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IMPACT STUDY OF ELEPHANT FOOT YAM (*AMORPHOPHALLUS PAEONIIFOLIUS*) CV. GAJENDRA PRODUCTION IN DISTRICT BAHRAICH UTTAR PRADESH INDIA

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ABSTRACT

Elephant Foot Yam (*Amorphophallus paeoniifolius*) is a traditional crop with a long history of cultivation in Asia and the Pacific. Yam is one of the important tuber crops widely cultivated in the sub-tropical regions for its underground food reserves. The tubers serve as a cheap source of energy especially for the weaker sections of the society. Due to its high photosynthetic efficiency and high dry matter production capability per unit area, substantial yields may be obtained under poor and marginal soils under harsh climatic conditions. The present study was carried out under FLD programme in adopted village by K.V.K. Bahraich district of Uttar Pradesh during kharif 2021-22, 2022-23 and 2023-24. Varietal replacement under Frontline demonstration was conducted on elephant foot yam by the active participation of the farmers with the objective of improved technologies of elephant foot yam yield production. The improved technologies consist improved variety (Gajendra), balanced fertilizers (Soil test based) application and integrated pest and disease management, etc. Result of the present study revealed the higher average yield in the varietal replacement demonstration was recorded (370.6 q/ha) as compared to farmers practice (250.5 q/ha) traditional adopted by the farmers. The percentage increase in the yield over farmer's 120.17 was recorded. The technology gap and extension gap were computed 129.33 and 120.17 q/ha respectively, along with 255.80 percent of technology index. The varietal replacement demonstration field gave higher average net return Rs. 1726083.30 and B: C ratio is 5.51 and FP 3.46.

Keywords : Elephant Foot Yam, (*Amorphophallus paeoniifolius*), Technology index.

Introduction

Elephant foot yam [*Amorphophallus paeoniifolius* Dennst- Nicolson synonym *A. campanulatus* (Roxb.) Blume] is a perennial herbaceous diploid ($2n = 2x = 26, 28$) of Araceae family, that is found across Australasian and African countries (Jansen *et al.*, 1996).

It's a very popular vegetable due to high productivity, nonirritant taste, and maximum monetary return within a short period of time (Dutta *et al.*, 2003). Mature underground corm and young shoots are used

locally as important cuisine, medicine and disinfectants in many Asian countries (Singh *et al.*, 2016).

The elephant foot yam is a significant tuberous crop within tropical and sub-tropical regions, esteemed for its considerable yield potential and culinary attributes (Ravindran & George, 2008). This crop enjoys extensive cultivation and consumption in southeastern nations, including India, the Philippines, Malaysia, and Indonesia. In the Indian context, it has attained the designation of a cash crop, attributed to its remarkable production capabilities, market desirability,

and profitable economic returns, with a production potential ranging from 50 to 80 tons per hectare (Mishra *et al.*, 2002). The tuber serves as an excellent source of both protein and starch, rendering it a favored vegetable in a multitude of Indian culinary traditions. In India, cultivation of this crop is prevalent across states such as Andhra Pradesh, West Bengal, Gujarat, Kerala, Tamil Nadu, Maharashtra, Uttar Pradesh, and Jharkhand.

The 'Gajendra' cv. of elephant foot yam (*Amorphophallus paeoniifolius*) contains specific minerals, carbohydrates, and anti-nutrients. The tuber also contains other components like calcium, iron, manganese, zinc, protein, fats, fiber, and various bioactive compounds.

Micro-Macronutrients Mineral Composition (mg/100g) for 'Gajendra'

Particulars	Contents
Phosphorus	152
Potassium	344
Calcium	172
Iron	3.37
Manganese	0.65
Zinc	1.47
soluble oxalate	17.15
crude protein	2.14 %
fat	0.46 %
crude fiber	1.68 %

Numerous researchers have evaluated the chemical composition of whole corms and cormels of elephant foot yam (Surjit and Tarafdar, 2015). It has been observed that in spite of the fact that elephant foot yam are neglected crops, their nutritional value is high. In addition to its minimal fat composition, the crop exhibits a higher nutritional profile compared to other tubers and root vegetables in terms of protein, mineral, and vitamin concentrations (Onwueme, 1978). The elephant foot yam, particularly cv. Gajendra, is introduced in Uttar Pradesh as a profitable and high-yielding tuber crop suitable for its climate. Its cultivation is encouraged due to its high production potential, nutritional value, and suitability for both tropical and subtropical conditions, which can withstand adverse weather and requires fewer agrochemicals compared to other crops. Improvement in yield production technologies to reduce cost of production is very much needed in elephant foot yam as it is a commercial tuber crop growing Uttar Pradesh state. In this regard, present study was undertaken to find out the most effective production and economic management practices in Elephant Foot Yam.

Materials and Methods

Front line demonstration (FLD) in method for transfer technology from research to farmer's field from 2021-22 to 2023-24 on 10 farmers field each year in adopted Villages Baraha, Rampur, Nafta, Katara, Surehawa, and Durgapur Mokam of district by Krishi Vigyan Kendra, Nanpara Bahraich U.P. To Study Impact of Elephant Foot Yam (*Amorphophallus paeoniifolius*) cv. Gajendra Production in Bahraich District Uttar Pradesh. The improved variety Gajendra elephant foot yam with replacing the local acrid variety that high yielding non acrid variety demonstration was conducted by Krishi Vigyan Kendra.

In the demonstration, improved variety Gajendra was grown in 0.5 ha area each farmer with integrated crop management practices and the farmers practice traditionally in 0.5 ha area for comparison. The integrated crop management practices consisting the conjoint use 20 t/ha FYM with a balanced fertilization of 120:60:80 NPK kg/ha. Improved variety of elephant foot yam i.e. Gajendra, which was introduced for demonstration, was released from a local selection in the Andhra Pradesh region of Kovvur and can produce 50–60 t/ha. The tubers are well-shaped, non-acrid, and typically free of propagules or cormels. Treated with fungicide namely, Diathan M-45 and integrated pest management strategies were demonstration as per need.

The Gajendra variety was a local selection. Salient features of technology are plant height upto 80–90 cm, canopy spread upto 85–92 cm, pseudo stem girth up to 11–15 cm, growth habit is erected, corm type stem, corm size 500–700 gm suitable for culinary purpose due softness and non-acrid which make it easy to cook. The technological interventions followed in farmers practice and demonstration is given in table 1. Before initiating the demonstration, the beneficiary farmers were given with skill training on various technological interventions to be followed in elephant foot yam cultivation. During harvest, yield data was collected from both the demonstration and farmers practice.

At the end, cost of cultivation, net income and cost benefit ratio were worked out. An average of cost of cultivation, yield and net returns of different farmers was analysed by the formula.

$$\text{Average} = \frac{(F_1 + F_2 + F_3 + \dots + F_n)}{N}$$

Where,

F= Farmer (s)

N= No. of farmers

In the present study, technology index was operationally defined as the technical feasibility obtained due to implementation of varietal replacement demonstrations in elephant foot yam. To estimate the technology gap, extension gap and technology index following formula used as given by Samui *et al.*, 2000.

Technology Gap = P_1 (Potential yield) – D_1 (Demonstration yield)

Extension Gap = D_1 (Demonstration yield) – F_1 (Farmers yield)

Technology index = $\frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$

B : C ratio = $\frac{\text{Net income (Rs/ha)}}{\text{Cost of cultivation (Rs/ha)}}$

Percent increase over farmer's practices = $\frac{\text{Improved practices} - \text{Farmers practices}}{\text{Farmers Practices}} \times 100$

Data from each demo site were collected and yield q/ha, per cent increase in yield, yield gap and B: C ratio were determined.

Results and Discussion

The findings of the study from data Table 1 revealed that. On the basis of pooled data during years 2021-22 to 2023-2024, of elephant foot yam experiment revealed that, the yield was recorded 370.6 / ha as compared to 250.5 q/ha in farmers practice which was higher to the tune of 47.96 per cent over farmer's practices in respective years. The results clearly indicate the positive effect of FLDs over the conventional practice. High-yielding varieties, fungicide treatment of the corm, timely sowing, the recommended fertilizer dosage, appropriate and timely irrigation, and plant protection measures were all responsible for the increase in output. The results are in consent with findings of Mishra *et al.* (2016) and Narayan *et al.* (2018).

It is depicted from data of Table- 2 reveals that, average technology gap in three years FLD programme was recorded 129.33 q/ha. This difference between potential yield and demonstration yield was may be due to difference in soil fertility, management skill of individual farmer and climatic condition of the area. These findings are in accordance with Mishra *et al.* (2016), Narayan *et al.* (2018), and Shil *et al.* (2014). On an average extension gap in yield of threeyear front line demonstration was 120.17 q/ha during 2021-22 to 2023-2024, respectively. Highlighting the necessity of educating farmers about the use of new technology (Table 2) using a variety of extension methods, such as

timely supply and demonstrations in vast areas of the block or village for quality inputs in technological guidance so as to minimize the technological gap in different components of elephant foot yam production technology reported in this investigation. This indicates the gap between tradition cultivation practice and improved cultivation practice. This gap can be reduced subsequently by using improved technology for production of elephant foot yam. Technology index shows the plausibility of the demonstration technology at farmer's field. The technology index was calculated 30.80 percent and 26.60 per cent during the year of demonstration. An average technology index was computed 28.70 percent. This proves the strength of new technology with recommended package of practices. This changes the thoughts of farmers to differentiate between conventional and improved technology and will help them to adopt this technology to increase their production and economics.

The data of Table 3 reveals that as far as average economics of elephant foot yam is concerned; gross cost, net income and benefit cost ration were Rs. 2101333/ha, Rs. 1726083.30 /ha and .Benefit cost ratio 1:5.51, respectively under demonstration plot. However, Rs. 1128333.34 /ha gross cost, Rs.876555.30 /ha net return with 1:3.46. Benefit cost ratio respectively. This is due to higher yield potential of Gajendra variety of elephant foot yam used in demonstration and improved package of practices applied during the growth period of the crop. The superiority of recommended package of practices under varietal replacement demonstration over farmer's practice was also reported by Pandey *et al* 2024.

Conclusion

The front line demonstration programme was effective in changing attitude, skill and knowledge of farmers regarding recent technology. The FLD initiated a significant positive result and given an opportunity to demonstrate the productivity of the new intervention under real farming situation. It requires collaborative extension efforts to enhance adoption level of location and crop specific technologies among of the farmers for bridging these gaps. The net return gained by farmers participated in this demonstration by cultivation of Gajendra variety of elephant foot yam has created greater awareness and motivated other farmers to adopt demonstrated technology for production of this crop. Therefore, extension agencies in the district need to provide proper technical support to the farmers through various educational and extension methods for better elephant foot yam production in District Bahraich Uttar Pradesh.

Table 1: Yield and yield difference of elephant foot yam under front line demonstration

Year	Yield (q./ha.)			Yield increment	Additional yield over local var.
	Potential	FLD	Farmers		
2021-2022	500 q/ha	365	247	47.78	118
2022-2023	500 q/ha	371	251	47.80	120
2023-2024	500 q/ha	376	253.5	48.32	122.5
Average	500 q/ha	370.6	250.5	47.96	120.17

Table 2: Yield gap and technology index of elephant foot yam under front line demonstrations

Year	No. of farmers	Technology gap (q./ha.)	Extension gap (q./ha.)	Technology Index
2021-2022	10	135	118	27.00
2022-2023	10	129	120	25.80
2023-2024	10	124	122.5	24.80
Mean		129.33	120.17	25.86

Table 3: Economics of elephant foot yam under front line demonstrations

Year	Constant cultivation (Rs./ha.)		Gross return (Rs./ha.)		Net Return Rs./ha.		B:C Ratio	
	FLD	Farmers/Verities	FLD	Farmers	FLD	FP	FLD	FP
2021-2022	306500	225000	2007500	988000	1519500	763000	4.97	3.39
2022-2023	315950	259000	2040500	1129500	1724550	870500	5.56	3.36
2023-2024	321800	272000	2256000	1267500	1914200	995500	6.01	3.65
Average	314416.67	252000.00	2101333	1128333.34	1726083.30	876555.30	5.51	3.46

**Fig. 1:** Yield gap and technology index of elephant foot yam under front line demonstrations

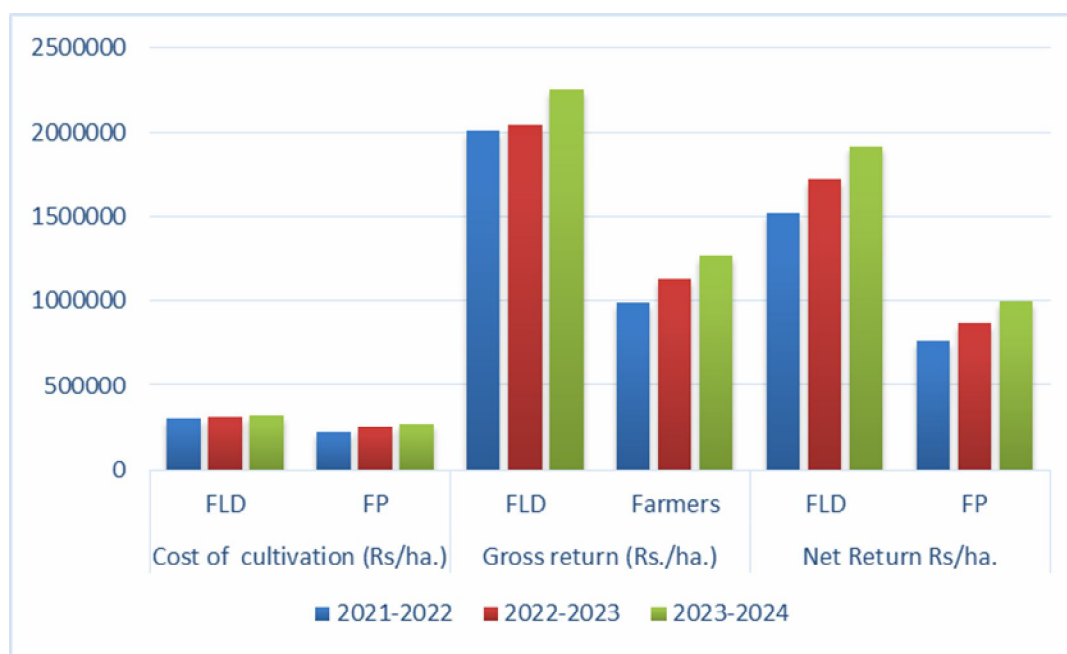


Fig. 2: Economics of elephant foot yam under front line demonstrations.

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Competing interests Authors have declared that no competing interest exists.

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