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Climate Smart Agriculture

Ananya Ghosh, Md. Hasim Reja, Arpita Nalia, Sahely Kanthal, Rajib Nath

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ABSTRACT

Indian agriculture is very much weather dependent. Sudden changes in Climate drastically reduce the agricultural production. Modern cultivation systems and climate change are interrelated with each other. Agriculture is the cause as well as sufferer of climate change. The adverse effect of climate change leads to food insecurity in rural marginal population. To combat the ill effects of weather abnormalities, the climate smart agriculture concept has come to the surface in 2010. It is a sustainable production management strategy by adopting and mitigating the adversity of climate change. Several climate smart technologies ensure quick recover to various risks and offer not only to meet present demands but also conserve natural resources for future.

Keywords Climate change, Adaption, Mitigation, Smart agriculture.

Ananya Ghosh*, Md. Hasim Reja, Arpita Nalia, Sahely Kanthal, Rajib Nath
Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia 741252, West Bengal, India
e-mail : ananya.ghosh0193@gmail.com
*Corresponding author

INTRODUCTION

For low and medium income countries agriculture is the prime source of employment, approximately 45% of total labor force (FAO 2015). Climate is the key factor governing crop and other farming performances. Change is predestined; a low of nature, which is acceptable if attributed to nature. Likewise climate change is also inevitable and refers to the variation in climate over time which leads to environmental contrariety. There are some interrelationships between agriculture and climate change, i.e. in one hand agriculture is a contributor to climate change and in the other hand agriculture is a sufferer too. Climate change already became a challenge to zero-hunger and food security. In this menace, the system of food production from small farm to global level must be very smart, efficient and resilient to maintain sustainability.

Causes of climate change

Natural causes of climate change includes continental drift, volcanoes, the earth's tilts, ocean currents whereas the manmade causes are industrial pollution, burning of fossil fuel, deforestation and agriculture.

Agriculture and food security in relation to climate change

Nearly 50% population of developing countries (Asian and African) depends on agriculture for their primary income generation. Food security is bound to fulfill four dimensions simultaneously viz, food supply, food access or marketing, food utilization

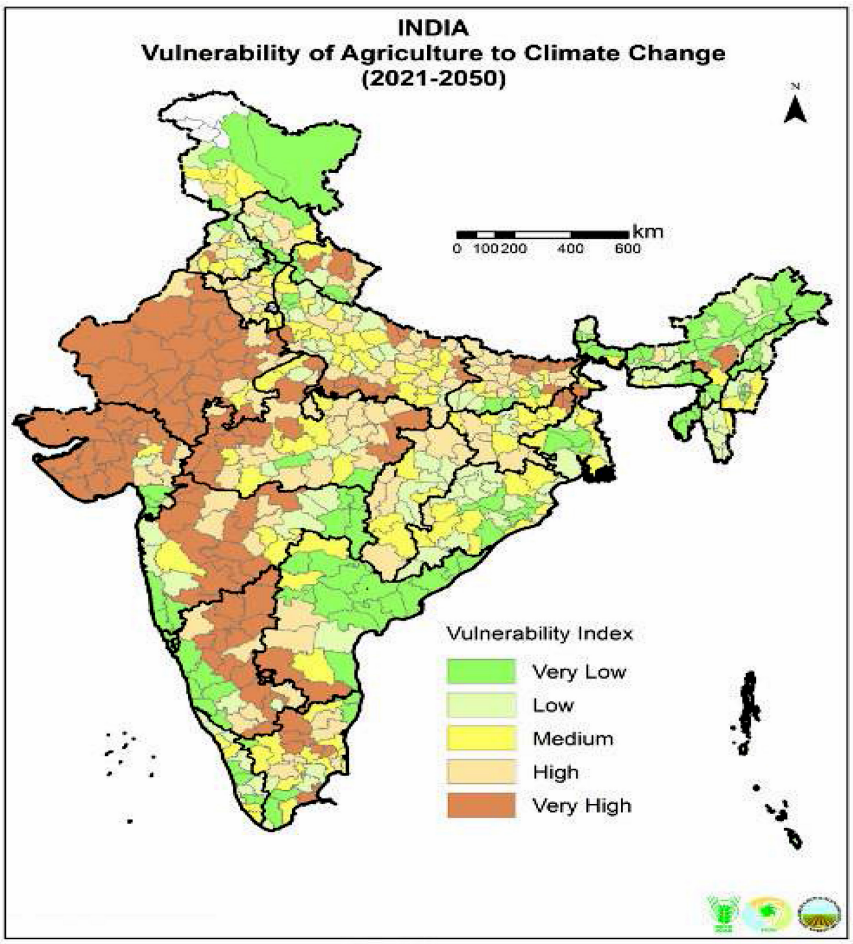

Fig. 1. Vulnerability of Agriculture to Climate Change (2021-2050) (Source : https://www.google.com).

and food system stability (FAO 2012). Uncertainty of any one of four dimensions results food vulnerability. Climate change transforms agricultural production through species distribution, reduced availability of good quality water in time, changing length and time of crop growing season, nutrient cycling and weather unpredictability. It also has indirect impact on storage, marketing, transport and human health which governs food accessibility (household income, price of food and market availability) and digestibility (food utilization). Adverse effect of climate change on agriculture leads to food insecurity especially among rural and marginal population as their livelihood depends largely on highly vulnerable agriculture, forestry and fishery. We can draw an idea about uncertainty of agriculture in relation to climate change from Figure1.

Climate smart agriculture

It is a sustainable production strategy to maintain food security by adopting and mitigating the adverse effect of climate change.

History of climate smart agriculture

The term climate smart agriculture was developed in the year 2009 and its concept was presented in 2010 at 1st global conference of food security (Lipper and Zilberman 2018). At 2nd and 3rd Global conferences discussions were concentrated on climate smart ag-

riculture sourcebook which were held during 2012 and 2013 respecitvely. Climate smart agricultural action plans was presented in the year 2014 at Climate Summit, New york.

Climate smart agriculture concept

There are three pillars of climate smart agriculture (CSA), namely sustainable production, adaptation and mitigation (https://csa.guide). It develops a inter relationship among different agricultural sectors like crop, livestock, agroforestry and fishery. It should be context specific and flexible over time and space because the smart technique of a particular place at a particular time may not be smart in other place or time. CSA mainly takes into consideration the most vulnerable marginal poor populations and women.

Adaptation and mitigation of climate change

According to IPCC adaptation is "Adjustment in natural or human systems in response to actual or expected elimatic stimuli or their effects which moderates harm or exploits beneficial opportunities" (IPCC Online 2001). Adoption may be autonomous or it can be planned one. Autonomous adaptations are short term adjustment by individual farmer which covers adoption of different crop along with sowing dates to overcome adverse climate change effects. Whereas, planned adaptation, is a long term practice, deliberately changing crop management technologies across various agro climatic regions.

Mitigation can be done by reduction of greenhouse gas emission, managing food waste, shifting human diet and sequestering carbon at both agricultural soil and upper ground plant biomasses. Mitigation strategies should be economically feasible and must not reduce the crop yield (FAO 2008).

Climate smart technologies

Climate smart technologies must be context specific. If includes weather, water, nutrient, carbon, energy and knowledge smart technologies (Prasad et al. 2014).

Weather smart technology

Weather variability affects the crop growth severely. Some weather smart strategies to mitigate the adverse effects are weather forecasting and early warning to weather variability, disaster based insurance.

Water smart technology

Since water is one of the prime input, some of the water saving technologies like System of Rice Intensification (SRI), drum seedling, direct seeded rice raised bed, micro irrigation may reduce the excess loss.

Energy smart technology

Modern agriculture is very much concentrated in energy efficiency management as well as environmental feasibility. Some of the energy effcient technologies are zero tillage, residue recycling.

Nutrient smart technology

Judicious application of nutrients not only helps to get better productivity but also maintain soil health for long term. Nutrients should be applied according to soil test based nutrient management practices, site specific nutrient management, integrated nutrient management.

Knowledge smart technology

Information on management practices of crop, contingent crop planning makes the cultivation very cost effective. Several mobile apps like Kisan Suvidha, IFFCO Kisan Agriculture, RML Farmer- Krishi Mitr, Pusa krishi, agri app. Kheti-Badi, Krishi Gyan, Crop Insurance and Agrimarket are now available to the farmers.

Some contingent weather planning

Flood

It can be classified on the basis of month of occurrence into three categories, namely early mid and late season flood. Early season flood occurs in the month of June-July, mid-season flood in August to September

and late season in October-November (Mishra et al. 2011). Strategies to combat the flood and drought at different time are furnished below.

Early-season flood

Re-sowing of direct seeded rice/oilseed/pulses/vegetables, gap filling and closer spacing, higher rate of fertilization, polyhouse for vegetable nursery.

Mid-season flood

Harvesting of panicles and drying in sunlight, gap filling with aged seedling, in case of complete crop failure direct sowing of green gram/black gram/sesame or any short duration cash crop.

Late-season flood

Paira and ratoon cropping, planting of cucurbits in poly bag, zero tillage planting technique.

Drought

Mulching and Anti-transparent spray, intercropping with pulses, short duration and early maturing variety introduction, cultivation of safflower, sesame or castor, alternate furrow irrigation or micro irrigation, effective weed management to eliminate competition for moisture, frequent intercultural operation to facilitate dust mulch, broad bed and furrow planting, wider inter row spacing, *in situ* water harvesting and life-saving irrigation, foliar fertilization, system of Rice Intensification, direct seeding and drum culture techniques to increase water use efficiency.

Conclusion

There is both direct and indirect influence of climate change on agriculture, direct influence by regulating temperature, rainfall, humidity and indirect by changing soil physical, biological and chemical properties. Climate smart pathway combines both mitigation and adoption which increases damage resistance and ensures quick recovery to various risks. It offers the scope of crop, livestock, fishery and agro forestry management, not only to meet the present demand but also to conserve resources for future.

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