YieldGapAnalysisofPotato in Arunachal Pradesh

ABSTRACT

A field demonstration on potato was carried out during 2017-18 and 2018-19 respectively in Tirap district of Arunachal Pradesh by Krishi Vigyan Kendra (KVK) Tirap. Kufri Jyoti variety of potato with full scientific practices were demonstrated in 45 locations in selected villages. The size of demonstration plot was 0,1 ha. The demonstration yield was recorded as 282 and 304 q/ha respectively as compared 217 and 234 respectively. Technology gap was 36 & 16, extension gap was 65 and 70 while technology index was 11 and 5 respectively.

Keyword:*Extensiongap,FrontLineDemonstration,Potato*

INTRODUCTION

The potato, or Solanum tuberosum L., is regarded as the third most significant crop for human consumption globally, right behind wheat and rice (International Potato Center, 2013). India is the country that produces the second most potatoes worldwide, after China, accounting for 38% of global production (PTI, 2020). Furthermore, potatoes, which currently occupy 21.8 lakh hectares and yield 52.5 MT, are regarded as India's fourth most important food crop after rice, wheat, and maize (Ojha & Saha, 2014). (Ghosh, 2020). After Uttar Pradesh (30.33%), West Bengal is one of the top potato-growing states in India, accounting for around 24.92% of the nation's output (NHB, 2022–23).

The farming of vegetables has become more commercialized. However, there is still a significant discrepancy between actual and prospective productivity. To provide food, nutrition and economic security for households, the nation urgently needs to increase the production of nutrient-dense food in a sustainable manner and boost farm family income. In Arunachal Pradesh, numbers of potato farmers are growing but the state's actual yield still lags far behind its potential. Therefore, there exists enough opportunity to enhance the productivity and production of potatoes in order to augment the income level of the state's farming population.

Since its introduction in the 1970s, yield gap analysis has been a powerful research tool. Utilized widely for measuring and analysing factors influencing yield gaps, it was created by the International Rice Research Institute (IRRI). There is a noticeable discrepancy between the actual yield that growers achieve and the production level that is realistically achievable with current technological enhancement, despite the fact that production has improved significantly in recent years. The current study evaluated yield loss in actual farming conditions and determined that insufficient supply of high-quality potato tubers from high yielding varieties (HYVs) and uneven application of N, P and K fertilizers were the main causes. In order to address the factors that contribute to yield erosion and reduced financial returns, the adoption and use of suggested technology through demonstration was successfully implemented.

MATERIALSANDMETHODS

The total forty fiveFront Line Demonstrations (FLD) on Potato wereconductedatfarmers'fieldinthe Tirap district of Arunachal Pradesh during Rabi season of 2017-18 and 2018-19 respectively to assess its performance. The alltotal demonstrations were done in following villages: Khela, Chomoithung, Sipini, Dadam, Paniduriya and Subang. The soil of the district is generally sandy loamintexture.Theareaundereachdemonstrationwas0.10 ha. Kufri Jyoti variety was demonstrated at farmers field with recommended package of practices. Before implementation of FLD, a field survey with potato growers done by Experts of KVK Tirap to know

the reality of potato production viz. knowledge of farmer's variety, seed rate, production methodology, yield etc.(Table 1). The farmers were replied that they are not using any critical input and also, they were growing old varieties of potato, that why their potato yield was poor.

The field visits on regular basis by KVK scientists to demonstration plots weremadetoensuretimelyapplicationofcriticalinputsand to solve other issues related to potato farming at field level. The other activities like – mobile advisories, group discussions etc., were also performed by KVK experts at the demonstration sites as to provideopportunitiesforotherfarmersofthearea.

Improved and suggested technologies were used as an intervention during the FLD to manage the assessed problem. As per the recommended practice, balanced fertilizer application of N:P:K:: 100:40:60 kg/ha were applied along with farm yard manure @ 5kg/m^2. The opinions of farmers were gathered in order to boost research and extension programmes.

The discrepancy between the potential and actual farm produce is known as the "yield gap." Any yield that is obtained within the experiment station is referred to as potential yield. When the best available techniques and maximum inputs are used in trials conducted on the experiment station during a specific season, the production of the crop in the particular environment is regarded to be the yield. The yield attained on the demonstration plots on the fields of the farmers under supervision of experts; is known as the demonstration yield. Regarding infrastructure and environmental circumstances, the conditions on the demonstration plots are very similar to those on the cultivators' fields. The yield that farmers really achieve on their properties while using their methods of farm management is referred to as actual yield.

The different following parameters viz.extension gap, technologygap, technology index (%) were worked out as per the work done by Samui *etal.*,2000asgivenbelow:

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 Potato

Particular	Technological intervention	Existingpractices	Gap
Variety	Kufri Jyoti	Very Old variety	Fullgap
Seed rate	25-30 q/ha	40 kg /ha	Partial gap
Seed treatment	Seed was treated	Not treated	Full gap
Sowing method	Line sowing	Line sowing	Partial gap
Spacing	60 x 20 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	5 kg/ meter^2	Nil/without recommendation	Full gap
Application of Bio fertilizer	Soil application of Azospirillum & PSB @ 2 kg/ha mix with FYM	No application	Full gap
Weed management	Done at 25 and 45 days after planting	Not common	Full gap
Harvesting	Manual	Manual	No Gap

Table 2 :Production and different extension parameters of Potato

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				
2017-18	2	Kufri Jyoti	20	320	282	217	29	38	65	11
2018-19	2.5	Kufri Jyoti	25	320	304	234	30	16	70	5

Where D stands for Demonstration and C stands for Check

RESULTSANDDISCUSSION

The performance ofhigh yielding varieties of potato for the year 2017-18 and 18-19 was analyzed (Table 2). Datarevealedthatunderdemonstrationplots,potatoyield was found substantially higher than that under farmer'spracticeduringboth theyear.Underdifferentlocations,the potato yield in demonstration plots ranged between260 to 318 q/ha, which was 29-30 percent higherover farmerspractice (localcheck).The different researchers have also been reported that high yielding varieties under balanced nutrients management resulted good yield (Jethi R. 2008 and Tomar *etal*. 2003). Mishra *et al.* (2009) has also reported that potato recorded higher yield under proper nutrient management condition in Malwa region of Madhya Pradesh. Kumar *et al.*(2011) has also reported that integrated nutrient management resulted better yield of potato under rainfed climatic conditions in Meghalaya. Mohapatra *etal.*(2008), Mollah (2011), Saini (2013), Singh (2013) and Venkatasalam (2012) has also confirmed the result.

Between the potential yield and the yield of the demonstration plots is called "technology gap." That was measured in both study years and came to 38 and 16 kg/ha with an average of 27 q/ha (Table 2). Different soil fertility statuses, agricultural methodsand local climate conditions may be the cause of the observed technology difference. Mishra *et al.* (2007) has also reported that potato yield can be increased by adopting the good management practices of blight control. He reported that blight is the major factor in potato cultivation.

The Extension gap was 65 and 70 q/ha (Table 2), respectively, based on data that was recorded. The study revealed that the average extension gap was 67.5 q/ha. This underscores the necessity of educating farmers through different extension methods, such as FLD, to encourage the use of new agricultural technology and reverse the trend of vast extension gaps (Seal *et al*. 2017 and Shubha *et al.2018).*

The viability of evolving technology on farmers' fields was demonstrated by the technology index. The more feasible technology is, the lower the technology index value. Mishra et al. (2007), Saini *et al.* (2013) and Singh *etal.*(2013) reported that variations in soil fertility level, weather, insect pests and illnesses could be the cause of the technology index's fluctuation, which ranged from 1.0 to 7.2% over the study period.

The technology index was reported to be 8% on average, indicating the good performance and efficacy of technical solutions. There exist adoption gaps between the farmers' practices and the shown plotsand since the farmers can see the very obvious outcomes between these plots, this leads to the adoption of the technology automatically.

During the interview with farmers; two important points were raised –

- Lack of quality potato tubers in market.
- Lackofawarenessaboutbalancedoseoffertilizers.

CONCLUSION

The Front line demonstration program is very effective programme where farmers are getting experience at their own field ; which also motivate neighboring farmers. In this way efficacy of the scientific package of practices among farmers increases.

The yield gap analysis revealed that the losses could be increased by 29-30percent. The technology gap 16-38q/haandcanbeattributedtodissimilarity of the soil fertility and local climaticsituation. Extension gap was 65-70 q/ha,whichneeded better extension approaches to dissemination of improved cultivation practices among farming community.The technology index indicates the viability of the technology exhibited and the effectiveness of the intervention points implemented to

close the potato yield gap.

REFERENCES

Jethi R. 2008. Participation of farm women in potatoproduction.*IndianRes.J.Ext.Edu.*,**8**(1):63-65.

Mishra,D.K.,D.K.Paliwal,R.S.TailorandA.K.Deshwal.2009.Impact of front line demonstrations on yield enhancementofpotato.*IndianRes.J.Ext.Edu.*,**9**(3):26-28.

Kumar M, Baishya LK, Ghosh DC, Gupta VK (2011) Yield andquality ofpotato (*Solanumtuberosum*)tubersasinfluenced bynutrient sources under rainfed conditions of Meghalaya. IndianJournal ofAgronomy56 (3):260-266.

Mishra, D.K., R.S. Tailor, G. Pathak, and A. Deshwal. 2007.Yield Gap Analysis of Blight Disease Management inPotato through Front Line Demonstration. *Indian Res. J.Ext.Edu.*,**7**(2&3):82-84.

Mohapatra BK, Maiti S, Satpathy MR (2008) Integrated nutrientmanagement in potato (*Solanum tuberosum*) - Jute (*Chorchorusolitorius*)sequence.IndianJournalofAgronomy53 (3):205-209.

Mollah MRA, Islam N, Sarkar MAR (2011) Integrated nutrientmanagement for potato-mung bean - T. aman rice cropping patternunderlevelBarindagroecological zone.BangladeshJournalofScientific andIndustrialResearch36(4): 711-722.

Samui, S.K., S. Maitra, D.K. Roy, A.K. Mandal and D. Saha.2000. Evaluation offrontlinedemonstration ongroundnut. *J.IndianSoc.CoastalAgricRes.*, **18**(2):180-183.

Saini, M.K., M.K.Saini andS. Kaur. 2013.Yieldgap analysisofgram andsummer moong through front linedemonstrations.*JournalofCommunityMobilizationandSustainableDevelopment*,**8**(1):146-149.

Singh, S.R.K., A.P. Dwivedi, A. Mishra and S. Chouhan. 2013.Yieldgapanalysisvis-à-visfactoraffectingsugarcaneproductioninMadhyaPradesh.*JournalofCommunityMobilizationandSustainableDevelopment*,**8**(1):60-63.

Seal A, Bera R, Datta A, Saha S, Roy Chowdhury R, Sengupta K,Barik AK, Chatterjee AK (2017) Evaluation of an organic packageof practice towards integrated management of

*Solanum tuberosum*and its comparison with conventional farming in terms of yield,quality,energyefficiencyandeconomics.ActaAgriculturaeSlovenica109(2):363-382.

Shubha AS, Srinivasa V, Shanwaz A, Anusha RB, Sharavathi MB(2018) Effect of Integrated Nutrient Management on Growth andYield Attributes in Potato (*Solanum tuberosum* L.). InternationalJournalofCurrentMicrobiologyandAppliedScience7(9):830-836

Tomer, L.S., P.B. Sharma and K. Joshi. 2003. Study on yieldgap and adaptation level of potato production technologyingridregion.*Maha.J.Ext.Edu.*,**22**(1):15-18.

Venkatasalam EP, Singh S, Sharma S (2012) Effect of organicmanures on yield and yield attributing characters of potato. PotatoJournal 39(1):84-87.