

Need of diversification of cropping system in India

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Diversification of agriculture refers to the shift from the regional dominance of one crop to regional production of a number of crops, to meet ever increasing demand for cereals, pulses, vegetables, fruits, oilseeds, fibres, fodder and grasses, fuel, etc. It aims to improve soil health and a dynamic equilibrium of the agro-ecosystem. Crop diversification takes into account the economic returns from different value-added crops. In India, Agriculture is largely in rice-based cropping system which has been recognized as an effective strategy for achieving the objectives of food security, nutritional security, income growth, poverty alleviation, employment generation, judicious use of land and water resources, sustainable agricultural development and environmental improvement (Singh, 2001). But, fragmented and small land holdings with inadequate operational resources are predominant and thus, rice - based cropping system approach becomes very much important for improving the productivity, generating additional income, employment and condition of the small and marginal farmers. Also, it has put a tremendous pressure on rice growers to make rice farming economically viable and ecologically sustainable due to rise in input costs, rapid degradation of rice ecologies due to imbalance use of fertilizers and injudicious water management, high competition in international market for rice and problems of managing buffer food grain stock in India. It is in this context, intensification along with better use of resources for remunerative crops in rice ecology through system perspective is essential. It has indicated decline in factor productivity along with emergence of multi - nutrient deficiency, build-up of soil pathogen and weed flora because it operates and removes nutrients from the same rooting depth. Continuous cereal cropping has been reported to reduce the productivity of the system. Introduction of short duration, photo-insensitive, dwarf and

input responsive high yielding varieties of rice and wheat in mid-1960's has led to adoption of rice-wheat cropping system (RWCS) in India. The system is being practiced in 10.4 m ha in the country (Singh, 2001) contributing as much as 40 per cent to the total rice and wheat production. However, rice-wheat cropping system (post green revolution phenomenon) has brought many problems that were not faced earlier and continuous practice has led to degradation in soil health and fertility. A problem of sustainability has recently emerged because of yields have reached a plateau and now declining even in highly productive zone (Hobbs *et al.*, 1991). Also, continuous use of chemical fertilizer without nutrient recycling has led to great loss of soil fertility and productivity. One of the reasons of the popularity of this cropping system is the compatibility of the two crops with respect to transplanting and sowing times. On the other hand, the sowing of winter crops *viz.*, pulses, oilseeds, potato and vegetable crops get delayed after rice. However, it has become possible to substitute wheat with the development of efficient short and medium duration rice varieties.



Crop diversification

Crop diversification concept : Crop diversification can be a useful means to increase crop output under different situations. Crop diversification can be approached in two ways. The main form and the commonly understood concept is the addition of more crops to the existing cropping system, which could be referred to as horizontal diversification. For instance, cultivation of field crops in rice fields or growing various types of other crops in uplands have been defined as crop diversification. However, this type of crop diversification means the broadening of the base of the system, simply by adding more crops to the existing cropping system utilizing techniques such as multiple cropping techniques coupled with other efficient management practices. The

systems of multiple cropping have been able to increase food production potential to over 30 t/ha, with an increase of the cropping intensity by 400-500 per cent. The other type of crop diversification is vertical crop diversification, in which various other downstream activities are undertaken. This could be illustrated by using any crop species, which could be refined to manufactured products, such as fruits, which are canned or manufactured into juices or syrups as the case may be. Vertical crop diversification will reflect the extent and stage of industrialization of the crop. It has to be noted that crop diversification takes into account the economic returns from different crops. This is very different to the concept of multiple cropping in which the cropping in a given piece of land in a given period is taken into account. Besides the above, some other terminologies are also used to define crop diversification. There are terms such as “crop substitution” and “crop adjustment”. It is necessary to indicate here that crop substitution and adjustment are linked to the main concept of crop diversification and are strategies often used to maximize profit of growing varieties of crops. The level of diversification will also be different in various countries. Diversification at farm level will involve growing of several crops for achieving self-sufficiency, but it may be a totally different approach at the national level. Crop diversification at national level will demand more resources and require selection and management of a specific crop or a group of crops sold freshly or value added to achieve higher profits.



Major driving forces for crop diversification : The major driving forces for crop diversification are:

- Increasing income on small farm holdings.
- Withstanding price fluctuation.
- Mitigating ill-effects of aberrant weather.
- Balancing food demand.
- Improving fodder for livestock animals.
- Conservation of natural resources (soil, water, etc.).
- Minimizing environmental pollution.
- Reducing dependence on off-farm inputs.
- Decreasing insect pests, diseases and weed problems.
- Increasing community food security

Indian agriculture is characterized by a dominance of small and marginal farmers (almost 68%) who suffer as a result of difficult socio-economic conditions. 75 per cent of the farm holdings are below 2 hectares and a large portion of rural people subsist as small holders. Income from these farms cannot be raised up to the desired level to sufficiently alleviate poverty in the countryside unless

existing crop production systems are diversified through inclusion of high value horticultural and arable crops. Furthermore, increased dependence on one or two major cereal crops (wheat, rice, etc.) witnessed after the green revolution makes the farming economy vulnerable to price

fluctuation arising due to demand-supply or export-import equations especially after the WTO began influencing markets. Crop diversification on the other hand, can better tolerate the ups and downs in the market value of farm products and may ensure economic stability for farming families of the country. The adverse effects of aberrant weather, such as erratic and scanty rainfall and drought are very

common in a vast area in agricultural production of the country. Incidence of flood in one part of the country and drought in the other part is a very frequent phenomenon in India. Under these aberrant weather situations, dependence on one or two major cereals (rice, wheat, etc.) is always risky.

Immediate need: In India, crop diversification in agriculture takes place vertically or horizontally, depending upon the market forces and also occasionally due to the domestic needs. With regards to use of land and water use and quality, there is an immediate need to consider the following factors (Aradhana, 2009): Farm produce processing into value added products will offer employment scope in non-farm works as in distillation of active ingredients from medicinal and aromatic plants (herbal products), scope of industrialization in agriculture for sugar, paper board manufacturing, etc. There is a need to find place-based approaches for diversifying the farming situations under various socio-economic conditions, infrastructure of market, domestic needs, supply of inputs, etc. The research and development on crop diversification is best done in a farmer-participatory mode where a multi-disciplinary team consisting of scientists will involve farmers from the project planning phase till arriving at conclusions and solutions. The concept of sustainable productivity for each land and water units through crop diversification needs to be fostered. There is critical need for promoting co-operatives in rural areas to solve micro-level and demographic problems. Strengthening food processing and other value-added industries in rural areas is a means to provide employment to rural youth. Alternate cropping systems and farm enterprise diversification are most important for environment protection. There are abundant opportunities in adopting the subsidiary occupations to the rice-wheat

cropping systems present in India. They are vegetable farming, fruit cultivation, floriculture, medicinal and aromatic plants cultivation, mushroom farming, dairying, piggery, goatery, poultry and duckery, fishery or aquaculture, bee-keeping, to provide ample scope for diversification of rice-wheat cropping system in north-western and south India and north-eastern states.

Advantages:

- Better use of land, labour and capital: Better area land through adoption of crop rotations, steady employment of farm and family labour and more profitable use of equipment are obtained in diversified farming.
- The farmer and labour engaged all the year round in different activities.
- Less risk to crop failure and market price of the product.
- The by-products of this farm can utilize properly as cattle, poultry, birds, etc. are reared with crop production.
- Regular and quicker return is obtained from various enterprises.
- Soil erosion can be checked as land kept under cultivated throughout the year
- Soil fertility can be checked as land kept under cultivated throughout the year.
- Diversified farming is less risky than specialized farming.
- Best use of all equipment's.

Disadvantages:

- Do not fetch desirable profit so long as co-operative

marketing facility is not there.

- Proper inspection of different enterprises is difficult.
- It is not possible to farmer to maintain all types of machinery required for different crops.
- The wastage of farm in any farm is difficult to detect.

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