

Farmer FIRST approach

for improving livelihood of pumpkin growers in Odisha

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Pumpkin hybrid 'Vimal' was raised with best management practices under Farmer FIRST Programme operational at Odisha University of Agriculture and Technology, Bhubaneswar during 2017-18 and 2018-19 in Gobindpur Gram Panchayat in Khordha district of Odisha. Because of the FFP interventions, farmers could produce 120 tonne fruit yield of pumpkin, which fetched them bills worth 5 lakh. The income generated from pumpkin cultivation brought significant improvement in livelihood of farm families in form of food and nutritional security, better health care, education of children and creation of household assets.

Keywords: Farmer FIRST, Livelihood, Pumpkin, Odisha

THE Farmer FIRST Project was launched by Indian Council of Agricultural Research, New Delhi in 2016-17 with a belief that a breakthrough in income and livelihood of farmers is possible by proper utilization of available resources in the farm and adoption of technology turned innovations with science touch. The scientists of OUAT implemented Farmer FIRST Project 'Enhancing productivity and profitability with 'Farmer FIRST' focus in Khordha district of Odisha' in the Gobindpur Gram Panchayat,

Khordha district, Odisha in March 2017 with this concept.

Agro ecological setting of the farms

The selected cluster of villages was located in East and Southeastern Coastal Plain Zone (NARP Agro Climatic Zone 63).



Pumpkin hybrid at fruit setting stage.



Pumpkin at seedling stage.

The area receives average annual rainfall of 1500 mm. The soil is red and lateritic. Agriculture is pre-dominantly rainfed and monoculture is common. Cropping was restricted to rainy season lasting for 4 months only. Agriculture is non-remune-

rative and very risky due to menace of wild animals like elephants, monkeys and boars. Migration of youth of farm families to far off cities in quest for work is common. The percentage of aged persons in farming was high. There were efforts by Gram Panchayat and line departments in agriculture to check migration, attract and retain the youth in agriculture.

Resources

The villages are surrounded by forests. The forest vegetation facilitates *in situ* rainwater harvesting and recharge of ground water. Thirty bore wells were dug up to exploit ground water for growing crops

Table 1. Improved package of practices for cultivation of hybrid pumpkin var. Vimal

Particular	Description
Pumpkin hybrid 'Vimal'(Tokita)	Small to medium size fruits with green to yellow colour at maturity, small cavity, less seeds/ fruit, light orange flesh colour. Fruit is sweet with excellent storability. Crop duration is long and yield potential is high.
Planting method	Direct sown crop. Ridge and furrow method of planting Plants/basin: 2-3 plants Seed rate: 1250 g/ha
Nutrient management	FYM: 25 t/ha Recommended dose of fertiliser @ 100-60-80 kg N-P ₂ O ₅ -K ₂ O/ha Method of application: Basal application as 50% nitrogen along with 100% P ₂ O ₅ and K ₂ O before planting of seeds. Remaining 50% N was applied as top dressing in two splits at the time of vining (25–30 days after planting) and at full blooming (55–60 days after planting). Method of application of fertilisers: Inorganic fertilizers were applied in the basins. Excess application of nitrogenous fertilizers at the time of flowering and fruiting was avoided to minimize production of male flowers and fruit drop.
Water management	Critical stages of irrigation to pumpkin are at vegetative stage, flowering stage and fruit setting stage. Irrigation at the time of fruit maturity was stopped to improve storability of fruits. Over irrigation during vegetative and early flowering stages cause excessive vine growth resulting in induction of more staminate flowers in the vine. It also encourages the pests and disease incidence. Furrow irrigation is adopted for pumpkin.
Weed management	At the initial stages of weed growth, hand weeding and hoeing are sufficient to check the weed growth. Butachlor @ 1.5 kg/ha was applied as pre-emergence to control weeds at the initial stage and promote early seedling vigour. Manual weeding at 21 days after planting integrated for satisfactory weed management.
Growth regulator/hormone application	The farmers were advised to apply ethephon/ethrel (2-chlorethyl phosphonic acid) @ 250 ppm four times; the first at 2- true leaves stage i.e. 15 days after planting and subsequently repeated thrice at 7 days interval.
Crop protection	Important insect pests recorded in pumpkin field are Red pumpkin beetle, Serpentine leaf minor and Aphids. Important diseases recorded in pumpkin field are Downy mildew, Powdery mildew, Anthracnose, Cucurbit phyllody and mosaic viruses. <i>Management strategies for insect pests</i> a) Clean cultivation b) Intermittent raking around the plant base c) Application of neem cake (one hand full or 100g in each basin) at the time of planting d) Spraying of carbaryl 50 WP @ 4g/l or Triazophos @ 2 ml/l e) For fruit fly: Application of bait containing 0.05% malathion and 10% gur or sugar in 20 litres of water. <i>Management strategies for diseases</i> a) Collection and destruction of infected plant parts b) Downy mildew: Spraying of karathane @ 0.1% at 14 days intervals for powdery mildew while mancozeb or chlorothanil @ 2 g/l at 7 days intervals c) Anthracnose : Application of mancozeb @ 0.2% or carbendazim @ 0.1% at 7-10 days interval depending upon the severity d) Mosaic virus disease: Spraying of 0.05% dimethoate at 15 day intervals to reduce the white fly population.
Specific intercultural operations	Fruit drop in pumpkin may be due to excessive vine growth due to high nitrogen nutrition coupled with high temperature. High soil moisture condition promote staminate flowers in the vine resulting low fruit set and low yield. The best way to control the vine growth within reasonable limits is by adjusting nitrogen fertilizer doses and frequency of irrigation. Application of two sprays of Ethrel @ 100 to 250 ppm at 2-true leaf stage and 4-true leaf stage to promote pistillate flowers in the vine and increase fruit yield. Dusting of pollen grains on stigma of opened female flowers to increase fruit set and covering fruits with paper or polyethylene sheets to avoid attack of fruit flies.

Apiculture was adopted during 2018-19 and bee boxes with active colonies were installed near pumpkin field.

round the year. Due to creation of water resources, it was possible to grow vegetables round the year in uplands and after harvest of rice in medium and low lands. Considering socio-economic importance of the crop and farmers' preference, the

project scientists decided to introduce hybrid pumpkin as an enterprise for livelihood improvement of the farmers.

Socio-economic importance of pumpkin

Pumpkin, an important

cucurbitaceous vegetable crop, is extensively grown in different parts of the country (acreage 72,000 ha with a production of 15.82 lakh tonnes and productivity of 21.97 t/ha). It is popular among the farmers due to high productivity, low cost of



Scientists interacting with farmers



Mature harvested fruits

production, long keeping quality of the fruits, adaptability to a wide range of climatic conditions, good transport potentialities and high nutritive value. It is the natural source of β -carotene (around 50 mg/100 g of edible portion) and matured fruits are used as industrial raw material for carotene production. All above-ground parts of plant (leaves, staminate flowers and both mature and immature fruits) are utilized as vegetable in different forms. Fully matured fruits, apart from use as cooked vegetable, are used to prepare value added products such as sweets, candy, fermented beverages, halwa, jams, sauce and ketchup. Yerussen prepared from immature fruits is very popular in Kerala. Seeds after removing the coat are used in confectionary. Seed oil (50% of the seed) is a common salad oil in the southern part of Austria, Slovenia and Hungary.

Technology

The farmers were encouraged to cultivate hybrid pumpkin in compact patches of land surrounding the bore wells. They were advised to raise pumpkin hybrid 'Vimal' (Tokita Hybrid Seeds) during 2017-18 and

2018-19. The seeds were planted with equal basin-to-basin spacing of 1.2 m in both sides. Bee boxes were installed in the field for better pollination and fruit setting. Farmers were organized into groups depending on location of bore wells and ownership of the land for effective execution of various activities viz crop production, crop protection and marketing. The improved packages of practices were recommended to various groups for cultivating pumpkin with high profit.

Group formation

During 2017-18, 43 households belonging to 21 Farmer Groups raised pumpkin in 21 compact patches. Each patch was taken care of by 1-3 farmers/household. Similarly, during 2018-19, 22 households formed 8 groups for raising the crop. Each group comprised 1-6 farmers/household. In case of single household, the family members participated in production and marketing of fruits and other economic products of the plants.

Productivity and profitability

2017-18: The crop was planted during 3 November to 20 December,

depending on whether the crop was grown in uplands or in medium lands after harvest of rice. The ripe fruits were harvested during 7 February to 30 March 2018. The crop took around 90 days for maturity. The compact patch size varied from 0.1 to 0.4 ha. The total crop area under pumpkin was 4.50 ha. The yield of ripe fruits varied from 22.50 to 36 t/ha with the average yield of 26.25 t/ha. The cost of cultivation varied from ₹ 81,000 to ₹ 1,25,000/ha with average value of ₹ 99,643/ha. The net return varied from ₹ 82,000-1,92,000/ha with the average of ₹ 1,15,976/ha. The benefit: cost ratio was 1.16:1. Price of mature pumpkin fruits was ₹ 8,000 and ₹ 8,500/tonne during 2017-18 and 2018-19, respectively.

The farmers got ripe pumpkin fruit production of 120.6 t from 4.5 ha of land area and realized gross return of ₹ 9,64,000, net return of ₹ 5,14,000 and B: C of 1.14:1 with an total investment of ₹ 4,50,000 within time span of around 3 months.

2018-19: The farmers planted the crop during 18 October to 29 December 2018 and harvested during 26 January to 30 March 2019.



Picking of matured fruits and assemblage for transportation.



Storage of ripe pumpkin fruits under shade of mango tree in summer before transportation.

The yield varied between 23.32 to 30.25 t/ha with an average of 27.21 t/ha. The cost of cultivation varied from, ₹ 74,500 to ₹ 88,500/ha. The gross return varied from ₹ 1,98,220 to ₹ 2,57,125/ha with an average of ₹ 2,31,306/ha. The net return varied from ₹ 1,22,220 to ₹ 1,70,500 /ha with an average of ₹ 1,52,681/ha. The B:C ratio was 1.94:1.

The farmers got mature fruit yield of 109.60 tonnes from 4 ha of land with an investment of ₹ 3,21,000 and realized gross return of ₹ 9,31,600, net return of ₹ 6,09,800.

Crop performance

The pumpkin fruit yield was marginally higher during 2018-19 (27.21 t/ha) as compared to 2017-18 (26.95 t/ha). This could be due to the introduction of apiculture for enhancing pollination and increased awareness among the farmers about scientific cultivation. The gross return during the second year was 7.6% higher than the first year mainly due

to higher price of produce. The net return (₹/ha) during the second year was 31.6% higher than that during the first year and so was the B:C ratio.

Marketing of produce

The project site was located at a distance of 25 km from district headquarter Khordha and 50 km from state capital Bhubaneswar. These two markets provided ample opportunities for disposal of produce with reasonable price. Due to good storability of fruits, there was no distress sale. They stored a part of produce for domestic consumption throughout the year.

Socio-economic impact

The income generated from pumpkin cultivation brought significant improvement in livelihood of farm families in form of food and nutritional security, better health care, education of children and creation of household assets. Impressed by crop

performance, the farmers of nearby villages have adopted the practice in more than 15 ha area. The technology can be transmitted to areas with irrigation water sources, viz. borewell points and riverbanks in Eastern India.

SUMMARY

The Farmer FIRST approach has worked well in improving livelihood of farmers in the adopted villages. The farming community adopted the technology primarily due to assured income with less post-harvest losses. They also used male flowers and twigs as vegetables and sold in urban markets. By adopting apiary, they got higher fruit yield and profit from pumpkin cultivation and extra income from sale of honey. The farmers accepted cultivation of hybrid pumpkin in the present climate change scenario.

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Success Story

Hi-Tech Pan Boroz: A new vista in betelvine cultivation

Betel leaf is one of the important commercial crops of the district South 24 Parganas. Out of total cultivable area of 368,197 ha of the district, betel leaf occupies 2,685 ha area covering around 35,000 households from six blocks. This crop has become mainstay of occupation for blocks namely Sagar, Namkhana and Pathar Pratima.

Betelvine, a shade loving crop, is usually grown in *boroz*—an artificial shade structure made up of bamboo, paddy straw and other related bio-degradable items. Growing betel vine within this structure is prone to numerous diseases and insect pests. These structures are also frequently affected by storms and cyclones in the coastal area. A durable *boroz* structure using GI pipes on concrete basement fitted with green shade net, 75% on the top and 50% on the side walls, was developed by KVK of South 24 Pargana. It is made up of non-degradable items, thereby, chances of pest and disease attack are very low. This *boroz* is fitted with micro-sprinkler irrigation facility, which reduces irrigation cost, maintains temperature and humidity within the *boroz* during the hot summer and dry winter. It gives uniform shading resulting in uniform colouration of leaf. After adopting this modern *boroz*, farmers are experiencing better profitability in betelvine cultivation due to lower cost of cultivation, minimum/no recurring cost for maintenance of *boroz* structure, higher production and higher market value of the produce (leaf) due to good colour, shape (roundish) and lustre of the leaf. The construction cost of a Hi-Tech *boroz* of 500 m² size is ₹ 300,000. Farmer needs to bear 50% of the total cost and the rest is assisted by State Department of Horticulture through NHM scheme. KVK has made an arrangement of getting bank loan of the farmers' contribution amount (50% of the total cost) through a tying-up programme with local banks. For the ease of the farmers, door step bank account opening was done at village level. At present, around 2,000 farmers approached KVK for getting this type of hi-tech *boroz* in lieu of their traditional one.



Betel crop on modified *boroz* structure

Source: DARE-ICAR Annual Report 2019-20