Economics of Production and input use efficiency in Tomato

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Growth in area and production of tomato in India: The production of tomato in India in increased from 4.24 million tonnes in 1991-92 to 19.40 million tonnes in 2013-14 at a compound growth rate of 6.72 per cent per annum which is one of the highest in the vegetables. The growth in the production of tomato was mainly possible because more of expansion which is grown at the rate of 4.93 per cent rather than because of increase in productivity (1.70 %). This indicates that there is tremendous scope to further increase the production through adoption of hybrids as the tomato area under hybrids are still low in India.

Economics of production of summer tomatoes

Data were collected from three major districts of Karnataka under four groups (30 each) based on the timing of transplanting of tomato viz tomato transplanted during first fortnight i.e., *April 1st -15th, TA2: April 16th -30th, TM1: May 1st -15th and TM2: May 16th -30th*. The input use pattern costs, returns, efficiencies of production and factors influencing production & efficiencies were estimated and given under the following heading.

Input use pattern: The average area of tomato planted during summer was 0.40 ha and the planting density of around 19036 plants/ha. The average per hectare input use levels of summer tomato in Eastern Dry Zone of Karnataka were 17.56 t of FYM, 306.51 kgs of N, 294.04 kgs of P_2O_5 and 251.50 kgs of K_2O, 131.99 human days of own labour and 260.59 days of hired labour. The input use pattern in different production groups were found almost similar except the nutrient inputs. The average yield realized was 45.5 t/ha and the yield differences among four different production scenarios were not different.

Economic feasibility : Economic feasibility analysis revealed that summer cultivation requires about RS 3.72 lakhs/ha of expenditure which included variable costs, costs on fixed inputs and marketing costs incurred by the farmers and the cost of production worked out to be Rs 8.20/kg. Farmers realized about Rs 6.85 lakhs/ha with the BC ratio of 2.86. Among four production scenarios, farmers who had planted tomato during May first fortnight realized highest net return (Rs 8.18 lakhs/ha) mostly due to the higher market price realization of Rs 26.73/kg of tomato

Decomposition of price and yield effects of timing of planting of tomato : Decomposition of total effects in change in gross income into price and yield effects of timing of planting of tomato revealed that the contribution of the price effect is the major contributor and the contribution ranges from 66 per cent to 95 per cent. This suggests that changes in the prices rather than change in yield plays important role in timing of planting of tomato.

Factors influencing tomato production: Cobb Douglas type production function was fitted to examine the factors influencing the tomato production in Karnataka. Nitrogen nutrient and the capital input were identified as the major factors influencing the production of summer tomato. The direction of the coefficient suggests that any further increase in the nitrogen will reduce the yield suggesting that the said input is overused. On the other hand, the summer tomato calls for the capital infusion s further augmentation of capital will increase the income from cultivation of tomato.

Risk Analysis of summer tomato production: Risk in terms of probability of successful cultivation of summer tomato is estimated and results indicated that probability of getting 45 t/ha of tomato yield during summer is 0.492. Similarly the probability of farmers getting a gross income of Rs 10 lakh/ha and net income of Rs 7 lakh/ha during summer tomato were 0.44 and 0.53 respectively.

Technical efficiency of summer tomato production in eastern dry zone of Karnataka-Data Envelope Analysis (DEA) analysis : Input oriented DEA model, was used under the assumption of constant returns to scale (CRS). The average TE of tomato producing farms was about 0.798 for the entire sample in eastern dry zone of Karnataka. Among four groups, the highest average TE was observed in TM_1 (0.858) followed by TA_2 (0.850), TM_2 (0.816) and TA_1 (0.670). Nearly 25 per cent of the sample respondents were found to have technical efficiency of 90 and above in the entire sample. Among four groups, highest technical efficient farms were observed in TM_1 (40 %), followed TA_2 (33.33 %) and TM_2 (26.66 %), whereas in TA_1 none of the farms were found technically efficient.

Nearly 25 per cent of farmers under the assumption of constant returns to scale were found efficient with values equal or more than 0.90, i.e. 30 of the total 120 farms. The average technical efficient score was 0.798 in this category. In case of variable returns, the average technical efficient score was 0.930 and nearly 70 per cent of tomato production farms had the score equal or more than 0.90. 37.50 per cent of the tomato production farms in Karnataka were performing at optimum scale.

Allocative efficiency of summer tomato production: The average allocative efficiency in pooled data of tomato production was about 0.860. Among four groups of tomato production, the highest average AE score was observed in TM_2 with the average AE of 0.869. The average AE in other groups of tomato production were 0.865, 0.855, and 0.849 in TA_1, TA_2 and TM_1 groups respectively.

The highest percentage of farmers (33.33 %) in the study region were found to have allocative efficiency of 90 and above in the pooled category. whereas among four groups of tomato production, highest number of farmers in TA_1 (43.33 %) are allocatively efficient having efficiency score 90 and above, followed by 40.00 per cent in TM_2, 26.66 per cent in TA_2 and 23.33 per cent TM_1.

About 46.67 per cent of farms have allocative efficiency score between 0.80 and 0.90 in the pooled sample. Among four groups of tomato production, 36.67 per cent the farms in TA_1, 50.00 per cent in TA_2, 56.66 per cent in TM_1 and 43.33 per cent in TM_2 were found to have allocative efficiency score 0.80 to 0.90

Cost efficiency (economic efficiency) of summer tomato production: The average cost efficiency in pooled data of tomato production was about 0.686. Among four groups, the highest average CE score was observed in TM_1 with the average CE of 0.728. The average CE in other groups of tomato production were 0.727, 0.709 and 0.580 in TA_2, TM_2 and TA_1 respectively. The lowest percentage of farmers (5.83 %) in the study region were found to have cost efficiency of 90 and above in the pooled category. Among four groups of tomato production, highest number of farmers in TM_2 (10.00 %) are cost efficient having efficiency score 90 and above followed by 6.67 per cent each in TA_2 and TM_1 and none of the farmers in TA_1 are cost efficient. About 37.50 per cent of the tomato producing farms in eastern dry zone of Karnataka were belongs to cost efficiency score 0.60 to 0.70. Among groups, 33.33 per cent in TA_1, 50.00 per cent in TM_1 and 36.66 per cent farms in TM_2 were belongs to CE score between 0.60 to 0.70, while 36.66 per cent farms in TA_2 were have CE score between 0.70 to 0.80.