Ecologically Sustainable Farming Systems

Agriculture as an occupation and a way of life is directly dependent on Nature. ASHA recognises that ecological sustainability of farming is intricately linked to the sustainability of farm livelihoods. If the very productive resources on which farming is based are eroded and degraded, it is obvious that farm-based livelihoods will be adversely impacted too.

As per Government of India's State of Environment 2009 report, "Direct consequences of agricultural development on the environment arise from intensive farming activities, which contribute to soil erosion, land salination and loss of nutrients. The introduction of Green Revolution in the country has been accompanied by over-exploitation of land and water resources and excessive usage of fertilizers and pesticides". The ecological damage caused by decades of intensive chemical-based agriculture is becoming increasingly apparent and farmers are facing the adverse consequences on a large scale. Soil health and fertility has declined drastically; farm ecosystems, which include earthworms, beneficial insects, birds and diverse plants, have been badly disrupted; water systems have been poisoned and groundwater has been depleted, creating extensive dark zones. The decrease in soil fertility is reflected in the average crop response to fertilizer use that was around 25 kg of grain per kg of fertilizer during 1960s, and has reduced to only 8 kg per kg of fertilizer by the late 1990s. The government's chemical fertilizer subsidy bill touching Rs.1 lakh crores is well known. On current trends it is estimated that 60% of groundwater sources will be in a critical state of degradation within the next twenty years. Pesticide poisoning is killing thousands of farmers every year; pesticide residues and water contamination due to agrochemicals are linked to various diseases like cancer, reproductive health problems, organ damage, lowering of immunity etc. It is important to acknowledge the various environmental and environmental health related problems that are caused by synthetic pesticides and fertilizers in our agriculture and address this squarely. There seems to be a mad rush towards Genetically Modified crops ignoring biosafety and other concerns. Without assessing the need, alternatives available, bio-safety, political rights of farmers and trade security, releasing of Genetically Modified (GM) crops into the environment would be a disaster for farmers, consumers and our environment.

Furthermore, this intensive "Green Revolution" paradigm is being implanted in all growing conditions in a one-size-fits-all approach, including rainfed pockets of the country increasing riskiness in agriculture. While the government invests public funds for propping up this kind of an intensive and unsustainable agriculture paradigm with subsidies, no incentives are in place for farmers who practice ecologically sustainable farming that builds up rather than depletes the nation's natural resource capital and ensures sustainable food security for the country.

Given that the current model of agriculture is reflecting "technology fatigue" and destruction of our natural resource and economic capital (acknowledged by India's Five Year Plan processes), there is an urgent need to re-orient Indian agriculture into an ecologically sustainable model. This is also supported by objective and independent assessments by the world's leading organizations. Such a shift is an urgent imperative given that the livelihoods of millions of farmers in the country depend intimately on the state of environmental resources. Special mention has to be made about Rainfed Farming and the neglect it has faced over the decades. Rainfed regions are characterized by high incidence of poverty, low education and health status, high distress in farming sector, distress migration, low employment opportunities and vulnerability to a variety of high risks. Apart from participatory watershed development projects, integrated farming system approach is advocated for these areas to increase productivity in a sustainable manner and to contribute to livelihood security.

In the recent past, the World Bank and UN agencies such as FAO, UNDP, UNEP, GEF, UNESCO and WHO perceived a need to assess the future directions that agricultural science, knowledge and technology should adopt, given the crossroads at which global (as also Indian) agriculture stands at. The largest global assessment ever was thus undertaken by 400 experts from different countries, over three years (2005-2007) and the resulting report was called the International Assessment of Agriculture Science, Knoweldge & Technology for Development or **IAASTD report**. This report also looked at the role of modern biotechnology, specifically transgenic or GM technology, given that transgenic technology is often touted as a solution for many current day agriculture-related problems. IAASTD (that India signed on to) found that agro-ecological approaches, and not GM, provide a sustainable answer to the world's food crisis. The IAASTD report affirmed that "a powerful tool for meeting development and sustainability goals resides in empowering farmers to innovatively manage soils, water, biological resources, pests, disease vectors, genetic diversity, and conserve natural resources in a culturally appropriate manner". These are some of the components of ecologically sustainable agriculture as opposed to intensive and largely monoculture, chemical-based agriculture based on inputs such as chemical fertilizers, pesticides and proprietary seeds produced by powerful private seeds corporations.

Global Experience with Ecological Agriculture

Olivier De Schutter, UN Special Rapporteur on the Right to Food ('Agro Ecology and the Right to Food') stated that 'to date, agro-ecological projects have shown an average crop yield increase of 80% in 57 developing countries, with an average increase of 116% for all African projects. Recent projects conducted in 20 African countries demonstrated a doubling of crop yields over a period of 3-10 years.'

UNCTAD (UN Conference on Trade & Development) in its Trade and Environment Review 2013 recommends that farming in rich and poor nations alike should shift from monoculture towards greater varieties of crops, reduced use of fertilizers and other inputs, greater support for small-scale farmers, and more locally focused production and consumption of food. The Review recommends 'mosaics of sustainable regenerative production systems that also considerably improve the productivity of small-scale farmers and foster rural development'.

There are often questions asked about the potential of organic farming in sustaining or improving yields. FAO says that when converting from poorly managed traditional systems, organic practices actually intensify the agricultural productivity, due to enhanced natural resources management and rotations. An FAO review states that organic agriculture can be described as "neo-traditional food system" as it uses scientific investigation to improve traditional farming practices anchored in multi-cropping systems, natural food preservation and storage, and risk aversion strategies that have traditionally secured local food needs. Various modeling studies looking at organic agriculture have concluded that it has the potential to secure a global food supply just as conventional agriculture today but with reduced environmental impacts. Findings suggest enough food could be produced on a global per capita basis for the current world population: 2640 and 4380 Kcal/person/day is the range. While productivity in organic production systems is management specific, studies show that in subsistence agricultural systems, it results in increased yields of upto 180 percent. Overall, the world average organic yields are calculated to be 132 percent more than current food production levels.

Organic farming has a significant role in the age of Climate Change. It stresses diversification and adaptive management that decreases vulnerability to weather vagaries. In organic agriculture, restricted use of mineral fertilizers reduces use of non-renewable energy and reduces the emissions of agricultural greenhouse gases. Therefore, both for mitigation and adaptation, this is a better approach to adopt.

India's experience with Ecological Agriculture

Long term studies from India also show that organic farming yields are comparable to 'conventional' cultivation yields (CRIDA, 2009). Tens of thousands of individual farmers across the country have long shown that organic farming, natural farming and other agro-ecology based farming methods result in sustainable yields, increased net incomes and reduced indebtedness. Even in suicide hotspots of Maharashtra and Andhra Pradesh, there are no reports of organic farmers having to resort to suicides.

The success stories of organic farming and ecological agriculture practitioners were dismissed earlier as isolated and non-scalable models dependent on the skills of a few innovative farmers. In Vidarbha, an NGO called Dharamitra, through a CAPART funded study taught 400 farmers a package of ecological practices to be practiced on one acre of their land holdings for a period of 3 years. Their study found net income increases of 25% to 80% compared to the rest of the farmer's land and yields that were comparable. The System of Rice Intensification, whose adoption is expanding constantly all over India, is also showing that agro-ecological practices can reduce resource use while sustaining or increasing yields. Lakhs of acres under System of Rice Intensification (SRI) and its variants for other crops like wheat, sugarcane and ragi, organic farming and zero-budget natural farming have led to good production and higher net incomes for farmers.

The largest breakthrough in ecologically sustainable agriculture has been in Andhra Pradesh. In 2004, 12 villages in Andhra Pradesh took a first step in ecological agriculture by adopting Non Pesticidal Management (NPM). The resulting savings of about Rs 60 lakhs for just one village on pesticides alone inspired a collaborative approach between the rural development department of the Government of Andhra Pradesh, the World Bank and NGOs like the Centre for Sustainable Agriculture with its network of partner NGOs. The movement for 'Community Managed Sustainable Agriculture' (CMSA) has now spread to more than 3 million acres. This is reported to be the world's largest state-supported ecological farming project. It is bringing farmers out of debt, enabling them to retrieve land pledged to moneylenders and has made Andhra Pradesh into a state that reduced pesticide and chemical fertilizer usage significantly. The yield of principal crops raised through CMSA has been compared to that of conventional agriculture through surveys which closely monitored 400 farmers' fields in 5 districts to look at yield of paddy, chilli, groundnut, redgram and cotton crops after they switched over to CMSA and found that yields have remained the same or increased slightly with NPM.

Spreading such work must be a priority of any Government committed to improving farm livelihoods and sustainable agriculture, and to releasing India's farmers from the clutches of agro input producers and traders, who are also the new class of moneylenders and agricultural information system on whom farmers have become dependent in the absence of ecologically sound, self reliant and state supported alternatives.

There are master practitioners in every State who can assist in making ecological agriculture part of a new paradigm for rural prosperity. The demand for organic food is one of the fastest growing demands for any product as consumers become increasingly wary of the ill effects of chemical-laden food and the potential health hazards of genetically modified (GM) food. India is ideally placed to avail of this opportunity. According to an ASSOCHAM study on West Bengal entitled 'Ushering A New Era of Prosperity' (2011), the demand for organic produce is growing at an annual rate of about 40 per cent in India and is likely to be worth Rs 10,000 crore by 2015 from current levels of about Rs 2,500 crore. The report estimated that organic farms provide 30 per cent more jobs per hectare. Adoption of organic farming could create 20 lakh additional jobs in farming over 5 years, plus 6 lakh additional jobs if farm

storing, processing, value addition, packaging and marketing facilities are included. Adoption of organic farming could increase net per capita income of a farmer by a whopping 250% to Rs 15,680/month.

Countries such as India with low chemical input use and without GM contamination are also ideally placed to take advantage of export market. It should be noted here that the GM path and the organic path are not compatible - small quantities of GM rice and wheat which found their way into US exports of rice and wheat to Europe as an unintended result of GM field trials caused import bans that resulted in millions of dollars of losses to US farmers.

GM Crops And Ecological Agriculture

A major impediment to the adoption of ecological agriculture is the unsubstantiated hype, claims and promises being held out on behalf of Genetically Modified (GM) crops. Production and productivity increases are attributed to GM technology without analyzing the real contributory factors as has happened with Bt cotton in India. In cotton for instance, while the Government of India has been claiming Bt cotton to be an unqualified success, Cotton Advisory Board data shows that cotton yield increased from 278 kg in 2000-01 to 470kg in 2004-05 when Bt cotton was less than 6% of all cotton grown. By 2012 when Bt cotton had spread to over 90% of all land, the yield had only increased to 481 kg despite irrigation increasing (over 100,000 new check dams were constructed in Saurashtra alone). Seventeen years after its introduction in USA in 1996, GM technology covers less than 4% of the world's agricultural land, is not increasing in the developed world and is rejected or severely regulated by most countries of the world. This is the result of growing scientific evidence of the adverse impacts of GM on health, environment and agriculture. The narrowing of seed choices for farmers and adverse impacts on exports in the case of contamination of farm produce with GM are also well-accepted.

GM technology is most used for making crops resistant to spraying of herbicides. This may be convenient (though not desirable) in the 4 countries (USA, Canada, Brazil and Argentina) which account for over 80% of GM crops worldwide since manual weeding is not possible where farms are in hundreds of acres. It is however a technology that is unneeded and unwanted in India where average farm size is less than 3 acres and weeding provides jobs for millions of women. A paper published in European Environment Agency's 2013 report states "GM crops are well suited to high-input monoculture agricultural systems that are highly productive but largely unsustainable in their reliance on external, non-renewable inputs. Intellectual property rights granted for GM crops often close down, rather than open up further innovation potential…". It further states that "science-based agro-ecological methods are participatory in nature and designed to fit within the dynamics underpinning the multifunctional role of agriculture in producing food, enhancing biodiversity and eco-system services, and providing security to communities".

Action Plan for Ecologically Sustainable Agriculture: ASHA's proposals

It is time that Indian policy makers make a decisive shift in their approach to farming and wholeheartedly support ecologically sustainable agriculture through the following measures:

- **Time bound, Programmatic Scaling up of Ecological Farming:** Since the support systems built through the Green Revolution period are explicitly oriented towards chemical-intensive and external-input-based farming, the government needs to take a deliberate programmatic approach to support a large-scale shift to ecologically sustainable agriculture. ASHA is advocating a

progressive approach since overnight shift is not feasible. The roadmap should include a large-scale pilot phase of 2 years following by scaling up as a planned mission, with at least 10% of cultivated land shifting to ecological farming each year. Such scaling up should rest on large scale campaigns against chemical farming, sound capacity building modules put into place extensively including for frontline agriculture department staff, farmer-to-farmer extension, farmer field schools, dissemination of information and knowledge in local languages in various appropriate forms and women farmers kept at the forefront of the shift.

- ➔ **Establish incentives to support eco-farming:** Special bonus should be given to organic farmers and rainfed farmers for the ecological services they are rendering, in preserving soil fertility, water resources and poison-free food systems. Some of the subsidies currently going to chemical agriculture should be reoriented as incentives for shift to organic agriculture. Separate mechanisms for subsidizing labour intensive operations should be put into place. An important component of such a support system would be **marketing support for organic produce**, including free certification systems, separate market yards and processing facilities for identity preservation. Support lent to organic marketing should be mainly given to farmers' collectives to ease cash flow issues, as well as infrastructure related matters (storage, processing, transport etc.).
- ➔ **Incorporate special focus on rain-fed agriculture and drought adaptation**: Here, there is need to focus on diverse cropping systems, ensuring protective irrigation and strengthening livestock based livelihoods. Water-efficient crops (like millets, pulses and oilseeds) and production practices (SRI, micro irrigation etc) need to be promoted and incentivised including through appropriate pricing mechanisms, market support and integration into various food schemes.
- ➔ **Allocate at least 50 percent agri-research funding immediately** towards farmer-empowering research on ecological farming using participatory approaches, and redirect the agenda of the NARS from corporate-driven high-input intensive technologies to farmer-led sustainable technologies, with special focus on smallholders and women farmers. In this context, it is important to democratize and make the NARS institutions accountable to the sustainability of agriculture. A sustainability index should be used to assess all research outputs, in addition to the conventional cost benefit analysis. Seed breeding should be taken up in organic growing conditions so that such seed is available for organic farmers.
- ➔ **Make organic farming the major strategy to combat Climate Change** by focusing on resilient systems, locally adapted varieties, and ecological farming practices along with increasing biodiversity, which will act as the best adaptation for climate change. Studies have shown that so-called 'climateproof' GM crops have been less successful.
- ➔ **All Class I and Class II pesticides should be banned in India**, and others should be phased out in a time-bound manner. Those pesticides banned elsewhere especially for their carcinogenic, teratogenic, endocrine-disrupting properties, need to be banned in India immediately. This is important in the context of constantly-emerging evidence on the adverse effects of such chemicals as well as the success of Non Pesticide Management (NPM), and other ecological farming methods (with diversity-based cropping systems) that effectively manage pests and diseases.
- ➔ **Subsidies on chemical fertilizers should be rapidly phased out** and money saved thereby (Rs 70,000 crores, 2011 – 2012) should be used as incentives for farmers who adopt ecological farming. This should include subsidy for local generation of bio-fertilizers, including the planting of trees for enhanced availability of biomass and nutrients.
- ➔ **A moratorium on all open air field trials and commercial release of GM crops** should be declared as recommended by the Supreme Court appointed Technical Expert Committee and the unanimous report of the multi-party Parliamentary Standing Committee on Agriculture.