

Uptake and Pathways in introducing the Vegetable Crop Capsicum by KVK Khordha, Odisha

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Abstract

This paper explains about uptakes and pathways of introducing a new vegetable crop capsicum in Khordha district of Odisha by Krishi Vigyan Kendra (KVK), Khordha. The crop was introduced in 2011 through different extension methods and today more than 550 farmers have adopted this crop replacing chillies. The on-farm trial results indicated that the net income was higher with an increase in yield of 170.8 - 215.1 per cent by adopting capsicum in open field condition compared to farmers' practice of cultivating green chilli. It was also observed that there was a reduction in yield and quality of capsicum grown during spring-summer in open-field condition. The technology trialed was planting of capsicum and maize in the ratio 4:1 by sowing of maize 45 days after transplanting capsicum. The KVK conducted a trial on intercropping of capsicum with maize. For any crop to be established in the district there is a requirement of employing different extension methods for larger adoption. In this case different extension methods viz., individual, group and mass media were employed for faster reach of this crop. On-farm trials, front line demonstrations, technology week, farmer scientist interactions, field days, exhibitions and trainings were the specific extension methods. During the period all possible ways for larger adoption of capsicum were undertaken by the KVK. The success points in introducing this crop is the availability of capsicum seeds with all input dealers and high market demand. KVK is still helping farmers in providing advisory services for increasing the area under capsicum and also for higher production.

Key words: Adoption, capsicum, new crop establishment, extension methods

Introduction

New crop development is the adoption of a plant in a particular geographic region (for the purposes of production) so that it can be manipulated as a crop for the

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generation of some commercial product for the satisfaction of consumers (Blade and Slinkard, 2002). Wallis *et al.* (1989) noted that it was important to have well-developed selection criteria to identify successful new crop industries in any region. The same is true in the introduction of crops to any region. This paper shares experiences in such a crop establishment in Odisha state of India. Odisha is an agrarian state in India with varied crops grown from time immemorial, however extension agencies have played a significant role in bringing changes in cropping systems. Introducing new crops that fetch more price among the farmers is one of the key agenda of the extension agencies. Uptake pathway involves the process of capturing how a biotech crop is introduced, adopted, disseminated and shared by farmers with others (Torres *et al.*, 2012). The same is true with hybrid crops being introduced, adopted and spread to larger communities.

In Odisha capsicum (*Capsicum annum* L. var. *grossum* Sendt) is grown on a limited scale in different districts and predominantly the supply of capsicum to the state is from other states. Khordha is one of the 33 districts of Odisha which has a favourable climate for cultivating cereals, pulses, oilseeds and different vegetable crops. Varieties of vegetables are grown during *rabi* season and this is found to be increasing day by day. Krishi Vigyan Kendra (KVK)-Khordha under the administrative control of ICAR-Central Institute of Freshwater Aquaculture is mandated to work in Khordha district with the mandates of technology assessment, refinement and demonstration. The KVK has been responsible for introducing new crops and varieties, breeds of animals and fish species with scientific package of practices for improving production and farm income. The farmers in Khordha district used to grow chilli after paddy was harvested and were not aware of capsicum cultivation, having the perception that “it will not grow in their soil and also will not be sold out in the local market.”

The KVK constantly tried to bring change in the pre-conceived idea of the farmers and introduce a high value and low volume vegetable capsicum under crop diversification in the district. Capsicum is also called bell pepper and is one of the high valued vegetables with higher concentrations of antioxidants. Nutritionists indicate that a small bell pepper could provide up to three times more of the recommended daily amount of vitamin C compared to any citrus food. The vegetable also possesses a very high content of vitamin A, C and E (all anti-oxidants) that help to effectively neutralize free radicals. India contributes one fourth of world production of capsicum with an average annual production of 0.9 million tons from an area of 0.885 million hectare with a productivity of

1266 kg per hectare (Sreedhara *et al.*, 2013). This paper is an analysis on the new crop development, its pathways and its performance through adaptive trials, demonstrations and using other extension methods with the following objectives:

1. To analyse the pathways of new crop development
2. To analyse the technology assessment and demonstration results undertaken in the crop
3. To study the impacts created in introduction of capsicum in the district

Materials and Methods

Study area

Khordha is one of the 31 districts of Odisha situated near the capital city Bhubaneswar. Khordha is the headquarter of the district of the same name and is situated on the National Highway No. 5. The district as a whole is divided into two geographical regions viz. South Eastern Coastal Plains and North Eastern Ghats comprising of 10 blocks. The former region has alluvial soils while the latter has red lateritic sandy soil and some patches of ideal alluvial soil. Except Baliana and Balipatna blocks which have alluvial soil, the other 8 blocks in the district have laterite sandy soils. While Baliana, Balipatna, Bhubaneswar and a small portion of Jatni Block are irrigated by canal systems of Mahanadi, Delta Stage II, Banapur Block is irrigated by Salia MIP, Tangi block by Malaguni MIP. Khordha district has about 39,702 hectares of high land, 43,499 hectares of medium land, 14130 hectares of cultivable and 15457 hectares of barren land. The high and medium land, together measuring around 83,151 hectares is conducive for horticulture while the cultivable and barren land is suitable for plantation of crops and vegetables. Cashew nut, mango, coconut, banana, citrus and brinjal, potato, cauliflower, onion, chilli, cabbage, cucumber, tomato *etc.* are the major fruit and vegetable crops in the district.

Selection of Farmers

The farmers under the study are the beneficiaries of the On-Farm Trial and Front Line Demonstrations of KVK. All the 30 farmers who benefitted out of the interventions of KVK were selected for the study. Farmers for the trials and demonstrations are selected from the adopted villages of KVK. The selected farmers have characteristic features of better socio-economic status and possess land to trial out the technology and are innovative. In the year 2012-13, 10 farmers were selected and 20 in 2013-14 from seven blocks (Tangi, Begunia, Khordha,

Jatni, Bhubaneswar, Baliana, Balipatna) and nine villages (Tankol, Kuradhilo, Saradhapur, Adakhandia, Kantia, Saradeipur, Nagapur, Taradapada, Rajas) of Khordha district.

Results and Discussions

Pathways of New Crop Development

Like any other crop introduction in the district, the KVK was working on awareness programmes for farmers to cultivate capsicum by replacing chillis to an extent, with the objective of increasing farmers' income. With this initiative the KVK constantly informed farmers that capsicum could be grown in Khordha district and the concern was "it will not grow in our soil and will capsicum be sold at the local market?" The opportunity to introduce the crop came to KVK during 2011 after the floods hit the district. KVK worked on the flood assistance programme and farmers were provided with seedlings of vegetables. Along with other vegetable seedlings capsicum seedlings were also provided but farmers were reluctant as they had the pre conceived idea that it would not grow in their soils. As the need of the hour farmers accepted the seedlings of capsicum and were astonished to infer that "Capsicum will grow in our Soil". Today the crop has spread to 550 farmers in the district cultivating capsicum due to the initiation of KVK. The timeline of the introduction is presented below:

Table 1. Timeline of Capsicum as a newly introduced crop in Khordha district

Year	2011-12	2012-13	2013-14	2014-16
Pathways	• Seeds were procured from other districts • No suppliers of capsicum seeds in Khordha district • Seeing is believing • Farmers become confident that capsicum can be grown in their soil	• KVK advised the input dealers to procure and supply seeds at district level • Location specific testing and confirmation	• Seed availability became common in the district • Capacity building of farmers through training, demonstration • Government provided seeds to farmers at subsidized rate (post phailin period)	• Inclusion in demonstration programmes under ATMA in different blocks of the district • Supply of capsicum seedlings free of cost through horticulture department • Various extension methods employed for horizontal spread • Spread to 550 farmers to adopt in the district • Local farmers have contributed to partial replacement of Capsicum supply from Bangalore

In 2011-12 capsicum seeds were procured from other districts as there were no input dealers who were interested to market. It was during this period that the flood assistance led to 150 farmers receiving and trying the crop from KVK. With a strong presence and contact with the input dealers KVK influenced them to procure capsicum seeds and today it is invariably available in all shops which paved

the way for farmers to adopt this crop. The pathway of new crop development took five years to influence the farmers to adopt this crop. Varietal Assessment and Frontline Demonstrations were carried out in the farmers' field selecting a hybrid variety "Indra" to assess its suitability to open field condition as well as the profitability of capsicum crop over green chilli. Today the district has more than 550 farmers who are cultivating both open-pollinated and hybrid varieties of capsicum adopting scientific management practices.

Varietal Assessment and Demonstrations

From the trial results it was observed that the net income was 142.7-163.2 per cent higher with an increase in yield of 170.8 - 215.1 per cent by adopting capsicum in open field condition compared to farmers' practice of cultivating green chilli. The farmers adopted a closer spacing of 60 x 45 cm for the hybrid Var. Indra instead of 75 x 60 cm as the plant growth is not vigorous in open field condition. The results of the assessment trials are presented below in Table 2.

Table 2. Results of Varietal Trials on Capsicum

Year	No of Trials	Yield (q/ha)		Net returns (in Rs/ha)		% of increase over control
		Farmers Practice	Recommended Practice	Farmers practice	Recommended Practice	
2012-13	10	112.0	353.0	130057	3,42,399	215.1
2013-14	20	123.6	334.7	238251	5,78,348	170.8

It was further observed that though fruiting continues in the plant with increase in temperature there is reduction in fruit size. The observation of fruit size during different stages is presented below in Table 3.

Table 3. Observation on Fruit Sizes at different stages of harvesting

Stage of harvesting	No of fruits (Ave no of fruits / kg)	Harvesting Period
Initial stage of harvesting	8-9	January-February
Mid stage of harvesting	12-13	March
Final stage of harvesting	18-22	April-May

The KVK also observed that there was a reduction in yield and quality of capsicum grown during spring-summer in open-field condition. The technology trailed was planting of capsicum and maize in the ratio 4:1 by sowing of maize 45 days after transplanting capsicum. To solve this problem KVK conducted an on-farm trial on intercropping of capsicum with maize.

Table 4. OFT results of intercropping of Capsicum and Maize

Result	Parameters	Data on Parameters	Cost of Cultivation	Net Income (Rs.)	B:C Ratio
T1	Yield of Capsicum(q/ha)	282.6	1,27,635	5,36,475	5.20
	Fruit/Kg	11-13			
	Fruit wt(gm)	97.4			
	Fruit damage (%)	6.15			
T2	Yield of Capsicum(q/ha)	311.7	1,40,195	5,98,300	5.68
	Yield of Maize cob(q/ha)	85.26			
	Fodder Yield(q/ha)	81.6			
	Fruit/Kg (no.)	10-11			
	Fruit wt(gm)	105.6			
	Green cob/ plant(no.)	1.625			
	Cob wt(gm)	530			
	Fruit damage (%)	3.85			

The trial indicated that intercropping of capsicum with maize has better profits for farmers with a B:C ratio of 5.68 compared to mono cropping of 5.28. The net income of monocropping was Rs. 5,36,475 and with intercropping it was observed to be Rs. 5,98,300 (Table 4).

Extension Methods Employed

For any crop to be established in the district there is need to employ different extension methods for larger adoption. In this case different extension methods, viz., individual, group and mass media were employed for faster reach of this crop. On-farm trials, front line demonstrations, technology week, farmer scientist interactions, field days, exhibitions and trainings were the specific extension methods. During the period all possible methods for larger adoption of capsicum were undertaken by the KVK. Special attempts were also made towards using mass media especially Doordarshan in documenting success stories. Farmers from all the blocks have been benefitted. The KVK also worked on popularising through the progressive farmers of the district as farmer to farmer extension will be faster. The employed extension methods and beneficiaries are presented in Table 5.

Table 5. Extension Methods and Activities towards promotion of Capsicum in the district

Year	Activity	Beneficiary	No. of blocks covered
2011-12	Technology Week on Integrated Agriculture	Farmers, Extension Personnel of Line Departments	10
	State Level Exhibition of KVKs of Odisha	Farmers, Extension Personnel of Line Departments	7
2012-13	Orientation Training Programme	Progressive Farmers, Block level ATMA Officials, LVAWs, VAWs	1
	Field Day	Farmers, Extension Personnel of Line Departments	1
2013-14	Vocational Training	Practicing Farmers	1
	Field Day	Farmers, Extension Personnel of Line Departments	1
2014-15	Training of Extension Functionaries	Block level ATMA Officials	4
	Door Darshan Coverage	Farmers	2
	Exhibition at Regional and State Level Krushi Mahostav	Farmers, Extension Personnel of Line Departments, NGOs	10
	Demonstration under ATMA	Farmers	1
	Farmer-Scientist Interaction	Farmers, Extension Personnel of Line Departments	4
2015-16	Pre-Rabi Sammelan	Farmers, Extension Personnel of Line Departments	10
	Exhibition at District Level Krushi Mahostav	Farmers, Extension Personnel of Line Departments	10
	Distribution of extension literature	Farmers, Extension Personnel of Line Departments	10
	Training	Progressive Farmers	7

Impact at Input and Market levels

The impacts of the interventions of KVK on this crop have been on the availability of seeds with all input dealers in the district. As the seeds are available and farmers have started cultivating the capsicum crop, its presence is widely seen in the local markets. Gradually the influx of capsicum from Bangalore markets to Bhubaneswar has been reduced as the crop is cultivated locally. It is also observed that Capsicum fetches a market price of Rs. 1600 to Rs. 4500/q during the months of January-April which is a boon to the farmers. The demand for capsicum is increasing at the household level and at the burgeoning chain of fast food restaurants. Udyan Fresh and Veggies Kart are looking for capsicum from KVK adopted farmers.

Conclusion

The lessons learnt in introducing capsicum by KVK, Khordha over the period of time are that employing a combination of extension methods for larger adoption, will be successful. With the availability of seeds with the input dealers it has become common for farmers to cultivate capsicum and farmers are also in an advantageous position as the crop fetches a good price in the market compared to chillies. The trials and demonstrations conducted by KVK and results linked to state governments to promote this crop is the key towards the spread. The net income was 142.7-163.2 per cent higher with an increase in yield of 170.8-215.1 per cent by adopting capsicum in open field condition compared to farmers' practice of cultivating green chilli which is one of the reasons for promotion. Over the period of time KVK expects that the district will be self sufficient with the availability of capsicum and reduce imports from neighbouring states. The flourishing small scale food cafes in Bhubaneswar city are a boon for the capsicum farmers.

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