3. Sustainable Agriculture: Issues and Action Points

Aditi Kapoor

Introduction

Agriculture is one of the key areas under threat from climate change. India, still an agricultural society with three out of five people dependent on agriculture and related activities, is particularly vulnerable to climate change. Agriculture, though lacking investment and showing stagnant growth, contributes 21% to the GDP and constitutes 11% of India's exports. Agriculture and allied activities support some of India's sunrise industries such as food processing, medicinal herbs, dairy farming and fish production. People dependent on agriculture form the proverbial 'bottom of the pyramid' and whose rising incomes alone can take India on to the path of growth and development.

Small and marginal women and men farmers, who form over 80%, or the bulk of India's farming population, are already finding it harder to cope with higher, variable temperatures and erratic rainfall patterns. In Gorakhpur district, Eastern Uttar Pradesh, for instance, shorter winters and sudden hot winds in the winter months have lowered wheat production, because wheat needs consistent low temperatures to mature properly. Farmers are giving up growing *arhar dal* (a common pulse) for the same reason and this has sent *arhar* prices soaring in the whole of India. The growing season for the popular pulse is now far warmer and the flowers cannot fruit. In Himachal Pradesh, the apple belt has moved upwards to cooler climes, leaving apple growers and the related packaging and transport industry to look for alternatives. In Anantapur district, Andhra Pradesh, sudden, untimely downpours have damaged mature groundnut crop just when the farmers were looking forward to harvesting a good yield to ensure food in their homes for the next 12 months.

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Climate scientists predict a gloomy future for agriculture

World scientists predict a gloomy future for climatic changes and their impact on agriculture in the Indian sub-continent. The Nations' Inter-governmental Panel on Climate Change (IPCC) fourth assessment report (2007) already records declining rice and wheat yields in north-western India as a result of increased water stress, caused by increased temperature, reduction in the number of rainy days and increased frequency of El Niño events.[1] The scientists also note degradation of crop land by saltwater penetration up to 100m inland in the Bay of Bengal during the dry season, caused by sea level rise, storm surges, erosion, and excessive ground water withdrawal. There has also been significant loss of coral reefs, with likely impacts on fisheries, and destruction of mangroves in the Indus delta (including in Bangladesh) due to reduced freshwater flows and salt water intrusion.

Scientists predict that disasters in the sub-continent will become more unpredictable, frequent and intense. Poor people, whose livelihoods are primarily dependent on land, water and forests, will be the worst affected by these disasters. Their models show that temperatures will increase by around 0.5-1.2ºC, sea level will rise by 1-3 mm per year. Worse, the sea level will continue to rise for centuries even if greenhouse gas emissions are cut, largely because sea water expands as it gets warmer but this expansion is slow and so will continue for a longer time. Further, annual precipitation is likely to increase by less than 10% but there will be more variation in the monsoon from year to year. Also, tropical cyclone intensity will continue to increase, with an increase in storm surge heights on coasts. Heat waves and very heavy rainfall events are also expected to become more common.

The global scientific report predicts that climate change will decrease agricultural production and farm revenues. The causes of this are complex: although increased atmospheric CO_2 would on its own increase grain yield, increased temperatures decrease grain yield directly and also indirectly by increasing water demand, and more frequent droughts and floods also reduce yield. Even by the most conservative estimates, a net decline in grain production of 4-10% in South Asia is predicted by the end of this century. Rice production could decline by 3.8% during the current century while in India,

[1] El Niño-Southern Oscillation (ENSO) events are temperature fluctuations in surface waters of the tropical Eastern Pacific Ocean that are the main sources of between-year climate variability in countries around the Pacific, Atlantic and Indian Oceans.

rain-fed wheat and maize yield is likely to decline by 2-5% over the next few decades.

Livestock productivity is also expected to decline due to reduced productivity of pasture, heat and water stress as well as increase in some diseases. Declines in marine capture fishery production are likely due to increased frequency of El Niño events, reduction in ocean productivity due to changed circulation, etc. Changes to freshwater fisheries and aquaculture are inevitable but poorly understood yet.

Summary of vulnerability of key sectors to climate change in South Asia:

Sector	Vulnerability	Confidence of IPCC prediction
Food and fibre	Highly vulnerable	High
Biodiversity	Highly vulnerable	High
Water resource	Highly vulnerable	High
Coastal ecosystem	Highly vulnerable	High
Human health	Highly vulnerable	High
Settlements	Moderately vulnerable	Medium
Land degradation	Highly vulnerable	High

India's National Action Plan on Climate Change recognizes the changes in climate predicted for India and what this would mean for agriculture. Quoting studies by the Indian Agricultural Research Institute (IARI), the NAPCC says: 'Every 1 deg centigrade rise in temperature reduces wheat production by 4-5 million tons. Small changes in temperature and rainfall have significant effects on the quality of fruits, vegetables, tea, coffee, aromatic and medicinal plants, and basmati rice. Pathogens and insect populations are strongly dependent upon temperature and humidity, and changes in these parameters may change their population dynamics. Other impacts on agricultural and related sectors include lower yields from dairy cattle and decline in fish breeding, migration and harvests.'

Considering that two-thirds of India's sown area is drought-prone and about 40 million ha is flood-prone, climate change will have a devastating impact on agricultural production in India. About 30 million people are affected each year in north and north-eastern flood plains.

It is, therefore, not surprising that one of its eight missions is dedicated to sustainable agriculture. The mandate of the National Mission on Sustainable Agriculture is to 'develop strategies to make India's agriculture more resilient to climate change'. The Mission notes that there is a need to 'identify and develop new varieties of crops, especially thermal-resistant varieties and alternative cropping patterns capable of withstanding extremes of weather, long dry spells, flooding and variable moisture availability.' The fourfold focus areas are dryland agriculture, risk management, access to information and use of biotechnology. The approach of the Mission, however, is not pro-small farmer and continues to be technology and market driven, ignoring several studies and field experiences that have proved that small and marginal farmers, who produce most of the food in developing countries cannot afford purchased inputs and large machines but need vitality of local natural resources to ensure sustainability of agriculture.

The Mission also ignores a serious scaling up of local and nature-friendly traditional solutions available for drought-proofing, taking advantage of elevated CO_2 concentrations, better yields and increased resistance to disease and pests. Genetic engineering, as proposed in NAPCC to deal with the above problems, may not be sole answer for the majority of our farmers who are small, often work on fragile soils with hardly any government support and minimum infrastructure. Science needs to be married in a pragmatic fashion with local knowledge, expertise and acceptance, needing wider consultations, a bottom-up approach and encouraging activities like farmer-to-farmer learnings, especially with women farmers who shoulder the bulk of the farming work, and a land-to-lab learning process.

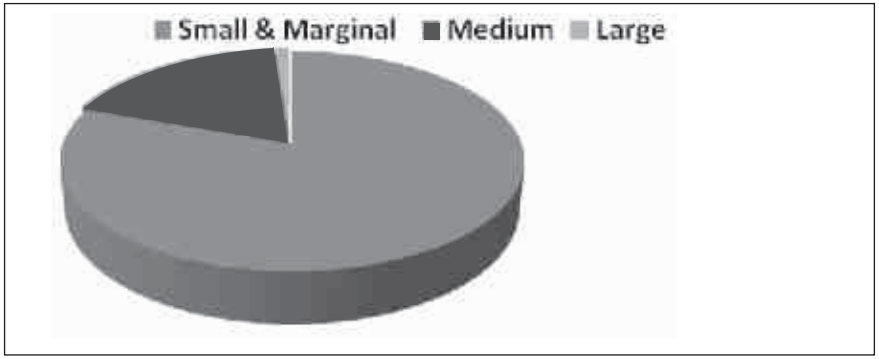
Food insecurity to hit small farmers, especially women, first

In the IPCC report, world scientists agree that it will be more difficult for South Asian countries to meet their growing demands for food. Increased urbanisation and decreased production (yield declines, limited availability of cropland) make increased demand and reduced supply all-but inevitable. This is very likely to result in increased cereal prices, with subsistence farmers worst hit. The report says that the risk of hunger[2] is already high and could increase by approximately 7-14% within the region.

[2]Food security is hard to predict as it also depends on the production and demand from other countries.

The Indian government is also worried that changing climatic conditions are going to hit the country's food security. Those to be affected first and worst will be the 71.2 million marginal farmers and 21.6 million small farmers with less than 2 ha of land. Together, they form 81% of the 115.50 million landholders in the country. Add to this the landless rural population which is already finding less work on the land as production is decreasing due to climatic variability. A little less than half of India's rural population, or 43%, is landless. Considering more than 80% of the smallholders have no irrigation facilities but depend on rain for growing crops, the situation becomes very bleak indeed.

Break-up of size of farm lands



Among small and marginal farmers, the plight of women farmers is worse. Though being in majority, the small and marginal farmers hold only a third (36%) of the total land resources. Women shoulder 60-80% of the farm work but own only about 10% of farm land. According to the report, in most regions women perform all operations pertaining to livestock management, crop production such as sowing, transplanting, weeding, harvesting as well as post-harvest activities such as threshing, winnowing, drying, grinding, husking and storage. Men often do only ploughing and help with sowing and threshing, usually doing tasks requiring lesser labour than women.

Yet, the government does not recognize them as farmers in their own right. So the research and development, the extension services, the credit policies and marketing systems do not address women farmers' needs and concerns at all. In the wake of climatic variability, women farmers face the threat of being completely asset-less, with no support from the government or the market. When their families migrate in distress, they even lose their social protection which comes from their support systems within the extended families and

larger community. Even the seminal 1954 Land Reform Act, which seeks to benefit the dalits and other socially marginalized groups does not focus on women. In some places like Andhra Pradesh and Maharashtra, there are a few examples of civil society organizations effectively using the law to issue land titles at least jointly in the names of wives. Though being worth emulating, this is not enough to ensure ownership of land among women farmers.

Interestingly, the IPCC does repeatedly emphasise the importance of access to basic social services for poor producers, good governance and their participation in decision-making in responding to climate change. The IPCC, however, does not take into consideration the gender aspects and the need to focus on women farmers as change agents through inclusive interventions and inclusive governance.

Unsustainability of conventional agriculture

Poor men and women farmers are both currently affected by the predominant agriculture systems that depend more on chemicals and large irrigation projects for boosting crop yields than on better soil nutrition and conservation of local water resources. They do not have the wherewithal to be dependent on markets for inputs such as seeds, fertilizers, water and pesticides. Ironically, this form of agriculture accelerates food insecurity in the long run as these farming practices degrade land and contaminate waterways with pesticides and herbicides (United Nations Information Centre (UNIC), May 2009 newsletter). Many of the crops grown with these chemical inputs are often water guzzlers and overuse groundwater without insuring against future water deficit through rainwater harvesting. These agriculture systems also encourage monoculture for optimum use of chemical sprays and thereby strip the soil of its nutrients without replenishing them through traditional practices such as crop-rotation and inter-cropping, which also ensure crop diversity. The residues from these crops cannot be used for fodder because they are full of unwanted chemicals. Instead, the crop residues are burnt, as in Punjab, the home of chemicals-driven agriculture. The excessive heat from the burning kills soil bacteria and fungus in the top soil, depriving the next crop of these natural soil nutrients. Instead, it means pumping in more chemicals. Even Norman Barlough, the father of the green revolution and much criticized now for promoting chemical-rich agriculture, has been quoted somewhere as having advised caution in optimizing the use of chemicals. That, however, is history.

India's agriculture policy, in focusing only on conventional agriculture to the exclusion of traditional agriculture still practiced by lakhs of small farmers, has remained myopic and witnessed stunted growth. The emphasis on wheat and rice through the National Public Distribution System (PDS) has, for instance, forced people to grow water-guzzling paddy in rain-fed arid zones by marginalizing coarse cereals that had the double advantage of being suited to the agro-ecological zones and being more nutritious than wheat or rice for poor farmers who cannot afford to buy food from the market to keep malnutrition at bay. If India is home today to the world's most malnourished people, this dimension of PDS has a definite role to play in it. With climatic changes, it is indeed imperative that coarse cereals become part of the 'adaptive crops' and are promoted by the government.

Several farmers practicing sustainable agriculture have also found that traditional crop varieties, and even local animal breeds, are more resilient to the changing climatic impacts than 'imported' crop varieties and animal breeds or cash crops grown as a single, stand alone crop. In the current conventional model of agriculture, the government however offers no incentive to farmers to cultivate flood resistant or drought resistant seed varieties. In flood affected Jogia block of district Sidharthnagar, where small farmers were forced to take only one crop, the rabi (winter) crop because of climate change, the use of a traditional early maturing paddy variety, Narendra-97, has given them the security of now taking three crops. The farmers found that their kharif (summer) crop, which took 135-150 days to mature, was often destroyed by the early floods and the intense rains which caused water-logging. Narendra-97 ripens in 90-100 days, can withstand the intense heat during May-June and provides good fodder. It makes good chivra (snack made of beaten rice) and sells well in the market. The variety was revived with help from the government agriculture university in Faizabad, Uttar Pradesh.

In the flood-prone Madhubani district of Bihar, for instance, Jaleshwar Yadav of village Gamhariya (block Satdhara) has been growing the fast disappearing barnyard millet that is an early maturing traditional coarse warm climate crop and can be harvested before the advent of floods. In flood prone eastern Uttar Pradesh, small farmers have benefited from switching from sugar cane, which can withstand floods but is water intensive but cannot withstand heat stress under changing climatic conditions, to the traditional and less water-intensive, more hardy maize crop which they can harvest before the arrival of floods and also get good fodder from the rest of the plant. The plant fills the gap between

the rabi and kharif crop so that land does not have to be left fallow. In this flood-prone region, the last two years have interestingly seen 'drought,' a condition thus termed when farmers do not get rains for up to two weeks in the monsoon season. Their crops cannot cope with the dry season.

The conventional chemical-and-irrigation-dependent agriculture systems have affected poor women farmers more. Men farmers now have more knowledge, and control over the increasing market inputs (seeds, fertilizers, pesticides, credit, even technology) needed to grow wheat, rice and most of the other food and cash crops – and have more access to markets. The vanishing of climate-resistant coarse cereals, for instance, has eroded the power women had over their farming systems. Women no longer go to the haats (local markets) to sell the extra ragi, bajra, jowar and other millets so have no cash incomes to give them a bit of economic freedom within their homes. They also now have little control over production and find it more difficult to ensure food security within their households. The adoption of these 'adaptive millets' will specifically help poor and small women farmers by reviving women's traditional knowledge of seed varieties, cropping patterns and harvesting cycles, giving them more production and better incomes. If the PDS is re-aligned to include regional marketing networks for local 'adaptive' millets, women can then access a wider market.

Women also face decreased milk production from their small animals and where help from visionary civil society organizations is available, increasingly prefer native species as they are more resistant to the local climatic changes.

Differences in conventional and traditional agriculture

Conventional agriculture ***Less adaptive; Less resilient***	**Traditional/sustainable agriculture** ***More adaptive; More resilient***
Linear relationship between each component of agriculture – cropping, animal rearing, agro-forestry	Cyclic relationship with mutual dependency
Driven by a single target of *maximising output*	Driven by multiple targets like *yield, fodder, replenished soil nutrients, water conservation, less energy intensive*
Usually suited to mono-cropping	Suited to multiple crops, also food crops
High dependence on market for inputs	Less dependence on market for inputs

Sustainable agriculture is adaptive

An Oxfam India-initiated civil society research paper authored by Dr G.V. Ramanjaneyulu and Dr Kavitha Kuruganti, both scientists and organic farming activists, shows how the better drainage and water holding capacity of organic soils reduces the risk of drought and soil erosion. The paper quotes a recent technical paper from International Trade Centre (WTO) and FiBL to say that organic (or sustainable) farming practices are in a good position to maintain productivity in the event of drought, irregular rainfall events and rising temperatures. The technical paper notes that soils under organic management retain significantly more rainwater thanks to the "sponge properties" of organic matter. Water percolation is 15-20% more in organic systems. Water capture in organic plots is twice as high as conventional plots during torrential rains, which in turn reduces the risk of floods.

The paper continues to say that the most important component of organic systems - diversity - contributes a lot to the resilience of organic farms. Enhanced biodiversity of organic farms have several positive ecological implications – pest prevention, and similar effects on diseases, better utilization of soil nutrients and water etc. Organic farming is also associated with decreased irrigation needs by about 30-50%. This becomes an important part of adaptation in drought conditions.

Given that the more ecological farming models are sustainable and have a strong adaptation potential, India's agriculture policy must re-oreint itself towards this.

Small farmers need sustainable agriculture

Having said that small farmers are at maximum risk from the impacts of climate change, climate-resilient sustainable agriculture offers best hope for them. They do not have savings or alternative livelihoods that will see them through if their crops fail or their livestock dies. Sustainable agriculture is particularly beneficial for women many of whom still retain the traditional knowledge of bio-fertilisers and bio-pesticides. Several on-the-ground experiments across India have shown how this knowledge, coupled with some modern scientific innovations, has helped poor farming families tide over the hunger crisis. For instance in village Janakpur (block Compeeganj), district Gorakhpur, Uttar Pradesh, women use pest repellent compost made at home

and NADEP that protects their crop even when it fails to rain for many days. The crop remains green and fresh. This also protects the 'friendly' insects while killing the 'hostile' insects; chemical pesticides indiscriminately killed all insects.

> *The name NADEP is derived from the name of the originator of this method of composting called, N.A.D Panduri Pandey.*
>
> *A number of agricultural wastes are available in farmland. But farmers in many areas still use conventional ways of pit composting, which takes almost a year for decomposing agro-wastes. At the same time there is plea from organic farmers that sufficient quantities of organic manures are not available locally. NADEP composting is an easy way to recycle agricultural wastes rapidly to produce good quality manure. The agricultural wastes and other organic wastes available on-farm can easily be converted into compost quickly using NADEP method.*
>
> *The use of unscientific agricultural practices for years has increased the incidence of many crop diseases and resulted in loss of soil fertility. Moreover the abundance of micro flora and fauna has been drastically reduced from the agricultural lands. Reviving soil fertility is of utmost concern for agricultural sustainability. Farmers like to apply organic inputs but lack of proper composting methods prevents them from doing so.*

The other advantage is the ability of small farmers to take up mixed cropping, crop-rotation and even agro-forestry when practicing sustainable agriculture. In Dudhai village (Sardarnagar block), district Gorakhpur, Uttar Pradesh, for instance, Prabhavati and her husband, Suryabhan, own just 1.5 acres of land, but use their piece very intensively growing a wide range of as many as 52 cash and food crops through the year using organic farming practices. These include paddy, bajra (coarse cereal), *maruwa* (traditional millet), groundnut and *til* (oilseed); vegetables like *lobhiya, tori or nenuwa,* lemon, bottle-gourd or *lauki and kathal;* fruits like guava, papaya, mango, *chakotra,* blackberries, mulberry and the *mahua* tree. They also grow shrubs with pest repellent properties like *neem, madaar, kaner,* trees of timber value, particularly *saagwaan,* several medicinal plants, spices like ginger, *haldi* or turmeric, *laung* and even bamboo.

The couple has married their traditional knowledge with scientific know-how to improve their traditional practices. For example, earlier Prabhavati used dung as manure but she did this arbitrarily so that a lot of its nutritive value for the farmland was lost. Then she learnt how to dig trenches and do composting

in them and how to use green manuring in a better way. She also learnt how to use cow urine, do vermi-composting and prepare NADEP. Though NADEP is to be made in a wood and cement enclosure, Prabhavati uses her home-grown bamboo and tree branches to make the enclosure. She has also learnt how to use produce from local trees and shrubs to prepare pest repellents. In many places, for instance, villages plant saunf or fennel on the borders of their small farms because the strong, sweet smell repels 'hostile' insects and also keeps wild animals like the *neelgai* at bay. Simplicity can indeed work wonders.

Sustainable agriculture can be food secure

The Ramanjaneyulu/Kuruganti paper deals with the critical question of whether sustainable agriculture or organic farming will be able to feed the growing population. On-the-ground sustainable agriculture experiments over large field areas have shown that this does not imply lowered yields. The authors quote an FAO report (2007) which says that "conversion of global agriculture to organic management, without converting wild lands to agriculture and without using N-fertilisers would result in a global agricultural supply of 2640 to 4380 Kcal/person/day". It is believed that sustainable intensification in developing countries through organic practices would increase production by 56 per cent. A meta-analysis of 133 scientific papers concluded that organic agriculture was particularly competitive under lower yield environments, a feature that is common in developing countries. Organic yields on average are comparable to conventional yields although yields do decline initially when converting from high-input systems and almost double when converting from low-input systems. In India, it should be remembered that a majority of land is rain fed and continues to be low-input by default.

The table here will give an indication of how crop yield, and cost-benefit ratio is exceedingly favourable, capable of preventing farmer suicides, under sustainable farming rather than under conventional farming:

On 6.4 ha, with 8 farmers in Punukula village, Andhra Pradesh (Kharif, 2001-02)

Particulars	Sustainable Agriculture	Conventional Agriculture
Average yield of cotton (Kg/ha)	1575	1450
Cost of plant protection ($/ha)	4300	8595.2
Net income ($/ha)	3420	-5200

Source: CSA, Hyderabad

To take the example of Subash Sharma, practicing sustainable agriculture for 14 years on 12 ha in Dorli, Maharashtra, the following positive fallouts of doing sustainable farming speak for themselves.

- For every 2½ acres of land, pits were dug for rain water harvesting resulting in augmentation of water supplies.
- Water holding capacity of soil is enhanced. Now 1cm rainfall in a ha of land results in 50000 lit of water absorption.
- About 3000 trees with 2000 of teak and others like mango, *sapota,* neem, tamarind, *jamun,* papaya &, *sithaphal* yield good incomes
- Trees have reduced the temperature by 3-4 deg centigrade, attracting birds to kill pests and adding bio mass.
- Every year, 10 tonnes of biomass per acre of land is incorporated in the soil.
- During 2007-08, there was very little rainfall (600mm) but the crops survived
- In 2006-07, the crops survived heavy rains
- Groundwater level has increased and Sharmaji now gets three crops a year

Conventional agriculture deepens the climatic crisis:

Mitigation potential of sustainable agriculture

After showing what needs to be done, it maybe worthwhile to list the ills of the conventional model of agriculture being promoted by India, and indeed the rest of the world. What are some of the fallouts of this agriculture?

For one, the subsidies given towards fertilizers and pesticides are growing at a phenomenal rate. It had crossed India's defense budget of Rs 1,05,600 crores in 2008-09 but following the 26/11 terror strike in Mumbai, the defence budget was hiked by 35% in 2009-10 and stands now at Rs 141700 crore. While agriculture funding needs to go towards adaptation to help poor, small farmers grow enough food themselves and for the world, the fertilizer subsidy simply swells the coffers of fertilizer and pesticide companies, encouraging them to spew more greenhouse gasses in the process of manufacturing and transporting. At the farmer level, the subsidies help the bigger farmers who have the wherewithal to buy them off the shelf, rather than small farmers who

end up living beyond their means if they buy these inputs. With climatic changes leading to reduced production and crop failure, the fear is that the number of suicides by small farmers may simply go up.

The growing subsidy for fertilizers in India

Years	2005-06	2006-07	2007-08	2008-09
Fertiliser Subsidy (INR/crores)	18299	25952	40338	119772* (estimated)

Source : Department of Fertilisers, Min of Chemicals and Fertilizers, Govt of India
The New Indian Express, July 8, 2008

The other major problem with conventional agriculture is its huge dependency on energy. The Ramanjaneyulu/Kuruganti paper deals with the mitigating potential sustainable agriculture:

> **Reduction in GHG emissions:** *Changes in farming models and practices towards sustainable agriculture offer a significant opportunity at reducing GHG emissions. Organic farms use on an average 33 to 56 per cent less energy per hectare, as per FAO (2007).*
>
> *Organic farming reduces its fossil fuel dependence in many ways. For instance, for soil productivity management, internal inputs and practices are used rather than chemical fertilizers – example, creating the micro-climate required for increased soil (beneficial) microbial activity. This is done by returning bio-mass to the soil. Legume production, crop rotation, mixed cropping etc., are other ways of achieving this. Pest management also does not depend on chemical pesticides but a variety of local resources and practices.*
>
> *IFOAM - International Federation of Organic Agriculture Movements - notes that avoidance of methane emission is also possible through organic agriculture – through the promotion of aerobic micro-organisms and high biological activity in soils, oxidation of methane can be increased. Through practices like System of Rice Intensification, which is mostly based on principles of ecological farming, flooding in rice paddies can be reduced and thereby, methane emissions.*
>
> *Nitrous oxide, result of overdoses and losses on nitrogen, can be effectively minimized through sustainable agriculture practices. While production of chemical fertilizers is an energy-intensive process that emits carbondioxide and nitrous oxide, application of nitrogen fertilizers makes the soil emit nitrous oxide. These can be avoided through organic farming.*

> *Sustainable agriculture also increases the Soil Organic Carbon (SOC) by incorporating organic materials into the soil. Soil can be a major source of storage of carbon, about twice as much carbon as in the atmosphere. Fertiliser use replaces soil organic matter in intensive systems, which reduces potential sequestration. Crop, tree and livestock integration with a systematic recycling of organic wastes is an integral part of sustainable agriculture. Long term studies have shown that compost application and cover crops in rotation were particularly adept at increasing soil organic matter even in comparison to no-tillage techniques. While conservation tillage is promoted elsewhere as a way of sequestration of carbon dioxide, this is often done by the use of chemical herbicides and GMOs which have their own ecological implications. In sustainable agriculture however, mitigation of climate change can be addressed both by carbon sequestration in the soils and minimized emissions of GHGs. Agro-forestry is also a desired principle of organic farming which further adds to the potential of Sustainable Agriculture in carbon sequestration.*

Action points

A civil society workshop organised in December 2008 brought together practitioners, government scientists, agriculture university professors, policy advocates and activists to sit with India's key climate negotiator and convince him of the need to change India's approach to agriculture. Since then, the negotiator has started talking about 'low external input agriculture,' even at industry meetings which is indeed welcome. More recently, organic agriculture has featured as one of the key components in the proposed national mitigation body. The announcement was made by India's Prime Minister so the hope is that merits of sustainable agriculture have reached the top echelons of decision-making. At the state level too, there have been some welcome steps in the near past. Himachal Pradesh has officially adopted organic agriculture, following Andhra Pradesh which came up with an organic agriculture policy about three years ago and has been rolling it out through its structures.

The National Mission on Sustainable Agriculture incorporates some of the recommendations made at the December workshop but the approach has still to change. One of the major challenges is the belief that bio-genetics can tackle climate impacts in agriculture. The jury is still out there on this and the Mission should first consult widely and learn from field experiments before taking decisions that may be impossible to roll back at a later date. Farmers, especially small farmers, have been withstanding climatic changes since they started ploughing the land. Now they need to be supported through the climatic

shocks that they are witnessing in a way that builds on their knowledge and expertise as far as possible. These farmers have many of the answers and the government needs to hear them.

Below are the recommendations, or action points, that summarise what the government should do to help small farmers adapt to climate change and to help mitigate climate change caused by conventional agriculture. These recommendations have been presented to the Indian government and are part of the paper authored by Ramanjaneyulu/Kuruganti. These action points still need to be reiterated, more loudly, at every forum for them to be really heard and incorporated into the government's new interventions.

- ***Definition of sustainable agriculture required:*** *Sustainable Agriculture is a misnomer for what has been proposed under the name of Sustainable Agriculture and therefore, a correct, common understanding of the term is required. The current set of proposals would not lead to improving the soil health, central to sustainable agriculture, nor to cyclical models of farming, internalizing farm inputs (including crop waste) into farming systems, which define sustainable agriculture[3]. On the contrary, the existing suggestions would continue the conventional linear, intensive models that further the existing dependency of farmers on external agencies for everything, including for knowledge. That is one of the reasons for the current day crisis in agriculture.*

- ***Creating the imperative for the paradigm shift:*** *The NAPCC makes no mention and assessment of Green Revolution-induced climate change in India. Shying away from stating the issues with the current model of agriculture will not create the imperative for a shift to sustainable agriculture, which is a requirement both for mitigation as well as adaptation. The NAPCC should clearly specify incentives to farmers for shifting to organic farming and sustainable agriculture practices. The government should realize that the imperative to shift to sustainable agriculture is larger than climate change.*

  The NAPCC, especially in the sections related to agriculture, does not bring up mitigation possibilities at all – while that could be a posture adopted at the international level, for common but differentiated responses, it is interesting to note that the only place where mitigation is mentioned is to make the entry of Genetically Engineered crops a possibility. Further, the NAPCC should expressly acknowledge

[3]Sustainable agriculture includes organic agriculture and is variously referred to as ecological agriculture or natural agriculture. It is characterized by agro-forestry, mixed cropping and crop rotation.

the potential that exists of mitigating GHG emissions from farming through a shift to organic farming.

- ***Policy approach:*** *Strategies should be evolved for a time-bound phasing out of climate change-inducing practices towards sustainable agriculture with clear targets and financial outlays. This includes a focus on the role of pasture lands, fisheries, animal husbandry (rather than the bias on crop husbandry that is present in the NAPCC) and seed banks governed by farmers' bodies as major thrust areas for adaptation. Or, when plans are made about access to information, the emphasis should not be just on information packages to farmers in a top-down manner about geo-spatial impacts of climate change, but also data on conventional vs. organic practices so that informed choices can be made by farmers.*

- ***Biotechnology:*** *On the use of biotechnology, especially genetic engineering, as part of the NAPCC (National Mission on Sustainable Agriculture), it is felt strongly that the government should focus on reducing the present subsidies to GHG-emitting practices like fertilizers rather than come up with GE seed varieties which are supposed to reduce GHGs. The proposed research like conversion of existing C3 plants to C4 plants for better adaptation using GE tools may not yield any results. Instead the focus should be on promoting crops like Millets which have C4 pathway and are more efficient in adapting to the climate vagaries. In fact, an assessment of the stress (in) tolerance of GE crops, high resource consumption and biosafety questions should be an important part of understanding the implications of Genetic Engineering as an agricultural technology in the era of climate change.*

- ***'Land to lab' programmatic interventions:*** *The NAPCC focuses too much on setting a research agenda for the NARS (National Agricultural Research System), following the old model of 'lab to land' research and not so much about programmes to be implemented immediately at the farmers' level. In the context of climate change and adaptation, there is hardly any time to be lost and farmers' need for resilient systems cannot wait for more research in the old paradigm to be taken up. The need is for solutions discovered from the farms, assessed and validated and spread to others, especially in terms of adaptation. There is a strong opinion that there is enough evidence of time-tested practices and experiences from the ground of certain sustainable agriculture principles and practices creating resilient farming systems. Further, civil society organizations also have enormous experience with creating effective people's institutions at the ground level which will allow for the delivery of programmes in an effective fashion. Therefore, the overwhelming need is for immediate programmatic interventions drawing on the strength of traditional knowledge and resources, farmers' innovations and experiences with the civil society.*

Alternative, horizontal extension systems with farmers' organizations at the centre are an important part of information-centred addressal of climate change.

As part of the NAPCC, capacity building of agriculture scientists and extension workers on organic farming should be taken up so that they are equipped to take the message to farmers.

- ***Traditional knowledge & resources:*** *The National Action Plan does not give adequate prominence to traditional resources and knowledge, which need to be made a cornerstone for interventions on sustainable agriculture. It was felt that popularization of traditional knowledge in addition to ever-evolving innovations in the fields of practicing organic farmers should be considered to be an important component of adaptation to climate change in agriculture. Such farmers, especially women farmers who are the traditional custodians of such knowledge, should be identified and lessons learnt and disseminated through the extension system.*

  There should be an emphasis on falling back on indigenous resources (seeds, animal breeds etc.), which have proven track record of adaptation to stress conditions. The Plan should also make Seeds, as replicable resources in the hands of farmers, especially women farmers who have been the traditional custodians of these seeds, institutionalise the form of seed banks, as a major thrust and strategy for adaptation. As part of the NAPCC, there should be a mechanism evolved to track and monitor genetic erosion for all of the country due to climate change. Women's knowledge on this aspect needs to especially harnessed and built upon.

- ***Centre-State relations:*** *State governments should be involved in consultations and planning right from the beginning – it is not enough that centrally-evolved plans are imposed upon them. In fact, it is ultimately the departments of agriculture and the extension and delivery mechanisms at the state level which will directly take everything to farmers and support them to bear the consequences of climate change. For instance, seed rolling plans need to be evolved by each state, with an emphasis on revival and restoration of open-pollinated, traditional and locally-adapted varieties and extension services need to be revamped and re-oriented, including a gender perspective and gender-responsiveness, at the state level.*

- ***'Public-People' Partnership:*** *Similarly, it was felt that civil society and its institutions should also be involved in planning and implementation related to the NAPCC. For instance, alternative, horizontal extension systems with farmers' organizations at the centre are an important part of information dissemination and learning for adaptation to climate change. The stress should be on public-people partnership in the Plan. There should be recognition that only market-driven*

technologies are not the answer in the era of climate change. There is a need for renewed thrust on public research in partnership with farming communities, especially women farmers.

- ***Risk management:*** *When it comes to Risk Management, it should be acknowledged first that the existing risk management strategies and mechanisms have failed farmers badly. There is a need for complete recasting of the existing models and mechanisms with special focus on risk insurance for women. We need new mechanisms to assess damage and loss and better ways to deliver support - including weather insurance, livestock insurance and effective crop insurance.*

- ***Clear convergence:*** *The Plan should clearly spell out how it converges with other plans and missions both within the NAPCC as well as in other agencies like the Planning Commission.*

- ***Social safety nets:*** *As part of adaptation strategies, strong social security nets should be put in place for the rural households, including a provision of minimal incomes, pension, insurance etc., with special emphasis on the agriculture workers, especially women who continue to outnumber men wage labour on farms.*

References

Prime Minister's Council on Climate Change (2008), 'National Action Plan on Climate Change', Government of India, New Delhi

See http://www.ipcc-wg2.org/, Chapter 12.

Oxfam International (2009), 'Strong Crops and Climate Shocks: Adaptation and Food Security for vulnerable Farmers' Draft version, Oxfam International, United Kingdom

Oxfam India, G.V. Ramanjaneyulu, Kavitha Kuruganti (2009), Sustaining Agriculture in the era of Climate Change in India: A civil society position paper, Centre for Sustainable Agriculture/Oxfam India, Secunderabad/New Delhi

World Bank (2008), Climate Change Impacts in Drought and Flood Affected Areas: Case Studies in India, World Bank, New Delhi

Gorakhpur Environmental Action Group, Oxfam India (2007), Adaptation Capacities of Communities to cope up with flood situations: Flood and Livelihoods Adaptive Capacity-based Compilation, GEAG, Gorakhpur

Bharat Dogra (2009), Protecting Livelihood, Encouraging Creativity: Small Women Farmers and GEAG, Bharat Dogra, New Delhi

Indian Agriculture Research Institute, P.K. Aggarwal et al (2009), Vulnerability of Indian Agriculture to Climate Change: Current State of Knowledge, IARI, New Delhi