25 acre each among Climate Smart Villages as per land availability and demand of the community. The subsidy will be given to community @ 80% per unit. The community irrigation system will include a 15 HP electric tube well or as per requirement and underground pipeline having riser for each plot to increase the water use efficiency.

## 5. Projected Calendar:

Indicate the dates of the following milestones for the proposed project/programme (projects which have four or more than four years of implementation period would require to have mid-term review after two years of implementation).

Milestones	Expected Dates
Start of Project/Programme Implementation	May 2017
Mid-term Review	31 <sup>st</sup> March, 2019
Project/Programme Closing	June 2020
Terminal Evaluation	October, 2020

## 6. PROJECT / PROGRAMME JUSTIFICATION

### a. Component wise details and justifications of the project components

#### *i. What is the business-as-usual development for the targeted sector?*

Farmers would continue cultivating rice-wheat through ground water extraction, which will continue to stress water resources in the region especially ground water and soil moisture. Shifting to wheat-maize system will not only reduce stress on water resources but also diversify livelihood option and reduce emission Green house Gas (GHG) from paddy as a co-benefit. The project therefore aims to improve the adaptive capacity of small holder farmers in Bihar by delivering a combination of climate resilient agriculture farming system interventions and enhance their capacity to ensure sustainability of the project. Major activities of the project will enhance resilience of agriculture sector to climate change.

Adapting to climate change often requires responses which range from adoption of concrete agricultural technologies, soil and water management practices at farm and landscape levels, economic and social safety nets which enable the poor farmers to cope with the vagaries of climate extremes. Individual and collective responses to the changing climate impinge on the perception of the problem, traditional knowledge and practices to deal with it. Therefore, the project constitutes components which focus on improved understanding of the most vulnerable regions and farm household to climate change impacts; develop capacities of farmers and departmental staff in responding adequately to climate change impacts; and designing and implementing a portfolio of adaptation measures at farming and community.

#### *ii. What are the specific adaptation activities to be implemented to reduce the climate change vulnerability compared to the business-as-usual situation?*

*Component 1: Targeting and identifying different climate smart interventions in targeted climate vulnerable villages in Bihar as per farmer's socio economic and bio-physical conditions*

This component aims at identifying, mainstreaming and prioritising the demand driven adapted climate smart interventions at the target domains, for improving the adaptive capacity of rural livelihoods to climate change. This component therefore involves following activities:

#### Activity 1.1: Baseline survey (Village development plan)

Baseline data of the practices being implemented will be collected through survey in each village and Focussed Group Discussions at community level. This will help in understanding the current vulnerability of the farmer at the village level due to climate change, existing coping strategy, identifying activities based on the geographical conditions of the field and socio-economic status of the farmers.

#### Activity 1.2: Analysis of village survey data and prioritising the climate smart agricultural practices

Data generated from the baseline survey of the villages and community will be analysed through qualified researchers/state department officials. Based on the various indicators on vulnerability, socio-economic criteria etc., agricultural practices will be identified and prioritized for each village and accordingly, necessary equipment would be bought for effective implementation of the practices.

Based on the outputs of the base line survey, a detailed village development plan will be prepared which will link to the other relevant ongoing programs of the state government. In each village, farmer's interest group will be created which will assist each other and share the knowledge

#### *Component 2: Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies*

This component mainly supports in enhancing the skill of farmers on effective and efficient implementation of agronomic practices. This activity will not help in enhancing the yield of agricultural crop and increasing their income but also help in sustainable development of the activities. This component involves following activities:

#### Activity 2.1: Skill development of young farmers/facilitators

In order to have greater impact, it is proposed that 50 young farmers/ facilitator interested in disseminating the agricultural information to farmers will be first trained. Youths will be trained twice in a year in 2 seasons i.e. Rabi and Kharif seasons. Since the agricultural technologies are need based on the season, skilled training will be provided for 2 years. These young farmers/entrepreneurs will also be provided with agricultural kits (including a tablet, package of practices information). These young farmers will be provided a honorarium of Rs 7000 per month for 3 year for assisting the project.

#### Activity 2.2: Capacity building of farmers for implementing climate smart agricultural practices

Skilled young farmers/entrepreneurs will further be responsible for training and capacity building of farmers. In 3 years /9 crop season (Kharif, rabi and spring), 300 trainings will be conducted having 50 participants in each training. Farmers would be trained on effective and sustainable agronomic measures, so that farmer could implement the practices in their own fields.

#### Activity 2.3: Exposure visits/Travelling seminars for disseminating the field practices

The CIMMYT-CCAFS project has successfully created 35 CSVs in Vaishali and Samastipur district of Bihar. Exposure visits play an important role, which has led Govt. of Bihar to decide on development of 100 climate smart villages in two corridors (one in north Bihar and one in south Bihar) where relevant climate smart agricultural practices will be demonstrated in large scale. Exposure visits/Travelling seminars would also be arranged for the farmers at the district, inter-district and inter-state levels, so that the activities could be replicated in other villages of the same and different districts. The lesson/experience would also be useful for other state for replicating the CSVs activities in their state.

*Component 3: Implementing/Innovating science based suitable climate change adaptation strategies/practices*

Activity 3.1: Developing excellence centre /innovation model at each village

Activity 3.2: Demonstrations proposed for climate resilience practices

It is proposed that *two corridors of climate smart agriculture* will be developed as a model community based large scale adoption of innovative technologies. In each corridor, 50 villages will be covered in a cluster where relevant climate smart agriculture practices. In each village, service providers / entrepreneurs will be identified and will provide the machineries required for the project at subsidize rate described in the proposal. These service providers will be trained for machinery operation and with the support of the young farmer / facilitator will provide the machinery service to the local communities for adoption of climate smart practices.

**Zero-tillage:** Zero-till or no-till farming is a way of growing crops without disturbing the soil through tillage using zero-till planter/drill. It increases the amount of water that infiltrates into the soil and increases organic matter retention and the cycling of nutrient in the soil. Zero-tillage improves soil properties, making it more resilient. It helps in timely planting, reduce cost, improve soil health, increase profits, help in adapting to terminal heat and reduce environmental foot prints. Zero tillage technology can be used in almost all major field crops

**Direct seeded Rice:** Traditional rice cultivation involves sprouting rice in a nursery and then transplanting the seedling into an intensively tilled field with standing water. With direct seeded rice, the rice seeds are sown directly in dry seedbed just like any other upland crop using multi-crop zero till planter. This eliminates the laborious process of manually transplanting seeding, which significantly reduces the crop's water requirement and improves the soil's physical condition. In delayed/uneven distribution of rainfall conditions, the direct seeded rice suffers less than transplanted rice.

**Raised bed planting:** Planting crops (wheat, maize and horticultural crops) in row geometry and on raised beds with furrow irrigation arrangements using a multi-crop raised bed planter. Helps in saving irrigation water by 30-40%, furrows act as drainage channel in case of heavy rains and hence save crops from excess moisture. This provides excellent opportunity for inter-culture operations and crop diversification. Beds can be used for longer time as permanent beds and without any tillage and hence save on cost, energy, increase income and improve soil health.

**Residue management/mulching:** Crop residue mulching is a system of maintaining a protective cover of vegetative residues and stubble on the soil surface. It adds to soil organic matter, which improves the quality of the seedbed and increases the water infiltration and retention capacity of the soil. Retention of the rice residue on soil surface acts as mulch and crops can be directly drilled without tillage while residue on surface using innovative planting machinery like Turbo Happy Seeder/Zero tillage.

**Laser land leveling:** A laser-leveller is a tractor-towed, laser-controlled device that achieves an exceptionally flat surface. Levelling the field ensures equitable reach and distribution of water and increases crop productivity. It also increases energy efficiency as less water means less need to run diesel pumps which leads to less GHGs. The estimated GHG mitigation is 163- 600 MT of CO<sub>2</sub>-eq per year (CIMMYT-CCAFS, 2014).

**Alternate wetting and drying (AWD) in rice:** In alternate wetting and drying, rice fields are alternately flooded and drained. The use of monitoring instrument like tension meter can help farmers decide when to irrigate their fields. Alternate wet and drying reduces methane emissions by an average of 48 percent



compared to continuous flooding. Combining this with precision fertilizer tools can further reduce greenhouse gas emission.

Nutrient Expert –decision support tool helps farmers decide location specific use of correct fertilizers for rice, wheat and maize in the hands of individual farmers. This site specific nutrient management tool adds value to soil testing and guide farmers for precision prescriptions even in absence of farmer’s access to soil testing. The Nutrient Expert decision support tool is interactive software and is available for free use on websites.

*Component 4: Mainstreaming adaptation strategies into policies and programmes through better Knowledge Management and Sharing*

*Activity 4.1: Organising Workshops*

Workshops would be organised for large number of stakeholders such as line departments, farmers, village councils etc. at the start of the project. Further, mid-term workshop would be organised around March, 2018 for reviewing the project activities. Final workshop would be organised during the end of project period to disseminate the result of final outcome/outputs of the project, challenges faced and highlighting the success.

*Activity 4.2: Development of Knowledge products*

Knowledge products such as films (bilingual), manuals for various project activities, posters and research papers will be developed for dissemination of the project implementation success stories to wider population.

**b) Details of the social, economic and environment benefits of the project**

Component/Activities	Key Benefits		
	Social	Economic	Environmental
Targeting and identifying different climate smart interventions in targeted climate vulnerable villages and enhancing farmers capacities	Farmers will be aware of the change implications and will be able to adopt/modify their farming activities.	The improved capabilities on risk will help marginal and small farmers in adopting the strategies to mitigate climate change impacts, which will enhance their income levels and improve their livelihood.	Perceptions of the farmers will change through adopting climate friendly activities
Risk management and science based suitable climate change adaptation strategies/ practices	Farmers will implement efficient agricultural inputs based on climate variability parameters. This will be a sustainable practice to be adopted by farmers.	Improved cropping strategies and adoption of best management practices such as optimum nutrient use, soil moisture conservation etc. will increase the net household income through increased farm returns i.e. yields and/or a reduction in production costs	Development of best management practices suitable and adaptable to each location will reduce the stress on natural resources.  Better matching of cropping systems to seasonal rainfall

		<p>Due to better adoption of improved policies, in addition to the benefit to the farming community, an improvement on the government mechanisms for better planning of scarce water and other resources will lead to long term benefits to the state's economy</p> <p>Reduced cost of labour as Wheat and Maize are implemented through less farmer's interference</p>	<p>variations is likely to increase water &amp; nutrient use efficiencies; reduce the environmental impacts and improve watershed performance.</p> <p>Shifting to wheat-maize system will reduce stress on water resources; diversify livelihood option and reduce emission GHG from paddy</p>
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### c. Sustainability of intervention

i. How will the project assure that the benefits achieved through its investments are sustained beyond the lifetime of the project?

The project follows a demand driven approach to developing adaptive capacities of stakeholders to climate change. Design of the various components is a result of the continuous collaborative engagement of the project partners in farmer-participatory climate adaptation research in the region. The adaptation strategies will be developed based on the thorough analysis of social, economic, agricultural and ecological dimensions of the problem of vulnerability to climate change conducted by the departments. The involvement of all the stakeholders in the design of the project supports the demand driven nature of the project promoting ownership and acceptance of the promoted solutions. Once the project is over, farmers will be provided requisite capacity for successfully implementing adaptation interventions in agriculture sector and will be well versed with the success rate of activities. This would therefore help farmers in comfortably applying and investing in these activities.

Implementation of the adaptation measures most suitable to different farm household typologies is done by the farmers themselves which is facilitated by trained young entrepreneurs/farmers and staff of the involved line departments (mainly DoA). The structured capacity development trainings for the staff through tools and manuals developed under the project provide ample scope for scaling up of capacity development of the entire staff of the department and farmers beyond the target district. The knowledge management strategy of the project ensures that the tools, manuals and other documents highlighting the key success factors and processes are available freely (open source) for utilization of stakeholders to sustain the adaptation beyond the project period and locations. These findings will help in ensuring sustainability.

**d. Analysis of the cost-effectiveness of the proposed project / programme:**

i. Cost effectiveness will compare alternative options available and how the proposed components/ intervention are best for given climatic conditions. It will also show how the community has preferred the selected interventions and their views / concerns are addressed while designing the project/ programme

The proposal should compare to other possible interventions that could have taken place to help adapt and build resilience in the same sector, geographic region, and/or community. A comparison of the chosen option vis-a-vis alternative options may be provided as per the **Table**:

**Table: Chosen options vis-a-vis alternative options**

Activity	Proposed Alternatives	Benefits
Improved resilience through adoption of climate resilient farming/livelihood system	<ul style="list-style-type: none"><li>• Cultivating rice-wheat crops with higher production cost and less productivity</li><li>• Providing options of sustainable intensification through cost saving and resource use efficient practices</li></ul>	<ul style="list-style-type: none"><li>• Activities proposed in the project are designed taking into account the climate change implications and to enhance the yield through multi-crop varieties, conserving soil moisture.</li><li>• The activities proposed in this project intend to enhance skills and knowledge of farmers so that they will be able to adopt their production system according to climatic situation.</li></ul>

**e) Alignment with the National and State Action Plans and other Policies / Programmes:**

The proposed project aligns with the national and state strategies to strengthen adaptive capacities of stakeholders to impacts of the changing climate. The Indian government has responded with the launching of its National Action Plan on Climate Change (GoI, 2008). A key priority is to focus on agriculture with possible adaptation strategies ranging from provision of better matched crop varieties, weather insurance to help farmers cope with crop losses and interventions to improve soil moisture. Similarly, within the framework of NAPCC, states have been encouraged to prepare and implement State Action Plans on Climate Change (SAPCC). Proposed activity is also prioritized under the Agriculture Chapter of Bihar State Action Plan on Climate Change. Agriculture has been identified as the most vulnerable sector with a majority of rural poor dependent on it for their livelihoods.

## f. Component wise technical standards:

*(Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, standards related to pollution control, etc. The details need to be provided for each of the interventions proposed)*

The overall objective of the project is in line with the National Mission on Sustainable Agriculture and highlighted under the SAPCC. The project will be governed as per the policy and preference of State Governments in adherence to all the specific local criteria. Apart from that the project would also adhere to the national scientific criteria with regard to adaption such as economic, social and environmental benefit etc. The involvement of the key stakeholders in the project formulation and the Project Management/ Implementation Mechanisms ensures compliance with the policy of participatory implementation of the project.

Activity	Applicable Standard	Application to project
Component 1: Identifying and targeting different climate smart agriculture interventions in accordance to farmer's socio economic and bio-physical conditions in selected villages in Bihar	Standard guidelines provided by DoA on sustainable agriculture practices	Enhance the food security, nutrition level and income of small and marginal farmers
Component 2: Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies	Standard guidelines provided by DoA	Enhance the capacities of farmers and state government officials for implementing climate change adaptation activities
Component 3: Implementing/ Innovating science based suitable climate change adaptation strategies/ practices	Standard guidelines provided by DoA  Standard guidelines of government of Bihar	Implementation of sustainable agriculture practices
Component 4: Mainstreaming adaptation strategies into policies and programmes through better Knowledge Management and Sharing	Activities would be linked to National Mission for Strategic Knowledge on Climate Change under NAPCC and standard guidelines and procedures of DoA, CIMMYT and DoE	Mainstreaming of adaptation activities

**g. Duplication Check:**

(Describe if there is duplication of project / programme with other funding sources, if any)

Project	Objectives	Complementarity	Geographical Coverage / Agency
National Food Security Mission	Food security	Enhancing the production of Rice, Wheat, Pulses, Coarse cereals and Commercial Crops.	Area under Wheat / Pulses
RKVY (BGREI)	Water saving	Multi-cropping technologies to meet the demand of vegetables, fruits, fodder, fibres and oilseed	Covers entire state

**h. Details on Stakeholder consultation:**

(Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations).

S.No.	Activity	Due date	Responsible stakeholders
1	Develop the plan for CSVs and submit for kind approval of the ACS	15 Feb., 2017	DAO
2	Review and approvals of the proposed plan and Steering committee meeting	20 Feb., 2017	APC, Principal Secretary, Agriculture, Director Agri and committee member secretary
3	Identify and prioritize blocks, villages and responsible persons for pilots	15 March, 2017	JDA/DAO/PD ATMA/ADH with other resource persons/ partners
4	Identify and prioritize Climate Smart Agriculture practices for kharif season for different CSVs	20 March, 2017	DAO/JDA with other resource persons/ CIMMYT/BISA-CCAFS/ KVKs/ICAR/SAU
5	Formation and registration of FIG	25 March, 2017	DAO/PD ATMA/ADH
6	Planning and capacity development workshops in each prioritised districts (Kharif)	15-18 April, 2017	CIMMYT/BISA-CCAFS in consultation with JDA/ DAO/PD ATMA/ADH and other partners
7	Organize inputs camps for the pilots from various schemes	15-25 May, 2017	DAO/JDA

	(Kharif)		
8	Pilot/implement CSVs	10-25 June, 2017	Block level officers with support from different stakeholders
9	Mid-term meetings/awareness events/travelling seminars/field days/feed back	05 Sept., 2017	DAO/JDA with other resource persons/ CIMMYT/BISA-CCAFS/ KVKs/ICAR/SAU
10	Steering committee meeting	10 Sept., 2017	Committee member secretary
11	Identify and prioritize Climate Smart Agriculture practices for Rabi season for different CSVs	20 Sept., 2017	DAO/JDA with other resource persons/ CIMMYT/BISA-CCAFS/ KVKs/ICAR/SAU
12	Planning and capacity development workshops in each prioritised districts (Rabi)	10-25 Oct., 2017	CIMMYT/BISA-CCAFS in consultation with DDA/JDA and other partners
13	Organize inputs for the pilots from various schemes (Rabi)	01-10 Nov., 2017	DAO/JDA
14	Pilot/implement CSVs	11-30 Nov., 2017	Block level officers with support from different stakeholders
15	Synthesize and document learnings of CSAPs from kharif 2017	30 Nov., 2017	DAO/JDA with other resource persons/ CIMMYT/BISA-CCAFS/ KVKs/ICAR/SAU
16	Mid-term meetings/awareness events/travelling seminars/field days/feed back	17 Feb., 2018	DAO/JDA with other resource persons/ CIMMYT/BISA-CCAFS/ KVKs/ICAR/SAU
17	Steering committee meeting	End of Feb 2018	Committee member secretary
18	Synthesize and document learnings of CSAPs from one year CSV pilots for scaling them further	15 May 18	JDA/DAO/PD ATMA/ADH with other resource persons/ CIMMYT/BISA-CCAFS/ KVKs/ICAR/SAU

**i) Learning and knowledge management component to capture and disseminate lessons learned from the proposed project.**

Component 5 of the project dealing with knowledge management and mainstreaming of adaptation strategies, describes both the cross-cutting and specific knowledge management functions that will be undertaken in this project. The project has been successfully piloted in 35CSVs of Vaishali and Samastipur district, Bihar. Based on successful results of pilots and demand by farmers, it has been envisaged to implement the project in 300 villages of the state. The project is expected

to generate crucial learnings in terms building climate smart agricultural options. The knowledge will include adaptation techniques at the farm level, best practices, benefits of early warning information, sustainable agricultural practices that improve adaptation ability and resilience; institutional capacity to sustain community based efforts to adapt to climate change and other policy recommendations and technical guidelines produced by the project.

**j. Sustainability of the project outcomes has been taken into account when designing the project**

Expected outcomes	Expected concrete Outputs	Sustainability mechanism	Responsible parties
<ul style="list-style-type: none"> <li>Stakeholders aware of the climate change impacts in the target region. Farm households and prioritized activity for implementation identified</li> <li>Finalized adaptation strategies suitable to the target locations and farm household typologies</li> </ul>	<ul style="list-style-type: none"> <li>10000 families' perceptions on climate change impacts, existing coping/ adaptation strategies to prevent the change and capacities to adapt to climate change will be identified and analysed</li> <li>Concerns/issues due to implications of climate change of 100 villages will be identified</li> <li>Prioritization of agronomic adaptation measures to be implemented at village level for 100 villages</li> </ul>	<p>Farmers will be aware of the implications of the climate change in their target domains and hence sustainably implement the practices even after the completion of the project.</p>	<p>Farmers and skilled young entrepreneurs</p>
<p>Farmers would be capacitated on effective implementation of agriculture practices. The implementation of agricultural practices will further be sustained by farmers.</p>	<ul style="list-style-type: none"> <li>Skill development of 50 young farmers / entrepreneurs on effective implementation of climate smart agriculture practices. Once capacitated, a business model will be developed for sustaining the farmers capacity development activities</li> <li>300 Capacity building trainings/workshops for farmers conducted</li> <li>60 exposure visits to target villages/ farms where adaptation</li> </ul>	<p>Capacity building of the farmers on how effectively the agronomics practices could be implemented. The activities could further be taken up by farmers. Skilled young entrepreneurs propose to develop business models which will lead to sustainable activities.</p>	<p>DoA and CIMMTY eventually farmers, Village Councils etc.</p>

	measures are implemented		
Farmers adjust their farm planning and operational decisions based on the climate forecast and also take preventive measures for saving the crops and minimizing the costs of production	Seasonal climate forecast provided for wheat and maize crops for 300 target villages through utilising and linking existing weather information of RAU/BAU	Real time services of weather information are proposed to be provided through the existing services of CIMMYT and RAU/BAU. Farmers/young entrepreneurs will be provided trainings on how existing weather information could be applied for planning farm practices.	DoA and CIMMYT eventually farmers, Village Councils etc.
<ul style="list-style-type: none"> <li>• Best Climate Change Adaptation measures implemented by the beneficiary households in the target locations</li> <li>• Improvement of resilience of farm households to the projected climate change impacts such as rise in temperature, erratic rainfall etc.</li> <li>• Enhanced farmer's income due to continued enhanced crop yield even during water stress conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of suitable agronomic adaptation measures in 100 target villages in two corridors</li> <li>• Value chain integration of climate smart farm households</li> <li>• Shifting to wheat-maize system will reduce stress on water resources; diversify livelihood option and reduce emission Greenhouse Gas from paddy</li> </ul>	Once the practices are implemented by farmers, they will have hands-on experience on implementing the best practices. These best practices are proposed to be sustained through the farmers as they would learn the yield increment and also ensure its food security and effective utilisation of water for crop production, which will also enhance their income.	DoA and CIMMYT eventually farmers, Village Councils etc.
Convergence of policies in programs that influence adaptation behaviour of farmers	Development of knowledge and outreach products like manuals, posters, films, research papers etc. dissemination the project activities, experience, challenges and outcomes	Knowledge products (films, manuals, publication etc.) will be developed for replication in other districts and states.	Policy makers, state department officials, farmers



k. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	<p>The project activities are in line with the priorities on climate change as predicted by Assessment report of Inter-governmental Panel on Climate Change and scientific report of Government of India. The activities are in-line with the National Mission for Sustainable Agriculture Mission under National Action Plan on Climate Change and Bihar Action Plan on Climate Change.</p> <p>The project activities are in convergence with the Environment Protection Act, 1986; Air (prevention and control of pollution) Act, 1981 and Water Pollution Control Act, 1984.</p>	No risk
Access and Equity	<p>The project provides fair and equitable access to the project beneficiaries and is based on clear vulnerability aspects linked to livestock productivity.</p> <p>During the project implementation and community level interventions, special focus will be given to women and disadvantaged groups in building their capacities and enabling their access to community level assets (knowledge and natural resources)</p>	<p><u>Risk:</u> Despite the best efforts to promote equity in the benefits of the project by selecting beneficiaries, in some cases, there may be a risk of diluting the principles of beneficiary selection.</p> <p><u>Mitigation option:</u> A common criteria for selecting the beneficiaries will be developed in order to have uniform selection of beneficiaries.</p>
Marginalized and Vulnerable Groups	<p>The beneficiaries of the project will be small and marginalised farmers at both household and community levels.</p>	<p>Adaptation and capacity building measures are designed based on</p>

	measures are implemented		
Farmers adjust their farm planning and operational decisions based on the climate forecast and also take preventive measures for saving the crops and minimizing the costs of production	Seasonal climate forecast provided for wheat and maize crops for 300 target villages through utilising and linking existing weather information of RAU/BAU	Real time services of weather information are proposed to be provided through the existing services of CIMMYT and RAU/BAU. Farmers/young entrepreneurs will be provided trainings on how existing weather information could be applied for planning farm practices.	DoA and CIMMYT eventually farmers, Village Councils etc.
<ul style="list-style-type: none"> <li>• Best Climate Change Adaptation measures implemented by the beneficiary households in the target locations</li> <li>• Improvement of resilience of farm households to the projected climate change impacts such as rise in temperature, erratic rainfall etc.</li> <li>• Enhanced farmer's income due to continued enhanced crop yield even during water stress conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of suitable agronomic adaptation measures in 100 target villages in two corridors</li> <li>• Value chain integration of climate smart farm households</li> <li>• Shifting to wheat-maize system will reduce stress on water resources; diversify livelihood option and reduce emission Greenhouse Gas from paddy</li> </ul>	Once the practices are implemented by farmers, they will have hands-on experience on implementing the best practices. These best practices are proposed to be sustained through the farmers as they would learn the yield increment and also ensure its food security and effective utilisation of water for crop production, which will also enhance their income.	DoA and CIMMYT eventually farmers, Village Councils etc.
Convergence of policies in programs that influence adaptation behaviour of farmers	Development of knowledge and outreach products like manuals, posters, films, research papers etc. dissemination the project activities, experience, challenges and outcomes	Knowledge products (films, manuals, publication etc.) will be developed for replication in other districts and states.	Policy makers, state department officials, farmers

	Marginalized and vulnerable households will be identified through the household survey data analysis and are included as beneficiaries in the project.	their adaptive capacities. Therefore, there is no risk for the community.
Human Rights	The project does not foresee any violation of human rights	No risk
Gender Equity and Women's Empowerment	Project would ensure participation by women fully and equitably, receive comparable socio-economic benefits and that they do not suffer adverse effect. It is proposed that amongst the total beneficiary, 35% would be women. Women would be involved in agricultural practices etc.	<u>Risk:</u> As per climate change studies, women are more prone to climate change compared to male population.  <u>Mitigation:</u> During the project implementation, gender differentiated impacts of climate change will be assessed and technologies and capacity development measures targeted at empowering women will be designed and Implemented
Core Labour Rights	Payments to labour under the project will be made as per Government approved norms duly following minimum wage rate and hence ensuring core labour rights.	No risk
Indigenous Peoples	Not applicable to this project	No risk
Involuntary Resettlement	Not applicable to this project	No risk
Protection of Natural Habitats	Project does not affect any of the natural habitats	No risk
Conservation of Biological Diversity	The project would not cause any negative impact on biodiversity values. However, the project activities will positively enhance the biodiversity richness of the state by shifting to promising hybrid varieties of Maize and high yielding varieties of Wheat.	No risk
Climate Change	To improve the adaptive capacity of rural community to climate change through portfolios of climate resilient agriculture interventions in targeted villages of Bihar. Project additionally has a co-benefit on reducing the GHG produced through adopting less	No risk

	energy requiring techniques, adopting laser based land-levellers practices <sup>1</sup> etc., which will contribute in mitigating the challenges of climate change	
Pollution Prevention and Resource Efficiency	Project activities are in convergence with the Air (prevention and control of pollution) Act, 1981 and Water Pollution Control Act, 1984 and Noise Pollution (Regulation and Control) Rules, 2000	No risk
Public Health	No adverse impact on public health related issues is envisaged.	No risk
Physical and Cultural Heritage	No adverse impact on cultural heritage related issues is identified.	No risk
Lands and Soil Conservation	The project envisages conserving the soil water, effectively utilising water, plantation of high yielding drought varieties etc. which will help in conserving the land resources.	No risk

## 7. IMPLEMENTATION ARRANGEMENTS

### 7.1. Selection of site (Developing Corridor of Climate Smart Practices)

Four Corridors have been selected in the meeting held on 19.12.2016 in the Chairmanship of Principal Secretary, Agriculture, Bihar, Patna. The First corridor will be Samastipur to Darbhanga State Highway, Second as Bihar Sharif to Patna Highway, third corridor as Bhagalpur to Munger highway and fourth corridor as Purnea to Katihar highway. 25 villages will be selected in each corridor (on the both side of the Highway). Average 100 farm families will be covered in each Climate Smart Village.

### 7.2. Working with communities

Community involvement is integral to the success of a Climate-Smart Village. Forms, or works with existing community groups, consisting of farmers, researchers, rural agro-advisory service providers and village officials. They are briefed on the objectives of Climate-Smart Villages and encouraged to formally register with the government (if they have not already) to benefit from subsidies on government schemes.

### 7.3. Conducting the baseline survey

Experts conduct a comprehensive baseline study to capture the current socio-economic situation, resource availability, average production and income and risk management approaches of village. This enables an assessment of the impact of the interventions after a one year of time.

#### 7.4. Prioritizing interventions

Stakeholders convene to prioritize and test which climate-smart technologies and approaches are best suited to their local conditions. Focus group discussions involve farmers in a choice

#### 7.5 Time line of disbursement schedule for proposed components

Project has been proposed for the duration of 3years involving mainly five components namely, Targeting and identifying different climate smart interventions in targeted climate vulnerable villages in Bihar as per farmer's socio economic and bio-physical conditions; Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies; Real-time promotion of risk management practices/ strategies of climate smart agriculture through agro-advisories for resource poor farmers in target domains; Implementing/Innovating science based suitable climate change adaptation strategies/ practices and Mainstreaming adaptation strategies into policies and programmes through better Knowledge Management and Sharing. Based on the success and demand of the product, it will be replicated to other villages of the districts. The timeline for each activity are as follows:

S. No.	ACTIVITY	Year 1				Year 2				Year 3			
		3	6	9	12	3	6	9	12	3	6	9	12
<b>1.</b>	<b>Targeting and identifying different climate smart interventions in targeted climate vulnerable villages in Bihar as per farmer's socio economic and bio-physical conditions</b>												
1.1	Village survey	■	■										
1.2	Focussed Group Discussions at community level	■	■										
1.3	Analysis of village survey data and prioritising the climate smart interventions for each village			■									
<b>2.</b>	<b>Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies</b>												
2.1	Skill development of 5 youths per village (Provision of certified training courses, agricultural kits etc.)	■	■			■	■						
2.2	Trainings of farmers on agricultural technologies			■	■		■	■					
2.3	Exposure visits/Travelling seminars at district, inter-district and inter-state levels				■			■				■	
<b>3.</b>	<b>Implementing/Innovating science based suitable climate change adaptation strategies/practices</b>												
3.1	Developing excellence/innovation model in each village (Provision of equipment, input material etc.)	■	■										
3.2	Replication of agricultural activities in other areas of villages using the equipment available at the model area of each village			■	■	■	■	■	■	■	■	■	

S. No.	ACTIVITY	Year 1				Year 2				Year 3			
		3	6	9	12	3	6	9	12	3	6	9	12
4.	Mainstreaming adaptation strategies into policies and programmes through better knowledge management and sharing												
4.1	Workshops- Inception, mid-term and final with partners and experts to review the project outcomes	■				■							■
4.2	Development of knowledge/outreach products (film, manual, booklets etc.) for disseminating the information to wider population												■

### 7.6. Capacity building of stakeholders and technology demonstration

To promote the community's involvement and motivate farmers, a range of tools and approaches are sometimes offered up front. These include CSA training in all 100 villages, The major CSA practices demonstrated in CSV will be Zero tillage wheat (ZTW), ZT Direct seeded rice (ZTDSR), permanent raised bed wheat (PBW), permanent raised bed maize (PBM), zero tillage maize, laser land levelling, new climate resilient varieties, cropping systems intensification through adjusting the planting dates and selecting the suitable varieties which fit into the system, green seeker and nutrient expert based nutrient management, better water and weed management. Also Scientists, private sector representatives, and local government organize regular training sessions for farmers on good agricultural practices. At some sites a small farm is used by the researchers to demonstrate the complete portfolio of interventions.

#### 7.7. Procedure for execution of demonstration/programme component-

7.7.1. Every Climate Smart village will be tagged to one scientist of nearest KVK and one specialist from Department of Agriculture like BTM/ATM/Agriculture Coordinator/others for technical guidance and supervision of the cluster farmers who will visit the cluster time-to-time and give advice to the farmers.

7.7.2. A flaxy board will be displayed on the site of the demonstrations/cluster on which name of the block, panchayat, village, name of programme component, inputs given with quantity, subsidy and other important information should be printed.

#### 7.8. Procedure for input distribution and subsidy payment-

7.8.1. The inputs like seed, fertilizers, pesticides and others will be distributed to the selected farmers at block level camps during Kharif/Rabi/Garma Mahotsav (Kharif/ Rabi/ Garma Mahabhiyan) prior to the sowing season.

7.8.2. Farm equipment will be distributed as per norms of Farm Mechanization.

7.8.3. At least 03 to 04 dealers will be identified by the executing agency for distribution of the inputs.

7.8.4. The input dealers will come in camp and display their inputs with rate.

- 7.8.5. The farmers will purchase all the inputs as per the demonstration model/ programme component with their own choice.
- 7.8.6. The subsidy will be given to the farmers/beneficiaries as per norms of the programme component.
- 7.8.7. The subsidy will be given to the farmers/beneficiaries through Direct Benefit Transfer (DBT).
- 7.9. Organisation of Field Day and crop cutting-**
- 7.9.1. Field day will be organised on the cluster site at the time of the maturity of the crops/season.
- 7.9.2. Crop cutting of that cluster will be organised and the yield performance will be recorded per ha/acre.
- 7.9.3. At the same time the crop cutting of the control plot will also be organised and yield will be recorded to compare the productivity with the demonstration plot/ cluster site plot.
- 7.9.4. Local farmers, public representatives and agriculture scientists/officers will be invited to visit the field day and crop cutting for its extension.
- 7.9.5. The productivity of each cluster will be recorded and it will be sent to the implementing agency. The implementing agency will send it to the concerned directorate and concerned directorate will keep the data records for knowing the effect of the programme component.
- 7.10. Monitoring and field visit of demonstration by Agriculture Scientists/Officers at state level -**
- 7.10.1. Each directorate will constitute two to three teams to visit the demonstrations/ cluster sites of Climate Smart Villages.
- 7.10.2. Scientist of ICAR/State Agriculture University/KVK/ Departmental Officers will be included in the team.
- 7.10.3. The team will supervise and monitor the demonstration/ clusters two to three times in cropping season and submit the report to the concerned directorate.
- 7.10.4. The team will also provide the technical know how to the farmers and field officers/ resource persons.
- 7.11. Success Story/Research Paper/ Other Publications -** The farmers for excellent work/ getting highest productivity for each component will be selected and their success stories will be prepared. The success stories will be printed and distributed to other farmers to adopt their technologies. Research papers and other publications will also be released through BISA/DRPCA/BAU/ICAR.

## 7.12. Administrative and Technical supervision –

### a) Describe the arrangements for project / programme implementation.

- i. Who will implement the project and what are their comparative Advantages and capacity compared to other potential implementing institutions?

The implementation of the project will be through a multi-department coordination with the overall responsibility led by Department of Environment and Forest, Government of Bihar.

Following are the responsibilities of the various implementing agencies:

Agency/committee	Responsibility
State Steering Committee	<p>Project Steering Committee headed by the Agriculture Production Commissioner/ Principal Secretary, Agriculture will advise the project in Administrative, financial and technical implementation, ensuring full implementation of project actions and review progress of the project against the agreed time lines.</p> <p>Constitution of Committee is given below;</p> <ul style="list-style-type: none"> <li>• Agriculture Production Commissioner/Principal Secretary - Chairman</li> <li>• Principal Secretary, Environment &amp; Forest/Representative - Member</li> <li>• VC RAU - Member</li> <li>• VC BAU - Member</li> <li>• Director Agriculture - Member</li> <li>• Director Horticulture - Member</li> <li>• M.D. BRBN, Bihar, Patna - Member</li> <li>• Director, ICAR - Member</li> <li>• Director, PPM, Bihar - Member</li> <li>• Director, Soil Conservation - Member</li> <li>• CGM NABARD - Member</li> <li>• Representative of CIMMYT-CCAFS (Dr. M.L. Jat/Representative) - Member</li> <li>• Representative, CIMMYT-BISA, Pusa - Member</li> <li>• Director, BAMETI - Member</li> </ul> <p style="text-align: right;">Secretary</p>
Technical Advisory committee	<p>Technical Advisory Committee headed by Director, Agriculture with following members:</p> <ul style="list-style-type: none"> <li>• Director Agriculture - Chairman</li> <li>• Director Horticulture - Member</li> <li>• Director Animal Husbandry - Member</li> <li>• Director Environment and Forest - Member</li> <li>• Director Extension RAU, Pusa - Member</li> <li>• Director Extension, BAU, Sabour - Member</li> <li>• Director, ICAR-RCER, Patna - Member</li> </ul>



Agency/committee	Responsibility
	<ul style="list-style-type: none"> <li>• Director, PPM, Bihar, Patna - Member</li> <li>• Director, Soil Conservation, Bihar, Patna - Member</li> <li>• Representative of CIMMYT-CCAFS (Dr R. Kumar Jat/ Authorised Scientist) - Member</li> <li>• Representative, CIMMYT-BISA, Pusa - Member</li> <li>• Representative of Village Council (VCs) - Member</li> <li>• Director BAMETI - Member Secretary</li> </ul> <p>TAC will be responsible for:</p> <ul style="list-style-type: none"> <li>• Preparing the implementation plan</li> <li>• Regular reviewing the progress of the implementation of the project</li> <li>• Overseeing execution of project activities, fund administration of the project and procurement of goods and services.</li> </ul>
D/o Environment (DoE)	<p>DoE will be responsible for the following tasks:</p> <ul style="list-style-type: none"> <li>• Oversee the project and main link with MoE FCC/NABARD for receiving the funds</li> <li>• Fund flow management, monitoring and reviewing the progress of the activity</li> </ul>
Director Agriculture	<ul style="list-style-type: none"> <li>• Implementation and supervision of Climate Change Adaptation measures in the beneficiary households in consultation with DoH, DoAH, RAU, BAU, ICAR-CRER, CIMMYT-CCAFS-BISA</li> <li>• Preparing progress report of the project for the steering committee meetings that will happen annually</li> <li>• Preparing and submitting report and Utilisation Certificates to the NABARD/DoE</li> </ul>
BISA/ CIMMYT	<ul style="list-style-type: none"> <li>• Providing training to line departments on agronomic, NRM and economic adaptation measures in consultation with DoA</li> <li>• Arranging exposure visits to target villages/farms where adaptation measures are implemented in consultation with DoA</li> </ul>
BAMETI	<ul style="list-style-type: none"> <li>• Extension and publicity</li> </ul>
JDA (Agro) Planning, Bihar	<ul style="list-style-type: none"> <li>• Documentation</li> </ul>
Regional level project implementation committee	<p>The Committee will supervise and monitor at Division level. The constitution of committee will be as follows,</p> <ul style="list-style-type: none"> <li>• Sr. JDA - Chairman</li> <li>• Other JDA - Member</li> <li>• Concerned DAO - Member</li> <li>• Representative from CIMMYT/BISA - Member</li> <li>• Representative from RAU/BAU - Member</li> <li>• Farmers representative (5) - Member</li> <li>• PC KVK - Member</li> <li>• Concerned Project Director, ATMA - Member</li> </ul>

Agency/committee	Responsibility
District Development Committee	<ul style="list-style-type: none"> <li>• Conducting baseline households survey in consultation with Village Level Committee.</li> <li>• Conducting stakeholder workshops and consultations at the state, district and community levels on appraising climate change impacts</li> <li>• Identification and finalising agriculture adaptation measures through research outputs and field demonstrations in the selected study villages in consultation with farming community</li> <li>• Providing agro advisories in consultation with DoH, DoAH, RAU, BAU, ICAR-CRER, CIMMYT-CCAFS-BISA</li> <li>• Development a web portal to house the central knowledge repository on project activities to enable evidence based policy in consultation with DoH, DoAH, RAU, BAU, ICAR-CRER, CIMMYT-CCAFS-BISA</li> </ul> <p>Constitution of District Development Committee will be as follows;</p> <ul style="list-style-type: none"> <li>• District Agriculture Officer - Chairman</li> <li>• Project Director ATMA - Member</li> <li>• Assistant Director Horticulture - Member</li> <li>• Assistant Director Plant Protection - Member</li> <li>• Project Coordinator KVK - Member</li> <li>• Deputy Director Soil Conservation (Concerned District) - Member</li> </ul>
Village level project implementation committee	<p>This committee will be responsible for implementation of the interventions proposed. The constitution of committee will be as follows,</p> <ul style="list-style-type: none"> <li>• Representative of state government (BAO/AC/BTM/ATM/others) - Convenor</li> <li>• Innovative farmers/farmers interest group (5) - Member</li> <li>• Young farmers/Facilitator - Member</li> <li>• Service provider - Member</li> <li>• Kisan Salahkar - Member</li> </ul>

Besides this state level project implantation committee, there will be two more committees local committees for effective implementation of the project

- i. How will the project be coordinated with (and/or mainstreamed into) Related development activities of the targeted sector?

DoE being the nodal agency for climate change in Bihar state will be responsible for the overall coordination of implementing agencies. The project will have a Steering Committee and Project implementing team, for supervising the project activities; monitoring its implementation and taking policy decisions.

b) Describe the measures for financial and project / programme risk management (also include environmental and social risk, if any).

Risk	Rating (High / Medium / Low, etc.)	Mitigation Measure
The farmers might not agree to do all the different management approaches	High	Targeted capacity building along with exposure visits will build the consensus
Bureaucratic hassles may delay in initiating the project activities and sanctioning of funds	High	Bureaucrats dealing with the concerned subject will be special invitees for the State Steering Committee on Climate Change. This would enable the policy makers to be well versed with the progress of the project activities and thus ease in sanctioning of funds.  Preliminary activities of the project will be initiated on time like baseline survey, capacity building of the community etc. and the information of initiation of project activities may be informed to the central ministry for ease in sanctioning of fund.
Events such as erratic rainfall, extreme high temperature may hassles the project activities	High	Agro-advisories services will be used to prevent such risks
Timely execution	Low	Better coordination with implementing entities involved. The project will have advisory panel who will guide the teams regularly with regards allotment of budget, workload etc.
Social issues (selection of beneficiaries)	Medium	A common criteria will be developed for selecting the farming community for execution of adaptation strategies
All activities suggested may not come to fruition as planned which might lead to conversion of agricultural land to non-agricultural land.	Low	Since each activity is headed by exclusive entities with high level of competence and experience, outcome of all activities will be ensured.

		Continuous monitoring will be done to ensure the same.
Minimum Support Price programme in the state might lead to more subsidy for rice-wheat system, leading to their continued adoption and hence diluting the climate smart measures	High	Farmers would be capacitated at the inception level on the long term benefits of shifting to wheat and maize varieties. Successful interventions would also be shown through the model fields proposed to be set up in all target villages
Poor governmental/policy control over ground water extraction	High	Bureaucrats from the State Ground Water dept. will be a part of the State Steering Committee on Climate Change. This would make them aware of the long term benefits of water security interventions and enable them to strictly impose policy on the farmers.

### 7.13. Monitoring and evaluating progress

(i) The lead partner in the village appoints a Coordinator to provide technical inputs and liaise with resource persons. Participating farmers maintain a daily diary of their farm activities and work with the Experts to monitor and evaluate the progress of their chosen interventions. These results are digitized and analysed by Experts at the end of every crop season (one Kharif and one Rabi)

(ii) Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan. (Monitoring and evaluation cost need to be included in executing entity management cost).

The progress of activities will be monitored by Department of Agriculture based on the agreed upon outputs, indicators and timelines. This process will also be steered through a Technical Advisory Committee, which will be constituted at the beginning of the project. TAC and DoE will be responsible for providing information to NABARD and MoEFCC. After the information is received, M&E would be done by NABARD and third party appointed by MoEFCC.

### 7.14. Expected outputs and outcome-

The above stated objectives will be met through a four-pronged approach that links major activities and major outputs – with goal of promoting sustainable agriculture – with focus on farmers - in which farmers and their leaders not only learn about Sustainable and Climate Resilient Agriculture but also prepare their own local level action plan and practice.

- Stakeholders aware of the climate change impacts in the target region. Farm households and prioritized activity for implementation identified
- Finalized adaptation strategies suitable to the target locations and farm household typologies
- Farmers would be capacitated on effective implementation of agriculture practices. The

implementation of agricultural practices will further be sustained by farmers.

- Farmers adjust their farm planning and operational decisions based on the climate forecast and also take preventive measures for saving the crops and minimizing the costs of production
- Best Climate Change Adaptation measures implemented by the beneficiary households in the target locations
- Improvement of resilience of farm households to the projected climate change impacts such as rise in temperature, erratic rainfall etc.
- Enhanced farmer's income due to continued enhanced crop yield even during water stress conditions
- Convergence of policies in programs that influence adaptation behaviour of farmers

At the end of project the District level farmers interaction on climate resilient and sustainable agriculture will be done in convergence with agriculture departments, other departments and agricultural universities.

Activities	Outputs
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<ol style="list-style-type: none"> <li>1. 100 villages in 04 districts will be taken for pilot project of Climate Smart villages</li> <li>2. Selecting the site</li> <li>3. Working with communities</li> <li>4. Conducting the baseline survey</li> <li>5. Prioritizing interventions</li> <li>6. Building capacity training and technology demonstration</li> <li>7. Monitoring and evaluating progress</li> <li>8. Disseminating outcomes</li> <li>9. Develop a communication module and guide book</li> </ol>	<ul style="list-style-type: none"> <li>• Development of Documentary Films, Flip Charts and Posters that can be used for of communication on Climate resilient and sustainable agriculture practices which can be adopted by farmers.</li> <li>• Specific inputs on tools / techniques and equipment that will help save time and energy in <ul style="list-style-type: none"> <li>○ routine domestic activities &amp;</li> <li>○ to reduce drudgery in activities related agriculture and animal husbandry</li> <li>○ learning for better management of daily affairs including nourishment of their children</li> </ul> </li> <li>• Information about assistance available to farmers under different government schemes and access.</li> <li>• Propose augmentation measures including multi-cropping to complement synergistic sequestration.</li> <li>• Build appropriate capacities to overcome challenges and sustain integrated production that optimizes carbon sequestration.</li> <li>• Focus on the linkages between water, soil and bio resources conservation and appropriate use.</li> <li>• Established utility of existing tools and change design if required, to promote long term support for action and benefits to farmers.</li> <li>• Device integrated policies and plans that twin the benefits of mitigation and adaptation.</li> <li>• Deliver appropriate information that will significantly enhance the levels of awareness and technical preparedness to make the best use of</li> </ul>
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**c. Disseminating outcomes**

To spread the message of climate-smart agriculture, participatory videos on success stories and testimonials from the pilot villages are screened in nearby villages. Success stories are also widely publicized through local, national and international media. Local government partners organize regular 'farmer field days' to motivate farmers; address their questions and improve on existing strategies

**d. Include a results framework for the project proposal, including milestones, targets and indicators with gender disaggregated data (as per the format in annexure).**

**Results Framework of the Project**

Outcome/Output	Indicator	Baseline	Target	Source of Verification	Risks and Assumptions
<b>Component 1:</b> Identifying and targeting different climate smart agriculture interventions in accordance to farmer's socio economic and bio-physical conditions in selected villages in Bihar					
Outcome 1.1: Stakeholders aware of the climate change impacts in the target region. Farm households and prioritized activity for implementation identified	Target communities understand and agree to implement the best practices on climate change adaptation in vulnerable locations	No understanding and agreement on climate change impacts and vulnerable locations/groups. Currently, about 5% stakeholders have a clear understanding of potential climate change impacts and recent climate change adaptation practices in agriculture sector	At least, 100 families per village in 100 target villages will be aware of the current climate change challenge in agriculture sector and agree to implement best practices in agriculture sector	Baseline surveys and focussed group discussion reports	Assumptions: Farmers agree to implement the informed best practices on agriculture.  Risks: Activities might not lead to the desired output in one season, which might lead to discouragement amongst farmers.

<p><b>Output 1.1.1:</b> Village perceptions on climate change impacts, existing coping/adaptation strategies and capacities to adapt to climate change analysed and understood</p>	<p>Researchers and line department staff understand farmer's knowledge on climate change and their existing coping and adaptation practices. Knowledge of farm household typologies based on adaptive capacities integrated into development of adaptation strategies by researchers and line department staff</p>	<p>Majority of researchers and line department staff are aware of farmer's livelihood activities. However, climate change lens has not been adequately applied.</p>	<p>50 young framers/entrepreneurs are able to analyse and prioritise the knowledge on farm household typologies based on adaptive capacities</p>	<p>Survey reports; Interviews with key villagers</p>	<p><b>Assumptions:</b> Farmers willing to learn and update their skills on more advanced agricultural practices</p>
<p><b>Output 1.1.2:</b> Concerns/issues due to implications of climate change of the specific area is identified</p>	<p>Identification of concerns/issues of specific area for implementing adaptation strategies</p>	<p>Limited information of village concern regarding crop loss due to climate change is available</p>	<p>Concerns of approx. 100 families/ village for 100 villages will be identified and documented for prioritization of adaptation activities</p>	<p>Baseline survey reports on list of villages and beneficiary households for implementation</p>	<p><b>Assumption:</b> Farmers cooperate in conducting the baseline survey.</p>
<p><b>Outcome 1.2:</b> Finalized adaptation strategies suitable to the target locations and farm household typologies</p>	<p>A suit of best management practices to adapt climate change impact based on farm household typologies and developed communicated</p>	<p>No knowledge and information on the coherence and suitability of a mix of adaptation strategies available with farmers and line department officials</p>	<p>6-8 typologies based package of practice manuals which include adaptation packages specific to study locations.</p>	<p>Technical and operational package of practices documents</p>	<p><b>Assumptions:</b> All stakeholders will participate and contribute in the preparation of package of practices</p>
<p><b>Output 1.2.1:</b> Implementation of agronomic adaptation measures</p>	<p>Number of households plan to adopt following best practices: a. Zero tillage b. Direct seeding c. Residue management</p>	<p>Farmers are going for traditional agricultural practices which are not climate resilient and hence are at high risk due to climate change</p>	<p>20-25% yield increase for wheat, maize and rice crops through adaptation of climate smart cropping system in</p>	<p>Monitoring and Evaluation reports of NABARD and third party appointed by the MoEFCC on successful agronomic</p>	<p><b>Assumptions:</b> Farmers are willing to learn &amp; adapt the recommended climate smart package of practices</p>



	d. Nutrient management etc.	implications	100 villages with 100 households/village at small and marginal farmer's land	adaptation measures	
<b>Component 2: Enhancing the capacities of stakeholders for implementing and sustaining the climate change adaptation strategies</b>					
<b>Outcome 2:</b> Farmers would be capacitated on effective implementation of agriculture practices	100 families women and young farmers capacitated on potential climate change impacts, developing and implementing the adaptation strategies	Community are mainly trained on livelihood practices. Very few farmers are trained on identification of climate change adaptation strategies specific to farm typologies	At least, 100 marginalized and vulnerable families per village in 100 villages of the study villages are trained on the new adaptation portfolio.	Capacity building and training documents including visuals and reports	Assumptions: Farmers acknowledge the limitation of livelihood practices and actively participate in the trainings
<b>Output 2.1:</b> Skill development of 50 young farmers /entrepreneurs on effective implementation of agriculture practices. Once capacitated, a business model will be developed for sustaining the implementation of activities	50 young farmers /entrepreneurs certified on potential climate change impacts, developing and implementing the adaptation strategies. A tool kit on best practices with necessary equipment will also be provided	So far, a network of trained people does not exist which can guide farmers on agricultural best practices	50 young farmers /entrepreneurs of the study villages are trained	Capacity building and training documents including visuals and reports	Assumptions: Youth express interest in implementing best practices on agriculture and willing to sustain the activities
<b>Output 2.2:</b> Capacity building workshops for farmers conducted	Number of training programmes organized Number of men and women farmers trained	Less than 1% farmers have capacities to adapt farm level climate smart agricultural practices	100 farmers families in each villages for 100 villages will be trained in climate smart agricultural practices	Training reports and visuals; Training manuals	Assumptions: Farmers show interest in the trainings Women have time and are allowed to participate
<b>Output 2.3:</b> Exposure visits to target	Number of field visits	No exclusive field visits to	60 exposure visits/ field visits will be	Field visit reports,	Assumption: Availability of

villages/ farms where adaptation measures are implemented	organized	expose farmers to climate smart practices are available	organized for farmers at district, inter-district and inter-state levels	visuals, videos	enough comparable and successful adaptation sites
<b>Component 3: Implementing/Innovating science based suitable climate change adaptation strategies/ practices</b>					
Outcome 4: Climate Change Adaptation measures implemented by the beneficiary households in the target locations	Improved resilience of farm households through crops yields, incomes and nutrition to climate change impacts compared to households not practicing climate smart agriculture	35 villages at a pilot scale practicing climate smart agriculture	100 households/ village for 100 villages to practice climate smart agriculture in the study villages	Impact evaluation Monitoring reports Remote sensing & GIS time series studies on cropping changes	Assumptions: Farmers are committed and willing to adopt the adaptation measures and are willing to contribute to the investment
Output 3.1: Implementation of Agronomic adaptation measures	Yield stabilization under water stress conditions	Presently 10-30% yield loss due to climate change in study regions	Yield stabilization suitable to changing climatic conditions and 15% higher yields compared to present activities	Field demonstrations Field data Monitoring and impact evaluation reports	Assumptions: Comparable rainfall years for assessments
Output 3.2: Value chain integration of climate smart farm	Farmers might integrate the best practices into the value chain.	Presently producer receives only 25-30% share in	Implementation of strategies to improve smallholder	M&E Reports	Assumptions: Smallholder farmers willing to aggregate in order to access value chains

households	Better producer share in consumer price for the farm produce of beneficiary households	consumer price Existing value chains are not catering to the climate resilient crops. Smallholder farmers not integrated enough into the value chains	and climate resilient crops into the value chains will result in 15-20% increase in existing producer share in consumer price		
<b>Component 4: Mainstreaming adaptation strategies into policies and programmes through better Knowledge Management and Sharing</b>					
Outcome 4: Knowledge based advisory system for integrating climate change adaptation strategies on agricultural into different agricultural policies	Convergence of policies in programs that influence adaptation behaviour of farmers	Lack of understanding on the trade-offs and complementarities of different policies and programs	Understanding of the incoherence and possible complementarities that can be achieved through convergence by the relevant stakeholders	Workshop reports with key stakeholders	Assumption: Perception of climate change threat by stakeholders to their policies and programs Risks: Reluctance of stakeholders to converge
Output 4.1: Development of knowledge and outreach products	Number of Policy makers/ Farmers/think tanks receive the information on the success of implementation of project activities for their decision making	Knowledge products on livelihood practices are available.	All interested Policy makers/ Farmers/think tanks receive and utilize weather based agro-advisories for farm planning and operations	Data on farmer subscriptions M&E Reports Exit survey	Assumptions: Policy makers/ farmers/think tanks find the information and knowledge relevant

  
 Director  
 BAMETTI, Bihar, Patna