

TECHNOLOGICAL TRANSFORMATION IN CROP PRODUCTION- A CASE STUDY

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Abstract

Tomato is a traditional crop as well as commercial crop in India. It is also a short term profitable crop and always has more demand and supply in the market. For that reason, many varieties of new tomato's seed and hybrid seeds are used for high production of tomatoes. Even though hybrid varieties give more income and more production, some kinds of farmers till now stick to the traditional variety of tomato crop cultivation because of the cost of production of the crop. So that this study would carry out what is the cost and returns for the both varieties of the tomato farming with help of the cost benefit analysis , Objective of this study was Cost and returns among traditional Tomato cultivating farmers and farmers involved in cultivation of Hybrid Tomato crop.

Keywords : Seed Rate, Irrigation, Harvesting Method, hybrids varieties, Transportation.

Introduction

Tomato (*Lycopersicon esculentum*) belongs to the genus *Lycopersicon* under the Solanaceae family. Tomato is an herbaceous sprawling plant growing to 1-3 m in height with weak woody stem. The flowers are yellow in colour and the fruits of cultivated varieties vary in size from cherry tomatoes, about 1-2 cm in size to beefsteak tomatoes, about 10 cm or more in diameter. Most cultivars produce red fruits when ripe. Tomato is a native to Peruvian and Mexican regions. Though there are no definite records of when and how it came to India, the Portuguese perhaps introduced it to India. Tomato is one of the most important "protective foods" because of its special nutritive value. It is one of the most versatile vegetables with wide usage in Indian culinary tradition. Tomatoes are used for soup, salad, pickles, ketchup, puree, sauces and in many other ways it is also used as a salad vegetable. Tomato has very few competitors in the value addition chain of processing.

Improved varieties

Arka Saurabh, Arka Vikas, Arka Ahuti, Arka Ashish, Arka Abha , Arka Alok, HS101, HS102, HS110, Hisar Arun, Hisar Lalima, Hisar Lalit, Hisar Anmol, KS.2, Narendra Tomato 1, Narendra Tomato 2, Pusa Red Plum, Pusa Early Dwarf, Pusa Ruby, Co-I, CO 2, CO 3, S-12, Punjab Chhuhara, PKM 1, Pusa Ruby, Paiyur-1, Shakthi, SL 120, Pusa Gaurav, S 12, Pant Bahar, Pant T3, Solan Gola and Arka Meghali.

F1 hybrids:

Arka Abhijit, Arka Shresta, Arka Vishal, Arka Vardan, Pusa Hybrid 1, Pusa Hybrid 2, COTH 1 Hybrid Tomato, Rashmi, Vaishali, Rupali, Naveen, Avinash 2, MTH 4, Sadabahar, Gulmohar and Sonali.

Climatic Requirement

The tomato is a warm-season crop. The crop does well under an average monthly temperature of 21°C to 23°C. Temperature and light intensity affect the fruit-set, pigmentation and nutritive value of the fruit. Long dry spells and heavy rainfall both show detrimental effects on growth and fruiting.

Soils

The tomato grows on practically all soils from light sandy to heavy clay. Light soils are good for an early crop, while clay loam and silt-loam soils are well suited for heavy yields. Tomatoes do best in a soil that has a soil reaction from pH 6.0 to 7.0. If the soil is acidic, liming is required.

Seed rate

- For raising the seedlings in the nursery bed 300 - 400 g/ha seeds are required.
- Hybrid seeds are very costly so they should be sown in plastic cups or ice cube trays, which require only 70-90 g.

Time of planting

Tomato is a day-neutral plant so widely it is found grown in any season. In the northern plains three crops are taken but in frost affected areas rabi crops are not fruitful. The kharif crop is transplanted in July, rabi crop in October - November and zaid crop in February months. In the southern plains where there is no danger of frost, the first transplanting is done in December-January, Second June-July Third in September-October depending on the irrigation facilities available

Raising seedlings

Seedlings are grown before one month of transplanting raised beds of 60-100 cm width and of convenient length. Soil solarisation of nursery beds by covering them with white transparent polythene sheets for one month should be done in hot summer months. It will kill the disease causing organisms like fungus, bacteria, and seeds of weeds.

Land preparation

Land is prepared to a fine tilth by thorough ploughing or digging 2 - 3 times. At the last ploughing organic manure and 10 kg carbofuran granules or 200 kg neem cake has to be applied.

Manuring

Apply well rotted farmyard manure / compost at 20-25 tha at the time of land preparation and mix well with the soil. A fertilizer dose of 75:40:25 kg N: P 203:K_0 / ha may be given. Half the dose of nitrogen, full phosphorus and half of potash may be applied as basal before transplanting. One fourth of nitrogen and half of potash may be applied 20-30 days after planting. The remaining quantity may be applied two months after planting.

Transplanting

The transplanting is done in small flat beds or in shallow furrows depending upon the availability of irrigation. In heavy soil it is usually transplanted on ridges and during the rains also it is advantageous to plant the seedlings on ridges. For indeterminate varieties/hybrids, the seedlings have to be staked using bamboo sticks of two meter length or planted in a broad ridge of 90 cm width and 15 cm height. The seedlings are planted in the furrows at a spacing of 30 cm and the plant is allowed to spread on the broad ridge.

Irrigation

Tomatoes need very careful irrigation that is just sufficient water at the right time. It is necessary to maintain an even moisture supply. During summer season, irrigation at every 5 to 7 days interval is necessary, whereas in winter 10 to 15 days interval is sufficient. A period of drought followed by sudden heavy watering during the fruiting period may cause cracking of fruits.

Weed Control

There is need of light hoeing during the first four weeks in the field which encourages the growth but also removes the weeds from the field. The surface soil is loosened by hand hoeing as soon as it is dry enough after every irrigation or shower. All weeds should also be removed in this process. Mulching with straw, black polythene and many other materials has been found beneficial in moisture conservation, in controlling weeds and some diseases.

Disease

Tomatoes are attacked by a vast range of fungus, bacteria and viruses. The most common diseases are anthracnose, bacterial spot, bacterial blight, bacterial canker, buckeye rot, damping off, early blight, fusarium blight, late blight, leaf curl, mosaic, powdery mildew, rots, and septoria leaf blight.

Harvesting Method

The harvest of tomatoes is dependent on the closeness to the market. Harvesting every day may be desirable during the peak of the season. Remove all diseased, misshapen, and otherwise cull tomatoes from the vines as soon as they are discovered. Remove discarded tomatoes from the field to avoid the spread and build up of diseases and insect pests.

Means of Transportation

Tomatoes are highly perishable in nature hence quick means of transportation is necessary. Tomatoes are transported by road through tractors, trucks and also by rail and air to distant markets. Village produce is transported to the nearby towns and city market only by road. The cargo services are also available for transportation. Processed tomatoes are having high export potential hence transported to different countries like USA, Saudi Arabia and Japan etc. The following section discussed the cost benefit analysis for the Traditional Tomato as well as Hybrid tomatoes.

Cost-Benefit Analysis

Cost-Benefit Analysis (CBA), sometimes called Benefit-Cost Analysis (BCA), is a systematic process for calculating and comparing benefits and costs of a project, decision or government policy. CBA has two purposes i.e., to determine if it is a sound investment decision (justification/feasibility) and to provide a basis for comparing projects. It involves comparing the total expected cost of each option against the total expected benefits, to see whether the benefits outweigh the costs, and by how much. CBA is related to, but distinct from cost-effectiveness analysis. In CBA, benefits and costs are expressed in monetary terms, and is adjusted for the time value of money, so that all flows of benefits and flows of project costs over time are expressed on a common basis in terms of their "net present value."

Review

Chapagain et al.(2011) in their study "Performance of Tomato Varieties during Rainy Season under Plastic House Conditions" revealed that the highest marketable yield was recorded from All Rounder (86.6 t ha⁻¹) followed by Srijana (80.8 t ha⁻¹). Srijana took the shortest period for flowering and harvesting with an average of 37 and 77 days after transplanting respectively. This was also the tallest variety (268.7 cm) with more clusters (36.23) per plant. However, the highest average single fruit weight was recorded from Manisha (61.94g), and the largest fruit size in US-04 with a diameter of 5.78 cm.

Sepat et al. (2011) in their study "Energy use efficiency and cost analysis of tomato under greenhouse and open field production system at Nubra valley of Jammu and Kashmir" was examined that the aim of this study was to estimate the amount of input and output energy per unit area and to make an economic analysis of tomato production in greenhouse and open field conditions at Nubra valley of Ladakh (I & K) in India.

Girija and Radha(2012) in their study “Awareness of Health Impacts of Genetically Modified Foods in India” discussed that many alarming health risks such as infertility, allergy, metabolic syndrome, cancer etc are being caused by consuming GM foods by the toxin produced by it. There is a great need to create awareness among the public on health effects of GM foods to avoid future health risk.

Fatima Baby (2013) in her study “a study on organic Tomato cultivation in Palamedu Panchayat, Madurai District” examined that Organic farming combines tradition innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved. Organic farming is being practiced in 130 countries of the world. Policy makers are also promoting organic farming for restoration of soil health and generation of rural economy apart from making efforts for creating a better environment.

Donkoh et al. (2013) in their study “Estimation Technical Efficiency of Tomato Production in Northern Ghana” concluded that mean technical efficiency was found to be 0.71, ranging from 0.36 and 0.99. The relatively high efficiency levels were as a result of agricultural intensification measures that the farmers followed as well as high levels of education and long years of experience in cultivating Tomatoes.

Paul et.al (2013) in their study “Effect of drip and surface irrigation on yield, water use- efficiency and economics of capsicum Grown under mulch and non mulch conditions in eastern coastal India” was examined that this system increased the yield and net seasonal income by 57 per cent and 54 per cent respectively as compared to conventional surface irrigation without mulch with a benefit cost ratio of 2.01. The benefit cost ratio was found to be the highest (2.44) for the treatment VD without mulch.

Tuhin and Somnath (2015) in their article “Economic Analysis of Hybrid Vegetables Cultivation by Marginal Farmers in Coochbehar District of West Bengal” found that Hybrid vegetables had excellent economic advantages in the existing socio-economic, technological and marketing frame. Hybrids offer higher return for all selected crops (cabbage, cauliflower, brinjal, tomato & cucumber) compared to local cultivars. But hybrid seeds are available from private sources only at higher prices.

Methodology

The present study was carried out in Thirumanuur village of Valapady Taluk, where predominantly Tomato was cultivated by a major section of the farmers. A structured questionnaire schedule was constructed and data was collected from the select farmers of this village involved in Tomato cultivation. And who had an experience of more than 15years in this crop.

Objective

To examine cost and returns among traditional Tomato cultivating farmers and farmers involved in cultivation of Hybrid Tomato crops.

Table 1 analysis cost and return of Hybrid tomato crops among the farmers of Thirumanur Village. The cost of cultivation was for 1 acre. It was evidence from the table that the farmer was able to get Rs.2, 72,200 as their net return after the deduction of various other expenses incurred. The total production kg per acre was 1, 25,000. The total cost of production was estimated to be Rs.9, 27,800 per unit average cost of production for Hybrid tomatoes was Rs.7.42 with Rs.9.6 as average selling prices Contain variable cost like cost of winter, cost of pesticides, labour cost for harvesting and market commission was observed to be more than Rs. 1,00,000). The harvest period of Hybrid tomato was for 5 months and picking of tomatoes was carried daily and on an average a farmer was able to carry a marketable surplus of 800kg per acre. Though Hybrid tomatoes variable cost of production was comparatively high to that of traditional tomatoes, the net return was at a higher end. Therefore the farmers reviewed that hybrid tomato crops yield was high and the other problems like wastage, and damage of the crop was less than that of the traditional tomatoes.

Table 1: Cost and Returns of Hybrid Tomatoes (Per acre)

S.No	Particulars	Value (in Rupees)
1	Cost of Seeds	2,100
2	Cost of Nursery preparation	1,900
3	Cost of Manure	19,300
4	Cost of Ploughing	4,800
5	Cost of Rigging and Pounding	6,900
6	Cost of Plastic Mulches	27,000
7	Cost of Fertilizer	48,550
8	Transplanting cost	1,000
9	Application Cost of Fertilizer	21,000
10	Cost of water	1,50,000
11	Cost of weeding	3,000
12	Cost of Herbicide	7,000
13	Cost of staking	90,000

14	Cost of pesticide with petrol	1,50,000
15	Application Cost of Pesticide	25,200
16	Labour Cost of Pesticide	1,50,000
17	Transport Cost	75,000
18	Freight Charge	25,000
19	Market Commission	1,20,000
20	Total Cost	9,27,800
21	Total production (kg per acre)	1,25,000
22	Total Return (in Rs per acre)	12,00,000
23	Average Unit cost of Production (per kg)	7.42 Rs
24	Average selling price (Rs)	9.6 Rs
25	Net Return (Rs)	2,72,200

Source: Primary Data

The cost of cultivation and returns from traditional tomatoes per acre was studied in Table 2. Though traditional tomato cultivation is at risk by means of damage during transportation, damages caused by rats and insects, etc. This crop has greater demand in the market by the consumers due to its taste. That is the only reason why certain farmers stick on to traditional tomato cultivation Table 2 deficits the actual cost and returns made by the select farmers of Thirumanur village The lifespan of this crop was 3 months that is 90 days. The total production was estimated to be 12,000 kg per acre with a total return of Rs.96, 000 out of which 64,650 was the total cost. The net return estimated was Rs.31, 350. Average selling price was Rs.8. The farmers revealed that normally the seed cost was very minimal because the majority of the farmers possessed their own seeds.

Table 2: Cost and Returns of Traditional Tomatoes (Per acre)

S.No	Particulars	Value in (Rs)
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1	Cost of Seeds	150
2	Cost of Manure	8,000
3	Cost of Ploughing	600
4	Cost of Rigging and Pounding	1,800
5	Transplanting Cost	1,200
6	Cost of Fertilizer	6,000
7	Application Cost of Fertilizer	600
8	Cost of water	10,000
9	Cost of weeding	3,000
10	Application Cost of Pesticide	1,800
11	Labour Cost of Harvesting	12,000
12	Transport Cost	5,625
13	Freight Charge	1,875
14	Market Commission	9,000
15	Total Cost	64,650
16	Total production (kg per acre)	12,000
17	Total Return (in Rs per acre)	96,000
18	Average Unit cost of Production (per kg)	5.38 Rs
19	Average selling price (Rs)	8 Rs
20	Net Return (Rs)	31,350

Source: Primary Data

Table 3 explains the problems encountered by traditional and Hybrid tomato cultivation farmers. The major problems faced by traditional tomato cultivating farmers was price problem, uncertain rainfalls, unpredictable monsoon, labour scarcity, mice problems and birds problems, in case of farmers involved in Hybrid crops involved with certain problems like price, uncertain rainfall, and unpredictable monsoon.

Table 3: Problems Encountered by Traditional and Hybrid Tomatoes Cultivating Farmers

S.No	Problems	Traditional Tomato	Hybrid Tomato
1	Price Problem	Yes	Yes
2	Uncertain Rainfall	Yes	Yes
3	Unpredictable monsoon	Yes	Yes
4	Labour Scarcity	Yes	Yes
5	Mice Problems	Yes	No
6	Birds Problems	Yes	No

Source: Primary Data

Conclusion

Cost of cultivation of Hybrid tomatoes was more advantageous to that of traditional tomatoes. The yield period was also more in case of Hybrid tomatoes. Therefore the technological transfer in hybrid seeds of various agricultural crops made in India had benefited the Indian farmers at large by way of creating employment, self-sufficiency in input supply and increase in income.

References

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