



P-ISSN: 2349-8528
E-ISSN: 2321-4902
IJCS 2019; SP6: 09-11

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**(Special Issue -6)
3rd National Conference
On**

**PROMOTING & REINVIGORATING AGRI-HORTI,
TECHNOLOGICAL INNOVATIONS
[PRAGATI-2019]
(14-15 December, 2019)**

**On-farm evaluation of management practices of
maize in rainfed area of Rajouri district of
Jammu and Kashmir**

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Abstract

Maize is a commodity of high economic significance in India. Attempts were made to improve productivity and to increase area under maize by adoption of recommended packages. In order to compare performance of recommended packages on farm trials (OFT's) were laid out at farmers' field to show out the worth of recommended packages over farmer practices. The demonstrations resulted in enhancement in productivity of maize crop. An on-farm experiment was conducted in low hills intermediate zone of Rajouri District of Jammu and Kashmir to study the impact of application of recommended dose of nutrients and full package of practices as against farmers' practice in maize under rainfed conditions. The treatments were evaluated at five locations during *kharif* 2016. Results of the study revealed that single intervention of applying recommended fertilizers nutrients over the existing farmers practice increased the overall grain yield of maize by about 16 per cent. The application of full recommended package of practices further increased maize yield by about 20 per cent where as net returns and returns per rupee invested by about 33 and 13 per cent respectively over the farmers' practice.

Keywords: Maize, rainfed area, nutrients

Introduction

Maize (*Zea mays* L.) is the third most important crop after rice and wheat in India and is cultivated over an area of 8.71 m ha with a production of 22.23 mt and the average productivity is 2,552 kg/ha (Anonymous, 2013) ^[1]. It has very high yield potential, which is expressed both by biomass production as well as grain yield. It is one of the versatile crops having wider adaptability under diverse agro-climatic condition. In addition to essential food for human being and quality feedstuff for animals, it also serves as basic raw material to different industrial products. Maize is a multipurpose crop, provides food for human beings, feed for animals, poultry and fodder for livestock. About 59% of the total production is used as feed, while the remaining is used as industrial raw material (17%), food (10%), exports (10%), and other purposes (4%) (Kumar *et al.* 2013) ^[3]. Maize has special significance in Jammu and Kashmir state because it accounts for staple diet of majority of the people. The total area under maize crop in the state is about 308.62 thousand hectare, having a production and productivity of 2,735 thousand quintals and 8.86 q/ha respectively (DES, 2015) ^[2]. Among the *kharif* crops, maize is an important crop in Rajouri District acts as the staple food for over 90% of the population and is grown mostly under rainfed conditions. Maize is considered as major livelihood crop in traditional growing district of Rajouri.

The present level of maize production needs to be increased in order to meet the ever increasing demands. This required level of production can be achieved through the increase in productivity, which in turn requires high level of management practices. The reasons for low productivity were traditional methods of cultivation practiced by the farmers. With the development of high yielding varieties and use of improved management practices, there is a much scope for further increase in yield, adoption of improved production practices is the key to higher production of crops and higher incomes to farmers. The average productivity is low as 0.89 t/ha to as high as 2.53 t/ha, indicating large variation and scope for productivity enhancement. Maize is an exhaustive crop having higher nutrient requirement than other cereals and absorbs large quantity of nutrients from the soil during different growth stages. There is a need for improving rainfed maize productivity as well as cropping intensity of the area through effective measures. The fertilizers have already proved to be kingpin in improving the crop productivity by contribution to the tune of 60%. It is therefore, necessary to demonstrate the effect of proper nutrient management and recommended package for maize on the farmers' fields. Keeping in view these considerations, present study was undertaken at farmers' field to demonstrate appropriate production technology for increasing productivity of rainfed maize.

Material and Methods

On-farm trials with farmers' participatory mode were conducted during *kharif* 2016 in district Rajouri. Five locations in district Rajouri were selected. The soils of the district are deficit in organic carbon, humus and medium in available nitrogen, phosphorous and low in potassium. Sowing was performed under the rainfed conditions, depending upon the onset of monsoon. The total rainfall received was 428.4 mm during crop season with maximum and minimum temperatures ranging from 29.8-31.2 °C and 11.6-21.2 °C. Maize *variety* Rasi 4794 was sown during the period under study. The different treatment were:

T₁: Farmers' practice (Imbalance use of fertilizers i.e. application of FYM according to availability and urea only, high seed rate, no criteria of method of sowing, plant protection measures and inappropriate weed control measures).

T₂: Recommended dose of nutrients (75 percent of recommended dose of nutrients i.e.45 Kg N, 30 Kg P₂O₅ and 15 Kg K₂O/ha + FYM @ 3 t/ha and other improved agronomic practices).

T₃: Full recommended package of practices (75 percent of recommended dose of nutrients i.e.45 Kg N, 30 Kg P₂O₅ and 15 Kg K₂O/ha + FYM @ 3 t/ha + zinc sulphate @ 10 Kg/ha and other improved agronomic practices).

FYM was applied on dry weight basis in the trials as per their respective quantity before the sowing of crop. In all the treatments, half dose of N and full doses of P₂O₅ and K₂O in the form of chemical fertilizer were applied at the sowing time. N, P₂O₅ and K₂O were applied through Urea, DAP and MOP. Rest of the management practices were followed in accordance with the recommended package of practices. Yields were harvested from net plot. Economics of the treatments was computed based upon prevalent prices. The statistical analysis of the data was performed by considering the locations as replications.

Results and Discussion

Grain yield

The data (Table 1) revealed that application of recommended fertilizer nutrients practice resulted in significantly higher grain yield of maize crop over the farmer practice alone. Single intervention of applying recommended fertilizer nutrients in the existing farmer's practice increased the grain yield of maize crop by about 16 per cent during the crop season of *kharif* 2016. Such a response to recommended application of nutrients clearly depicts that in district like Rajouri, productivity of maize crop can be substantially boosted by applying balanced nutrient doses. Yield of maize crop further increased by adopting full package of practices in all the locations. The magnitude of increase in maize yield owing to the application of recommended package of practices over recommended nutrient was 3 per cent during the year 2016. Such a response to applied nutrients and improved cultivation practices can be expected in the farmers' field. Balanced application of nutrients and improved cultivation practices have been reported to be essential for sustained productivity (Prasad *et al.* 2002^[4] Rinwa *et al.* 2003^[5] and Sharma *et al.* 2011)^[6].

Table 1: Effect of farmers' practice, recommended nutrients and recommended package of practices on yield and economics of maize during *kharif* 2016.

Treatment (5 Locations)	Grain Yield (q ha ⁻¹)	Gross Return (₹ ha ⁻¹)	Cost of Cultivation (₹ ha ⁻¹)	Net Returns (₹ ha ⁻¹)	B:C Ratio (₹)
T ₁ : Farmers' practice (Imbalance use to fertilizers)	25.78	52149	26400	26349	1.97
T ₂ : Recommended nutrients (75 Per cent of recommended dose of NPK (N ₄₅ , P ₃₀ , K ₁₅) + FYM @ 3 t ha ⁻¹)	29.96	61950	28200	33950	2.20
T ₃ : Recommended Package (75% of recommended dose of NPK + FYM @ 15 t/ha + Zinc sulphate @ 10 kg ha ⁻¹)	30.86	63450	28520	34929	2.22
LSD (P=0.05)	0.61	1365	522	2347	0.04

Gross returns

Gross returns were significantly influenced by full recommended package of practices during the year. Significantly highest gross returns ₹ 63450 were obtained under T₃ (recommended package of practices) and was followed by T₂ (recommended fertilizer nutrients) ₹ 61950.

However, treatment T₁ (farmers' practice) resulted in lowest gross returns of ₹ 52149 during the year of study.

Net returns

The higher yields following the application of recommended fertilizers to the farmer's practice and full recommended package of practices fetched increased net returns in maize

crop. On an average, the recommended technology package (T₃) recorded 33 per cent higher net returns over farmer's practice and 3 per cent higher net returns over recommended application of nutrients during the crop season.

Benefit: Cost ratio

Owing to increase maize yield, the Benefit:Cost ratio expressed in terms of returns per rupee invested was significantly higher under recommended application of fertilizer nutrients over the farmer's practice alone during the crop season (Table 1). Benefit:Cost ratio further increased with the adoption of full package of practice. On an average, the recommended package of practice increased returns per rupee invested by about 13 per cent over the farmer's practice and about 0.9 per cent over recommended application of nutrients during the crop season.

Impact of on-Farm Trials

We know that seeing is believing, therefore after seeing the performance of on-farm trials at different locations, many farmers of the village showed eagerness to adopt full package of practices in maize crop. However, some of them were afraid with the view that it would be costly technology but later on after seeing the net returns, they also agreed to adopt this technology. Further, due to increased income by selling grains and fodder of maize, majority of the farmers ready to apply full fertilizer nutrients. Further it was noticed that farmers sale their produce, which earlier fulfill their needs only for sustaining family and animals fodder requirement.

Conclusion

The findings of the present investigation conclusively inferred that for feeding the growing population, farmers should go for recommended package of practices in maize crop without any compromise. Resource poor and marginal farmers who can not afford to apply full package, they should at least apply the recommended dose of nutrients to sustain yields and fetch higher returns.

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