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Impact Assessment of Pigeonpea + Maize Intercropping in the Eastern Uttar Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The net return of pigeonpea cultivated is lower due to failure to implement recommended intercropping and modern technology in the farming community in eastern Uttar Pradesh. To compensate for this anomaly, ICAR-IIVR-KVK, Deoria performed On-Farm-Trials (OFTs) for the evaluation of pigeonpea + maize intercropping in farmers' fields in various adopted villages in the Deoria District of Eastern Uttar Pradesh.
Place and Duration of Study: The two year assessment and refinement study was carried out by the Krishi Vigyan Kendra, Malhana, Deoria, working under the ICAR-Indian Institute of Vegetable Research, Varanasi, UP, during 2015–16 to 2016-17.
Methodology: In the present study of sole pigeonpea crop and intercropping of pigeonpea + maize was evaluated through on-farm trials (OFTs) among selected farmers' field during Kharif season

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2015-16 to 2016-17 in the eastern region of Uttar Pradesh, India,. Technology options for assessment of sole pigeonpea crop (T_1) and pigeonpea + maize (T_2) with improved packages and practices developed by IIPR, Kanpur, Uttar Pradesh, were tested at five selected farmer's field.
Results: Maximum average gross return (Rs 103460 ha^{-1}), net return (Rs 71730 ha^{-1}) and benefit cost ratio (3.2:1) were recorded under intercropping of pigeonpea + maize, which was 41.50 percent, 43.40 and 5.96 percent more than the sown of sole crop of pigeonpea (T_1) for gross return, net return and benefit cost ratio respectively, during the period of the on-farm trial.
Conclusion: The higher value of the equivalent yield, the more feasible technology for the farming community of Eastern Uttar Pradesh, India.

Keywords: Pigeonpea; intercropping; equivalent yield; benefit cost ratio; on-farm trial.

1. INTRODUCTION

Pulses are an important part of the Indian diet since they are high in protein and can be cultivated in a variety of agro-climatic zones across the country. It has a variety of potential uses and is important for both the nation's existing farming systems and the vegetarian diet. Pulses are consumed far more frequently in India than any other type of protein, illustrating the importance of pulses in their daily diet. As a result, increasing pulse output is critical in order to provide a balanced diet to the nation's people as part of the country's malnutrition program. It also contributes to a more sustainable agriculture farming system by enriching the soil through biological nitrogen fixation, and its deep root structure makes it more ideal for production under rain-fed conditions. Arhar dal this low-cost pulse provides a lot of protein, carbohydrates and dietary fiber [1,2]. You with the iron and calcium you require every day. Furthermore, it is a good source of folic acid, which is necessary for fetal growth and protects against infant deformities during pregnancy. It also plays a vital part in the sustainable agriculture farming system.

Intercropping is the practice of growing two or more crops at the same time on the same plot of land with a certain row-planting pattern for the raised production per unit area. The implementation of intercropping systems has been made necessary for rapidly growing population, increased food consumption, a shortage of scope for expanding cultivation to new areas, and the diverse needs of small farmers in terms of both food and money [3,4]. The growing companion crops provide a chance to use the available space for profitable to the farming community in the eastern part of Uttar Pradesh. Although Uttar Pradesh is India's largest producer of pigeon pea, its average output is lower than that of adjacent states such as Jharkhand and Bihar (Prasad et al., 2017). To recompense for this, pigeonpea growers produce a variety of short-duration crops as intercrops, including black gram, green gram, soybean, groundnut, bajara, sorghum, maize and millets, to generate momentary revenue. Small-land-holders, pigeonpea growers, don't have to wait until the harvest of their only pigeonpea crop to see a return. Multiple uses of the currently limited land resources to intercrop cost-effectively significant short-duration crops with pigeonpea would help to sustain pigeonpea cultivation and provide interim returns to marginal and small farmers, in addition to supplying the rising demand for vegetables and pulses. Information on intercropping practices and ecological benefits in pigeonpea with maize is offered in this research article.

2. MATERIALS AND METHOD

In the present study, the yield and economic assessment of the intervention of intercropping of pigeonpea + maize in the eastern region of Uttar Pradesh, India, was evaluated through On Farm Trials (OFTs) at selected farmers' field during kharif season 2015-16 to 2016-17. The study was carried out by the Krishi Vigyan Kendra, Malhana, Deoria, under the Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh, in sandy loam soil having a well drained rainfed condition in the Deoria district. Technology options for assessment and refinement, sole pigeonpea crop and pigeonpea + maize developed by IIPR, Kanpur, Uttar Pradesh, were assessed at five selected farmers field. The crop was sown in the first week of July using the ridge method, 60 cm apart. Maize and pigeonpea were planted on the same row to keep plant populations at a single cropping level. Pigeonpeas were planted 25 cm apart in the midst of the ridges, and maize was planted as an intercrop inside the ridges. Phosphorus, potassium, and nitrogen fertilizers were applied

as recommended for pigeonpea intercropping and sole crop. Phosphorus, potash, and nitrogen are applied using dia-ammonium phosphate, murate of potash, and urea. Need base intercultural operations and plant protection measures were applied time to time. Maize mature crop was gathered at the end of October, and pigeonpea crop was harvested in April. All of the observations were made during crop harvesting. Benefit cost ratio and equivalent yield are calculated by the below given formula.

Benefit cost ratio = Gross return (Ra/ha)/Cost of cultivation (Rs ha^{-1}) …….(1)

Pigeonpea Equivalent Yield (PEY) for intercrop = Pigeonpea Yield + Maize Yield x Maize price / Pigeonpea price ….(2)

3. RESULTS AND DISCUSSIONS

3.1 Interpretations of Growth Parameters

The data presented in Fig. 1 revealed that the maximum average plant height of 214.4 cm was noted under the sole crop of pigeonpea, which was 8.9 percent more than the pigeonpea + maize intercropping during the investigation period. The data

presented in Fig. 2 clearly indicated that a higher average number of branches 20.45 plant^{-1} was recorded in the sole pigeonpea crop, which was 27.41 percent higher over pigeonpea + maize intercropping during both the years of on-farm trial. Hence the maximum number of pods 127.4 plant^{-1} was noted under the sole crop of pigeonpea which was 5.90 percent higher than the intercropping of pigeonpea + maize in the years of investigation of on farm trial (Fig. 3).

3.2 Interpretations of Yield Attribute and Yield

The data presented in Fig. 4 indicated that maximum average grain 214.4 per pod was recorded under sole crop of pigeonpea, which was 8.9 percent higher than the intercropping of pigeonpea + maize during the investigation period of on-farm trial. Therefore, the data shown in Fig. 5 revealed that a higher average test weight (108.5 gm) of pigeonpea was noted under sole crop, which was 23.74 percent higher than the intercropping of pigeonpea + maize during both the years of on farm trial from 2015-16 to 2016-17

Maximum average grain yield of 1518 kg ha^{-1} of pigeonpea was found under the sole crop of pigeonpea, which was 31.94 percent higher than the intercropping of pigeonpea + maize during the study period of on-farm trial from 2015-16 to 2016-17. In accordance with findings by Marer et al. [5], Lingaraju et al. [6], Thimmegowda [7], Dania et al. [8], and Jonas et al. [9], yields under alone maize systems were higher compared to those under intercropping systems. The higher average equivalent yield of 2116 kg/ha of pigeonpea was recorded under intercropping of pigeonpea + maize, which was 34.77 percent higher than the sole crop of pigeonpea during the investigation period of the on-farm trial of both years.

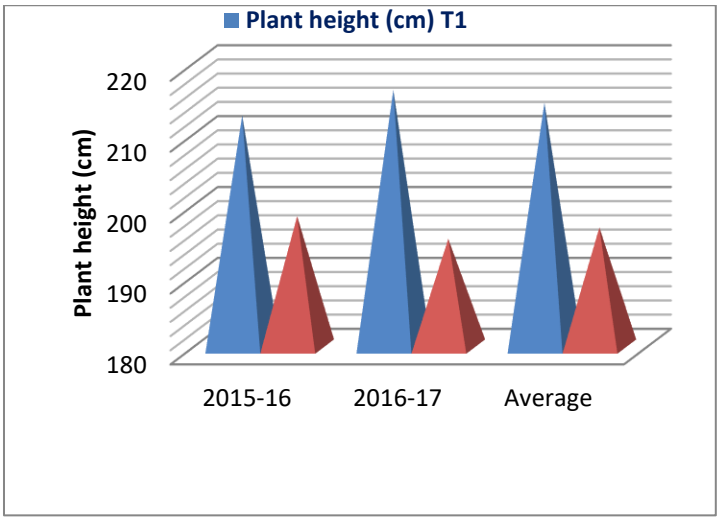

Fig. 1. Shows the pigeonpea plant height under sole crop of pigeonpea and intercropping of pigeonpea + maize during OFT

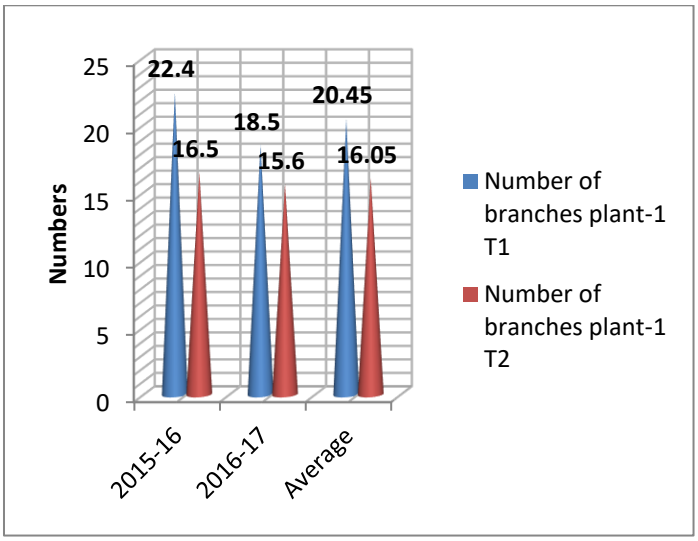

Fig. 2. Shows the number of branches per plant during both the period of OFT

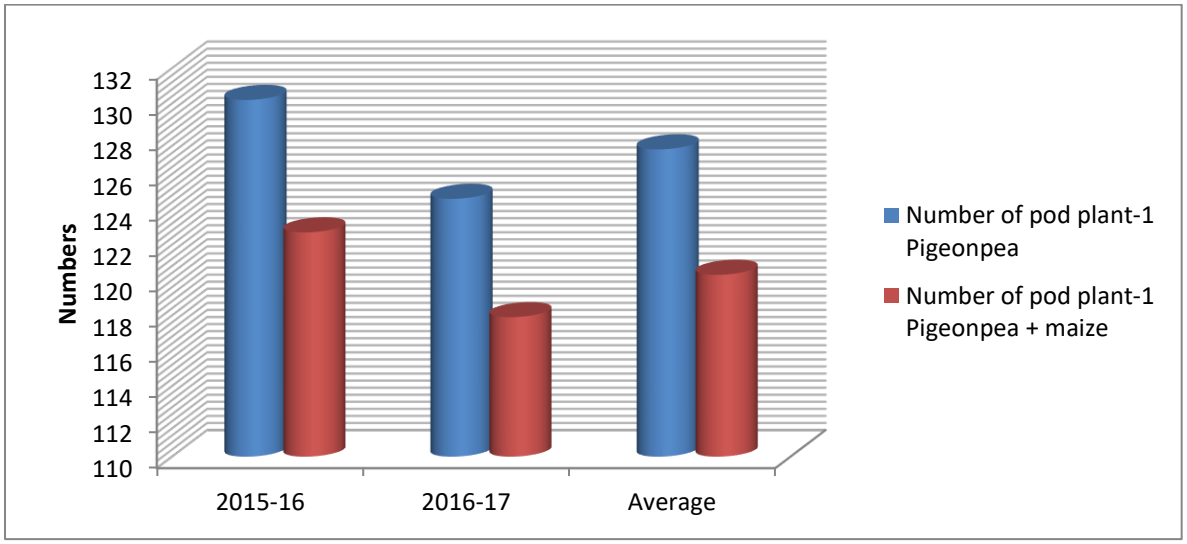

Fig. 3. Effect of sole crop of pigeonpea and intercropping of pigeonpea + maize on number of pod per plant

3.3 Interpretations of Economic (Rs ha^{-1})

Maximum average gross return (Rs 103460 ha^{-1}), net return (Rs 71730 ha^{-1}) and benefit cost ratio (3.2:1) were recorded under intercropping of pigeonpea + maize, which was 41.50 percent, 43.40 and 5.96 percent more than the sown of sole crop of pigeonpea (T_1) during the investigation period of the on-farm trial.

Table 1. average gross return, net return and benefit cost ratio of pigeonpea crop under on farm trial. From 2015-16 to 2016-17

Technology Option	Average Economics (Rs/ha) of OFT					
	2015-16			2016-17		
	Gross return (Rs ha-1)	Net Return (Rs ha-1)	Benefit cost ratio	Gross return (Rs ha-1)	Net Return (Rs ha-1)	Benefit cost ratio
T_1	65780	44395	2.80	80443	55643	3.24
T_2	95480	64780	3.10	111440	78680	3.40

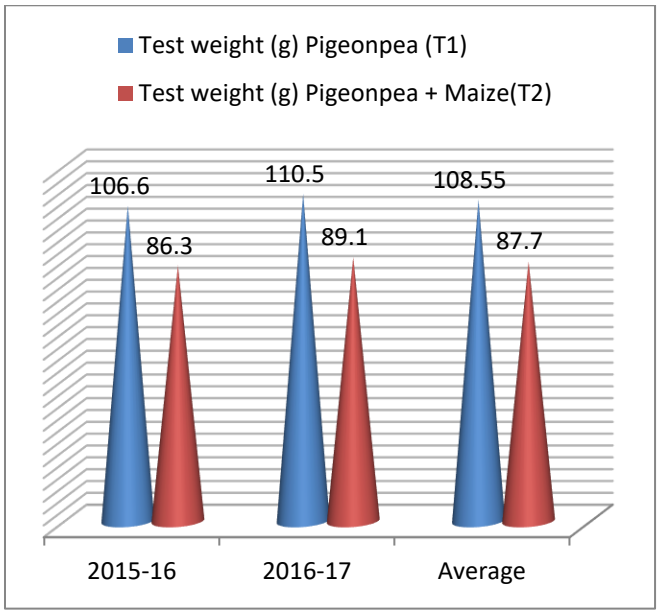

Fig. 5. Effect of sole crop of pigeonpea and pigeonpea + maize intercropping on test weight (g) pigeonpea under OFTs

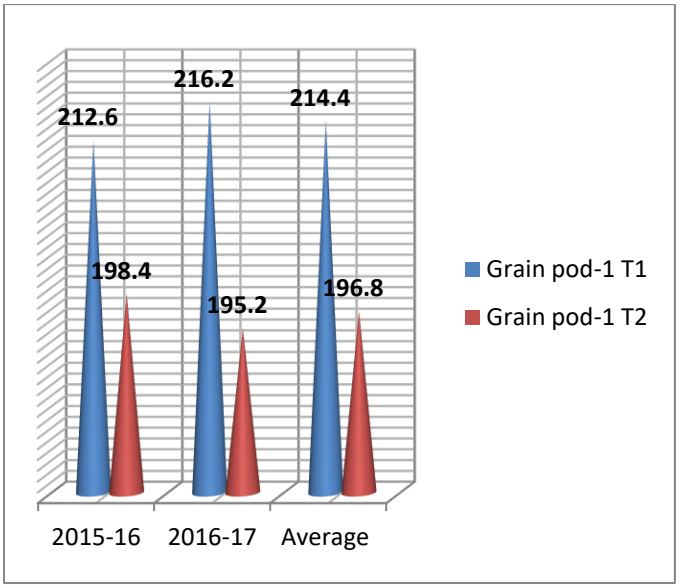

Fig. 4. Effect of sole pigeonpea crop and pigeonpea + maize intercropping on grain per pod

4. CONCLUSION

The evaluation of enhanced technology through OFTs boosted the equivalent yield of pigeonpea in the eastern part of Uttar Pradesh significantly. The on-farm trial might result in a 41.50 percent increase in average gross return, a 43.40 percent rise in net return, and a 5.96 percent increase in benefit-cost ratio. According to the following findings, pigeonpea + maize sown in an intercropping system is more beneficial than pigeonpea grown alone. To a considerable extent, this enhances revenue as well as the farming community's livelihood. In the eastern region of Uttar Pradesh, there is a need to undertake a multi-pronged approach that includes increasing pigeon pea production as well as net return through enhanced technology.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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