



## Agricultural Sustainability through Crop Diversification

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Crop diversification means growing more than one crop in an area. Diversification can be accomplished by adding a new crop species or different variety, or by changing the cropping system currently in use. Commonly it can mean adding more crops into an existing rotation. Diversification can also be implemented to replace low-value commodities with high-value commodities, such as vegetables and fruits. It can also include an integration of crops and livestock, defined as mixed farming. Crop diversity encompasses several aspects, such as crop species diversity, varietal diversity within crop species, and genetic diversity within crop species. It is recognized as one of the most feasible, cost-effective, and rational ways of developing a resilient agricultural cropping system. Examples of diversification over space include substitution of rice crop in kharif season with maize, millets, soybean, groundnut, sunflower, vegetables, pulses etc. in uplands of high rainfall regions or in medium lands of low rainfall regions. Similarly, examples of diversification over time include intercropping of mustard in wheat, sesamum in sugarcane (at planting time), sunflower in sugarcane, red gram in upland rice, and groundnut in maize/sorghum/bajra/upland rice. Varietal or genetic diversification refers to growing of different varieties with diverse tolerance/resistance to a stress, so that large scale damage is avoided in such event.

The main objective of crop diversification includes:

- improving soil health and biodiversity, and reducing pest (insect pest, disease and weed) load.
- to reduce the regional dominance of one crop to regional production of a number of crops.

This will help to produce millets, pulses, oilseeds, vegetables, fruits, fibres, fodder, and grasses with the objective of self-sufficiency, and reducing the pest load and import bill on oilseeds and pulses.

### Benefits of Crop Diversification

1. **BIODIVERSITY:** Crop diversification increases agricultural biodiversity (genetic, species and ecosystem), improves crop yields and produces quality to address both food and nutritional security. This practice also acts as a buffer against pests and diseases, as it can yield many agronomic benefits in pest management by breaking insect and disease cycles, reducing weeds and soil erosion, and conserving soil moisture. The more diverse a farming system is with plants, animals and soil-borne organisms, the more varied the population of beneficial pest-fighting microbes in the soil.
2. **CULTURAL:** This land-use approach is part of traditional cultural heritage practices, where evolution of socio-cultural patterns, cultural values, governance structures and natural elements are interconnected. The traditional knowledge of local communities for ecosystem management and sustainable use of natural resources is key in adapting agriculture to climate change and it is an essential element of local adaptive capacity that

can be enhanced through local seed systems, farmers' rights to traditional crops and market access for local varieties. Compared with modern hybrids, traditional crop varieties are cheaper, easier to access, more diverse and more resilient to climate pressures.

3. **CLIMATE CHANGE:** Crop diversification provides resilience against extreme and highly variable weather conditions resulting from climate change. It increases carbon sequestration in soils while mitigating greenhouse gas emissions. The most promising sustainable agricultural management strategies to maintain existing soil organic carbon stocks and restore them in carbon-depleted soils include crop diversification practices such as intercropping in woody cropping systems, which simultaneously address soil degradation, climate change and food security. In particular, several studies already demonstrated the potential of intercropping for restoring soil organic carbon losses derived from the conversion of native ecosystems to croplands in Mediterranean environments.
4. **SOCIO-ECONOMICAL:** Through crop diversification, farming households can spread production and economic risk over a broader range of crops, thus reducing financial risks associated with unfavourable weather or market shocks. The inclusion of a variety of crops, in some areas, can lead to the development of new agriculture-based industries, improving the economic potential of a rural community. This approach can reduce production costs and increase income in small farm holdings. For example, the inclusion of legumes into rotation reduces spending on nitrogen fertilizer or adding crops into the rotation, resulting in fewer pest problems and reducing expenditures on pesticides.

Some potential challenges to increased adoption of crop diversification on the farm are:

- Market demand may be limited by a range of factors, such as government policies, subsidies, etc.
- Lack of infrastructure for storage and transportation.
- Absence of suitable equipment.
- Price and supply of inputs.
- Lack of technical knowledge and references regarding their production practices.
- Lack of crop varieties adapted to the specific region.
- Fear of increased complexity.
- Public regulations.

#### **Ways for popularizing crop diversification:**

- Identifying crops which provide higher net return as compared to the prevailing crops
- New crop should be acceptable to farmers with stable yield
- New areas of crop diversification should be explored. Bund crops (planting of black gram or red gram on bunds of rice field), alley crops, relay crops, catch crops, trap crops, mixed crops, and inter crops have potential role in crop diversification.
- Crop diversification in water scarce areas can be popularized by using micro-irrigation. Responsive crops such as tea and close spaced crops should be identified for sprinkler irrigation. For drip irrigation, potato, tomato, sweet potato, chilli, banana, papaya and fruit crops should be identified
- Integrated farming system embracing suitable crops should be promoted.
- Subsidy on solar pump with micro-irrigation should be prioritized for the crop diversification programme.
- Strengthening marketing facility for crops grown under crop diversification.
- Priority in export of produce grown under crop diversification.