Yield gap analysis of Ginger in Arunachal Pradesh

Abstract

A demonstration on ginger (variety: Nadia) was performed at selectied villages in Tirap district of Arunachal Pradesh during 2021-22 and 2022-23 respectively. Before demonstration a field survey was carried out to know the ground reality farmer's practice of ginger. During first years of demonstration the total 15 numbers of plots were demonstrated having per plot size of 0,20 ha while 20 plots were second years with same size of plots. The demonstration yield was recorded as 118 q/ha & 142 q/ha as compared 99 & 108 q/ha respectively. The B:C ratio was 4.68 & 3.95 as compared 2.27 & 2.66.

Keywords: Demonstration,ginger,technologygap,technologyindex

Introduction

India is aptly referred to as the "Spice Bowl of the World" due to the rich diversity and excellent quality of spices it produces. India holds a significant global ginger production share of approximately 33%, with China and Nepal following suit. Vedic documents from as far back as 6000 B.C. mention its varied characteristics. From North to South, East to West, temperate to subtropical climates, ginger grow. The world's largest variety of spices is found in India. The popular spice ginger comes from the rhizomes of the Zingiber officinale plant. Since ancient times, ginger has been utilized as a food supplement and to treat a wide range of illnesses and afflictions.

Tribal farmers grow the crop commercially to augment their income and use it as a spice, condiment, and medicinal [1]. In addition to being used as an ingredient to enhance flavor, ginger can reduce bloating, intestinal gas, constipation, and other fermentation-related issues. It has antioxidants in it. These molecules aid in the control of free radicals, which are substances that can harm cells in excess of a certain quantity.

Ginger is grown on 116.90 thousand hectares of land in India; its average yield was 529.30 thousand MT, and its average productivity was 4.30 MT/ha. As of 2022 [2], the states of Madhya Pradesh, Karnataka, and Assam are the top producers of ginger in India. However, the tribal farmers partially harvest their ginger three months after planting and use a high seed rate of 800-1000 kg/acre. These activities raise the risk of rhizome rot disease. It is for this reason that the crop has suffered greatly over the last 15 to 20 years, leading to a decrease inoutput [3]

Still, yield in the Arunachal Pradesh affected by many biotic and abiotic issues, including not using raised bed systems, inadequate field drainageand the prevalence of ginger rhizome rot disease, can be blamed for yield loss in real agricultural circumstances [3,4,5]. Despite having a favorable climate and soil, mostly as a result of a lack of awareness and implementation of new technologies in the areas of integrated nutrient management (INM), planting protection techniques, seed treatment and variety selection.

Transferring innovative ideas from their original origins to final users is known as technology transfer [6,5].In order to close these gaps, Krishi Vigyan Kendra (KVK) – Tirap, Arunachal Pradesh conducted front-line demonstrations (FLDs) in the fields of farmers, showcasing to them the superiority of the Nadia ginger variety and its in addition to other agronomic practices.

MATERIALSAND METHODS

The Nadia variety of ginger were used for demonstration during the years of 2021-22 and 2022-23 respectively. The Deomali, Mopaya, Lapnan, Jumdang, Old Subang, New Subang villages were selected for demonstration of trials during the both years. During 2021-22, total 03 ha area was demonstrated with 15 numbers of demonstrations while during 2022-23, 04 ha area with 20 numbers of demonstrations. The first week of April was the transplanting time of ginger. The ginger tubers having 5-6 cm length and average weight 22 gm were planted at farmers field; with a spacingof45 cm x 30 cm in the raised bed facilitated betterrhizomedevelopmentwhilealsoavoidingrhizomerotdisease.FYM 20 t/haandNeemcake2t/hawas also applied duringlastploughing.Spraying of Neem oil at 5 ml/l(1500PPM)forcontrolofshootboreranddrenching of *Trichoderma viride*at 5 g/liter forcontrolofrhizomerot Table 1).

The freshrhizomesharvestedatmaturitystage. Performanceand yields of ginger with full package and practices werecomparedagainstnormalfarmerpractice.Theextensionparameters such as Extension Gap, TechnologyGap, and Technology Index were calculated byformulaesuggestedbySamuietal.[11],RenbomoandPijushKanti[12],andKaleetal.[13]tostudytheimpactoffront-linedemonstrationsovertraditionalpracticesbyfarmers.

Technology Gap $= P_i$(Potentialyield)$- D_i$(Demonstration yield)

Extension Gap $= D_i$(Demonstrationyield)$- F_i$(Farmers yield)

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

$$\text{Benefit Cost ratio (B:C ratio)} = \frac{\text{Netincome}(\text{Rsha}^{-1})}{\text{Costofcultivation}(\text{Rsha}^{-1})}$$

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

Table 1: Improved practices vs farmer's practices of Ginger

Particular	Technological intervention	Existingpractices	Gap
Variety	Nadia	Very Old variety	Fullgap
Seed rate	1600 kg/ha	2200 kg /ha	Full gap

Seed treatment	Seed was treated	Not treated	Full gap
Sowing method	Line sowing	Line sowing	Partial gap
Spacing	45 x 30 cm with 6 cm depth of sowing	60 x 30 cm with 8 cm depth of sowing	Partial gap
Application of recommended dose of manure	20 t/ha	Nil/without recommendation	Full gap
Application of Bio fertilizer	Soil application of Azospirillum & PSB @ 2 kg/ha mix with FYM	No application	Full gap
Drenching	drenching of *Trichoderma viride*at 5 g/liter	Not applied	Full gap
Weed management	Done at 20,40 and 60 days after planting	Not common	Full gap
Spraying of Biopesticide	Neem oil @ 5ml/litre of water	Not sprayed	Full gap
Harvesting	Manual	Manual	No Gap

Table 2 :Production and other extension parameters of Ginger

Year	**Area**	**Variety**	**No of Demos.**	**Potential Yield**	**Average Yield (q/ha)**		**% increase over Check**	**Technology gap (q/ha)**	**Extension gap (q/ha)**	**Technology index (%)**
					D	**C**				
2021-22	3	Nadia	15	210	118	99	19	92	19	43
2022-23	4	nadia	20	210	142	108	31	68	34	32

Where D stands for Demonstration and C stands for Check

Table 3 : Economics of Ginger cultivation

Year	Yield(q/ha)		Costof Cultivation (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		BenefitCost ratio B:CRatio	
	D	F	D	F	D	F	D	F	D	F
2021-22	118	99	83000	121000	472000	396000	389000	275000	4.68	2.27
2022-23	142	108	81000	118000	568000	432000	320000	314000	3.95	2.66

Where D stands for Demonstration and C stands for Check

RESULTSANDDISCUSSION

The data from table 2 reveled that there was potential of 210 q/ha of ginger. During the first year of demonstration, 118 q/ha demonstration yield was recorded as compared 99 q/ha under farmer's practice. Meanwhile during the second year; demonstration yield was recorded higher (142 q/ha) as compared previous years as compared farmer's practices of 108 q/ha. The higher yield under demonstration may be the result of tuber's treatment before transplanting, application of sufficient amout of manure, azosipirrilium. whichhelpssuppressthegrowthof*Phythiummyriotylum*fungus,therhizomerotdiseaseandaraisedbedthatfacilitatesexcess. waterdrainedout.Andalsoavoidanceofrhizome rot incidence. This finding is also supported by Sarmah et al. [14], Borah et al. [15],andSialandTarai[1].ShahandZala[12]obtained an average yield of ginger (133 q/ha)under Gujarat conditions.

The Nadia variety resulted 19 & 31 % higher yield respectively during the both yearoverfarmers'practices.Thesignificantincreaseinyieldmaybeattributedtoimprovedrhizomedevelopmentdue to the application of Tricoderda in demonstration fields;whichmayleadhealthy spouts development, better growth and development of plants which turned into better yieldSarmahetal.[14],Borahetal.[15].

Theextension gap during the bothyear's of demonstration was recorded: 19 & 34 q/ha which can easily be minimized by different dissemination technologies among farming community. Only adoption of improved varieties can minimize this extension gap; as reported by HiremathandNagaraju's[13]andKale et al. [9].

The technologygapmay be attributed to variations in inherent soilfertility,adoptednewpractices,andweatherconditions [14,12). Variety-wise, location-specifictrialsandrecommendationsarerequiredforminimising the technology gap in yield in differentsituations. Ashok Kumar et al. [5],Kale et al. [13], Singh et al.[17], and Chapke[15] have also wrote similar results.

The Technology index was 43 during first year of demonstration as compared to 32 during the second years of demonstration.Lower the value of Technology Index indices that there is muchmore scope of introducing technology to reach adesiredtarget.Thus, thereismuchscopefordemonstratedtechnologyingrowinggingerin Tirap district of Arunachal Pradesh.

Similar resultshave earlierbeen reported in mustard by Jeengaret al. [16],Kale et al.[13],

Katare et al. [11], Keshavareddy et al. [12]andDayanand[18]andAshokKumaretal. [5].

It is clear from Table 3 that cost of cultivation was higher in farm's practice as compared to demonstration; during both years. The demonstration cost/ha was Rs. 83000 & 81000 respectively as compared to 121000 & 118000. The gross return was higher in demonstrations (Rs.472000 & 568000 as compared to 396000 & 320000) during the both year. The superiority of gross return over farmer's practice is due to higher yield od demonstration plots. This is also supported by Prasanta et al. [19], Ali et al. [18], Dorhoo [20],and Rahman et al. [16].

The Netreturnswerealso higherinthedemo plotsas compared farmer's practice during tboth years (Rs. 389000 & Rs 477000 as compared 275000 & 314000).

The benefit cost ratio was also higher (4.68 & 5.88) as compared farmes plot (2.27 & 2,66) during both years of study.

The findingsproving thatgrowingginger (var.Nadia)inthedemonstration plotswill help to fill the gaps of technology and also assist the tribal area region's ginger growers inachievinghigheryields

CONCLUSION

The Nadia variety of ginger produced higher yields (118 & 142 q/ha) during the both years as compared to farmers yield (99 & 108 q/ha). Which turned into good economic return as well as impressive benefit cost ratio.

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