Tropical Plant Research
An International Journal
© Society for Tropical Plant Research

ISSN (E): 2349 – 1183
ISSN (P): 2349 – 9265
5(1): 14–18, 2018
DOI: 10.22271/tpr.2018.v5.i1.003

Policy article

Revisiting climate change adaptation through proactive policy designing and institutional mechanism

Ashish K. Chaturvedi*, K. Madhava Chandran and U. Surendran

Water Management (Agriculture) Division, Centre for Water Resources Development and Management, Kozhikode-673571, Kerala, India

*****Corresponding Author: ashispc@gmail.com

[Accepted: 27 January 2018]

Abstract: Climate change is a foremost challenge for agricultural productivity. The vulnerability is predominantly located in tropical regions with marginal farmers of developing countries. Enhancement of the adaptive capacity to climate change could be possible through revisiting the policy options with institutional reforms for adapting to the climate risks and sustaining the resilience in India. Innovative win-win approaches with key policy framework include innovative institutions, technologies, management systems and necessary financing mechanisms. Areas for utmost importance comprise agricultural research, irrigation, information technologies, market support, rural roads and extension services. Support from stakeholders to ensure effective adaptation/ mitigation strategy implementation and to provide financial support for addressing climate change issue is very essential. Along with these principles, a strong public-private partnership with successful institutional mechanisms may lead to the formulation of climate change adaptation strategies.

Keywords: Climate Change adaptation - Policy - Principles - Institutions.

[Cite as: Chaturvedi AK, Chandran KM & Surendran U (2018) Revisiting climate change adaptation through proactive policy designing and institutional mechanism. *Tropical Plant Research* 5(1): 14–18]

INTRODUCTION

Climate change is an unequivocal process, which is evident and has been identified for affecting the agricultural system in the world (IPCC 2007). Increase in greenhouse gas (GHG) emission using fossil fuel-based inputs and equipments, deforestation and land conversion are some of the outcomes due to unmanaged agricultural activities. As a part of these changes, it will result in reduced crop yield, dramatically increased food insecurity and invalidating traditional agricultural practices. Therefore, proactive redefining of policies for introducing climate-resilient agricultural practices is essential. The policy interventions require improved technologies for a "climate-smart agriculture", which can resist, tolerate and adapt to any changes in climate. Suitable policies which enforce incorporation of climate-smart technologies in agriculture need to be constructed especially in developing countries like India. Climate policies play a significant role in adapting climate resilience in agriculture by shaping the practices which are most suitable in particular location (Nelson 2009, Seo 2010). Clear cut policy and institutional designs are the need of the hour to encourage the innovative diffusion of these practices and technologies. Proper implementation of these climate-smart agro-technologies can help farmers to adapt or mitigate the climate change.

Principle oriented institutional mechanisms for climate-smart agriculture in India

Agriculture is the main economic foundation in India as it provides livelihood to around 52% of the population and contributes about 18% towards GDP of the nation (OECD Economic Survey :India 2017). Agriculture sector contribution in the economy of the nation is remarkably high than world's average (6.1%). Being the second largest producer of agriculture produce, India accounts nearly 7.68 percent of total global agricultural output. However, most of the agricultural inputs in India including fertilizers, electricity, water and loans are subsidized. Fertilizer (urea) only subsidies amounted to 0.5% of GDP in FY 2014–15, resulting in its high demand and imbalanced use, polluting soils and water resources. Similarly, subsidy in electricity have led

Received: 28 November 2017 Published online: 31 January 2018
https://doi.org/10.22271/tpr.2018.v5.i1.003

to uncontrolled exploitation of groundwater, contributing to water stress (OECD Economic Survey: India 2017). Rapid population growth is a great threat to food security, and to meet the requirements, innovative technologies coping with climate change are required. To increase agricultural productivity in a socio-environmentally sustainable manner to strengthen farmers' resilience to climate change is the key target for climate-smart agriculture. Policy designing and institutional mechanisms should have innovative practices with better climate forecasting, risk insurance and proven early warning systems. Transferring existing technologies from the lab to the land, and developing new technologies such as drought or flood tolerant crops to meet the food demands are important under the changing climate. Creation of principle oriented climate change policies as well as enabling policy environment for adaptation are essential.

Climate change may have a profound impact on agriculture by different means, which necessitate information for better decision making for growers, suppliers and markets. The effectiveness of farmer response to changing climate is enhanced by the improved human capital of farmers (Schultz 1975). Therefore, rural schooling, farmer training and communication networks need to be improved for climate change adaptation. The livelihood of millions of farmers will be influenced directly by climate change, as food prices are likely to increase. Hence, developmental efforts including attention to warming, precipitation changes, increased climate variability and market impacts are driven by changes in climate and climate policy require re-examination (World Bank 2009). Adaptation strategies should be incorporated locally with globally acceptable policies, which demand improved global connections via international trade and other global linkages (Martin & Anderson 2010).

Win-win action plan for climate change adaptation

A win-win approach is required for climate change adaptation along with policy interventions and institutional synergies. A crucial component possesses enhancing knowledge allocation and developing aptitude by creating and integrating national and regional knowledge networks or platforms for dissemination of climate-smart agricultural practices and technologies. There are a large number of technologies and practices to scale and speed of climate change requires considerable investment in filling knowledge gaps in research. It includes the development of a decision-support system for prioritizing adaptation and mitigation options. Early action for climate-smart agriculture must involve:

- Scaling up high-quality agricultural management practices and technologies with adequate funding to enhance the adaptive capacity.
- Strategy and policy expansion with enhanced institutional engagement.
- Demonstration of the economic feasibility of existing good practices, sustaining indigenous traditional practices in different localities and identifying key areas.
- Testing, monitoring, reporting and verification of methods for better agriculture management under simulated climate in farmer's field.
- Piloting and scaling up market-based mechanisms for mitigation

A scheme for revisiting the specific priorities with institutional mechanisms along with policy principles for climate change adaptation has been outlined in figure 1.

Policy priorities

Expand public agricultural resilience and R&D

Increasing public agricultural R&D investments is essential and important for agricultural productivity under long-term lowering food prices (World Bank 2009). Resilience in these R&D investments under climate change should target improvements in agricultural productivity, resistance to more variable growing conditions, water use efficiency and better agricultural water management. New crop and trait combinations with improved soil and water management practices will be required to meet demands for global food security. Policymakers need to formulate policies for incentives and proper funds to improve public agricultural research capacity devoted to poor regions, especially those facing severe climate change.

Encourage partnership between public and private R&D

Industry and government R&D can play complementary roles. A bridge between emerging public-private sector R&D in agriculture should be constructed so that dissemination and exchange of adaptation technologies are more frequent.

Harness agricultural biotechnology and water management

Support for agricultural biotechnology for adaptation in agriculture is emergent, but there remains lacuna using agricultural biotechnology, and to develop forward-looking regulatory frameworks for climate change adaptation (Fedoroff *et al*. 2010). Hence, use of agricultural biotechnology and regulations should be made flexible. Similarly, irrigation scheduling and crop water requirement for better water management is essential for sustainability.

Better information and forecasting

Investment in modern information-forecasting devices and techniques should be fostered with rapid pace on regional as well as global scales so that improved accuracy may be achieved in modeling techniques with long-term seasonal forecasts.

Support competitive and responsive agricultural markets

Encouragement of input and output agricultural markets with a competence and responsiveness under climate change should be given priority in making future policies and institutional frameworks. Adequate communication and transportation infrastructure should be integrated in competitive input and output agricultural markets to delimit their ability to respond efficiently. Improvements in communications will help in integration of spatial agricultural markets as a quick policy response (Jensen 2007).

Improved GHG emission measurements

At present, carbon markets refining the GHG markets which stimulate innovation of adaptation technologies requires a reduction in global GHG emissions. As a policy response, effective measurement of GHG emissions in agriculture involves institutional innovation, technological hardening and a better understanding of GHG measurements.

Institutional Frameworks

Institutions for information, dissemination and communication

For assessing the impacts of climate change on agricultural production, institutions play a key role. Therefore, for the dissemination of information provided by such R & D sectors, separate institutions with standard regulations should be incorporated in climate resilient agriculture management. These include institutions engaged in agricultural research, extension, agricultural production and marketing statistics and provision of climate-related information. Recently, International Institute for Environment and Development (IIED) has reported some key issues that need to be addressed in designing agricultural research programs that are responsive to climate change (Anderson *et al.* 2010). Improving the use of climate science data for agricultural planning can reduce the uncertainties generated by climate change and improve early warning systems.

Generate climate field schools

For incorporating climate information within the farm, schools should be opened which will be beneficial for farmers on-farm decision making and substantial improvement subsequently generating early warning system. Such efforts were made in countries like Indonesia (FAO 2010).

Institutions to improve co-ordination and collection of socio-economic data

Proper co-ordination between institutions assessing climate change impacts is the need of the present era for collecting data from diverse regions. Therefore, with standard regulatory mechanisms for coordinating various institutes to work hand in hand, collection of socioeconomic data along with farmer's perceptions becomes important for climate change adaptation strategies.

Institutions to support financing and insurance

Climate-smart agriculture needs extended investments at the farm level to enhance the resilience under varying climate (McCarthy *et al*. 2011). So, there must be such institutions which could support farmers in financing and insurance needs. Capturing the synergies between mitigation and food security is a key opportunity for climate-smart agriculture requiring institutional capacity as well as reduced transaction costs.

Climate forecast and agri-management clinics

At each block and district level, climate forecast management clinics should be established to disseminate knowledge among big and smallholders. These clinics should have a group of scientists, skilled persons and

self-help groups from diverse fields of agricultural sciences such as agronomy, pathology, soil science, plant physiology etc. It will also be helpful in explaining basic physiological, agronomical and pathological aspects through farm demonstrations. It should be used as agri clinics/ agri business and also as KVKs.

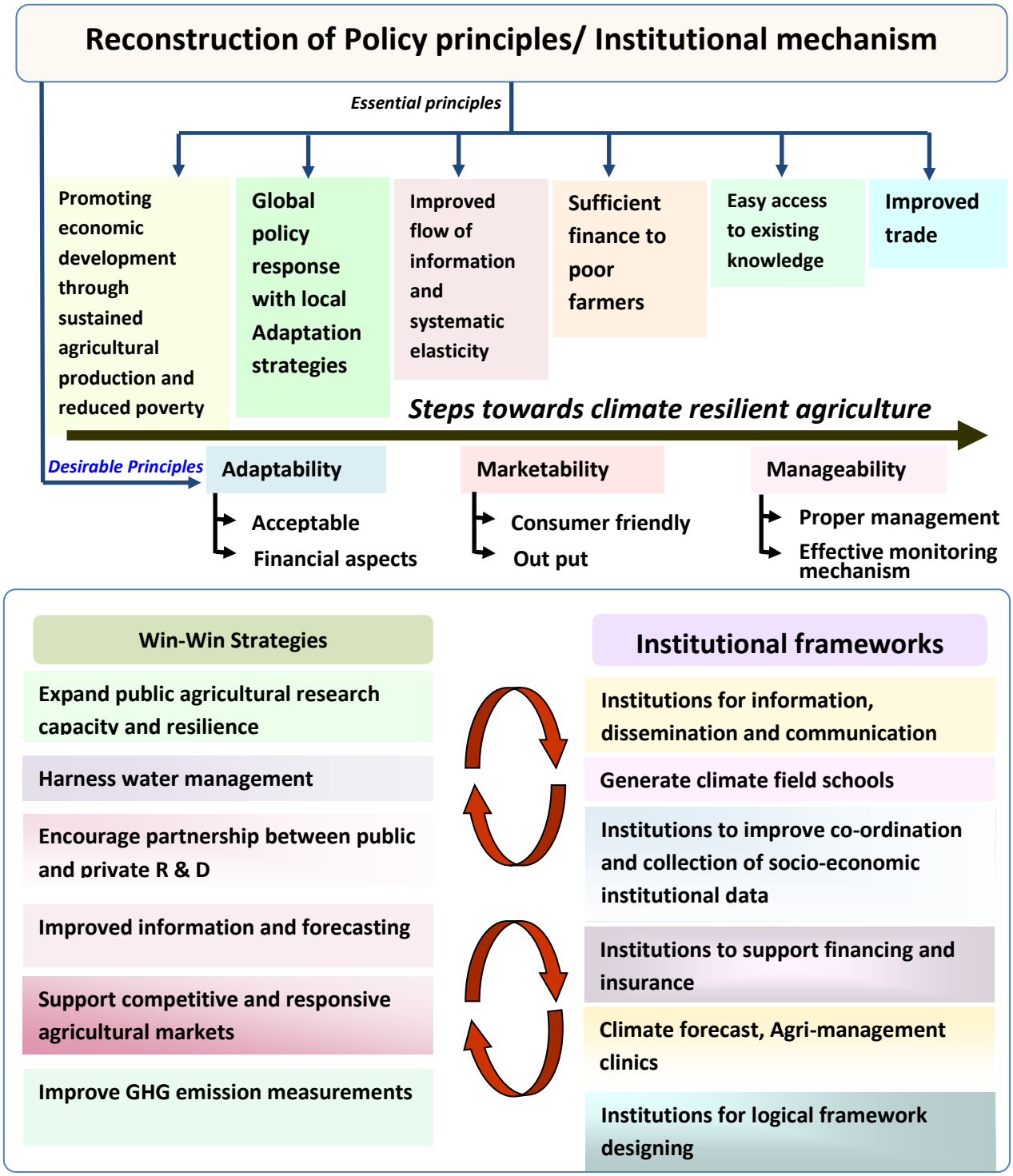

Figure 1. Schematic representation of policy interventions with institutional framework for climate change adaptation.

Institutions for logical framework designing

Climate-resilient agriculture needs a proper management, which is acceptable to farmers through logical framework designing (NORAD 1999). It requires effective performance management and monitoring of the ongoing projects towards the achievement of specified objectives. Also, regular reporting of results to decision-makers will improve the performance index of certain problems.

CONCLUSION

Climate change poses a major challenge for agriculture at the global level. Therefore, revisiting the policy options with institutional reforms is the need of the hour for adapting the climate risks. Key policy framework includes innovative institutions, technologies, and management systems, as well as the necessary financing mechanisms. Areas of utmost importance comprise agricultural research, irrigation, rural roads, information technologies, market support, and extension services. Cooperation among Governments for effective implementation of adaptation and mitigation strategies and to explore financial means for addressing climate change is essential. Apart from these issues, a strong public-private partnership is warranted for generating climate resilience.

ACKNOWLEDGEMENTS

We are grateful to Executive Director, Centre for Water Resources Development and Management (CWRDM), Kerala for providing essential support and encouragement for this work. Authors wish to thank the anonymous reviewers and editor for fine tuning the paper.

REFERENCES

Anderson S, Gundel S, Vanni M (2010) The impacts of climate change on food security in Africa: a synthesis of policy issues for Europe. IIED, London.

FAO (2010) "Climate Smart" Agriculture: Policies, practices and Financing for Food Security, Adaptation and Mitigation. Food and Agriculture Organization, Rome.

Fedoroff NV, Battisti DS, Beachy, RN, Cooper PJM, Fischhoff DA, Hodges CN, Knauf VC, Lobell D, Mazur BJ, Molden D, Reynolds MP, Ronald PC, Rosegrant MW, Sanchez PA, Vonshak A & Zhu JK (2010) Radically rethinking agriculture for the 21st century. *Science* 327 (5967): 833–834.

IPCC (2007) Climate Change 2007: Synthesis Report. Contributions of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva.

Jensen R (2007) The digital provide: information (technology), market performance, and welfare in the South Indian fisheries sector. *The Quarterly Journal of Economics* 122 (3): 879–924.

Martin W, Anderson K (2010) Trade distortions and food price surges. In: *Paper for the World Bank-UC Berkeley conference on agriculture for development—revisited*, Berkeley 1: 1–2.

McCarthy L, Lipper L & Branca G (2011) Climate-smart agriculture: smallholder adoption and implications for climate change adaptation and mitigation. Mitigation of Climate Change in Agriculture Working Paper 3: 1–37.

Nelson G (2009) Climate Change: Impact on Agriculture and Costs of Adaptation. IFPRI, Washington, DC.

NORAD (1999) The Logical Framework Approach, Handbook for objectives-oriented planning, Fourth edition, Norwegian Agency for Development Cooperation ISBN 82-7548-160-0.

OECD Economic Surveys: India 2017. Executive summary; OECD Economic Surveys: India, pp. 1–58.

Schultz T (1975) The value of the ability to deal with disequilibria. *Journal of Economic Literature* 13(3): 827–846.

Seo S (2010) Is an integrated farm more resilient against climate change? A micro-econometric analysis of portfolio diversification in African agriculture. *Food Policy* 35 (1): 32–40.

World Bank (2009) Development and Climate Change. World Bank pp. 12.