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**IMPACT OF CLIMATE CHANGE ON INDIAN AGRICULTURE**

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Abstract

Climate change is, in theory, the perfect topic for global discussion. It is a growing global problem and concern, calling for concerted efforts by the developed as well as developing countries. The chief factor that is responsible for the climate change is the “greenhouse effect”. The extra greenhouse gases (GHG) – India ranking 4th in GHG emission – which we have released are responsible for the strongest threat namely the “global warming”. [Global warming](http://en.wikipedia.org/wiki/Global_warming) is projected to have far-reaching and intense impacts on conditions affecting agriculture, including [temperature](http://en.wikipedia.org/wiki/Temperature), [carbon dioxide](http://en.wikipedia.org/wiki/Carbon_dioxide), glacial run-off, [precipitation](http://en.wikipedia.org/wiki/Precipitation_%28meteorology%29) and the interaction of these elements. Already the effects are visible, making many people, especially those dependent on agriculture, vulnerable. Concerns about the impact of climate change on agriculture connected with environmental problems are among the major developmental issues in India today. The Gangotri glacier is already retreating at a rate of 30 metres a year. An increase in rainfall is simulated over the eastern region of India but the north-western deserts may see a small decrease in the absolute amount of rainfall. Diseases for human, crops and animals are on the rise. There is risk of continuous fall in productivity and production. Climate change and vulnerability have physical, financial and ethical implications. Sustainable development needs climate stabilisation. The objectives of this paper are – *one* to analyse the impact of climate change on Indian agriculture, and *two,* to suggest strategies and actions to mitigate the problem and the challenges ahead. Our emphasis is on civic response that combines international policy agreements with autonomous and local efforts in-keeping with geo-political and economic conditions. It seeks to integrate knowledge (including research) and action for and by the people at the levels of farming as well as framing polices.

*Keywords*: Agriculture, civic response, global warming, vulnerability

**Introduction**

Environmental scientists concur that the activities of many of the 6.6 billion humans on the earth are contributing to the warming of our planetary climate, referred to as ‘global warming’, ‘climate change’ and so on. Climate change refers to the rising temperature of the earth due to an increased amount of carbon dioxide (CO2) and other greenhouse gases (GHGs). Ministry of Environment and Forests, Government of India defines it as “a statistically significant variation in either the mean state of the climate or in its variability” (Hans, 2011). As a result of this global warming trend, catastrophic events are forecast – events that would definitely ruin our day, may be even in our life, our children’s lives too, if we make it that far. We are not simply the consumers of ecological resources and its custodians but also the leaders, the pivotal generation of environmental action for hope and healing, at least step by step, need for responding intelligently to the global warming crisis. We must join with our fellow citizens to stop global warming with one consciousness, one purpose and intelligence, for once (Makower, 2010). Evidently there is growing pressure on and struggle for resources, which for developing and agrarian economies like India pose serious challenges.

Agriculturists have become vulnerable because of physical and financial losses, year after year. A study reveals that out of the 100 per cent GHG emissions, sector-wise, agriculture and related sectors account for 23 per cent. According to Scientists, India’s contribution to global warming is 4 per cent while that of China is 6 per cent. The growing of rice, the only grain used almost exclusively for food, results in the emission of some 12 to 14 per cent of the world’s annual methane (CH4) budget, about half of which is produced in India ( Christianson, 2000). Agricultural sector is the Achilles’ heel of the Indian economy contributing 17-18 percent of GDP, and 60 percent of labour. Indian agriculture in general and that in the North Eastern states and the adjacent states is facing serious threat. Therefore, in this paper we try to analyse the impact of the crisis on Indian agriculture and the required combat mechanism, particularly from the side of the civil society organisations.

**Impact on Indian Agriculture**

Anthropogenic global warming is human-caused global warming. This is the uppermost issue today. The 20th century was the warmest since the year 1400; of the twelve of the recent warmest years in India, eight were recorded during the first decade of the 21st century, 2009 being the warmest (temperature anomaly 0.913° C. About 20 per cent in monsoon rainfall, more and more retreating of the glacier, increasing soil salinity, and heat stress and flood havoc simultaneously across regions, all are causing a web of vulnerability affecting the future of Indian agriculture and the questions of food security, employment and income scenarios (Hans, 2012). Agriculture in India is in a peculiar situation of growth with vulnerability (Hans, 2010). Estimates predict that with increase in temperature by 2080-2100 the probable loss in crop production is 10-40 per cent. There will be a 10% reduction in wheat production in the high yield states of Punjab, Haryana and Uttar Pradesh (India’s wheat belt).

Besides cereals, there will be loss of non food crops: fish and dairy products. The loss in farm-level net revenue will range between 9 and 25 per cent for a temperature rise of 2-3.5°C. Agriculture in the coastal regions of Gujarat, Maharashtra and Karnataka is also likely to be affected negatively. Loss in quantity and quality of food production and intake coupled with the challenges of FDI-retail marketing could pose more difficulties for Indians. There could a new type of inflation viz. climatic inflation or climate change inflation, a new type of refugee called ‘climate refugee’[[3]](#footnote-3). One day that will dominate the international flow of India’s 70 percent of rural population faces the most risk, especially in the North Eastern states (including Bihar and Uttar Pradesh) with a combined population of 250 million and adjacent states of West Bengal and Odissa. Agriculture will become more capital-intensive and small and marginal farmers will be forced to leave land leading to economic inequality. They simply cannot change to high-end cash crops, including flowers and fruits. Briefly the impact on agriculture is in terms of change in topography, change in farm size, change in cropping pattern, loss of inputs and output, change in employment pattern and change in consumption pattern (Kumar, et.al, 2009).

So there will be food insecurity, job insecurity, flooding, energy challenges, increased migration and urban challenges. All this is will be despite India having more than 345 registered Clean Development Mechanism (CDM) projects, more than any other country and about a third of all projects globally (in terms of the overall volume of CDM reductions

**Strategies to Mitigate** **Climate Change**

It is clear that if no immediate steps are taken by world leaders, global warming could prove much more than just an economic threat. There is need for complementary efforts top scrutinise and rethink existing schemes on global warming that may add to vulnerabilities (Shyamala, 2011, Bali, et.al, n.d.). Some strategic suggestions from our side are as follows.

* Increasing efforts for the recovery of ozone layer
* Reversing air pollution
* Encouraging and enlisting people’s participation in fighting global warming, with incentives – a green patriotism
* Developing ‘best’ (healthy) practices at all levels – personal, family, community (e.g. planting a carbon neutral rooftop garden, recycling our wastes, buying locally and healthily grown foods (avoiding food miles and piles)support for consumption of vegetarian food, regularly, regulating vehicular services etc
* Fostering an integrated growth process – agriculture, industry and services, involving all stakeholders – rural people, urban people, manufacturers, consumers, policy-makers, scientists and green movement leaders
* Ensuring equity in emissions
* Avoiding farm sector crisis (e.g. farmers’ suicides, misuse of SEZ land etc
* Hone the appropriate coping skills; link gender and poverty concerns with ecological concerns
* Encouraging organic farming and use of bio-fertilisers and biomass fuel (even with tariff concessions)
* Strict control on population growth that can add “fuel to the fire”[[4]](#footnote-4)
* Bring all-round awareness through ‘education’ about climate change, its impact and modes to mitigate problems, not losing common sense when nature calls

**Special Role of the Civil Society**

Civil society is not making noise for no reason. Its voice is being heard and needs to be heard in our political, ecological and economic fora. Taking civil society and its workers into confidence and cooperation helps consolidate community management of resources, biodiversity preservation, harvest management along with (rural) man management – a sort of Community Supported Agriculture (CSA) and Empowerment for Environmental Management (EEM). It will bring dividends even from a financial perspective. It will boost investment in agriculture (which is less than 2 per cent at present) and rejuvenate agriculture-research considering multidisciplinary nature of environmental management. Build consortia of farmers, soil scientists, meteorologists, agricultural economists, agro-financiers, media, NGOs etc for suitable interventions and innovations, particularly in drought-prone and biodiversity hotspot areas shaping a scientific and at the same time a civic response to climate change and its impacts. This will be in-keeping with ‘equity-based growth’ that is being discussed post Cancun 2010. India having a rich tradition of grass root and civil society movements must cash on its strength for mobilising mass support for growth with equity and stability.

 All further problems from and through climate change will be through population route. Repulsive and explosive forces are already joining hands. Good that climate change issues are entering public domain. Efforts being taken in this direction by educational and research institutions such as Madras Institute of Development Studies, Amity School of Natural Resources and Sustainable Development, Centre for Environmental Planning and Technology are to be much appreciated and encouraged. Self help groups (SHGs) – the most relevant grassroots agencies for development through group management – still seem to be preoccupied in financial intermediation. Being very active in the ‘empowering’ process they need to take up environmental issues in a big way at least as a part of social intermediation. That is the civic need (response) and responsibility. Our common future needs our common voice. This is the crux of civil society response or local governance for risk reduction and return increasing objectives of agricultural growth today. Civil society mobilisation can transcend bureaucratic barriers and political (election) warriors. They can start with creating awareness, mass education, training and research to protect and promote a sustainable agronomy. It can realise a democracy in action, without faction. Managing rural economy with a participatory approach by all the stakeholders in the village will be a profitable enterprise. It is necessary to fight disease and disaster in the village and the global village with a human rights approach. A healthy interface between human resource and natural resources in general and commons in particular can be ensured. A humane approach to agronomy will mean a quality assurance for people and the environment.

 In the tsunami-hit lands of Andaman, Several NGOs (e.g. Voluntary Health Association of India, Nehru Yuva Kendra, Nandi foundation, Tata Institute of Social Sciences etc) actively participated in enhancing livelihood security of the affected people. They took up ‘cash for work’ programme and did desiltation of water bodies, clearing of fields from damaged crops, strengthening of river bunds and so on. The rescue, rehabilitation and reassuring measures helped agriculture to revive (Kumar et.al, 2009). With multi-stakeholder response and reach-out required for managing climate change and its impact on agriculture, political will and strong partnerships are vital (Leuthard, 2008). Every civil society unit then becomes a ‘leading’ and ‘working’ group, with a common objective to promote successful (active) partnerships to enhance our natural and human environment his will be a part of the larger genus: ‘good governance’, needed in Indian agriculture to meet all risks, challenges and uncertainties (Kiran et.al., 2009).

**Conclusion**

Dealing with Climate change is very much a part of environmental governance, and both of the so called ‘developmental process’. We all need to realise that ecological balance thorough sustainability and climate stability is as important as national security and public health. People need to come together for the cause, once again upholding Gandhian principles of self help, self reliance and self sufficiency. Today India has a strong base to do this in the form of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREA) and its provisions farm management, both pre harvest and post harvest. After all climate change is not just about environment or farming or forestry. It engulfs demographic trends, growth initiatives, energy-use, lifestyles, human rights and security. Healthy civic response and responsibility can go along way in mitigating the problem posed by climate change. We need to continue such steps together. There is life in movement and death in stagnation. The risk of climate change alone should be enough to motivate/re-energise us. As far as agriculture – the first culture of man – it may longer be a way of life, but can we allow it to be away from life? The old cliché still holds good: if there is a will there is a way.

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3. Nay, it is already there. One day climate refugees may come to dominate the international flow of migrants since they are losing not just land, but food supplies and livelihoods (Brown, 2004). [↑](#footnote-ref-3)
4. There is also a population-growth history that can't be ignored. During at least the last half of the 20th century, population growth exploded in developing nations. From 1950 to 2000, world population grew 2.5 billion to six billion -- an increase of about 140per cent. Over that period, India went from 350 million people to over a billion – up 182 per cent, outpacing even China's increase. By comparison, the U.S. grew from 157 million to 287 million – a rate of increase that is well below the world average. Rising number of people will generate emissions into the future. We cannot go only by ‘per capita method’ to measure contribution to climate change and to fix responsibility. Fighting climate change is a complex and dynamic undertaking. As with most metrics, the per capita standard is too simple, opines Antholis (2009). The responsibility is, therefore, both of the posterity and the present generation. [↑](#footnote-ref-4)