International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; SP6: 131-134

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(Special Issue -6)
3rd National Conference
On
PROMOTING & REINVIGORATING AGRI-HORTI, TECHNOLOGICAL INNOVATIONS [PRAGATI-2019]
(14-15 December, 2019)

Promotion of lowland rice variety Swarna sub - 1 through front line demonstration in eastern Uttar Pradesh

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Abstract
The study was carried out in Masodha, Sohawal, Milkipur and Pura blocks of Ayodhya district of eastern UP. These four blocks were purposely selected because; these blocks have maximum low land condition where traditional rice varieties were grown. Apart from frontline demonstrations, other extension methodologies *viz*., trainings, farmer-scientist interactions, Gosthies, Kisan Mela, field days and media coverage were also employed to get the maximum impact. The data were collected during the training programmes with the help of well structured training evaluation schedule. Total ten practices were selected as criteria to evaluate the farmers' knowledge gap and adoption of lowland rice production technologies. The results of the study revealed that the farmers had gained knowledge about the production technologies under lowland condition ranging between 13.33% in case of plant protection measures to 100.0% in case of high yielding Swarna Sub-1 variety, after attending the training programmes. It was noticed that maximum gained in adoption level was found with high yielding variety (100%), followed by establishment method (70.00%), time of sowing (65.00%), nutrient management (65%), seed rate (57.50%), weed management (45.00%) and spacing (32.50%).After attending training programmes, the farmers started adopting the improved technologies ranging from 22.50% for harvesting techniques to 95.00% for high yielding variety i.e. Swarna Sub-1.

Keywords: Knowledge, adoption, impact, sub 1, production technology, training, FLD

Introduction
Training programmes organised by KVK are very effective tool in any extension methodology being used for dissemination of latest agricultural technologies to the farmers. The formulated course content of training programmes specifically address to the latest technologies for higher agriculture production and also help to reduce constraints faced by the farmers during the farming practices. Front line demonstration is another extension tools for building confidence among the farming community for the technologies to be demonstrated. Demonstration provide an effective learning situation as farmers "see the crops themselves", "interact with the scientists and extension workers on the fields", and "get doubts clarified then and there itself". Thus, the training programme and demonstration are effective tools for disseminating newer technologies to the specified agro-ecological situations.
Present and anticipated global food demands necessitate asignificant increase in crop productivity in marginal farmlands. Rainfed lowland deep water rice together accounts for approximately33% of global rice farmlands (IRRI Social Statistics Database; Huke and Huke, 1997) [3]. About two thirds of the shallow and intermediate rainfed lowland rice lands are in India, Thailand, and Bangladesh. In India, the traditional deep water areas are limited,

about 0.4million hectares in West Bengal, 0.5 million ha in Bihar and approximate 0.6 million ha in eastern UP, being 13-14% of the area under wet season rice.

Lowland rice is cultivated in low lying areas of 5 to 25 cm of standing water, which are highly vulnerable to monsoon flash floods of 30 cm or more that can rapidly and completely submerge the rice plants. When partially or completely submerged, most rice varieties display a moderate capacity to elongate leaves and the portion of stems that are trapped underwater. This elongation growth leads to a spindly plant that easily lodges when floodwaters recede. If the flood is deep, underwater elongation growth can exhaust energy reserves, causing death within a matter of days. Of the lowland rainfed rice farms worldwide, over22 million hectares are vulnerable to flash flooding, representing 18% of the global supply of rice (Khush, 1984) [5]. An estimated ten million hectares in Bangladesh and India alone are marginalized by the threat of flooding each monsoon season (Huke and Huke 1997) [3]. As a coping strategy, farmers have traditionally cultivated chronically flood-prone lowlands with landraces that can endure 10 days or more of complete submergence and resume growth uponde-submergence (Catling 1992) [1]. However, these submergence tolerant landraces produce less than 20q/ha of grains in comparison to the 60-75 q/ha of yields with advanced semi-dwarf high yielding varieties. Unfortunately, the popular HYVs grown in large areas of eastern India are sensitive to complete submergence and usually die within 7 days of complete inundation.

The marker-assisted introgression of the SUB1 region has successfully improved submergence tolerance in a wide range of mega-varieties without any penalties on development, yield, and grain quality (Sarkar *et al*. 2006, 2009; Neeraja *et al*. 2007; Singh *et al*. 2009) [8, 6, 11]. These new lines endure submergence, as long as the flood occurs after the seedling stage but before flowering and the flood completely subsides within 10 to 20 days, depending on floodwater conditions. Land mark achievement in lowland technologies in 2009–2010, Swarna Sub-1 was released in India, Indonesia, and Bangladesh; BR11-Sub1 was released in Bangladesh; and IR64-Sub1 was released in the Philippines and Indonesia. The low yields coupled with less returns from lowland rice discouraged the farmers not to grow and adopt newer technologies in such agro ecosystem. The substantial change in lowland technologies using *sub1* gene along with the increasing interest of the farmers and the release of high yielding varieties of Swarna Sub-1rice provided the impetus to KVK to formulate and design specialized farmers training programmes impart knowledge as well as skills involved in the production of rice under lowland conditions. Besides this, frontline demonstrations along with other extension efforts were also planned and executed to narrow down the time lag and ensured speedy adoption of technologies.

Materials and Methods

The study was carried out in Masodha, Sohawal, Milkipur and Pura blocks of Ayodhya district of eastern Uttar Pradesh during 2011 to 2014. Three villages from each block were purposely selected where rice crops grown under submerged conditions and where flushes of flood prevailed during rainy season. Thus, in total, twelve villages were selected where trainings and demonstrations programme were executed by Krishi Vigyan Kendra. Various training programmes of short and medium-long durations were constituted and imparted during the period. Advance and recent technologies related to lowland rice production system were formulated under course content of training programmes. In total, 14 trainings and 76 ha front line demonstrations were executed benefitting 560 and 190 beneficiaries respectively, in the selected areas during the course of study. Under FLD programme high yielding variety Swarna Sub-1 were demonstrated along with improved agronomic practices for submerged condition. During the training programme, 30 farmers were randomly selected from each block (10 farmers from each village). Well structured interview schedule were distributed to each selected farmer and thus, pre and post programme information data were collected through personal contacts during the course of study. The gathered data were processed, tabulated, classified and analyzed in terms of percentage for fulfilling the objective of study. Total ten technological practices were selected as criteria to evaluate the farmers for the extent of knowledge gained and adoption level regarding lowland technologies as a result of training programmes and front line demonstration conducted.

Results and Discussion

Knowledge level of beneficiaries

Knowledge plays an important role in the adoption of an technology or any innovation by the farmers. It is assumed that the knowledge of a farmer to a larger degree depends upon the extent of exposure of technologies given to him. The gain in knowledge by the beneficiaries about the improved package of practices of lowland rice was measured in terms of percentage. Knowledge of beneficiaries was assessed under two major aspects i.e., knowledge before training and knowledge after training programmes. Similarly, front line demonstrations laid out during the course of study proved to be further speedy adoption of lowland rice production technologies. The results so obtained are presented in Table 1. The data reveals that the beneficiary farmers of the training programmes on wetland rice production technologies gained highest knowledge about high yielding variety i.e. Swarna Sub-1 (100.0%) followed by establishment method (60.83%), time of sowing (53.33%), nutrient management (58.7%), seed rate (50.00%), weed management (39.17%), land preparation (30.83%), harvesting techniques (28.33%), plant spacing (27.50%) and plant protection measures (13.33%). The findings of the study revealed that the beneficiaries gained knowledge ranging from 13.33% in case of plant protection measures to 100.00% in case of high yielding variety after attending training programmes. This might bedue to the fact that the beneficiary respondents possessed more knowledge about technologies due to trainings and demonstrations programme. The contents of these training programmes were designed and perceived in such a manner that easily be understood by the trainees and ultimately resulted into a substantial gain in knowledge through work experience. The findings are line with the findings of Joseph (2008) [4] and Singh *et al.* (2014) who reported a significant difference in the knowledge between trained and untrained farmers.

Table 1: Impact of training programmes on gain in knowledge level of beneficiaries

S. No.	Improved technology	Knowledge level of beneficiaries				Gain in knowledge level	Rank
		Before training	Rank	After training	Rank		
1.	Land preparation	83 (69.17)	I	120 (100.0)	I	37 (30.83)	VII
2.	Establishment method	21 (17.50)	VIII	94 (78.33)	III	73 (60.83)	II
3.	High yielding variety (Swarna Sub-1)	00 (0.00)	X	120 (100.0)	I	120 (100.0)	I
4.	Time of sowing	18 (15.00)	IX	82 (68.33)	V	64 (53.33)	III
5.	Seed rate	34 (28.33)	V	94 (78.33)	III	60 (50.00)	V
6.	Spacing	48 (40.00)	IV	81 (67.50)	VI	33 (27.50)	IX
7.	Nutrient management	27 (22.50)	VII	90 (75.00)	IV	63 (52.50)	IV
8.	Weed management	32 (26.67)	VI	79 (65.83)	VII	47 (39.17)	VI
9.	Plant protection measures	53 (44.17)	III	69 (57.50)	VIII	16 (13.33)	X
10.	Harvesting techniques	65 (54.17)	II	99 (82.50)	II	34 (28.33)	VIII

Figures in parenthesis indicate percentage

Adoption level of beneficiaries

The data presented in Table 2 revealed that the majority of farmers used traditional method of agronomic practices *viz.*, use of local cultivars/races (100%), late sowing (86.67%), poor weed management (85.83%), traditional establishment methods ie. 35 days old seedling transplanting (85.00%) and poor nutrient management due to continuous flooding (82.50%)before acquiring training, whereas, after attending training programmes 95.00% beneficiaries adopted high yielding variety of submerged condition ie. Swarna Sub-1, 78.33% timely sowing, 59.17% proper weed management, 85% establishment method *ie.* direct seeding and 82.50% adopted appropriate method of nutrient management. Such a higher level of adoption in case of high yielding variety Swarna Sub-1 coupled with other improved practices had actually paved the way for its wider spread at speedy rate. In case of other technologies, 31.67.% farmers were practicing plant protection measures before attending training programmes and 57.50% started after acquiring training programmes. Maximum gained in adoption level was found with high yielding variety (100%), followed by establishment method (70.00%), time of sowing (65.00%), nutrient management (65%), seed rate (57.50%), weed management (45.00%) and spacing (32.50%).Due to submergence tolerance the variety Swarna Sub-1 was accepted by all the farmers of the locality. Adoption level of beneficiaries increased more than 50% with all the improved practices. However, plant protection measures and weed management practices required further need of trainings as the adoption level were less as compared to other agronomic practices. These findings were in agreement with Patel *et al*. (2003) [7] and Singh *et al*. (2014) [13]. After attending training programmes, the farmers started adopting the improved technologies ranging from 22.50% for harvesting techniques to 95.00% for high yielding variety i.e. Swarna Sub-1. This might be due to the fact that gain in knowledge, skills and confidence level of farmers through training programmes on different production technologies such as high yielding variety, establishment method, time of sowing, nutrient management, seed rate, weed management, plant spacing, plant protection measures and harvesting techniques has helped in improving the productivity lowland condition and consequently its speedy adoption among the farmers.

Table 2: Impact of training programmes on adoption level of beneficiaries

S. No.	Improved technology	Adoption level of beneficiaries				Gain in adoption level	Rank
		Before training	Rank	After training	Rank		
1.	Land preparation	76 (63.33)	I	108 (90.00)	II	32 (26.67)	VII
2.	Establishment method	18 (15.00)	VII	102 (85.00)	IV	84 (70.00)	II
3.	High yielding variety (Swarna Sub-1)	00 (0.00)	X	114 (95.00)	I	114 (95.00)	I
4.	Time of sowing	16 (13.33)	IX	94 (78.33)	VI	78 (65.00)	III
5.	Seed rate	34 (28.33)	V	103 (85.83)	III	69 (57.50)	IV
6.	Spacing	39 (32.50)	III	78 (65.00)	VII	39 (32.50)	VI
7.	Nutrient management	21 (17.50)	VI	99 (82.50)	V	78 (65.00)	III
8.	Weed management	17 (14.17)	VIII	71 (59.17)	VIII	54 (45.00)	V
9.	Plant protection measures	38 (31.67)	IV	69 (57.50)	IX	31 (25.83)	VIII
10.	Harvesting techniques	51 (42.50)	II	78 (65.00)	VII	27 (22.50)	IX

Figures in parenthesis indicate percentage

Impact of frontline demonstrations

The data (Table 3) revealed that there is sizeable increase in the area from 6.0 ha in 2011to 30.0 ha in 2014 under FLDs' laid out on Swarna Sub-1 by KVK, Faizabad. In 2011, only 15farmers were covered under FLDs' but in the subsequent years their number rose to 75 till 2014.This subsequent increase in area as well as farmers coverage played a catalytic role in further dissemination of Swarna Sub-1 in Faizabad district. It was also revealed that there was significant increase in grain yield of Swarna Sub-1 which ranged from 56.51% to73.79% over local check i.e. Mehsuri. This is in conformity with findings of Haque (2000) [2] and Verma *et al.* (2015) [12]. Similarly, benefit cost (B: C) ratio ranged between 2.14 to 2.82 under demonstrations which was far less in case of local check. The field performance of Swarna Sub-1 under FLDs' strongly narrate it ssuperiority, in terms of percent increase in yield and B: C ratio over local check, among the other farmers. This leads to the speedy spread of Swarna Sub-1 variety in lowland areas of Faizabad district. The productivity gain under front line demonstration over existing practices of rice cultivation created greater awareness and motivated the other farmers to adopt suitable production technology of rice under rainfed lowland condition in the district.

Table 3: Yield performances of high yielding var. Swarna Sub-1 under demonstration

Year	No. of demonstrations	Area(ha)	Demo yield(q/ha)	Local check (q/ha)	Yield increment (%)	Net return (Rs./ha)	B.C ratio
2011	15	06.0	53.7	30.9	73.79	25080	2.26
2012	40	16.0	54.2	33.5	61.79	27390	2.38
2013	60	24.0	53.9	31.4	71.65	25400	2.14
2014	75	30.0	56.5	36.1	56.51	28920	2.82
Mean	190	76.0	54.57	32.97	65.51	26697	2.40

Conclusion

Thus, it can be concluded that there is technology gap, which need to be bridged by promoting the scientific production and protection technologies in varied condition. Training programmes backed by the field demonstrations conducted by KVK with the apparent objective for popularization of Swarna Sub-1in the district have proved to be the most effective and come up as an effective tool in the result toriented speedy dissemination of knowledge and technical skills to the farmers. Agricultural extension activities have resulted in increase in area under recommended variety Swarna Sub-1 and other agronomic practices. Further efforts are being made by way of Organising different extension activities for motivation of the farmers for further popularization and adoption of Swarna Sub-1. Therefore, for enhancing the production and productivity of a crop, strategy should be made for getting the more and more recommended technologies adopted by the farmers.

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