E-ISSN: 2706-8927
P-ISSN: 2706-8919
IJAAS 2019; 1(1): 230-231
Received: 28-07-2019
Accepted: 30-08-2019

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Impact of Front line Demonstration on Wheat (*Triticum aestivum L.*) Productivity in Haridwar district of Uttrakhand

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DOI: https://doi.org/10.33545/27068919.2019.v1.i1a.699

Abstract
Krishi Vigyan Kendra Dhanauri (Haridwar) conducted front-line demonstrations in the fields of 10 selected farmers of the adopted villages of the Haridwar district during Rabi season 2017-18 and 2018-19 with an objective to study the effect of the recommended dose of fertilizers on the grain yield of wheat variety HD-2967 at farmers' field. Farmers' practices comprised the use of 100 kg nitrogen + 60 kg phosphorus, while the recommended dose of fertilizers was 120 kg N_2 + 40 kg P_2O_5 + 40 kg K_2O with one foliar spray of soluble NPK (18:18:18) at the vegetative growth stage and one spray of micronutrient liquid fertilizer at the grain filling stage of wheat. Results showed that the average yield obtained was 42.70 and 43.90 q/ha respectively under the recommended dose of fertilizers whereas in farmers' practices the yield recorded was 37.50 and 38.00 q/ha during 2017-18 and 2018-19 respectively. The average percent increase in yield with the recommended dose of fertilizers over farmers' practice was 14.65 percent. The extension gap recorded was 5.2 and 5.9 q/ha during 2017-18 and 2018-19 respectively.

Keywords: Demonstration, Productivity, *Triticum aestivum*

Introduction
Wheat (*Triticum aestivum L.*) is the most important cereal crop in the Haridwar district of Uttrakhand and plays an important role in food and nutritional security. Fertilizers play a vital role in the production and productivity of the wheat crop but continuous and imbalanced use of chemical fertilizers adversely affects the production potential and soil health. Nutrient management in wheat is the most basic factor which is found to exert a great influence not only on the growth and yield attributes but also for obtaining sustained productivity (Mudalagiriyappa *et al*., 2016) [2]. The use of recommended chemical fertilizers in combination with organic manure is essentially required to improve soil health (Bajpai *et al*., 2006) [1]. Foliar feeding of nutrients along with soil application helps in augmenting the nutritional requirements of crops. Foliar nutrition facilitates to overcome problems like immobilization, fixation, and leaching of nutrients and provides efficient nutrients for correcting deficiencies, especially for short duration crops. Water-soluble fertilizers supply crops with optimal rates of nutrients throughout the growth cycle in the most efficient manner, without degrading soil and water resources, and they have a high content of primary nutrients with low salt index and high solubility. In general, the majority of the soils in the Haridwar district are low in organic carbon, phosphorus, and micronutrients and medium in potash. Therefore, the present study was conducted at progressive farmers' fields of different adopted villages to assess the impact of recommended fertilizer application on wheat through FLD in the Haridwar district of Uttrakhand.

Material and method
The study was carried out by Krishi Vigyan Kendra Dhanauri, Haridwar. Front-line demonstrations (FLDs) were conducted with selected 10 farmers of the adopted villages covering an area of 0.2 ha each. Wheat variety HD 2967 was sown by the farmers during the first fortnight of November with recommended agronomic practices along with the recommended dose of fertilizers (120 kg N + 40 kg P_2O_5 + 40 kg K_2O) along with one foliarspray of one percent soluble NPK (18:18:18) at the vegetative stage and one foliar

spray of one mL liquid soluble micronutrient fertilizer mixture (contains 3.0% zinc, 1.5% iron, 0.5% copper and 0.5% boron) per liter of water at the stage of grain formation stage in both the years while in check plots, farmers of this district were using 120 kg DAP and 150 kg urea which contributes to only 91 kg nitrogen and 55 kg P_2O_5. FLDs were conducted to study the gap between potential yield (61 q/ha) and demonstration yield, extension gap, and technology index. The data on the output of demonstration plots and check plots were recorded. The farmers were guided by the KVK scientists in the aspect of the package of practices to be followed during the crop season along with the advice for the application of a recommended dose of fertilizers. Technology gap, extension gap, and technology index were calculated using the formula suggested by Samui *et al.* (2000) [3].

Results and Discussion:

The results of the front-line demonstrations revealed that an average yield of 42.70 and 43.90 q/ha was obtained during 2017-18 and 2018-19, respectively which has shown an increase of 13.8 and 15.5 percent (Table-1) respectively over the local check. Data further presented that the yield of wheat in the year 2018-19 was increased successfully which communicates the positive impact of front-line demonstrations over other local practices of wheat cultivation. Similar findings were observed by Singh *et al.* (2016) [4].

Technology Gap

The technology gap (18.30 and 17.40 q/ha in the year 2017-18 and 2018-19 respectively) reflected the farmers' cooperation in carrying out such demonstrations (Table 1). The technology gap observed may be attributed to variability in soil fertility and climatic conditions. The extension gaps were 5.20 and 5.90 q/ha during the period of the study, emphasizing the need to educate the farmers through various means for the adoption of improved agricultural technologies. Further implementation of the recent production technologies with high-yielding varieties would subsequently transform this alarming trend, which otherwise is widening the extension gap.

Technology Index

The technology index showed the feasibility of the evolved technology at the farmers' field. The lower the values of the technology index, the more is the feasibility of the technology. As such, an increase in the technology index from 30.34 to 28.38 percent (Table 1) suggested that the demonstrated technology was feasible to be adopted by the farmers.

Table 1: Productivity, extension gap, technology gap, and technology index of Wheat grown under FLD and local check

Year	Average yield in FLD (q/ha)	Average yield of local check (q/ha)	Increase overall local check (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (q/ha)
2017-18	42.70	37.50	13.8	5.2	18.3	30.34
2018-19	43.90	38.00	15.5	5.9	17.4	28.38

Table 2: The economic impact of Wheat under FLD with the traditional package of practices

Year	Cost of cultivation (Rs./ha)		Gross Return (Rs./ha)		Net Return (Rs./ha)		B:C ratio	
	Demo.	Local check	Demo.	Local check	Demo.	Local check	Demo.	Local check
2017-18	38500	36500	69388	60938	30888	24438	1.80	1.66
2018-19	38800	36700	79020	68400	40220	31700	2.03	1.86

Benefit: Cost (B:C) Ratio

The benefit to cost ratio from recommended practices was comparatively higher than the local check during both the years of the demonstration (Table-2). The average net return from the demonstrations was ₹ 30888 and ₹ 40220 per hectare while from the local check it was ₹ 24438 and ₹ 31700 per hectare during 2017-18 and 2018-19, respectively. The benefit-cost of demonstrations and local check were observed to be 1.80, 2.03 and 1.66, 1.86 during 2017-18 and 2018-19 respectively.

Conclusion

The present study demonstrated a significant positive result and permitted the researcher to demonstrate the productivity potential and profitability of the recently developed technology under a real farming situation which they had been encouraging for a long time. The results of the front-line demonstrations persuasively brought out that the yield of wheat could be increased with the intervention of recommended fertilizer application and high-yielding varieties. From the above findings, it could also be concluded that the use of high-yielding varieties of wheat cultivation reduced the extension and technology gap to a great extent. This would sustainably enhance the income as well as the livelihood of the farmers living in this district.

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