



## Steering Agriculture through the Concept of Triple S: Seed, Soil and Sustainability

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### Abstract

Indiscriminate use of agrochemicals for higher agricultural production may lead to a number of problems. Chemical agriculture leads to degradation of soil physical characteristics, reduced soil fertility and such a system of agriculture, in a true sense, also intensifies the problem of crop insects, pests and diseases. Thus it may be safely stated that a pure chemical agriculture can not help in realizing the dream of sustainable agriculture. On the other hand, going for sole organic agriculture is not a solution for the reason that such a system has comparatively low production potentials. Therefore an integrated system of agriculture is the need of the hour. Organic agriculture and chemical agriculture have to be blended in a wise manner, and soil nutrients together with the use of organic inputs (manures and composts) and inorganic inputs (chemical fertilizers) may help in the long run. The role of Integrated Crop Management (ICM), Good Agricultural Practices (GAP), Better Management Practices (BMP), Transgenic Crop Varieties (TCV), etc. towards sustainable agriculture should be critically considered and a holistic approach should be framed out. We can certainly meet this challenge working collectively on a broader concept of Triple S—"Seed, Soil and Sustainability".

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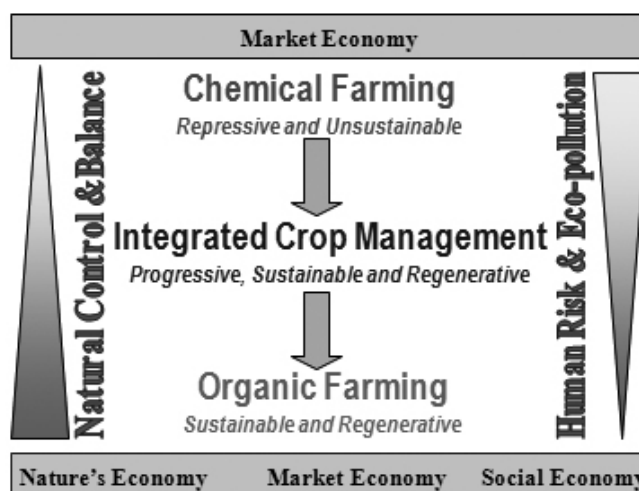
In the past 100 years, agriculture has witnessed greatest transformation in its history of over ten thousand years. Institutions and industries provided technologies and products to farmers and largely decided the fate of agriculture. The intervention certainly helped increasing crop yields for some period but in the long run created more problems for sustainability in agriculture. Farming which was the business of farmers with every decision being taken by them for crop production is no longer their enterprise. Now, it is largely dependent on agro-input industries and others' who have posed to champion the cause of agriculture.

Now, farmers realize that the chemical farming they practiced for long is no longer sustainable. Rather it has degraded their soils, affected the soil fertility, increased the problems of pests and diseases, enhanced the expenses and yielded the low profits. With this realization across the world, two strong philosophies, rather three, have emerged in farming namely:

- Chemical farming: Farming with synthetically compounded chemicals,
- Organic farming: Farming without synthetic chemicals and genetically modified interventions, and
- ICM (Integrated Crop Management)/BMP (Better Management Practices)/GAP (Good Agricultural Practices) farming: Farming with an optimum mix of the former two.

The key features of these systems have been highlighted in the figure above. Ideally, everybody would be wishing to have organic farming. However, it is impossible to move all

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farmers directly onto it without sacrificing on the crop yields and preparing ourselves to face the problems of shortages of food and fiber. A balanced approach of ICM, BMP and GAP is ideal to undo slowly the damages inflicted to agriculture by an orthodox chemical farming. Most do agree on this and are making increasing efforts worldwide to sustain agriculture for the present and future generations.

Simply, when we eliminate the use of synthetic chemicals from a conventional chemical farming it becomes an organic



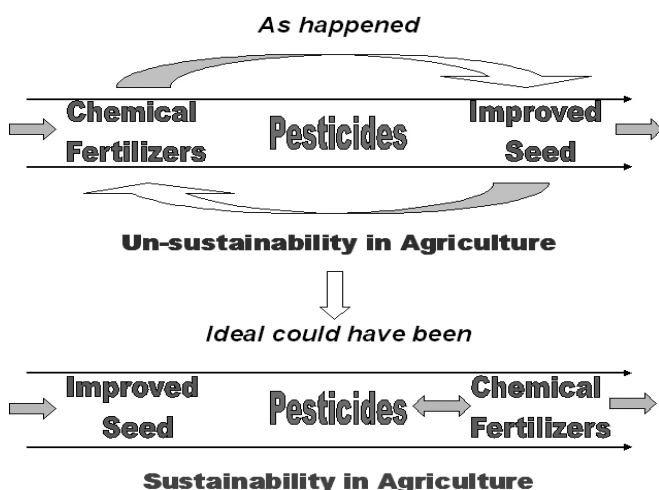
farming. This is possible by substitution of synthetic chemicals with natural products and natural processes.

Fertilizer chemicals were brought essentially to supplement organic manures and composts that our farmers produced and used earlier in large quantities to maintain the soil fertility. However, over years, fertilizers occupied the primary place, and manures and composts the secondary. Long term experiments of research institutions including those of Indian Council of Agricultural Research (ICAR), New Delhi clearly show that high crop yields cannot be sustained with the use of only chemical fertilizers. The continued and increased use of fertilizers with low or no use of manures and composts has already reduced the carbon content of our soils to less than 0.4%. No matter, how much chemical fertilizers and water we use now, the crop yields cannot be increased or even stabilized. One gets high yields when the carbon content of soil is close to 1%, which keeps all the natural processes alive in the soil.

We have technologies to process organic resources generated to the tune of 700 mt annum<sup>-1</sup> (plant, animal and other wastes) into quality manures and composts, but there is no strong political will to work for this. If we do this we can certainly improve our soil fertility to meet much of the nutritional requirement of the crops enabling farmers move progressively towards sustainability in agriculture.

Unfortunately, technology unfolding in agriculture has happened in a wrong periodicity. First came the chemical fertilizers, then pesticides and then the really improved seeds. Had it been the reverse, we would have faced far lesser problems of soil fertility, pesticide hazards and environmental pollution. Farmers would have progressed more learned to sustainable agriculture with a pride and dignity.

### **The Periodic Sequence of Technology unfolding in Agriculture**

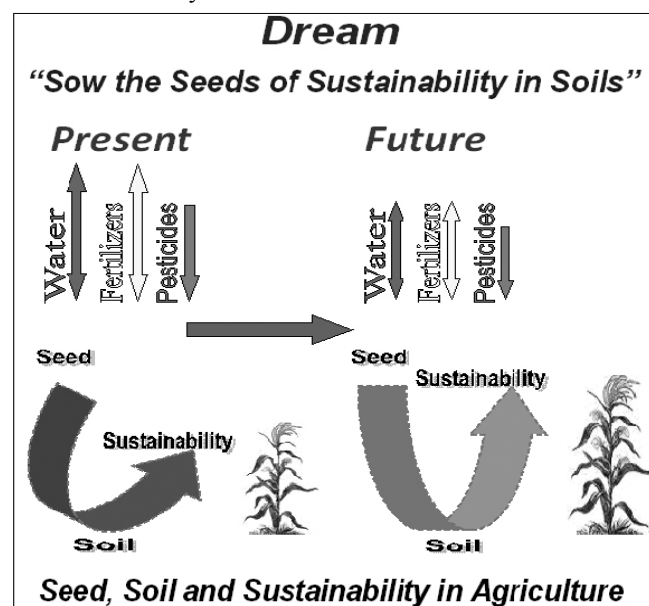


Aiming for sustainability with a definite roadmap is certainly a good option for India where land holdings are small and farmers are resource poor. Certain crops like legumes which do not respond to fertilizer chemicals need to be grown using only organic manures and composts. Pests and diseases are not

much a problem when crops grow healthy, and now when we have lot of good seeds.

Growing crops organically with low yields for the sake of a premium makes no sense and is not a sustainable enterprise. All good things including self-enterprise, better price, safer environment, peace and harmony will follow automatically if we help farmers to move on the path of sustainability in agriculture.

Condemning everything researched and produced under the conventional chemical farming is bad. Improved seeds, irrigation systems, soil and water management, integrated nutrient and pest management systems are integral parts of the sustainable agriculture. GM seeds are very important. Rather these need to be understood for their closeness to nature as gene transfer also occurs naturally, though at a very slow pace. The introduced genes accelerate the production of certain chemicals in plants to produce certain expected results. Undoubtedly, this will have some unknown effects in the long run but unlikely the ones we had with pesticides and fertilizers. May be growing GM crops under organic management would help reduce some of the likely effects of this intervention.



Steering agriculture following the path of sustainability is very essential. With a Targeted Breeding for ideal crop parameters through genetic engineering, we need to promote Sustainable Farming through ICM, and Smarter Irrigation through drip and micro-irrigation systems. This is highlighted by Joel K. Boume Jr. in 2009 in his article "The Global Food Crisis" in National Geographic Magazine.

India, still with a far lesser use of fertilizer and pesticide chemicals than many developed countries, has a great potential to offer better crops to the world. We can certainly meet this challenge working collectively on a broader concept of Triple S—"Seed, Soil and Sustainability". If we can do this we will eventually be addressing the issues related to all the three economies—Market Economy, Social Economy and Nature's Economy of human establishments.