

3Ps for Inter-Generational Global Food Security

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The prospect of meeting the food demand of a growing human population is daunting though not insurmountable. Agriculture, the managed food production system, has been one of the most significant factors for human population growth. The human population has increased from about five million in 8000 BCE, when agriculture commenced, to seven billion in 2011, is expected to surpass nine billion by 2050 and may peak at 10 billion. The current global food production appears to be adequate to feed seven billion people, unfortunately, inefficiencies in the food value chain result in massive food loss and waste that equates to food for over two billion people.

Despite our 10,000 years of experience in agriculture, current agricultural practices and technologies are still inefficient and have over the years exacerbated the adverse impact of agriculture on the environment. Over two million metric tons (active ingredient) of pesticides are applied each year in the world and pests continue to cause losses over US\$1.4 trillion every year. Insect pests alone destroy food that can feed about one billion people. Nearly half of the amount of fertiliser applied to fields often does not reach the plants and ends up in soil or waterways. Agriculture utilises around 70 per cent of available water in the world today; however, irrigation technologies are often inefficient and result in water wastage. Poorly designed and implemented irrigation schemes have caused waterlogging, salinisation and alkalinisation of soils. About 23 per cent of all usable land has been affected by degradation to a degree that reduces its productivity. Globally over one billion hectares of land are already salinised. If agricultural practices continue to degrade the land and render it unfit for future use then agriculture would not be much different from mining in terms of resources exhaustion.

The global food security challenge is to feed the world in the face of population growth, uneven food access, increasing shortage of water and suitable soils to increase food production, climate change, volatile markets, degraded ecosystems and the preservation of natural ecosystems. The planet earth is about 4.5 billion years old and is estimated to last for about another two billion years. Unless we do something very drastic and make ourselves extinct, humans could continue to live as long as there is life on this planet. The simple question then is how to meet the food demand of ten billion people without compromising the health of the environment and the primary source of food production. Long-term vision and strategies to ensure that present and future generations will have on-going food security achieved in ways that do not damage ecological systems are a challenge for today.

The first and foremost needs are for a transformation and shift from 'agriculture' to 'ecoagriculture' -- essential for sustainable food production that will reverse land degradation, conserve biodiversity and ecosystem services. This transformation can be achieved through the implementation of 3Ps necessary for sustainable food production and availability for the present and future generations. Biosecurity, the safeguarding of resources from biological threats, is an integral part of the 3Ps.

The 3Ps stand for the entire food value chain security:

Produce food sustainably

- Food production must not compromise the long term productive capacity of water and land based ecosystems. Productive capacity of land is the 'principal resource', food production practices and technologies are 'investment strategies', and harvest or production is 'dividend' earned. We must live on 'dividends, keeping the 'principal resource' intact forever or leave it enriched rather than depleted.
- Improve agriculture technologies and maximise input resource use efficiency (water, nutrients, sunlight).

- Diversify the portfolio of food sources – there are potentially promising yet under-utilised land based plant and animal species and species in the ocean. Global food security has become increasingly dependent on a handful of crops such as rice, wheat, maize, soybean and potato. There is urgent need to look for ‘future foods’ and new protein sources that have lighter environmental foot print.
- Develop better understanding of the biological diversity of soils in agro-ecological systems - there are billions of microbes in a gram of arable soil – understand their potential use in increasing crop productivity. We have during the 10,000 years of agriculture screened, identified and selected handful of plant and animal species that have significantly impacted our growth and progress. It is about time to thoroughly screen the microbes and identify and select the potential ‘game changers’.
- Invest in bio-saline agriculture - a relatively new way of dealing with salinity in agriculture and developing productive farming systems for areas that are already damaged.

Protect food from loss in the value chain

- Secure the food value chain from loss or waste - It is not only that we produce food sustainably, it is equally important that we do not lose what we grow and produce. Currently we lose food that can feed over two billion people. We must safeguard our food production regions from biosecurity threats.
- Develop supply chain infrastructure and postharvest treatments that will increase the storage life of food, maintain food quality and prevent pest infestations.
- Zero tolerance to food waste -- food waste is a misnomer; it is unused food energy -- develop options for using it for better purposes such as animal feed and bio-fertiliser and food waste should not be a source of environmental pollution.

Provide bio-secure and safe food

- Food trade and distribution must not expose the recipient/importing regions and communities to unacceptable biosecurity risks (Safeguard trade). Some of the major problems of food insecurity in the world are caused by distribution of food that exposed the importing countries and regions to pest and disease risks. Currently introduced pests cause about \$1.4 trillion losses world-wide.
- Food safety - supply clean, green and pest and disease free food. With increase in demand for processed food, the issue of food safety is becoming extremely important.
- Promote ‘glocalisation’ - it is localisation at a global scale. This is a push towards regional food trade and distribution, which is not only energy efficient in terms of transport and storage but also reduces biosecurity threats.
- Community connect -- enhance community engagement and understanding of the food value chain and risks to its sustainability. Community engagement and awareness of food security, biosecurity and food safety issues is a must to ensure that we follow the long-term vision.

Enabling environment and support for innovative research and development and farming will be the backbone of this new paradigm.

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