

## Can we have an organised Sustainable agriculture System that can ensure our food security?

P.R.Reddy

Director Grade Scientist (Retd), CSIR-NGRI, Hyderabad-500 007, Telangana State

E-mail: parvatarreddy@gmail.com

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### ABSTRACT

Agriculture practices vary from place to place. Even concepts and methodologies need to be changed, taking in to consideration a region's ecosystem peculiarities and socio-economic aspects. From time to time decisions are taken by the concerned focusing on the problem on hand, ignoring or not worrying about repercussions of any decisions taken to overcome the problem on hand. At a later stage when setbacks of significant nature crop up critics pounce on the decisions taken earlier, forgetting decisions and execution mechanisms change with time and our focus should be to take steps that can improve the situation, instead of wasting our energies in finding reasons for spilled milk.

Green Revolution was hailed for bailing us out of a tricky situation in 1960s and 1970s. In the process the introduction of chemical fertilizers, chemical pesticides led to deterioration of soil fertility and overall environmental degradation. While there is a definite necessity to improve our soil fertility and proper usage of depleted water resources, it is essential to take up any steps that can help our country as a single entity and not a disjointed forty and odd independent segments.

**Key words:** Food Security, Green Revolution, Sustainability, chemical fertilizers & pesticides, soil fertility, organic farming.

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### PREAMBLE

It is the intellect of an individual that makes his way of logical analysis more impressive, rather than the merits and demerits of the subject during a debate. Majority of the present day problems faced by us needs an in depth understanding of the problem before taking up apt preventive and curative measures. In the absence of such a measure the intellect can hoodwink a routine planning, administrative and execution mechanism and makes his business choices get the needed support compared to more useful sustainable measures. These intellectuals have been invariably responsible for setbacks noticed in the present day local, regional and global food production and environmental degradation. Overcoming these manipulations at different levels can we ensure an organised sustainable agriculture system in the foreseeable future amidst various setbacks? To have an in depth analysis of the problem let us look in to various aspects. Agriculture practices vary from place to place. Even concepts and methodologies need to be changed, taking in to consideration a region's ecosystem peculiarities and socio-economic aspects. Ecological or sustainable agriculture, as the name suggests, is a kind of farming that is sensitive to local conditions. It makes judicious use of available resources and tries to bind locally available plants, trees, birds, animals, insects and micro-organisms to interplay in a mutually beneficial fashion - one that results

in nutritious, rich and chemical-free crops. An organised approach pays attention to soil fertility, agricultural biodiversity, climate mitigation and adaptation, green knowledge development, a decent living for farmers and gender inclusiveness. Sustainable agriculture can essentially be described as the practice of farming ecologically. Rather than focusing only on the economic viability of the crops, sustainable agriculture also involves using non-renewable resources effectively, growing nutritious foods and enhancing the quality of life of the farmers. Besides the obvious benefits, sustainable farming also allows farmers to transform their farms into giant recycling centres. They can turn crop waste and animal manure into fertilizers, use crop rotation to enrich the soil and reroute rainwater to fuel the irrigation system. Not only does this save money, but it also conserves natural resources. Sustainable farming also lowers the need for chemicals and pesticides, and it makes the transition to a more organic, clean farming process a lot more feasible. It is basically aimed at stimulating green and rewarding small holder farming by supporting and scaling up promising approaches. With the above criteria gaining importance we come across a significant number of articles supporting or opposing "Green Revolution" measures introduced in 1960s that bailed us out from food deficient country in to a self sufficient one by 1970s. The resultant adverse effect on soil productivity capacity and overall negative impact on our ecosystem adversely affected our food production by 2000. Various remedial measures

have been suggested by learned scientists for ensuring sustainability of agriculture .

As per one school of experts it is advisable to re-introduce the traditional agriculture to make our agriculture sustainable. As stated by a highly respected agriculture and Climate expert "The traditional agriculture was soil and climate driven farming system that encompasses the animal husbandry. It provided socio-economic, food and nutrient security with the healthy food. Those were the "Golden Days" in the history of farming. It was an environment-friendly system and was highly successful & sustainable. No pollution, no worry about seeds and fertilizer adulteration as they used good grain as seed and compost of farmyard manure and green manure as fertilizer. Following growth in population the food production balance got disrupted and in order to find a solution to ever-growing problem, 1960s saw the chemical inputs technology and genetically modified seed technology entering India in the form of much eulogised "Green Revolution Technology". With the help of those technologies, food security was achieved to a considerable extent. But, it came at huge costs with negative impact on environment. The Green Revolution increased the production substantially in terms of quantity but could not achieve the quality of traditional agriculture in terms of food and fodder. The technology includes high yielding seeds, chemical inputs (fertilizers & pesticides, insecticides, herbicides, etc) and irrigation; all of them increased the cost of agriculture. To reduce the burden on farming community the government introduced input subsidy, a huge component. Studies on paddy/rice production figures of 1970s & 1980s in Andhra Pradesh revealed that the traditional paddy under irrigation yielded 1300 kg/ha; by adding high yielding seed this increased by 500 kg/ha; and by adding chemical fertilizers the yield level rose further by 2000 kg/ha. That means total yield achieved was 3800 kg/ha under farmers' fields. This was far less than research station yields of 5000 to 6000 kg/ha. The present average yields of farmers' field are 2600 – 2800 kg/ha as the yield curve flattened since 1984-85. Only increase in area under irrigation contributed to additional increase in production after 1984-85. Studies clearly reflect that high yielding seeds were tailored to chemical fertilizers under irrigation. This severely affected dry-land agriculture that constituted around 60% of the cultivated land. This forced dry-land farmers migrating to urban areas as the dry-land agriculture with high input costs became unsustainable and non-remunerative".

Even though what has been stated above was true, to meet our ever increasing demand for quantity of food products the steps taken during "Green Revolution" were to a large extent necessary at that phase . As we look in to various negative impacts due to chemical fertilisers, chemical pesticides, high yielding seeds it is clear that none took in to cognizance the negative impacts, as the

focus at that time was on higher production to cater to the needs of ever increasing population. Lack of co-ordinated monitoring system that brings in to light area specific soil and water role in our food production resulted in depletion of soil fertility and non-availability of sufficient water for irrigation. Even though the increase in production, as stated above, after 1984-85 was attributed to increase in cultivable land we are alarmed by conversion of fertile lands in to urban conglomerations from Kashmir to Kanya Kumari shrinking the cultivable land steadily from around 2005. To ensure re-emergence of free pollution environment and sufficiently good agriculture land with fertile soil it has become necessary for a proper co-operation between farmers of different segments of our country; a necessity. Instead of assuming our country is made up of 40 isolated segments with conflicting interests it is essential to bring together all the states in developing a beneficial sustainable food security package that can help every Indian. Such a development alone can help us to survive and grow amidst number of hurdles faced by our agriculture based economy.

\*\*\*A sustainable approach to farming is economically viable, environmentally sound, and socially beneficial: it works for the farmer, the land, and the community. Sustainable agriculture is grounded in the idea of stewardship: preserving the resources that allow us to meet our own needs, so that future generations can meet theirs too. This idea might seem too obvious to need stating, but its implications are far-reaching. If we are serious about sustainability, we cannot continue to farm in ways that deplete soil, pollute water, reduce biodiversity, and impoverish rural communities. We need a new agricultural toolkit. And farmers across America, with the help of science, are developing that toolkit. Crops require fertile soil and protection from weeds and insect pests in order to produce the food we need. Sustainable agriculture meets these requirements with sophisticated management practices grounded in the science of agro-ecology, which views farms as ecosystems made up of interacting elements—soil, water, plants, and animals—that can be modified to solve problems, maximize yields, and conserve resources.

Research has shown that agro-ecologically based methods—such as organic fertilizers, crop rotation, and cover crops—can succeed in meeting our food needs while avoiding the harmful impacts of industrial agriculture. As farmers incorporate these practices into their work, many benefits emerge: Less pollution, healthier and more fertile soil that is less vulnerable to drought and flooding. Also it can result in a lighter impact on surrounding ecosystems and greater biodiversity, reduced global warming impact and less antibiotic and pesticide resistance. This checklist of benefits adds up to more than the sum of its parts. The ultimate benefit of adopting sustainable agriculture is that in doing so, we make it more likely that our farms will remain

healthy and productive for future generations. Ultimately, it is farmers themselves, by adopting sustainable practices, who will turn sustainable agriculture from a movement of forward-thinking innovators into standard operating procedure for U.S. food production. But consumers and policy makers have a role to play as well. The current system in practice in different parts of the world is the result of policy choices—and we will need to make better policy choices to move that system in a new direction.

Even though what is pointed out above is the right path, we find difficult to switch over to pure organic cultivation, as farmers from different segments of the country are more interested in producing more to gain financially at the expense of quality. Soil fertility and depletion of ground water are going to adversely affect our food production, in the near future, unless the experts convince the farmer the necessity to change the age old cultivation practices.

#### **What we need to make our initiatives sustainable?**

Take the roads of Punjab during the monsoon and you will find most fields turned into pools of water. It's mainly the water pulled out from the underground vault to support the kharif crop of paddy (rice). Neither a native plant nor suited to the agro-climatic region, paddy has pushed out maize and cotton, which were common in the pre-green revolution era. From 2,27,000 hectares in 1960, the area under paddy rose to 26,12,000 hectares by the year 2000; a growth rate of 1,050 percent. In fact, estimates by the Commission for Agricultural Costs and Prices suggest that to grow one kilogram of rice, 5337 litres of water is required, which is double the figure for West Bengal (2605 litres), a natural habitat for the crop. The conventional method of rice cultivation requires flood irrigation (730 mm per hectare) as it helps check the growth of weeds. This is why paddy was traditionally grown mostly on floodplains of rivers and around drains, even in Punjab. Expansion of irrigation canals and accessibility to groundwater through pump sets meant more area could be brought under this crop. The DSR rice cultivation technique, which involves sowing the seeds instead of transplanting saplings, is practiced in central Punjab district of Moga to save on labour and fuel used to power pumpsets when power supply is erratic. It is noticed that introduction of a machine that drills the seeds in the soil can be profitable, but one has to take extra care for one and a half months as weeds may flourish due to less water. In addition, DSR does not work everywhere. It needs good loamy soil. Also, farmers are wary of this technique as they are more in groove with the conventional practice. Infestation of weeds requiring regular monitoring is another reason that DSR got restricted to few pockets. Most of the Punjab farmers now practise system of rice (or root) intensification (SRI), which has many takers

across the world. SRI involves plantation of saplings 10-12 days old instead of three weeks in a grid pattern with space of eight inch on all sides. The idea is to get better nourishment for the roots which can support a strong plant. The soil moisture is maintained through irrigation every four to five days instead of keeping the fields flooded all the time. If better water availability pushed paddy, assured procurement made it stay. The green revolution, introduced in India in 1960s, came with high-yielding varieties of wheat and paddy meant to make the country self-sustaining in food production. Assured procurement of these two crops by government agencies for distribution to other states fetched better prices for farmers. Over time, paddy dovetailed well with wheat, a major winter crop of Punjab. Consequently, machinery was also specifically designed for wheat-paddy cycle, which further pushed the combination. Even though the economics reveals paddy cultivation in Punjab is flourishing it has pushed back Maize, Cotton and other irrigated dry crops leading to an imbalance in the agriculture output. No one is ready to convince the Punjab farmer the need to grow the nutritious Maize and other ID crops along with Paddy. A time may come when a Punjab farmer while ready to import his favourite staple food of Makki ki roti and Sarson Ka Saag, would be competing with the conventional rice growing farmers of W.Bengal, Orissa, Andhra Pradesh, Tamil Nadu and other states, leading to unhealthy competition. In areas where one can grow rice due to presence of thick loamy soils, as all along the east and west coastal belts, in major river basins these techniques can be used by gaining needed knowledge through proper interaction between Punjab and other farmers, especially when monsoon aberrations have resulted no assured water supply to practice conventional flow irrigation.

Any planned initiative aimed at in ensuring food security should be termed as an Indian initiative and not x.y and z state initiative. This aspect assumes importance if we go through the recent study on "Virtual water trade". Due to lack of a properly planned export and import of food products we are running India dry, while China is conserving its water supply by importing water intensive crops such as soya. Concerns over looming water scarcity in large tracts of Asia and Africa, especially due to climate change, have led researchers to develop new analytical approaches to quantify expected water losses. One such concept is 'virtual water trade', which refers to the water embedded in commodities. A country that exports wheat, for example India, is in effect exporting the water needed to grow it. When states like West Bengal and other states along the coast, as stated earlier, use half the quantity of water for growing one kg of rice compared to Punjab our agriculture scientists encourage rice cultivation in Punjab, setting aside clear warnings that India will be deprived of precious water much faster compared to China. If such

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short sighted approaches are allowed to continue we would face many setbacks in ensuring food security.

In nutshell it is essential to take proper care of our water, soil and other essential components for achieving sustainable agriculture amidst monsoon vagaries. Everyone needs to focus on this important approach. To a considerable extent our dedicated experts tried to introduce the state of the art technology, hoping the steps introduced would meet our food needs. They succeeded to a considerable extent but failed to visualise the negative impact of the production enhancement chemicals on soil fertility and quality of the product. Instead of criticising their initiatives, as now we know what ails our food production, let all the experts

pool in their energies and expertise to take immediate and long standing preventive and curative measures to ensure food security. As explicitly explained in the previous paragraph our food export and import trade policies should be periodically monitored introducing apt mid course corrections.

### **Web-links:**

1) [http://www.ucsusa.org/our-work/food-agriculture/solutions/advance-sustainable-agriculture#.VLUX\\_CuUcik](http://www.ucsusa.org/our-work/food-agriculture/solutions/advance-sustainable-agriculture#.VLUX_CuUcik)

2) <https://www.thethirdpole.net/2015/07/08/india-loses-and-china-gains-water-through-food-trade/>