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Action Plan of KSAPCCS in Implementation of Agriculture and Water Sector in Connection with Environmental Change of Livelihood of Farmers

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Abstract

The primary aim of this research study is to strengthen the efficiency of the KSAPCC, particularly in the Sustainable Agriculture and Integrated Water Resource sectors by reflecting on the implementation challenges, policy and communication gaps with an added emphasis on stakeholder engagement. The key research questions focus on the water and agricultural sector and are aimed at Identifying factors influencing the efficiency of KSAPCC implementation, Analyzing outlined policy actions and on-ground challenges faced. Improving multi-stakeholder approaches and Recognizing potential policy approaches, education and communication strategies to strengthen further implementation. The study was carried out using a two-

An interview with stakeholders from government, civil society and academics at the state level, as well as discussion with farmers in the Uttara Kannada region was conducted. The study concludes with recommendations for effective implementation of the statewide climate plan through strengthening bottom-up approaches in policy development processes, improved fiscal management, building resilience through enhanced scientific approach and strengthened decision making, capacity building requirements at different levels and promoting widespread awareness on climate change as well as its impacts.

pronged approach- policy analysis and qualitative surveys.

Keywords: KSAPCC, Agriculture, Livelihood, Farmers

Introduction

Human activity is causing the climate emergency to accelerate at an unprecedented rate. The effects of climate change are visible in every region across the world. Extreme weather events such as heat waves, cyclones and heavy rains have become more intense and frequent since the 1950s as a result of anthropogenic activity. Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the Earth's climate system, increasing the likelihood of severe, pervasive and irreversible impacts on people and ecosystems. The Intergovernmental Panel on Climate Change Assessment Report 6 (AR6) states that all climate models indicate a high likelihood for climate extremities such as droughts, tropical cyclones, wildfires and heavy rainfall by the end of the century. This will be further exacerbated by frequent pluvial floods and erratic rainfall patterns in the South Asian region (IPCC 2021: Summary for Policymakers)^[8].

As a result of increased scientific understanding, a growing number of impacts and more and more possibilities for cheap action, increased political and economic discussions on climate change were observed at the beginning of the 21st century. Limiting climate change requires substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks (Kumar, 2018)^[18]. Climate policy requires planning and action for implementation at a global, national and subnational level. The mode of achieving rapid and sustainable climate action is through science-based targets, realistic and participative implementation and monitoring as highlighted by UNEP (UNEP, 2021)^[17].

Most governments acknowledge the need for rapid action and are increasingly adopting national programmes for mitigating climate change. Under the Paris Agreement of 2015, all countries are supposed to regularly (every 5 years) develop, submit and implement their so-called Nationally Determined Contributions (NDCs), including amongst others mitigation and resilience-building measures. The recent IPCC AR6 Physical Science report suggests that the Paris goal of limiting global warming to 1.5°C compared to pre-industrial levels is still in reach, if early action is taken globally.

According to the scenarios of the 2007 IPCC report, a temperature increase of 2.7°C to 4.3°C by the 2080s, precipitation level rise of 6-8% and sea level rise of 88 cm by 2100 are likely in India (IPCC, 2007)^[7]. Such a scenario would have a perceptible consequence for the livelihood and survival of rural communities largely dependent on agriculture and allied sectors, while

also indirectly impacting the urban populations at large. Projected trends in climate change pose a looming threat for an ecologically sensitive, developing and largely agrarian country like India. To counteract such projections and promote economic and inclusive growth, the Government of India introduced the National Action Plan on Climate Change (NAPCC) in out the pursuit of development goals that offer growth with long- term 'climate change cobenefits'. Through eight sectoral missions the NAPCC focuses on key sectors impacted by or having an impact on climate change, including agriculture, water, forestry, energy and urban planning. (EMPRI & TERI, 2013)^[9].

In June 2009, the Government of Karnataka organised a Coordination Committee to oversee the adoption of the NAPCC at the State Level. It mandated the preparation of The Karnataka State Action Plan on Climate Change (KSAPCC) to the Environmental Management & Policy Research Institute (EMPRI) and The Energy and Resources Institute (TERI), with the first assessment resubmitted in December 2013. The KSAPCC focuses on those sectors that are important to the local economy and livelihoods, such as agriculture, water, biodiversity, health, transport, energy, industries, urban development and forestry. The KSAPCC was the first policy document to tackle climate change on state level in Karnataka. It laid the ground for crucial mitigation and adaptation action. The revised version of the KSAPCC is under preparation in 2021 and is expected to be released in 2022.

Based on climate research and scenarios cited between 2004 to 2011, the KSAPCC identified scope for immediate actions. The document defined 200 actions of which 31 were tagged as priorities or entry points. It established sector wise target areas with determined action points. The implementation mechanism, determination of interventions and emerging trends in each section are based on missions identified in NAPCC. In order to achieve sector wise targets, the document charts out responsibilities of various departments for implementation of the plan and allocation of funds. The bulk of implementation with regard to individual action points as well as allocation of funds for each target area, and action point for five years beginning from 2012 till 2017, lies with the state government departments.

The Agricultural and Water Landscape

Karnataka is divided into ten agro-climatic zones and observes three growing seasons. Agriculture contributes 28.6% to the state's Gross State Domestic Product (GSDP). Almost 65% of the geographical area of the state is under cultivation and agriculture accounts for more than 50% of the state's workforce (EMPRI & TERI, 2013)^[9]. Among these, kharif, the monsoon season lasting from July to October, accounts for 70% of the annual food grain and oilseed production. As per the KSAPCC report, an overall increase in production and yield of major crops such as paddy, maize, and sugarcane has been observed over the last decade. The introduction of these high yielding varieties has progressively reduced the cultivation of traditional varieties of crops such as banana, mango and vegetables in the state, although specific figures for the increase as well as decline have not been quoted in the KSAPCC. The related loss of agricultural biodiversity is a serious concern. Droughts affect agricultural production in the state to a great extent, so do floods, to which especially kharif crops are prone. Agriculture is highly vulnerable to climate change because of its wide exposure to increasing temperature, precipitation change, pests and diseases. Studies suggest that a number of districts may become vulnerable with respect to crops presently grown. Likewise, opportunities emerge in terms of improving cultivation conditions for a variety of crops in different areas. However, a net decline of 2.5% in agricultural production has been predicted by a recent study over the next two to five decades with a major reduction in coastal regions. (EMPRI & TERI, 2013)^[9].

The KSAPCC document has identified climatic, technical and social challenges in the agriculture sector with respect to the crop yield especially for dry land agricultural practices, theft of irrigation pipes, energy efficiency at farm level, agriculture and horticultural biodiversity. The Government of Karnataka has a broad and efficient policy framework to support agriculture and allied sectors. The Government of India also supports the state government through financial and technical support. Co-existence of policy framework by the state and initiatives led at the national level have provided opportunities for climate risk assessment and increased the resilience of the agrarian sector and its dependents. This is demonstrated in the KSAPCC document through programs and policies such as Karnataka Agriculture Policy, High yielding varieties programme which covers various integrated programs, National Food Security Mission, Rashtriya Krishi Vikas Yojna, Bhoo Chetna, National Horticulture Mission, Sujala Watershed Programs, Schemes on Micro-irrigation, as well as initiatives promoting organic farming.

In terms of water, the state of Karnataka has seven river basins and receives a total of 236 billion m3 of water every year, 92% of it through rainfall. Around 47% is 'lost' through evapotranspiration and another 46% flows into the Arabian Sea, into Andhra Pradesh and Tamil Nadu. Karnataka meets its requirement from the remainder of about 7.5% paired with groundwater. There are nearly 37,000 tanks and lakes with a water spread area of 6.9 lakh hectare and more than 20,000 irrigation tanks (EMPRI & TERI, 2013) ^[9]. As a study by NABARD-ICRIER (2018) points out, the physical water productivity, which is defined as the ratio of agricultural output to the amount of water consumed (from all available sources of water like rainfall, irrigation, etc), of rice (kg/m3) is lowest in Karnataka among 16 dominant rice growing states in India.

Objectives

The main objective of this study is to understand policy, education and research interventions undertaken in the field of climate change, with an emphasis on Sustainable Agriculture and Integrated Water Resource Management, that could complement or strengthen state level programmes under KSAPCC. It intends to recognize policy and implementation level actions as well as gaps within water resources and agricultural sectors, while also suggesting ways for strengthening linkages and exploring opportunities for possible areas of intervention.

Further, this study aims to investigate opportunities for improving availability and utilization of water resources for sustainable agriculture in the evolving climate change scenario, which could be effectively implemented under the aegis of KSAPCC. Lastly, this study would also help identify and establish partnerships with stakeholders for implementing the aforementioned objectives, and help develop Information-Education- Communication strategies for communicating the outcomes as a way forward, as well as developing a two-year plan to address potential policy and education improvements.

Key Research Questions

Based on its objectives, the key research questions for the study are as follows:

- What are the major factors influencing effective implementation of KSAPCC within the water and agricultural sector?
- What are the actions outlined for integrated water resources and sustainable agriculture in the KSAPCC, progress and challenges faced in their implementation?
- What are the ways to improve engagement of multiple stakeholders for better understanding of the focus sectors as well as KSAPCC implementation?
- What policy approaches, education and communication strategies could be designed for better implementation of the state-level plan?

Study Area

Flanked by the Arabian Sea, Karnataka is a coastal state in the south west of India. It is the eighth largest Indian state by size and the ninth by population. While the Western Ghats account for a bulk of the state's forest cover, over 77 per cent of its geographical area is arid or semi-arid, much of this is concentrated in North Karnataka. Karnataka is also the third most urbanized state in the country and water availability is a major concern (Jogesh and Dubash, 2014) ^[1]. The climate of Karnataka State varies from very humid rainy monsoonal climate in the West Coast, the ghats and mainland areas to semiarid warm dry climate on the east. There is a large variation in precipitation with higher amounts in the Western Ghats reducing towards the eastern plains (Irrigation in Karnataka, n.d.)

The study includes surveys of stakeholders from government line departments as well as Farmers group of Uttara Kannada through focus group discussions. The Uttara Kannada region has lately been drought prone, although it generally experiences a good annual rainfall. This was one of the major reasons for selecting this region as a study area. Farmers here have been facing drought every year in the summer season and lack of water storage management is affecting their agricultural practices. The city of Karwar is the administrative headquarters of the district. Karwar, Ankola, Kumta, Honnavar, Bhatkal, Sirsi, Siddapur, Yellapur, Mundgod, Haliyal and Supa are the taluks of the Uttara Kannada District. The main geographical feature of the district is the Western Ghats of Sahvadri range, which runs from the south through the district. Moisture-bearing winds come from the west, the yearly rainfall average is 3,000 mm (120 inch) on the coast, and as high as 5,000 mm (200 inch) on the west-facing slopes of the Sahyadris, which receive as little as 1,000 mm (39 inch) annually. Eighty percent of the district area consists of forest land. The Uttara Kannada district agroclimatic divisions include the Coastal plain (consisting of Karwar, Ankola, Kumta, Honnavar and Bhatkal taluks) and Malenadu (consisting of Sirsi, Siddapur, Yellapur, Haliyal, Joida and Mundgod taluks). In Uttara Kannada district the study has covered six taluks- Haliyal, Supa, Siddapur, Sirsi, Kumta and Mundgod and eleven villages - Janaga and Yadoga (Haliyal tq); Alur (Supa tq); Dasanagadde and Hulimane (Siddapur tq); Tigani and Kantraji (Sirsi tq); Bhavikodlu and Harumaskeri (Kumta tq); Hunagund and Salagaon (Mundgod tq).

Methodology

The secondary analysis of the KSAPCC document was done through developing linkages between the state-level policy and the key questions of the study. The state level action plan identifies a set of sector-wise priority actions to address climate change impacts in Karnataka. Out of these 31, 8 priority actions were identified as a focus areas of this study, and the inferences from the policy analysis as well as onground survey were drawn in line with these action points. The primary data collection for the research study was

The primary data collection for the research study was undertaken by capturing views of different stakeholders through an open-ended questionnaire, with specific questions for target groups. The questionnaire consisted of two phases of questions, the first phase focused on key research questions aimed at understanding the current gaps in policy implementation and future improvements to be considered in the KSAPCC revisions. In the second phase, questions were focused on the respondents from each group to primarily understand their role and the risks and challenges being faced in the policy implementation and execution on the ground level. The surveys were done through online mode as well as in-person discussion with stakeholders. The survey, which aimed to find the challenges in the State Action Plan on Climate Change and garner prospective policy recommendations for its effective implementation, covered responses from 11 Key Informant Interviews and 10 Focus Group Discussions. All interviews were held during the period of August to October in 2021.

Analysis and Discussions

The Karnataka State Action Plan on Climate Change encompasses a total of 200 actions of which 31 are tagged as priority or entry points on climate change for the state, spread across multiple categories including implementation, data management, research and development as well as policy intervention; and covering a range of sectors. Out of these 31 priority actions, 4 from the agricultural sector and 4 from the water sector fall under the scope of this study (See Table 1). A more detailed analysis of these sector-specific action points and reflections from the qualitative surveys have been provided in the following sections.

Table 1: Priority Action Points for Agriculture and Water Sector

Sector	Priority Action Points
Agriculture	Establishing a State Level Policy body for devising
	cropping shifts
Agriculture	Promotion of Dry land farming
Agriculture	Rendering theft of sprinkler pipes unviable
Agriculture	Creation of a market for indigenous agricultural crops
Water	Enforcement of Karnataka Groundwater Act
Water	Creation of Policy body for restricting groundwater use
Water	Introduction of a groundwater cess
Water	Revision of pricing policy for irrigation water
Source: EMPRI & TERI, 2013	

Agriculture

According to multiple key informant interviews and focus group discussions, the policies working on-ground with respect to agriculture sector are National Food Security Mission, Rashtriya Krishi Vikas Yojana as well as Bhoo Chetna, which was completed in 2017, however its major International Journal of Advanced Multidisciplinary Research and Studies

technical core - micronutrient adoption has been continued through soil enrichment programs. Other than these, few policies such as the Bhoo samruddhi programme, and Krishi Bhagya Yojana are also being implemented according to the surveys conducted for the study.

Priority/Entry Point 1: Establishing state level policy body for shifting cropping patterns

The KSAPCC document mentions increasing crop yield production by promoting shifting cropping patterns in agriculture through establishing a State Level Policy body for devising cropping shifts. It states that as temperature and rainfall change with climate, the agro-climatic features of a particular zone might become favourable for a new crop or may adversely affect the survival of existing crops.

Priority/Entry Point 2: Promotion of Dry Land Farming

According to the State Action Plan of Karnataka, dry land farming could become a successful technique to address the issue of water scarcity and fodder unavailability, especially in the northern Karnataka region, which could also offer a reliable source of income to rural communities, largely dependent on agriculture for their income. Thus, promotion of dry land farming in Karnataka has been identified as one of the entry points needing immediate action.

Priority/Entry Point 3: Rendering theft of sprinkler pipes unviable

As per the State action plan on climate change, Karnataka is promoting the adoption of water efficient technologies such as drip and sprinkler irrigation techniques with a view to enhance water productivity and consequently, the cost of cultivation. The state's Department of Rural Development and Panchayat Raj promotes rainwater harvesting and sprinkler irrigation systems under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), as a drought proofing measure. According to the recommendation on Karnataka State Water Policy as submitted by Karnataka Jnana Ayoga, key technological innovations, along with expansion of drip and sprinkler irrigation, could help reduce water use even in the more water intensive crops such as paddy and sugarcane.

Priority/Entry Point 4: Creation of a market for indigenous agricultural crops

One of the action points states creation of a market for indigenous agricultural crops. As per the state action plan, indigenous resilient varieties of crops such as maize, rice, sorghum require interventions to safeguard their conservation. These indigenous varieties need attention not only to conserve gene pool but also to combat climate change impacts.

Water

The policy analysis reveals that Karnataka State Water Policy and Mahatma Gandhi National Rural Employment Guarantee Scheme outlined in the KSAPCC are being implemented on the ground. The latter scheme ensures livelihood and food security by providing unskilled work to people through creation of sustainable assets in the rural areas, and is also being implemented for the farmers of the agricultural sector:

Priority/Entry Point 5: Enforcement of Karnataka Groundwater Act

According to the KSAPCC document, groundwater, which is one of the important sources of irrigation, has been indiscriminately used in the state with the extraction levels exceeding 100 per cent in many regions. The document states that in the agriculture sector, surface irrigation sources and traditionally used tanks have lost the cadence of irrigation and there has been a shift on the development of groundwater-based irrigation that has also led a way for intensive multi-season agriculture. Thus, the groundwater withdrawal is far in excess of recharge leading to declining water levels and increasing pumping costs.

Priority/Entry Point 6: Creation of Policy body for restricting groundwater use

The Karnataka State Action Plan on Climate Change focuses on Groundwater resources that are subjected to over-extraction, especially in 35 overexploited and 3 critical taluks, as quoted in the plan. It states that unplanned and excessive extraction of groundwater may lead to a no-water situation in the near future.

Priority/Entry Point 7: Introduction of a groundwater cess

The Karnataka Water Policy 2002 mentions that the utilization of groundwater within the state is not uniform. The interior parts of Karnataka (both in the North and South), utilize more groundwater than the coastal regions. This has led to several wells drying and thus rendered farmers' investments to the extent of Rs. 2000 crores in fructuous. According to a status report which is a part of State Specific Action Plan (SSAP) on Climate Change for Water Sector by Public Affairs Centre (2017), there is over-extraction of ground water in 43 Taluks of the State; where in 29 Taluks, over 50% of the available groundwater has already been extracted.

Priority/Entry Point 8: Revision of pricing policy for irrigation water

As recognised by the 2002 Karnataka Water Policy, the rainfall in the state is erratic and not distributed evenly. Thus, the state's irrigation system is highly dependent on surface water from perennial rivers, while groundwater is a fast-depleting source of water for irrigation.

Key Challenges in implementation

The key challenges in implementation of agriculture and water sector in connection of environmental change of livelihood of farmers:

- 1. Awareness amongst farmers: The interaction with farmers showed that a larger part of the farming community is unaware about climate change and its impacts, especially in terms of the significance of shifting cropping patterns and dry land farming practices, as well as about the necessity of optimum water utilization for growing crops with maximum production. The knowledge on climate change and its impacts, is critical for the farmers in devising adequate adaptation mechanisms and building resilience.
- 2. Stakeholder engagement: The KSAPCC document highlights a need for engagement of stakeholders from

development of the policy to its implementation, alongwith subsequent outreach mechanisms. Policy level and on-ground challenges are outlined in the KSAPCC for the agriculture and water resources sector, however most of these issues were not reflected during the surveys, seemingly due to the communication gaps in translation of policies as well as climate-relevant knowledge into actions. The farmers' group stated that they have been benefiting from the Central Government schemes implemented within the state, however the state schemes have not been benefited by all the farmers. The surveyed farmers believe that the state schemes are mostly meant for farmers of specific caste categories, hence they all have not been able to benefit from them.

- 3. Inter-departmental coordination and communication: Climate change being a cross-cutting issue needs to be addressed jointly by government line departments. The policy mentions no specific mechanisms for coordination among departments and joint implementation of activities to mitigate climate impacts. Also, the state action plan elements are not designed in tandem with the ongoing or potential activities of the key departments.
- 4. **Budgetary allocation:** The surveys showed that the budget allocated for the policies are not aligned with the time- frame and have mostly expended towards administrative purposes and awareness raising. Additionally, price rates for labour, hybrid seeds and chemical fertilizers have increased drastically which had a huge impact on the farmers' income. The farmers also brought up the issue of the schemes being benefited only by farmers who have their own farm lands, however farmers' with lands under revenue/forest department have not been able to take advantage of those schemes.
- 5. **Resource constraints and uncertainty:** Few farmers are benefiting from the Central Government schemes i.e. PM Kisan Samman Nidhi, etc. The farmers stated that they have hardly been able to benefit from the State sponsored schemes. In addition, financial issues have been increasing from the past ten years due to continuous increase in the price of agricultural resources. Weather events and resultant drought conditions had exacerbated their problems.

Conclusion

The Karnataka State Action Plan on Climate Change is the first ever plan which establishes a comprehensive roadmap, to tackle the issues of climate change in the state through provision of a scientific framework, while also outlining various challenges and highlighting feasible action points to be implemented by various sectors. As per the study's focus on water and agriculture, this majorly includes participation of public, civil society and other stakeholders during the formulation of policies, lower allocation of funds and awareness level among farmers pertaining to government policies as well as climate change impacts. Other policy gaps have emerged due to reluctance of uncertainty among farmers to adopt new methods and technologies in farming as well as limited coordination and convergence with various departments during preparation of the KSAPCC. Furthermore, the deeper review of the KSAPCC document shows that the departments found it difficult to allocate proper funds for the implementation of certain action points, due to their generic nature. These

challenges are expected to be addressed in the second phase of the KSAPCC, which is under revision. Lack of understanding amongst farmers regarding climate change and changing rainfall patterns, emerged as one of the most significant challenges faced to adapt to climatic changes. For instance, on one hand an action point states creation of a market for indigenous agricultural crops and the study shows that farmers are not easily accepting the new schemes drawn by the government, however on the other hand, expansion to other crops is a necessity according to the changing agro- climatic zones and climate scenarios. Additionally, it is in the farmers' interest that the category wise benefits of state-sponsored schemes are removed in the future and that all schemes are made generally beneficial to every farmer. The study also identifies the gap of over a decade in the revision and scientific approach of the KSAPCC. Most policies have an implementation period of 2 to 5 years, which makes it necessary for the state government to revise and review the action plan, for necessary updates from time to time.

Recommendations

- 1. Participatory approaches need to be encouraged, through effective stakeholder engagement right from the development stage of the policies and plans, in order to enhance ownership amongst the stakeholders as well as ensure effective on-ground implementation. Provision of hand holding support to the beneficiaries could also prove fruitful.
- 2. Promoting exchange of local scientific information and traditional knowledge, to inform the farmers about suitable cropping patterns as per the changing climatic conditions, while taking into account farmers' perceptions and cognition processes. This could be done via seasonal advisories and weather forecasts using mobile-based tools and community radios, and organizing community-level drives.
- 3. Promotion of bottom-up approaches within the policy formulation process helps to build on the experience and knowledge of local stakeholders and communities, improving transparency, stakeholder participation, successful and cost-effective implementation of policy solutions.
- 4. Capacity building of farmers on climate-resilient technologies with complementing energy solutions emerges as one of the needs. Like, micro irrigation and sprinkler irrigation through sensor-based monitoring systems, for promotion of better utilisation of water resources.
- 5. Financial support and/or subsidies to farmers in times of high labour prices and increasing costs for hybrid seeds as well as chemical fertilizers, especially considering the uncertainty related to climate.

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