ADOPTION OF CLIMATE-RESILIENT MAIZE HYBRIDS VS OPVS ON INCOME GENERATION

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Maize is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Globally, maize is known as the queen of cereals because it has the highest genetic yield potential among the others. In India, maize is the third most important food crop after rice and wheat. Maize in India contributes nearly 9 % of the national food basket, cultivated under 9.3 M hectares gross area. There were 15 million farmers engaged in Maize cultivation in India. Maize generates employment of more than 650 million person–days at farms. Maize qualifies as a potential crop in realizing the broader vision of doubling farmers' income by 2022. Maize is a source of more than 3,500 products including specialized Maize like QPM (Quality Protein Maize). Maize is the only food cereal crop that can be grown in different seasons and requires a moderate climate for growth since it has been recognized that C_4 plant species have a higher optimal temperature for undertaking photosynthesis than C_3 plants. Being a C_4 plant, Maize uses 3-fold less water and gives a higher yield per hectare even in a shorter period than any other food grain crop. Improvement in the maize value chain across its various stages will be extremely crucial for making Indian maize competitive in the international market both in terms of quality and prices. Maize assumes significant importance in not only among food grains but also for the wholesome development of the agribusiness value chain in India (www. Ficci. in). Planting high-yielding single-cross hybrids played a major role in raising maize production. India stands at 5th rank in Maize hybridization in the world. Syngenta hybrids have made us market leaders in Karnataka, Andhra, Maharashtra, MP, Rajasthan and Tamil Nadu. Our focus is mostly in central and south India.

Maize consumption in India can broadly be divided into three categories viz. feed, food and Industrial non-food products (mainly starch). Feed accounts for about 60% of the maize consumption in India. The most important use and demand driver of maize is poultry feed which accounts for 47% of total maize consumption. Livestock feed accounts for 13%. Food consumption accounts for 20% of Maize consumption, with direct consumption being 13% and the form of processed food being 7%. Starch is the most important in this category accounting for 14% of the total maize consumption.

A combination of factors such as increasing industrialization, urbanization, housing activities and infrastructure development triggered the

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conversion of agricultural land into non-agricultural uses. This has resulted in a decline in the area under cultivation. The scope for expansion of the area available for cultivation is also very limited. The pattern of land ownership imposes limitations on the models that can be adopted for agricultural development. As per the latest Agricultural Census 2010-11, marginal and small holdings of less than 2 hectares accounted for 92.0 percent of the total holdings and 61.0 percent of the total operated area. They in turn are unsuitable for conventional technology and machinery use to boost agricultural production. This led to a process of marginalization of small and marginal farmers and the casualization of agricultural labourers.

A higher proportion of farmers rely on farm-saved seeds leading to a low seed replacement rate. It is desirable to achieve the required and recommended seed replacement rate to accomplish higher production and productivity. Quality seeds and planting materials are key agricultural inputs, which determine the productivity of crops. It is estimated that the quality of seed accounts for 20-25 percent of productivity.

Most of the remote farmers are smallholders, and their limited ability to purchase maize hybrid seeds is one of the reasons for the poor adoption of hybrid seeds. Dissemination of hybrid maize should target non-traditional areas also to scale the maize production at the local level. Due to changing climatic conditions, maize yield is adversely affected, so it is essential to concentrate on the promotion of climate-resilient maize hybrids. In that case, Drought-Tolerant Maize (DTM) hybrids are more profitable than open-pollinated varieties and offer resilience to changing climatic conditions. Moreover, maize hybrids provide higher yields compared with OPVs. However, there are several barriers to adopting maize hybrids by the small holding farmers, such as high prices and non-availability of the seed. As the price of maize hybrid seeds is high, smallholder farmers cannot afford to purchase them, forcing them to grow open-pollinated varieties. In this background, rapid adoption of drought-tolerant maize hybrid will be promoted among the small and marginal farmers of the targeted group. Further, a higher proportion of farmers are dependent on farm-saved seeds leading to a low seed replacement rate. It is necessary to achieve the required and recommended seed replacement rate to accomplish higher production and productivity. So, intervention in quality seeds and planting materials determines the productivity of crops.

Nowadays, seed quality enhancement approaches have been widely used to improve germination, reduce seedling emergence time and improve stand establishment and yield. It can enhance rates and percentage of germination and seedling emergence which ensure proper stand establishment under a wide range of environmental conditions. These post-harvest treatments include priming, hardening, pre-germination, pelleting, etc., improving their performance after harvesting and conditioning, but before they are sown. Therefore, hands-on practices and education on seed quality enhancement techniques and post-harvest handling are very much important at the farm level to upgrade their seed quality.

Improved maize cultivars have been observed to maintain maize cultivation, primarily under smallholder farming situations. The development of enhanced maize varieties remains a major goal of improved maize programmes and research organisations worldwide. If farmers use these upgraded OPVs, maize can deliver significant economic advantages through higher grain yields and lower risk. Smallholder farmers grow traditional maize types, which have lower production than modified

maize varieties. The adoption of improved maize varieties is primarily owing to limited access and high prices, which result in decreased maize yield.

Many challenges, including economic, institutional, external, social, and cultural contexts, limit smallholder farmers' adoption of agricultural technology such as OPV maize varieties. Socioeconomic characteristics (such as age, education, gender, and family size) influence farmers' decisions to utilize improved maize seeds (OPVs). Technology also has a big impact on farmers' decisions to adopt OPVs. The adaption of improved hybrid seed production technologies with high-yielding hybrids enhances productivity with the available resources. There is scope for doubling the farm income through hybrid seed production by fetching more market prices than the grain cost of local varieties.

With the idea that farmers will use the improved maize variety, yields will increase, resulting in increased agricultural productivity and farm returns. Increased crop production and farm returns are the primary reasons for using improved maize varieties (OPVs). The adoption of enhanced maize varieties is a lifeline for the majority of the population in most parts of India that rely on agricultural production while living in drought-prone areas. This adoption boosts crop production and farm profits. It also helps maize growers and households reduce food insecurity and alleviate poverty at the home level.

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