Economics of Production and input use efficiency in Papaya

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The estimation of economics of papaya in Karnataka was taken up in Mandya, Mysore and Malavalli areas of Karnataka during 2015-16. The average size of holding of papaya was 0.46 ha (1.14 ac) and the most popular variety was Red Lady. The spacing adopted by the farmers ranged from 8x8, 8x7, 8x6 feet. The details are given under following subheads.

Input use pattern in Papaya: The average planting density was 1860/ha and farmers applied about 32 t/ha FYM and 570, 953 and 1024 kg/ha of N, P and K nutrient respectively. Papaya cultivation employed about 202 days of men labour and 403 days of women labour. It was observed that the majority of men labour were employed from their family while majority of women labour were hired from outside.

Costs of Papaya Cultivation: The total cost of papaya cultivation worked out to be Rs3, 72, 643 /ha. The total working costs excluding the costs on fixed inputs and other costs worked out to Rs 306565 /ha. The major costs of cultivation of papaya in Karnataka was on inorganic fertilizers (24.6 %) and the human labour input (2.7 %)

Yield: The **a**verage yield realised by the farmers in the region was 110.09 t /h against the potential yield of about 200 t/ha. The average yield per plant worked about the 56.39 kg as against the potential yield of more than 80 and up to 125 kg. Measure of dispersion (Variability) was examined through the coefficient of variation (CV) which indicated the existence of large variability across farmers and the CV of per plant was about 63 per cent.

Returns and Economics of papaya cultivation: The average gross returns was Rs 9,48, 473/ha and the net return realized was Rs 5,75,830/ha. The net return over the working expenses was about Rs 6, 41, 908 /ha. The distribution of net profit or loss revealed that nearly 15 per cent of farmers realized net return as high as more than 10 lakh. On the contrary, nearly 19 per cent of farmers incurred loss in cultivation of papaya. However, it was observed that nearly 57 per cent of farmers earned per hectare net income of more than Rs 7 lakh. Further, Cost of Production worked out to be Rs 3.38/kg as against the average price realization of Rs 8.73/kg. with BC Ratio of 2.55.

Risk analysis & Probability of Success in Papaya cultivation: Based on the data collected from Karnataka, the probability of cultivation of papaya at different levels with regards to yield, gross return and net return was generated using Z score and other statistics (Table 5). From the table it can be inferred that the probability of getting the average yield of 110 t/ha is about 0.49 suggesting that the risk involved is relatively high. Similarly the probability of getting the gross return of Rs 9.48 lakhs which is the average yield of the study is about 0.50 and that of net return (Rs 5.76 lakhs) is about 0.51. . Further it was revealed that there is risk of incurring loss in cultivation to the extent of 15 per cent

Factors influencing papaya production: Cobb Douglas type of production function was used to identify the factors influencing the papaya production in Karnataka. Men labour (0.5155) and nutrient nitrogen (0.6000) among nine factors included in the model were found influencing the papaya production significantly and positively suggesting that these is a further scope to increase these inputs in increasing the income of farmers.

Optimum allocation of resources for papaya cultivation: The optimum number of plants

of papaya is estimated to be planted 1815/ha instead of presently planted 1864/ha. Similarly the optimum use of men labour (man days/ha), women labour (women days/ha), FYM (t/ha), N (kg), P (kg), K (kg) are 196.24, 251.6, 21.8, 571.52, 950.92 as against the average use level of 139, 398, 34, 471, 798 and 726, respectively.

Estimation of technical, allocative and economic efficiencies in papaya: Linear Programing models in DES for estimation of TE: Data envelope analysis (DEA) which is a frontier method that does not require specification of a functional/distributional form, & accommodate scale issues was used for estimation of TE, AE and EE. In Linear Programing models in DES, Constant returns to scale, Non- increasing returns and Non- decreasing returns forms were used. Technical Efficiency (TE) which refers to the firm‘s ability to produce the maximum possible output from a given combination of inputs and technology. In Linear Programing models in DES, Constant returns to scale, Non- increasing returns and Non- decreasing returns forms were used. The results indicated that the nearly about 53.3 % of farms under assumption of constant returns to scale performed with efficiency level >=0.90 or more (Table 8). The average efficiency score was 0.798. Remaining 46.7 % of farms, which did not operate at the maximum efficiency level, could reduce the input level by 20.20 % and maintain the same level of papaya production as achieved by 46.7 % of the farmers.

Impact on technical efficiency due to variable returns to scale: : The relaxation from CRS to VRS is necessary, as all farms did not operate at the optimum scale due to imperfect competition, constraint in finance, etc. The no. of efficient farms increased to 25 from 17. These better results were mainly due to the inclusion of scale efficiency, which the previous model did not take into consideration. Further, the lower value of standard deviation of mean in model with variable returns suggested concentration of farms in the higher efficiency levels

Distribution of papaya farms in three zones of production frontier: Nearly 46.7 % of the papaya farms were found to be operating in the zone of increasing returns (or suboptimal zone) and production scale of these farms can be increased while decreasing costs, since they were performing below the optimum production scale. No farms in decreasing returns zone (supra-optimal) i.e, none of the farms were performing above the optimum scale of production. Nearly 53.3 per cent were performing at optimum scale of production .i.e., constant returns zone.

Economic and allocative efficiencies in papaya farms: In the first step, the cost efficiency (economic efficiency) was estimated through cost minimization approach. Given the input prices W_i and the output levels Y_i , CE was calculated as CE = Wi Xi * / Wi Xi i.e., the ratio of minimum cost to observed cost. And in the final step the allocative efficiency is calculated residually as AE= CE/TE. The output specifications of output (Y) and inputs (Xi) are as same as in previous slides and W_i is the input price vectors for the 10 Xi variables specified above. When the firm is producing with an optimum scale, allowing it to maximize profits, then it is termed as economic (or scale) efficiency. Economic efficiency is a product of technical and allocative efficiency. It is the ratio of minimum cost to observed cost

The average allocative efficiency score achieved by the sample farmers is 0.439 suggesting that the majority of farmers are yet to achieve the allocative efficiency. In fact only seven per cent of the farmers were found to achieve the allocative efficiency (score of 0.9 or above) in papaya production. Nearly 50 per cent of farmers had the allocative efficiency score ranging between 0.30 and 0.60. As regards the cost efficiency or economic efficiency (CE) in Papaya production, the average score is 0.355 suggesting that the farmers producing papaya are yet to achieve the economic efficiency. In fact only 3 per cent of the farmers were found to achieve the economic efficiency suggesting that to large extent in

papaya production inefficiency exists as regards the allocation of resources based on its prices.