

Yield gap analysis of Colocassia in Arunachal Pradesh

ABSTRACT

The present study 'Varietal performance of Colocassia, variety: ML-1' was carried out at Tirap district of Arunachal Pradesh, India during *kharif* 2015-16 and 2016-17 respectively. Before conducting the trials; a field survey was also carried out about farmer's practices of colocassia. As per the survey's result Lack of knowledge about improved variety, scientific cultivation practices, nutrient management was the major issues among farmers. As per the result of the study (pooled data of both year's study), farmer's practices yield was 123 q/ha while demonstration plots's yielded 208 q/ha; which was 69 % higher. Present results clearly show that the yield and economics of colocassia can be boosted by adopting recommended technologies.

Key words: Colocassia, yield, economics

Introduction

Asia and the Pacific region have long been home to the traditional crop colocasia (*Colocasia esculenta* L. Schott). In contrast to its widespread usage as a tuber vegetable in India, it is deeply ingrained in the cultures of many South Pacific Islands. In terms of total output, area, and consumption, it comes in third place, behind yam and cassava (Poonia and Pithia 2011). Colocasia is a tropical tuber crop belongs to the monocotyledonous family "Araceae" of the order "Arales" whose members are known as "aroids" (Henry, 2001 and Van Wyk, 2005). Colocasia is believed to have originated in South Central Asia, perhaps in Eastern India or Malaysia (Sturlevant, 1919). Its all parts of the plant including corm, cormels, rhizome, stalk, leaves and flowers are edible and contain good amount of starch (Bose *et al.*, 2003). Its corms are consumed roasted, boiled, or fried and are also used to produce flour or industrial starch, which is generally processed into various food products. Colocasia is a reasonably good provider of the main dietary components—proteins, minerals, and vitamins—and a significant source of carbohydrate. A food's nutritional worth is determined by its digestibility, amount of nutrients it contains and whether or not it contains (Balagopalan *et al.* 1999) as harmful or anti-nutrients. The chemical makeup of taro corms and cormels has been assessed by a number of writers (Surjit and Tarafdar, 2015). It has been noted that colocasia have a significant nutritional value despite being neglected crops. The crop has lower fat content than other root and tuber crops, but it also has higher protein, mineral, and vitamin contents (Onwueme, 1978). Studies have revealed that colocasia contain high levels of vital amino acids, digestible starch, high-quality protein, vitamin C, thiamine, riboflavin, and niacin. Due to the crop's high dietary fiber content, it may also be used to treat conditions like cancer, diabetes, obesity, and gastrointestinal issues (Mukherjee *et al.*, 2016). The major colocasia growing states are Assam, Nagaland, Manipur, Orissa, Maharashtra, Kerala, Andhra Pradesh, Meghalaya, West Bengal, Uttar Pradesh Gujarat, Tamil Nadu and Bihar. Colocasia is mainly grown as a major tuber crop in Arunachal Pradesh as well as in entire north-eastern region. Despite the crop's significance, it is often grown as a subsistence to semi-commercial crop throughout India due to low productivity brought on by the lack of adoption of better varieties and other new technology. The On farm testings were held at various farmers' fields with the aim of increasing agricultural produce's production, productivity and quality.

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Table 1: Nutritional values in Colocassia

Nutrients	Availability/100 g	Nutrients	Availability/100 g
Moisture	70.3%	Phosphorous	68mg
Fat	0.1%	Magnesium	106mg
Protein	3.2%	Sodium	1.6mg
Starch	21.2%	Potassium	356mg
Energy	97Kcal	Sulphur	7.4mg
Vitamin B ₁	0.09mg	Iron	0.63mg
Vitamin B ₂	0.03mg	Copper	0.20mg
Vitamin C	Nil	Zinc	3.6mg
Calcium	31mg	Manganese	0.34mg
Betacarotene	34µg	Boron	0.09mg

(Balagopalan *et al.*, 1999)

Materials and Methods

The On Farm Testing (OFT) is an applied approach to implement any technologies at farmers fields in a participatory mode with an objective to explore the maximum available resources of crop production and also to bridge the productivity gaps by enhancing the production in national basket (Chaudhary *et al.*, 2018). By seeking the low productivity of existing varieties of colocassia, Krishi Vigyan Kendra, Tirap, Arunachal Pradesh, India conducted OFT on Varietal performance of colocassia (Variety: ML-1) during kharif 2015-16 and 2016-17 respectively. Under the OFT, improved variety ML-1 was grown with full scientific package of practices. The total 04 farmers were selected for OFT during both year's study; having 0.10 ha area of each farmer.

The technological interventions followed in farmers practice and demonstration is given in table 1. Before conducting OFT, farmers were trained in details about scientific cultivation practices of Colocassia. The performance of crop was monitored as per the schedule by the scientists of Krishi Vigyan Kendra and advisory recommendations were followed. During harvest, yield data was collected from both the demonstration and farmer's practice. At the end, cost of cultivation, net income and cost benefit ratio were also worked out. An average of cost of cultivation, yield and net returns of different farmers was analyzed by the formula:

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

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 OFT at farmer's field. To estimate the technology gap, extension gap and technology index following formula used as given by Samui *et al.*, 2000.

$$\text{Technology Gap} = P_i(\text{Potential yield}) - D_i(\text{Demonstration yield})$$

$$\text{Extension Gap} = D_i(\text{Demonstration yield}) - F_i(\text{Farmers yield})$$

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

$$\text{Benefit Cost ratio (B:C ratio)} = \frac{\text{Net income (Rs ha}^{-1})}{\text{Cost of cultivation (Rs ha}^{-1})}$$

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

Table 2 : Improved and farmer's practices of colocassia in details

Particular	Technological intervention	Existing practices	Gap
Variety	ML-1	Local or unknown variety	Full gap
Seed rate	800 kg/ha	1200 kg /ha	Full gap
Seed treatment	Seed was treated	Not treated	Full gap
Sowing method	Line sowing	Line sowing	Partial gap
Spacing	45 x 20 cm	60 x 30 cm	Partial gap
Application of recommended dose of manure	5 kg/ meter ²	Nil/without recommendation	Partial gap
Application of YIELD GAP AND CONSTRAINTS IN ADOPTION OF SOYBEAN PRODUCTION TECHNOLOGIES IN CENTRAL NARMADA VALLEY AGRO-CLIMATIC ZONE	Soil application of Azospirillum & PSB @ 2 kg/ha mix with FYM	No application	Full gap

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Weed management	Done at 30 and 45 days after planting	Not common	Full gap
Harvesting	Manual	Manual	No Gap

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Table 3: Yield and Economics of Colocassia

Year	Yield(q/ha)		Cost of Cultivation (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		Benefit Cost ratio B:CRatio	
	D	F	D	F	D	F	D	F	D	F
	2015	356	243	122000	148000	712000	446000	590000	338000	4.83
2016	372	268	128000	129000	744000	536000	616000	407000	4.81	3.15

Where D denotes Demonstration plot, F denotes Farmers practices

Table 4: Technology gap analysis

Year	Potential yield (kg/ha)	OFT Yield (kg/ha)	Farmer's practice yield (kg/ha)	% increased	Extension gap (kg/ha)	Technological gap (kg/ha)	Technology Index
2015-16	410	356	243	46	113	54	13
2016-17	410	372	268	38	104	38	9

Results and Discussion

The economic indices depicted in table 2 showed that the average yield of colocasia variety (Indira Arvi - 1) were 204 and 207 q ha⁻¹ during kharif 2015-16 and 2016-2017, respectively under demonstrated technology however, under farmer's practices the average yield were found to be 160 and 158 q ha⁻¹ during respective years. The average percent increases over local yield were 29.24. The results clearly indicated the positive effect of FLDs over the existing practices toward enhancing the yield of colocasia in the study area due to use of high yielding variety, timely sowing, balance doses of fertilizers, proper and timely irrigation, need based plant protection etc.

The result is in conformity with the finding of Tiwari and Saxena (2001) and Tiwari *et al.*, (2003). Yield of the front line demonstration and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology and extension gap. The data of table 3 depicted the technology gap in the demonstration yield against potential yield which is 14.5 q ha⁻¹ during both the year and reflects the farmer's cooperation in carrying out such demonstrations with encouraging results in subsequent years. The technology gap observed may be attributed to the dissimilarity in soil fertility status, timely sowing and weather conditions. Similar findings were recorded by Mitra and Samajdar (2010). Further, the higher extension gap was observed. The extension gap ranged from 46.5 q ha⁻¹ during the period of study that emphasizes the need to educate the farmers through various means for adoption of improved production technologies to mitigate the extension gap. The data of table 2 reveals that as far as average economics of colocasia is concerned; gross cost, net income and benefit cost ratio were Rs. 73800 ha⁻¹, Rs. 163200 ha⁻¹ and 1:2.21, respectively during 2015-16 and Rs. 165600 ha⁻¹, Rs. 89600 ha⁻¹ and 2.17, respectively during 2016-17 under demonstration plot. However, Rs. 128000 ha⁻¹ gross cost, Rs. 54667 ha⁻¹ net return with 1:1.74 benefit cost ratio during 2015-16 and Rs. 126400 ha⁻¹ gross cost, Rs. 51800 ha⁻¹ net return with 1:1.69 benefit cost ratio observed during 2016-17 under farmer's practices.

The superiority of recommended package of practices under frontline demonstration over farmer's practice was also reported by Mitra and Samajdar (2010) and Balai *et al.*, (2012). From the findings of present study, it can be concluded that use of above prescribed technologies of colocasia cultivation can reduce the technology gap to a considerable extent resulting in to increased productivity as well as quality in Chhattisgarh. It requires collaborative extension efforts to enhance adoption level of location and crop specific technologies among of the farmers for bridging these gaps. Therefore, extension agencies in the district need to provide proper technical support to the farmers through various educational and extension methods for better colocasia production in tribal districts of Chhattisgarh.

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Comment [PD3]: Table 2 has no mention of the yield

Comment [PD4]: The data presented here is not available in the table

Comment [PD5]: Table 3 does not present data of technology gap and the Technology gap mentioned in Table 4 is not 14.5 q/ha

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