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Research Paper

Mainstreaming Adaptation Strategies in Relevant Flagship Schemes to Overcome Vulnerabilities of Climate Change to Agriculture Sector

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A B S T R A C T

As an ecologically vulnerable region, Jammu and Kashmir faces varying impacts of climatic change and climate variability. Reduced water availability for irrigation affected by erratic rainfall pattern, loss of soil moisture, degraded soil health, extreme drought events, shifts in snowfall regimes has resulted in agricultural productivity decline. Agriculture is a significant sector of the economy with important economic and social benefits and contributes to the subsistence of 70 percent of the population and accounts for approximately 14.8 percent of the state gross domestic as well. National Action Plan on Climate Change (NAPCC) was launched in June 2008 to fulfill India's vision of sustainable development in the light of climate change. Eight unique priorities were included in this National Action Plan, including a "National Agriculture Mission" and a "National Water Mission." India is among the few nations to have a dedicated National Climate Change Adaptation Fund (NAFCC). However, this scheme's fund limitation leaves little scope for out-scaling the adaptation practices under any particular project. This paper identifies the schemes and policies of the Government of India's flagship programs. It proposes the systematic mainstreaming of financial capital under these schemes for adaptation and mitigation actions contemplated under State Action Plans of Climate Change. Integration of adaptation into development planning is crucial in ensuring that the required adaptation can be made for the climate change crisis's scope and urgency.

***Key words*:** Climate change, Adaptation, Mainstreaming, Institutionalizing, Flagship schemes

Climate change will manifest itself most prominently through changes in the water cycle, and its impacts are likely to get amplified in agrarian economies like India. Climate change is increasing the water cycle variability, reducing the predictability of water availability, inducing extreme weather, and decreasing water quality, threatening all sectors' water security [1]. These impacts are likely to be amplified in agriculture-dependent developing economies like India and are widely expected to stress the country's water management and governance systems and institutions.

The dependence of the livelihoods of people in the Himalayas on agriculture is huge. Many people are dependent on allied activities like post-harvest management, horticulture, food processing. The Indian Himalayan Region is a significant source for supplies of some food crops, fruits, and medicinal crops. A shifting climate has strained the Himalayan regions' agricultural and livelihood systems by altering temperatures, melting glaciers and snow, altered precipitation patterns, and more frequent and extreme weather events. However, scientific observations and studies on climate change impacts on agriculture in the Himalayan region are limited and mainly focus on climate sensitivities. The number of rainfall events and the number of rainy days has declined by 52% and 34% during the last ten years in the Himalayan region. The incidence of high-intensity rainfall and droughts has increased. These changes have disrupted the hydrological systems and reduced the availability of water resulting in frequent crop failures, declines in irrigation potential (25%), decreased agricultural productivity (26%), and loss of rural livelihoods (34%) in traditional rural sectors in the region [2]. Due to the observed and projected climate change, there is high uncertainty in crop production in the near future and adequate attention must be given to sustain Himalayan agriculture [3].

In the UT of Jammu and Kashmir, since 1980 there has been a 0.8°C rise in average annual temperature, while the increase in maximum temperature is 0.97°C, and the smallest rise in minimum temperature is 0.76°C [4]. It is also witnessing sudden changes in precipitation and snowfall pattern. The J&K is on the path to having a greater chance of extreme temperature events and more extreme rainfall and minimum temperatures in the future. There is vital evidence between changing climate and climatic extremes in the region [5]. In 2019, a study on recent trends in the Kashmir valley precipitation regime showed a consistent decrease in annual precipitation at the rate of 5.1 mm/year [6].

Increased global temperatures, climate change, variability, decreased availability of water for irrigation, and a rise in climate extremities result in crop germination failure,

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leading to a decline in agricultural productivity [7]. Most of the cultivated area of the UT is rain-fed, and with the reduction in rainfall, rain-fed agriculture is being affected. Horticultural crops like apples and walnut also decline because of a reduction in the timely rain. Kashmir valley-based agriculturalists believe that an abnormal rise in temperatures can drastically affect the native plant species, increasing their sterility and lowering overall production. Climate change is threatening to loss of food security of more than 4 million people dwelling in vulnerable areas like Uri, Gurez, Karnah and Kishtwar, and Doda areas in case of failure of fruits and food grains. UT of J&K is predominantly an agrarian economy with about 70% of its population, of more than 1.25 crore dependent on agriculture and allied activities [8]. Paddy produces the largest area of agricultural production, followed by maize and wheat. Maize is the main crop in Jammu, and there is also some wheat production.

According to Agriculture Census 2015-16 report, the total operational holding area in the erstwhile state of J&K is 0.842 million ha. The operational holding area by marginal farmers (landholding below 1 ha) is 0.397 million ha, and small farmers is 0.221 million ha, semi-medium farmers is 0.154 million ha, medium farmers is 0.059 million ha, and large farmers is 0.011 million ha in the erstwhile state of J&K [9]. About 3.3% of the erstwhile state's total geographical area is under cultivation, of which 60% is rain-fed with frequent moisture stress (https://icar.org.in). The percentage of gross irrigated area to the gross cropped area was 43.01% for 2017-18 [10]. As per Jammu & Kashmir Economic Survey 2017 report, agriculture's economic contribution to erstwhile state's Gross Domestic Product (GDP) is steadily declining, but agriculture is still demographically the broadest financial sector. Yield per hectare of food grains, fruits, vegetables is far below the country level averages due to which agriculture contributed only 14.85% to erstwhile state's GDP in 2017-18. Significant variation in crop yield was reported from rice varieties grown in plains and high-altitude regions of the valley [11]. Variety of horticulture crops like fruits and vegetables, plantation crops, and floriculture are also cultivated in J&K. The favorable climatic conditions and fertile soil provides immense scope for the promotion of the horticulture sector.

Moreover, this sector is labor-intensive. It provides employment opportunities to a sizeable number in the processing of its products, which makes it a crucial component to the erstwhile state's economy. Apple, pear, walnut, almond, cherry, apricot, and a large variety of other fruits are widely grown in J&K. It is the major apple-producing state accounting for more than 70% of the total apple production in the country, and the production per hectare is 10.25 metric tons, which is higher than the national average of 7.98 [12].

Approximately 0.67 million ha (80% of total operational holding) of agricultural land is prone to one or the other disaster - including landslides, floods, and drought in 11 districts of the erstwhile state [13-15]. The fact that out of this, 0.397 million ha of land belongs to marginal farmers further exacerbates the vulnerability of agricultural systems in the state. Smaller-size of agrarian land per farmer limits multi-cropping and increases sensitivity towards climate shocks. Changes in climatic conditions are causing the expansion of the usual range of pests, which in turn are causing more diseases in crops, and as a result, the annual food production is decreasing [16]. It has been further reported that in the last few years, because of climate change and substantial reduction of water for agriculture, there has been a dismal production of paddy, and as a result, farmers in many areas of the valley have now adopted horticulture [17].

The country's large population and its high poverty and low adaptive potential make adaptation imperative for sustainable development. Integration into growth plans, initiatives, and projects is one of the most critical measures to ensure that adaptation to climate change can be accomplished on a global scale [18]. Following the creation of the National Action Plan on Climate Change (NAPCC), officials concentrated on increasing the effectiveness of the Plan's primary missions. There was awareness that climate changes were regional, and adaptation measures needed to be developed at a more significant geographic scale. India has created a National Adaptation Fund to adapt to the effects of climate change (NAFCC). However, the comparatively small amount of available funds under the NAFCC cannot make a stand-alone difference at scale. Investing in improved water management and climate-resilient agriculture is therefore critical for helping communities deal with climate-induced uncertainties [19]. Although some sectors have begun to make climate adaptation a priority, there is a tremendous amount of potential to incorporate climate risks into growth. This paper identifies the central sector's management of climate threats and the incorporation of adaptation into their central strategies, budgets, and programs.

MATERIALS AND METHODS

There are a number of schemes operating at the national and state levels, focusing on water security and climate adaptation. To map and identify schemes with scope, objectives, and provisioned activities covering all or part of the Agriculture sector, the following steps, as described by [20] were taken:

Fig 1 Flow of work

Identification of stakeholder department:

The government departments' web portals and latest union budget statements were reviewed to identify schemes having direct or indirect relevance to Agriculture and Water sector components.

Select: From the identified schemes, the screening was done based on the schemes' scope, objectives, and provisioned activities, after which only those schemes with a clear link to climate-resilient agriculture were selected.

Review: For the selected schemes, a detailed review and analysis were carried out for its linkages with the State Action Plan on Climate Change.

Synthesize: The identified activities were categorized under different components and based on the number of activities under each component.

RESULTS AND DISCUSSION

Overview of national and state climate change action plan

Adaptation is needed to prepare communities, regions, countries, and societies for the consequences of climate

change. Adaptation is a broad subject covering many sectors and socio-economic frameworks. The United Nations Framework Convention on Climate Change defines adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities." There are many different kinds of adaptation, including anticipatory and reactive, private and public, and autonomous and scheduled [21]. As soon as India's National Action Plan on Climate Change (NAPCC) was developed, a need was felt to execute action under its priority missions. There was also a recognition that climate-linked vulnerabilities were essentially local, and adaptation mechanisms needed to be correspondingly developed at a coarser scale. In 2009, the Government of India (GoI) pleaded with states to produce action plans in line with the National Action Plan's goals on Climate Change (NAPCC). A top-down approach was adopted to conceive state climate plans in India. J&K State Action Plan on Climate Change was also prepared and submitted to MoEF&CC, GoI, and approved by the Steering Committee of MoEF&CC, GOI for funding to the tune of 6435 Crore. The SAPCC had 11 missions to be addressed for adaptation and mitigation. A total of 235 actions have been proposed by 10-line departments. The Plan proposes 125 actions to be taken up under high priority.

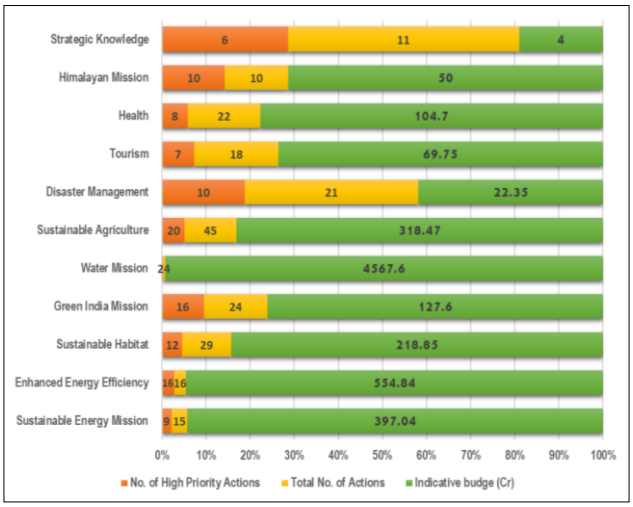

Fig 2 Outline of SAPCC funding and priority

It is evident from (Fig 2) that the maximum amount of funding has been allotted to combined sectors of Agriculture and Water, i.e., Rs. 4886Cr, thereby recognizing the weightage and importance of these sectors to the impacts of climate change.

There is a sense of urgency (and incentive) among certain parties to complete this exercise before distributing funds under the next Five-Year Plan [22]. However, this initial suggestion of funding did not materialize, and most states and Union Territories (UTs) have since established their climate plans at "various levels of motivation and speed." GoI set up the National Adaptation Fund on Climate Change (NAFCC) in 2015 to resolve this gap [23]. According to the National Bank for Agriculture and Rural Development (NABARD), which is the scheme's key implementer, nearly 26 states received a total of over Rs. 650 Cr for pilot projects from the fund. Some states have also applied for and obtained support through the UN FCCC's Adaptation Fund and the GCF's Green Climate Fund [24]. So far, Jammu and Kashmir have also received funding for one project being implemented by the Agriculture Department under the Sustainable Agriculture Mission for "Climate Resilient Sustainable Agriculture in Rain-Fed Farming Areas of Jammu and Kashmir," which has been approved for funding to the tune of Rs. 22.5 Crore under NAFCC through NABARD.

The project's key objective is to reduce the agricultural vulnerability of farmers in water-stressed, rain-shadow zones of Jammu & Kashmir and to encourage integrated farming systems that have multiple benefits. The project calls for water management infrastructure in areas of moisture stress, while drainage systems are vital to the low-lying regions' productivity. It will mainly concentrate on rain-fed farming (dryland agriculture), such as water harvesting and aquifers recharge. The project could not be extended to the entire state, as budget constraints preclude it.

Table 1 Priority actions under Agriculture Sector identified under SAPCC

A. Crops and Animals	
1. Crop efficiency and protected cultivation	-Stress tolerant varieties, particularly drought and flood -Crops efficient in water use -Precision farming -Hi-tech green houses -Poly green houses
2. Agro-horticultural interventions	-Micro-irrigation -Zero tillage, -Trash mulching, vermicompost, biofertilizer -Root stock, progeny plants
3. Livestock	-Disease management -Fish farming -Forage & fodder production
4. Economic viability	-Crop diversification -Weather based crop insurance
B. Capacity building of stakeholders	
5. Planner/ extension workers/farmer	-New and appropriate technologies -Forecasting for livestock management
C. Environmental sustainable in rainfed and irrigated systems	
6. Sustainable productivity	-Integrated farming model organic / forest linked farming -Integrated nutrient management -Conservation of natural water bodies for fish stock -Grassland management
7. *In-situ* Moisture Conservation	-Roof-top water harvesting ponds, tanks -Soil erosion check measures
D. Agribusiness agreement	
8. Research	-Bio-control/bio-fertilizer laboratories -Development of stress tolerant varieties -Increasing Nutrient use efficiency -Forecasting model for yield and weather -Conservation of pollinators
9. Infrastructure	-Cold-chain for agro-horti-floriculture products -Bio-diversity Parks

Prioritized actions under state action plan on climate change – Agriculture sector

The National Sustainable Agriculture Mission aims to support four areas of crucial climate adaptation in agriculture: dryland agriculture, risk management coupled with weather insurance, access to information, and use of technology. J&K has proposed 45 actions under the sustainable agriculture mission and 20 being priority actions with an overall budget requirement of Rs. 318.47Cr (Table 1) shows the priority actions envisaged under Agriculture Sector.

Investment based interventions

It is well understood that the effects of climate change have drastically affected the agriculture sector. The majority of the population dependent on rainfed agriculture is vulnerable to changing climatic patterns and disasters. Hence, an integrated approach to linking climate change adaptation and disaster risk management is required to reduce the sectoral vulnerabilities and become climate and disaster resilient. The following are the recommended interventions that are to be implemented in agriculture and allied sectors. However, to implement all the adaptation and mitigation plans, there was little funding available. Now, to overcome the impediment of funding, the adaption action programmatic mainstreaming of adaptation into the agriculture sector with ongoing Government of Inia flagship programs can be worked out. Through mainstreaming, it is possible to incorporate climate risk considerations into its programs and budget, what actions the department took to integrate adaptation into its programs, and how they implemented these actions.

Table 2 Investment-based interventions and vulnerabilities for agriculture and allied sectors

Investment-based interventions	Vulnerability
Climate-smart agriculture package (including horticulture): 1. Promotion of climate-resilient crop varieties for agriculture and horticulture 2. Promotion of crop diversification (eg. through Seed distribution) for shift to low water requiring and high-value, or commercially more viable crops based on local agro-climatic and market conditions 3. Sustainable crop management practices (eg. System of Rice Intensification, organic farming, integrated soil-water-nutrient) 4. Enhancement of agri and allied infrastructure (including grain storage, cold storage, chilling plants) 5. Establishment of FPOs and dairy collectives for horticulture, agriculture and dairy products	• Marginal farmers (81.5%) are vulnerable to hydro-meteorological disasters and drought due to low irrigation and mono-cropping levels. (J&K Farmer's Guide) • It is estimated that the crop water demand under Jammu's subtropical condition increases by 7% if the temperature alone rises by 30ºC. Temp variations during the Rabi harvest adversely affect wheat production because it shortens the plants' growth stages. The wheat yield is expected to decrease to the amount of ½ quintal per degree of temperature increase by 10ºC. • The testing and validation of the CERES-maize model under subtropical conditions predicted that a significant reduction in maize yield by 34% could be observed under an increase in temperature of 30ºC. • Studies have shown that the production and quality of fruit and vegetables are affected by high temperature and exposure to elevated carbon dioxide levels and even ozone concentration. • J&K is facing an acute shortage of cold storage for storing grains and vegetables. Cold storage facilities in south Kashmir are available with a total capacity of 0.06 million MT against a requirement of 0.3 million MT. • The non-availability of cold chains for storage and long-distance shipment of traditional meat products is a major constraint to their introduction in local and national markets and to promoting their export. • Climate change is threatening to loss of food security of more than 4 million people dwelling in vulnerable areas like Uri, Gurez, Karnah, Drass, Leh and Kishtwar, and Doda areas in case of failure of fruits and food grains. (DPR NAFCC, 2016)
Implementation of insurance for horticulture crops based on yield rather than weather event under Weather Based Crop Insurance Scheme (WBCIS)	• According to reports as of December 2019, Pradhan Mantri Fasal Bima Yojana (PMFBY) did not cover the cash crops of J&K and other losses incurred by farmers due to adverse weather conditions. • In Kashmir, horticulture continues to be the backbone of the economy, contributing annually over INR 10,000 crore (USD 1.36 billion) to the region. According to official figures of the government, the area under production of fruits in Jammu and Kashmir is currently 0.331 million hectares. • In November 2019, snowfall caused more than 30% loss to apples. • 95% drop in the production of saffron, causing financial loss to the saffron growers, due to dry spell in the Kashmir valley.
Enhancement of livestock value chain services: 1. Veterinary support for livestock 2. Provision of quality fodder 3. Infusion of hybrid vigour/breeding services	• The dairy sector's significant hindrances are livestock diseases, lack of quality fodder and nutritious feed, technical guidelines, and vet services. • Droughts and floods can have a significant effect on livestock production • Lack of dairy information sources is one of the reasons of low milk production for the farmers of hilly areas

Major schemes with objectives aligned with climate change adaptation

Mainstreaming in the context of climate change refers to the incorporation of climate change considerations into established or ongoing development programs, policies, or management strategies, in addition to implementing adaptation initiatives separately. In order for climate change adaptation to be sustainable and applicable on a wide scale to enable the people, especially the poor, to cope with the possible risks of climate, it must be incorporated, integrated or "mainstreamed" into the policy apparatus of governments [25]. The CSS or national flagship programs, some of which are funded entirely and some up to 75 percent by the Central government, are ideal for the mainstreaming of climate change adaptation since it is aimed at the socio-economic development of the poor and disadvantaged sections of society that are most vulnerable to climate change. However, considerations of Climate Change Adaptation interventions are not clearly articulated in the flagship CSS that are being implemented by the various ministries/departments. (Table 2) shows the alignment of adaptation actions and their corresponding flagship govt schemes has been worked out:

Table 3 Schemes with components for alignment with climate change adaptation

S. No.	Scheme	Objectives	Budget (Crores)
1.	The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)	-Contour trenches, contour bunds, boulder checks, gabion structure, Gandhi underground dykes, earthen dam, stop dam, farm pond, dug well, spring shed development activities, renovation of traditional water bodies, de-silting of tanks. -Drought proofing including afforestation and tree plantation -Horticulture, plantation, nursery, composting structures, infrastructure for liquid bio manure, fish drying yard, livestock shelter, infra for azola cultivation(fodder), grasslands, bamboo, rubber and coconut plantation, perennial grass plantation (e.g., stylo, vertiver, etc), fodder trough for cattle.	101500
2.	National Rainfed Area Authority (NRAA)	-Its mandate is wider than mere water conservation and covers all aspects of sustainable and holistic development of rainfed areas, including appropriate farming and livelihood systems approaches.	4.41
3.	Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) - Accelerated Irrigation Benefit Programme (AIBP)	-Through Long Term focus on faster completion of ongoing Major and Medium Irrigation Fund including National Projects (LTIF) in NABARD	1798
4.	Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) - Per Drop More Crop (PDMC)	-Provides end-to end solutions in irrigation supply chain, viz. water sources, distribution network and farm level applications. Fertigation, solar pumps	4,000
5.	Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) - Har Khet Ko Pani (HKKP)	-Water bodies restoration, rainwater harvesting structures, groundwater recharge structures, water storage structures, water distribution network, command area development, creation of new water sources through Minor Irrigation (both surface and groundwater), Diversion of water from source of different location where it is plenty to nearby water scarce areas, lift irrigation from water bodies/rivers at lower elevation to supplement requirements	1050
6.	Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) - Watershed Development Component (WDC)	-Bridge area treatment, drainage line treatment, rainwater harvesting, in-situ moisture conservation, check dams, nalabund, farm ponds, tanks; Converging with Mahatma Gandhi NREGA for creation of water potential in identified backward rainfed blocks including renovation of traditional water bodies; Effective rainfall management like field bunding, contour bunding/trenching, staggered trenching, land levelling, mulching etc. -Nursery raising, afforestation, horticulture, pasture development, livelihood activities	3960
7.	Rashtriya Krishi Vikas Yojana (RKVY) - Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RAFTAAR)	-Community tanks, farm ponds, plastic/RCC lining/water storage structures on farm, terracing, gully control measures, spill ways, check dams, diversion drains and spurs, protection walls, percolation and minor irrigation tanks Stress-tolerant varieties -Green house/poly house/shade net house infrastructures, nurseries, vermicompost units, solar pumps, solar drying, solar energy in green house, distribution of farm equipment, bio-pesticide, poultry farms, cattle feed units, dairy assisting equipment, breeding farms, nursery -Tissue culture labs/units, soil and pest testing labs, ATMA infrastructure, establishment/strengthening of bio-fertiliser production units, seed processing facilities and seed storage godowns, construction/maintenance of godowns and warehouse, vaccine production unit, milk processing	3191 / 20.37

		units, cold storage, fish ponds/reservoirs, post harvesting technology units, kisan call centres, infrastructure for azola production, infra for hydroponic fodder, feed processing units, fodder block making -Objective of making farming as a remunerative economic activity through strengthening the farmer's effort, risk mitigation and promoting agribusiness entrepreneurship.	
8.	Pradhan Mantri Fasal Bima Yojna (PMFBY)	-Provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests and diseases.	15695
9.	Atal Bhujal Yojana (ABhY)	-Monitoring and disseminating groundwater data, aquifer mapping water harvesting and artificial recharge, surface water harvesting are key components under which following activities are undertaken: piped irrigation networks in canal command areas, check dams, percolation tanks & desilting tanks, recharge shafts/wells/ trenches/bunds, rooftop surface water harvesting, stormwater harvesting structures, farms ponds/farm ditches -Develop climate resilient agricultural practices to drought proof crops, crop diversification (drought & salt resistant crops)	6000
10.	Flood Management and Border Areas Programme (FMBAP)	-Flood forecasting, hydrological modelling	750
11.	National Hydrology Project (NHP)	-Under 3 key components i.e. water resource monitoring system, water resource information systems and water resource operation and planning system, activities supported include water resource assessment tools, ground water modelling, digital technology for river basin and investment planning, measurements of stream flow, groundwater and water storage, hydro-informatics centres for hydrological modelling, strengthening of India's water resources information systems and regional /state water resources information systems	200
12.	River Basin Management (RBM	-Mapping river migration zones	200
13.	Jal Jeevan Mission (JJM)	-Dedicated bore well recharge structures, rain water recharge, rejuvenation of existing water bodies, building canals and canal channels, canal networks, functional household tap connections/ drinking water supply	
14.	Integrated scheme on agricultural marketing (ISAM)	-Warehouses, godowns, primary processing infrastructure such aa cleaning, cutting, de-podding, de-cortication, bleaching, grading, sorting, packing, labelling, waxing, ripening, chilling, pasteurization, homogenization, freezing, refrigeration etc., ancillary/supporting infrastructure like parking sheds, internal roads, garbage disposal arrangements, boundary walls, drinking water etc., market related extension, e-trading infrastructure, mobile infrastructure for post-harvest operations viz. grading, packaging, quality testing etc., agribusiness ventures	490
15.	Special Livestock Insurance for Scheduled Castes (SCSP)	-Providing safety mechanism to the farmers and cattle rearers against any potential loss of their animals due to death and to demonstrate the value of the insurance of livestock to the people and popularize it with the ultimate aim of attaining qualitative improvement in livestock and their goods.	0.3
16.	National project on soil health and fertility	-Promoting use of Integrated Nutrient Management organic manuring, soil amendments (lime/ basic slag) in acidic soils, distribution of micro-nutrients. -Soil testing laboratories, Fertilizer Quality Control Laboratories	315
17.	Soil Health Card	-This scheme provides in Soil Health Card to every farmer. Additionally, 100 mobile soil-testing laboratories have been set up across the country. In Kashmir, under the soil health card scheme (Rising Kashmir, 2019), 90473 soil samples were collected, 88646 samples have been tested and 695275 soil health cards have been distributed among the farmers. The soil health card helps improve soil fertility and access the different types of soil and their ability to support crop production. Also, specific recommendations are provided to the farmers on the use of fertilizers and micronutrients to be applied for improving soil health and fertility.	500
18.	Member of Parliament Local Area Development Scheme (MPLADS)	-Rainwater harvesting structures, boring construction, handpumps, tubewells, water tanks, water tankers, lift irrigation, culverts, rainwater harvesting parks, public groundwater recharging facilities, piped water supply.	3960
19.	National Horticulture Mission	-The missions aims to foster holistic growth through area-based differentiated strategies that includes research, technology promotion,	2310.25

		extension, and post-harvest management, processing and marketing. Ponds, drilled wells, tube wells, reservoirs with plastic/RCC lining, community tanks, farm ponds, water harvesting system. -Nursery, establishment of new gardens, mushroom production, beekeeping, horticulture mechanization (power tillers), on-farm collection and storage units, spawn production and compost making units, and green construction houses, shade net house, plastic mulching, plastic tunnels, anti-bird/ hail nets. -Markets, post-harvest management facilities, food processing units, tissue culture units, seed infrastructure like drying platform, storage bins, packaging unit and related equipment.	
20.	National Mission on Sustainable Agriculture (NMSA) - Paramparagat Krishi Vikas Yojana (PKVY)	-Model Organic Cluster Demonstrations: Conversion of land into organic, Integrated Manure Management, Custom Hiring Centres, Packing, Labelling and Branding of produce Model Organic Farm practices: Vermi-compost, manure management, bio- fertilisers, input distribution to local groups and organic farmers, soil sampling for residue testing, biological nitrogen harvesting Under Model organic farm practices: organic input production units, organic fairs	500
21.	National Mission on Sustainable Agriculture (NMSA) - Rainfed area development and climate change (RADP)	-Vermicomposts, farm mechanisation inputs such as seeds, fertilizers, manure, plant nutrients etc, horticulture, livestock, fishery, apiculture etc. mushroom, medicinal & aromatic plantation, on farm development such as sillage making, seed bank, seed production, green house, low tunnel polyhouse, lining of ponds/wells constructed under Mahatma Gandhi NREGA, water lifting devices (solar, electric, diesel) Besides, soil test/soil health card based nutrient management practices, farmland development, resource conservation and crop selection conducive to local agro climatic condition will also be promoted. -Storage/packing/processing units	207
22.	National Mission on Agricultural Extension and Technology (NMAET)	-This Mission aims to restructure and strengthen agricultural extension to enable delivery of appropriate technology and improved agronomic practices to farmers. NMAET consists of four sub missions- Sub Mission on Agricultural Extension (SMAE), Sub-Mission on Seed and Planting Material (SMSP), Sub Mission on Agricultural Mechanization (SMAM) and Sub Mission on Plant Protection and Plant Quarantine (SMPP). -Climate-smart agriculture package (including horticulture) -Promotion of climate-resilient crop varieties for agriculture and horticulture -Promotion of crop diversification (e.g., through Seed distribution) for shift to low water requiring and high-value, or commercially more viable crops based on local agro-climatic and market conditions -Sustainable crop management practices (e.g., System of Rice Intensification, organic farming, integrated soil-water-nutrient) -Enhancement of agri and allied infrastructure (including grain storage, cold storage, chilling plants)	2877.40
23.	National Food Security Mission (NFSM)	-Community and field ditches linking natural drains, water harvesting structures, ponds, tanks, site specific rain water management activities, water carrying pipe. -Drought resistant high yield variety seeds, demonstration of certified seed production, bio-fertilizers, plant protection chemicals, weedicides, bee keeping in arhar, city compost, promotion of arhar on rice bunds, promotion of plantation crops on bunds, demonstration kits	2113.79
24.	National Livestock Mission (NLM)	-This Mission's focus is on the sustainable development of the livestock sector by enhancing livestock feed and fodder availability. Enhancement of livestock value chain services. The Mission will cover everything relevant for improvement of livestock productivity and support projects and initiatives required for that purpose subject.: -Veterinary support for livestock -Provision of quality fodder -Infusion of hybrid vigour / breeding services	370
25.	National Program for Dairy Development (NPDD)	-The Mission is to create and strengthen infrastructure for production of quality milk including cold chain infrastructure linking the farmer to the consumer, train the dairy farmers, strengthen dairy cooperative societies/Producers Companies at village level, o increase milk production by providing technical input services like cattle feed, and mineral mixture and to assist in rehabilitation of potentially viable milk federations/unions.	300

26.	Pradhan Mantri Kisan Sampada Yojana (PMKSaY)	-Food processing units, cold chains, pack houses, pre-cooling units, ripening chamber, transport infra, reefer trucks/ mobile pre-cooling trucks, deep freezers/ frozen storage, ware houses, site development, testing laboratories, cleaning grading, sorting and packing facilities, minimal processing facilities for agri-horti produce, milk chilling centres, training centres, institutional strengthening, temperature controlled solar powered retail carts	1081
27.	Dairy Processing & Infrastructure Development Fund (DPIDF)	-The objective of this scheme is to modernize the milk processing plants and machinery and to create additional infrastructure for processing more milk. Funding will be in the form of interest-bearing loan, which will flow from NABARD to NDDB/NCDC and in turn to eligible End Borrowers.	60
28.	Supporting Dairy Cooperatives and Farmer Producer Organisations engaged in dairy activities (SDCFPO)	-The aim of this Plan is to establish a competitive market platform for the dairy producers by providing the necessary infrastructure for the dairy industry to enter the traditional dairy sector. SDCFPO can be treated as a solution provided by GoI to the dairy farmers by providing capital loans during inconsistent market conditions, weather effects or natural calamities.	100
29.	Livestock Health & Disease Control (LHDC) Scheme	-This scheme aims to prevent, control and contain animal diseases and curb the spread of the prevalent diseases in livestock and poultry.	438

It is evident from the (Table 3) above that there are a number of schemes and actions which can be assigned to the climate change adaptation programms to overcome funding constraints. A major cross-sectoral scheme – Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) that mentions enhanced rural disaster preparedness as a stated outcome is also primarily financed by the central government. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is the single largest scheme that have approved budget outlay of Rs. 1015 billion.

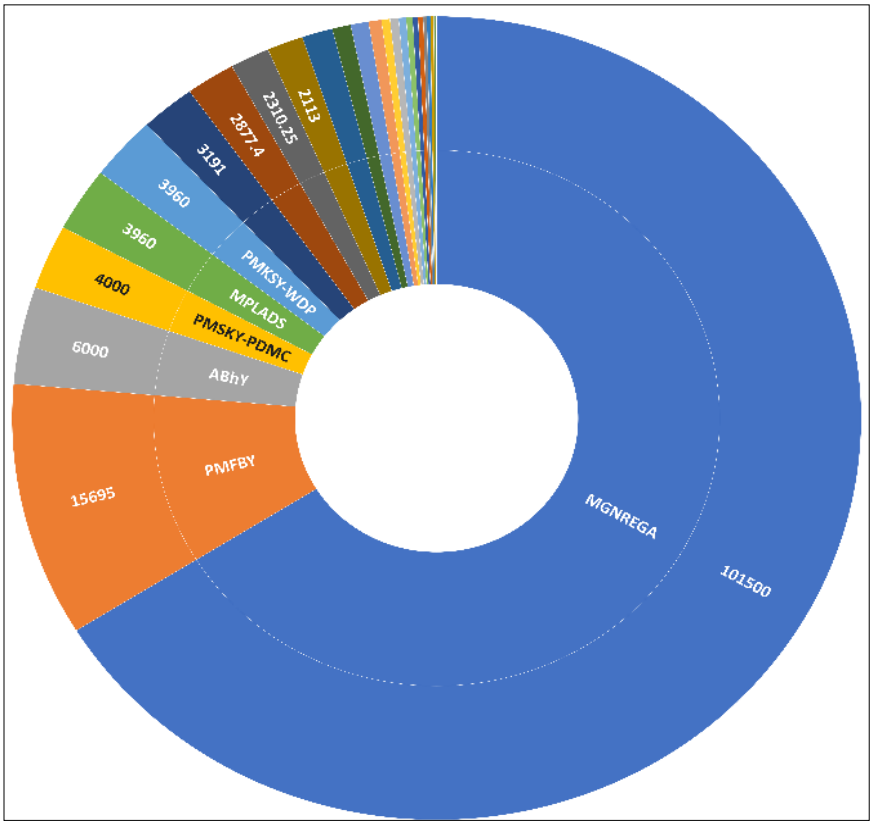

Fig 3 Breakup of funding of various central govt schemes

This is followed by Pradhan Mantri Fasal Bhima Yojna (PMFBY), with Rs.157 billion approved budget. The other schemes like ABhY, PMSKY, PMKSY, etc., also have a good chunk of funding channelized towards improving the agriculture and water sector. The key components that have been considered and for which schemes are mapped include crop diversification, Stress tolerant varieties, particularly drought and flood, Crops efficient in Water use, Precision Farming, Micro-irrigation, Vermicompost, Biofertilizer, Disease Management, Integrated Farming Model, Organic / Forest linked Farming, Integrated Nutrient Management, Soil erosion check measures, Bio-Control/Bio-Fertilizer Laboratories, Development of stress-tolerant varieties, Increasing Nutrient use efficiency, Cold-chain for agro-horti-floriculture products, water resource assessment, water supply augmentation, demand management, water quality water management, and water risk management strategies to enhance resilience against droughts and floods.

The UT of Jammu & Kashmir is one of the least carbon-intensive states/UTs in India – however, it is also one of the most vulnerable geographies – both in terms of disaster as well as in terms of climate change. Despite the existing vulnerabilities, climate change and disaster risk reduction do not seem to have received their due attention in the development plans. Neither the Disaster Risk Reduction plans nor the SAPCC is backed with a tangible financing plan corresponding to the scale of investment required. Most of the sectors do not have any significant state-level scheme. Most of the schemes related to agriculture, water, sanitation, health, power, etc., are from above mentioned centrally sponsored schemes.

Apart from grants from the government, Public Sector Undertakings (PSUs) have been another significant source of investment for the erstwhile state. Many factors, both policy-based and otherwise, have discouraged the successful mainstreaming of climate action. Some of these include limited coordination between the climate planning and sectoral implementation agencies, inadequate capacity among officials to interpret technical climate assessments and integrate them in the project and budgetary planning, capacity constraints in obtaining external funding, and limited ownership of the mechanism beyond the interest of some motivated bureaucrats. Incumbently, lack of dedicated preparation and budgetary allocations, existing policy structures continue holding climate change at the periphery of state economic and development planning. Another important obstacle to state climate policies is the interaction between state planning and ongoing socio-economic and environmental challenges. Coordinating institutional efforts and establishing institutional relationships can improve the overall institutional efforts. Physical, institutional, social, and economic resources must be incorporated to promote lasting economic growth. Designing and implementing policies in a cohesive, inclusive and coordinated manner by developing a comprehensive MIS coupled with GIS will provide opportunities for improving coordination and integration of climate change adaptation and mitigation efforts across the different sectors, including agriculture.

CONCLUSIONS

Agriculture and the green-economy are essential to achieving the 17 SDGs. Source of both food and raw material, agriculture. Agriculture represents the most prominent job sector and is the primary source of food and income. In Asia, a majority of the population relies on agriculture for subsistence. The sustainable development goal (SDG) 13 envisages taking urgent action to combat climate change and its impacts. Since the SDGs are interconnected in many contexts and a link with agriculture is clear under the steps needed quoting "Strengthening resilience and adaptive capacity of agriculture to the impacts of climate change, and lowering greenhouse gas emissions without affecting food production". While focusing on identifying mainstream interventions and mapping convergence and co-financing opportunities for executing them with existing institutional mechanisms and systematic frameworks, this study identified all 29 national-level schemes and reviewed for components contributing to agriculture and water management. The paper shows that numerous flagship programs in India, which can be channelized towards the impacts of climate change and adaptation in agriculture sector, with institutional overlaps in some regions. Development through institutional convergence is a must for implementing climate-resilient adaptation practices and it is not without challenges. While intersection has been the underlying principles of a majority of development schemes and programs, and rightly so, as a way forward, it is recommended to employ and pilot the mainstreaming options to overcome financial restrictions in adaptation funding. It is recommended that there is a need to maintain a robust MIS and GIS for funding provisions and convergence under each scheme related to climate change adaptation for mainstream actions at the district level/panchayat level.

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