A study on resource use efficiency and economic returns for tapioca in case of member and non-member farmers of FPOs in Karur district of Tamil Nadu

SM KAVIBHARATHI and N KUMARASAMY

Department of Agribusiness Management
PGP College of Agricultural Sciences, Namakkal 637405 Tamil Nadu, India
Email for correspondence: kumarasamytnau@gmail.com

© Society for Advancement of Human and Nature (SADHNA) ***Received: 23.01.2022/Accepted: 25.03.2022***

ABSTRACT

In this paper, an attempt was made to analyze the production of tapioca in the Karur district. Based on the area, two Taluks namely Kulithalai and Aravakurichi were selected. The total sample size was 120 tapioca growers comprising 60 member and 60 non-member farmers of FPOs. The study revealed that the area of average size holding of tapioca, cropping intensity and educational status were significantly higher in case of FPO member farmers. It was observed that the average cost of cultivation of tapioca was Rs 49,323.14 for non-member and Rs 46,708.58 per ha for member farmers. Estimated gross return of tapioca of member farmers was Rs 1,05,000.45 and net return was Rs 58,291.87 per ha. Estimated gross return of non-member farmers was Rs 90,432.07 and net return was Rs 41,322.68 per ha. The benefit-cost ratio of member farmers and non-member farmers was 1.24 and 1.21 respectively. The value of coefficient of multiple determinations for member farmers was 0.69. The value of coefficient of multiple determinations for non-member farmers was 0.65. At overall level, the member farmers and non-member farmers ratio of MVP/P_X was greater than unity in case of nitrogen and irrigation charges that indicated the underutilization of these resources. The ratio of MVP/P_X was less than unity in case of plant protection, labour days, manures and phosphorus which showed excess utilization of these resources.

Keywords: Resource use efficiency; return; member farmers; non-member farmers

INTRODUCTION

A farmer producer organization (FPO) gives a robust framework for the small producers for organizing themselves for effective linkage with markets (Salokhe 2016). It gives bargaining power to small farmers, enable cost-effective delivery of extension services and empower the members to influence the policies that affect their livelihood. FPO helps to overcome the constraints imposed by the small size of individual farms (Kumar et al 2019). FPO members are able to leverage collective strength and bargaining power to access financial and non-financial inputs, services and appropriate technologies, reduce transaction costs, tap high value markets and enter into partnership with private entities on more equitable terms (Paty and Gummagolmath 2018). Major activities of a FPO are supply of inputs such as seed, fertilizer, machinery, market linkage, training, networking and financial and technical advice. The present study was conducted to estimate the cost, return and profitability on farms and assess the resource use efficiency in production of tapioca of member and non-member farmers of FPOs.

METHODOLOGY

Karur district of Kerala was selected purposively for the study based on the area under tapioca cultivation. A sample of 120 tapioca growers comprising 60 member and 60 non-member farmers of FPOs were drawn from Kulithalai and Aravakurichi Tehsils of Karur district during 2019-2020. The collected data were analysed by applying the standard cost concepts used in farm business analysis and the data were further analyzed by making the use of different mathematical models such as translog, linear, non-linear ie Cobb-Douglas production function and

the results of best suitable model ie Cobb-Douglas production function was used for estimating resource use efficiency.

Estimation of production cost, return, resource use productivity and efficiency

The collected data were analysed by applying the standard cost concept used in farm business analysis. For this simple analysis was done to calculate gross return and output-input ratio. The simple statistical tools viz percentage and average were used. The standard cost concept was used for calculating different costs viz Cost A, Cost B and Cost C.

Cost A= Hired human labour, total bullock labour, planting material, manures and fertilizers, irrigation charges, plant protection charges etc

Cost B= Cost A + rental value of land + interest on fixed capital

Cost C= Cost B + imputed value of family human labour

Functional analysis

The data were further analyzed by making the use of different mathematical models such as translog, linear, non-linear ie Cobb-Douglas production function and the results of best suitable model ie Cobb-Douglas production function were used for estimating resource use efficiency.

For resource use efficiency, the following formula was used:

$$MVP = b_i \frac{\bar{Y}}{\bar{X}} p_y$$

where b_i= Production elasticity corresponding to the i^{th} input, $\bar{X}$= Geometric mean of particular independent variable, $\bar{Y}$ = Geometric mean of dependent variable, Py= Price of output

RESULTS and DISCUSSION

Estimation of cost and return in tapioca production

The data on cost of cultivation of tapioca of sample farms (Table 1) reveal that in overall, per hectare Cost A of member farmers was Rs 20,610.69 and non-member farmers was Rs 21,506.50. The overall member farmer per hectare Cost B was Rs 21,307.55 and non-member farmers was Rs 23,000.08.

Overall per hectare cost of cultivation of non-member farmers was Rs 49,323.14 and share of materials input cost was Rs 21,506.5 which was 44.33 per cent of the total cost. The maximum contribution was of hired human labour use with Rs 19,983.80 (41.19%) to the total cost. The power use in the form of bullock pairs and tractor hours contributed the minimum share to the total cost of cultivation of tapioca which was 3.73 and 2.83 per cent respectively. Among the materials input cost cuttings shared the maximum (31.61%) followed by manure (5.58%), fertilizer (4.98%) and minimum in plant protection and irrigation which shared nearly 1 per cent each. The per hectare maximum cost incurred ie Rs 19,983.80 was on hired human labour and it was Rs 3,830.45 for family labour.

Across the farm size of holdings, the total per hectare cost of cultivation of tapioca varied from Rs 48,078.66, 49,782.55, 48,690.30 and 49,032.10 of marginal, small, medium and large farmers respectively. The major cost was involved in hired labour which was from Rs 18127.15 to 20,669.13. The Cost A was ranging from Rs 19,205.03 to 22,469.78/ha.

The overall per hectare cost of cultivation of member farmers was Rs 46,708.58 which varied from Rs 40,953.07, 46,600.36, 48,193.26 and 53,283.72 for marginal, small, medium and large farmers respectively and share of materials input cost was found to be Rs 20,610.69 which was 43.64 per cent to the total cost.

The large contribution was observed in hired human labour use with Rs 20,456/ha that was 42.97 per cent to the total cost. The power use in the form of bullock pairs and tractor hours contributed the minimum share to the total cost of cultivation which was 3.56 and 2.43 per cent respectively. Among the materials input cost, cuttings of tapioca shared the maximum (31.61%) cost followed by manure (5.64%), fertilizer (4.38%) and minimum in plant protection and irrigation which shared nearly 1 per cent each. The most important cost was involved in labour use; hired labour use was required more and was found to be Rs 20,456.45/ha. The input value of family labour use was Rs 3,754.56/ha. Major cost on hired labour use involved ranged from Rs 16,584.36 to 21,986.34/ha.

The materials input cost was next to the labour use cost which was ranging from Rs 16,800.01 to

Table1. Estimation of cost and return in tapioca production (Rs/ha)

Component	Member farmers				Overall	Non-member farmers				Overall
	Marginal	Small	Medium	Large		Marginal	Small	Medium	Large	
Cost of seed (cuttings)	10,000.23 (29.54)	10,000.35 (32.45)	11,167.54 (34.34)	13,432.33 (29.65)	12,000.45 (31.61)	14,117.49 (30.64)	15,002.57 (30.75)	16,132.60 (33.13)	14,689.70 (30.58)	15,333.60 (31.61)
Cost of manures & fertilizers	3,500.45 (6.79)	3,555.167 (9.23)	4,300.21 (9.57)	5,344.03 (11.55)	4,022.57 (9.43)	4,144.34 (8.99)	4,922.186 (10.09)	5,273.17 (10.83)	6,173.02 (12.85)	5,122.60 (10.56)
Cost of manures	800.37 (2.96)	1,234.32 (5.26)	1,850.00 (4.43)	2,450.72 (6.14)	1,675.04 (5.64)	1,775.96 (3.85)	2,498.15 (5.12)	2,866.02 (5.89)	3,715.52 (7.74)	2,705.06 (5.58)
Cost of fertilizers	1,745.18 (5.57)	2,045.02 (4.32)	1,847.78 (3.54)	2,287.84 (4.58)	1,945.14 (4.38)	2,368.38 (5.14)	2,424.04 (4.97)	2,407.10 (4.94)	2,457.5 (5.12)	2,417.54 (4.98)
Cost of plant protection chemicals	300.26 (1.39)	360.38 (1.93)	450.12 (1.39)	525.67 (1.68)	480.55 (1.34)	492.38 (1.07)	533.92 (1.09)	577.82 (1.19)	623.60 (1.30)	564.50 (1.16)
Irrigation charges	453.52 (1.98)	485.29 (0.76)	499.59 (1.00)	520.54 (1.08)	486.94 (1.07)	450.82 (0.98)	477.17 (0.98)	486.19 (1.00)	518.1 (1.08)	485.80 (1.00)
Hired human labour charges	16,584.36 (40.14)	20,987.16 (45.45)	20,786.98 (42.54)	21,986.34 (41.35)	20,456.45 (42.97)	18,127.15 (39.34)	20,669.13 (42.37)	19,627.38 (40.31)	19,407.2 (40.4)	19,983.80 (41.19)
Bullock pair charges	3,567.35 (7.54)	3,876.30 (5.76)	2,765.12 (4.76)	1,245.45 (1.30)	3,245.34 (3.56)	3,312.84 (7.19)	2,596.29 (5.32)	1,678.18 (3.45)	0 (0.00)	1,809.41 (3.73)
Tractor/h	450.46 (1.08)	589.35 (1.43)	850.47 (2.43)	1,500.24 (4.76)	1,042.35 (2.43)	683.06 (1.48)	855.92 (1.75)	1,381.21 (2.84)	2,586.20 (5.38)	1,374.72 (2.83)
Land revenue	149.00 (0.01)	163.00 (0.01)	152.00 (0.01)	127.00 (0.01)	145.00 (0.01)	152.00 (0.03)	176.00 (0.02)	141.00 (0.02)	138.00 (0.02)	164.00 (0.02)
Cost A	16,800.01 (39.35)	17,680.177 (40.97)	20,115.20 (42.37)	24,561.13 (44.56)	20,610.69 (43.64)	19,205.03 (41.68)	20,935.84 (42.92)	22,469.78 (46.15)	22,004.40 (45.81)	21,506.50 (44.33)
Rental value of land	13,435.65 (22.45)	11,543.34 (21.04)	9,654.76 (19.56)	11,245.26 (21.32)	10,765.65 (20.52)	12,654.54 (24.12)	13,325.76 (25.32)	8,424.56 (18.54)	10,117.20 (19.65)	11,130.52 (20.67)
Interest on fixed capital	8,765.65 (18.76)	12,213.54 (20.65)	13,324.54 (22.89)	12,543.60 (20.87)	12,234.43 (20.97)	10,480.51 (20.32)	9,520.95 (19.34)	10,795.96 (20.43)	11,910.70 (21.87)	10,177.03 (20.87)
Cost B	22,201.30 (49.43)	23,746.88 (50.38)	22,979.30 (48.67)	23,788.86 (47.22)	21,307.55 (47.82)	23,135.05 (48.04)	22,846.71 (49.46)	19,220.52 (46.62)	22,027.23 (45.82)	23,000.08 (47.77)
Family human labour	3,550.95 (11.22)	3,467.387 (8.65)	3,675.457 (8.96)	3,990.569 (8.22)	3,754.56 (8.54)	4,738.58 (10.28)	3,715.145 (7.62)	3,521.745 (7.23)	4,021.44 (8.37)	3,830.45 (7.9)
Cost C	40,953.07 (100.00)	46,600.367 (100.00)	48,193.26 (100.00)	53,283.72 (100.00)	46,708.58 (100.00)	48,078.66 (100.00)	49,782.55 (100.00)	48,690.30 (100.00)	49,032.10 (100.00)	49,323.14 (100.00)

Figures in parentheses represent percentage to total cost C

24,561.13/ha. Overall the cost incurred by non-member farmers was comparatively higher than member farmers.

The data on cost of cultivation of tapioca of sample farms (Table 1) reveal that in overall, per hectare Cost A of member farmers was Rs 20,610.69 and non-member farmers was Rs 21,506.50. The overall member farmer per hectare Cost B was Rs 21,307.55 and non-member farmers was Rs 23,000.08.

Profitability in cultivation of tapioca

The cost and return of tapioca of non-member and member farmers of FPOs is represented on gross return received, net return obtained after subtracting the total cost of cultivation, per quintal cost of production and benefit received on per rupee investment (Table 2). Estimated gross return of member farmers was Rs 1,05,000.45/ha and for non-member farmers was Rs 90,432.07/ha. The obtained net return was Rs 58,291.87 and 41,322.68/ha of member and non-member farmers respectively. The cost of production of tapioca was Rs 575.13/q for non-member farmers and Rs 502.54/q for member farmers.

The overall benefit-cost ratio of member farmers was 1.24 which varied from 1.42, 1.31, 1.14 and 1.17 for marginal, small, medium and large farmers respectively. The overall benefit-cost ratio of non-member farmers was 1.21 which was 1.08, 1.13, 1.31 and 1.12 for marginal, small, medium and large farmers respectively. The results of present findings are similar to the results reported by Tavya and Ramanathan (2007).

Resource use efficiency in tapioca cultivation

The resource use productivity and resource use efficiency for tapioca production were analyzed with Cobb-Douglas type production function framework. Cobb-Douglas type of production was fitted to the sample data separately. The regression coefficient for identified resources for tapioca is presented in Table 3.

The coefficient multiple determinations of member farmers (R^2) indicated the proportion of total variation in the dependent variable (ie crop output) explained by the independent variable jointly. These resource variables were included in the production. It was observed that at overall level, the value of coefficient of multiple determination (R^2) was 0.69 that indicated that 69 per cent of variation in tapioca production was explained by using variables included in the function. It is also revealed that the regression coefficient for labour (X1) was positively significant. Manures (X2) were positively statistically significant indicating effect of variables on yield of tapioca. Nitrogen (X3) and phosphorus (X4) were positive but phosphorus was statistically non-significant indicating no significant effect of these variables on yield of tapioca. Manure (X2), nitrogen (X3) and irrigation (X6) cost were positive and found statistically significant at 1, 10 and 5 per cent level of probability respectively. Plant protection (X7) was negatively significant.

The positive and significant coefficient indicated that one per cent increase in the labour, manure, nitrogen, phosphorus and irrigation charges would increase the yield by 0.31, 0.17, 0.19, 0.25 and 0.19 per cent respectively. Negative and significant coefficient indicated that one per cent increase in the plant protection would decrease the yield by 0.12 per cent.

The coefficient multiple determinations of non-member farmers (R^2) indicated the proportion of total variation I in the dependent variable (ie crop output) explained by the independent variable jointly. Seven resource variables were included in the production. It was observed that at overall level, the value of coefficient of multiple determinations (R^2) was 0.65 that indicated that 65 per cent of variation in tapioca production was explained by using variables included in the function. It is also revealed that the regression coefficient for labour (X1) was positive.

Manures (X2) were positive found statistically significant indicating significant effect of these variables on yield of tapioca. Nitrogen (X3) and phosphorus (X4) were positive but statistically non-significant indicating no significant effect of these variables on yield of tapioca. Total labour days (X1) were positive and found statistically significant at 1 per cent level of probability. Manure (X2) and irrigation charges (X6) were positive and found statistically significant at 1 per cent and 10 per cent level of probability respectively. Plant protection (X7) was negative coefficient and significant at 1 per cent level of probability.

At overall level, positive and significant coefficient indicated that one per cent increase in the labour, manure and irrigation charges would increase the yield by 0.23, 0.37 and 0.14 per cent respectively. Negative and significant coefficient indicated that one

Table 2. Gross return and benefit-cost ratio of tapioca

Component	Farmers category				Overall
	Marginal	Small	Medium	Large	
Member farmers					
Production of tapioca (q/ha)	94.35	95.17	96.55	98.00	96.45
Gross return (Rs/ha)	1,00,579.46	1,07,594.64	1,01,101.27	1,05,154.73	1,05,000.45
Total cost (Rs/ha)	40,953.07	46,600.36	47,193.26	48,283.72	46,708.58
Net return (Rs/ha)	59,626.39	60,994.27	53,908.01	56,871.01	58,291.87
B-C ratio	1.42	1.31	1.14	1.17	1.24
Cost of production (Rs/q)	457.43	508.67	495.56	511.87	502.54
Non-member farmers					
Production of tapioca (q/ha)	84.48	87.57	88.25	91.48	85.76
Gross return (Rs/ha)	88,456.23	91,899.2	89,143.54	92,587.76	90,432.07
Total cost (Rs/ha)	46,078.66	48,782.55	50,690.30	49,032.10	49,109.39
Net return (Rs/ha)	42,377.57	43,116.65	38,453.24	43,555.66	41,322.68
B-C ratio	1.08	1.13	1.31	1.12	1.21
Cost of production (Rs/q)	588.38	562.58	554.30	580.32	575.13

Table 3. Results of estimated Cobb-Douglas production function

Variable	Regression coefficient	
	Member farmers	Non –member farmers
Constant (intercept)	1.253 (0.2976)	1.376 (0.3860)
Total labour days (X1)	0.3154 (0.2347)***	0.2387 (0.1317)***
Manures (q) (X2)	0.1765 (0.1986)***	0.3708 (0.1141)***
N (X3)	0.1947 (0.1140)*	0.1453 (0.17060)^{NS}
P (X4)	0.2543 (0.1754)^{NS}	0.0271 (0.0498)^{NS}
Irrigation cost (X6)	0.1925 (0.0687)**	0.1467 (0.0192)*
Plant protection cost (X7)	-0.1243 (0.0365)***	-0.2185 (0.0432)***
R^2	0.69	0.65

Figures in parentheses are the standard errors of respective regression coefficient; ***Significant at 1% LoS, **Significant at 5% LoS, *Significant at 10% LoS

Table 4. Resource use efficiency of member and non-member farmers

Resource	MVP	FC (PX)	MVP/PX	Remarks
Member farmers				
Total labour man days (X1)	124.34	200.00	0.6217	Excess utilization
Organic manure (q) (X2)	85.87	550	0.1561	Excess utilization
N (kg) (X3)	50.65	15.48	3.33	Under-utilization
P (kg) (X4)	25.65	28.87	0.88	Excess utilization
Irrigation charges (Rs) (X6)	16,546.6	1.00	16,546.60	Under-utilization
Plant protection (Rs) (X7)	-7,659.5	1.00	-7,659.50	Excess utilization
Non-member farmers				
Total labour man days (X1)	132.55	200.00	0.6627	Excess utilization
Organic manure (q) (X2)	84.45	650	0.1299	Excess utilization
N (kg) (X3)	194.56	6.87	28.320	Under-utilization
P (kg) (X4)	31.32	32.00	0.9788	Excess utilization
Irrigation charges (Rs) (X6)	14,320.54	1.00	14,320.54	Under-utilization
Plant protection (Rs) (X7)	-8,564.54	1.00	-8,564.54	Excess utilization

per cent increase in the plant protection would decrease the yield by 0.21 per cent.

Resource use efficiency of non-member and member farmers

The resource use efficiency was studied and the marginal value product (MVP) of each explanatory variable was computed with factor cost (FC) to know the resource use efficiency of farmers and the results are presented in Table 4. It is seen that at overall level the ratio of MVP/PX was greater than unity in case of nitrogen (3.33) and irrigation charges (16,546.60) indicating the under-utilization of these resources.

The ratio of MVP/PX was less than unity in case of plant protection (-7,659.5), labour days (0.6217), manures (0.1561) and phosphorus (0.88) which showed excess utilization of these resources. Use of these resources should be curtailed down for maximization of profit. At overall level the non-member farmers and member farmers ratio of MVP/PX was greater than unity in case of nitrogen (28.320) and irrigation charges (14,320) indicating the under-utilization of these resources.

The ratio of MVP/PX was less than unity in case of plant protection (-8564.54), labour days (0.6627), manures (0.1299) and phosphorus (0.9787) which showed excess utilization of these resources. Use of these resources should be curtailed down for maximization of profit.

CONCLUSION

The study concluded that the return and profitability of member farmers was significantly higher than non-member farmers. The effective utilization of resources of member farmers was significantly more than the non-member farmers. Hence government should make efforts to form more FPOs and awareness about FPOs should be spread among the non-member farmers. Proper guidelines are needed towards marketing for non-member farmers which can be given by FPOs. Technology facilities like computer, internet, mobile etc must be provided to each and every member in FPOs.

REFERENCES

Kumar S, Thombare P and Kale P 2019. Farmer produce company (FPC): a journey of farmers from food grower to food seller. Agriculture and Food: e-Newsletter **1(9):** 42-46.

Paty BK and Gummagolmath KC 2018. Farmer producer companies- issues and challenges. Extension Digest **1(3):** 23p.

Salokhe S 2016. Farmers producer organization for effective linkage of small producers with market. International Journal of Applied Research **2(10):** 142-146.

Tavya S and Ramanathan S 2007. Economic analysis of Chinese potato cultivation in Tamil Nadu. Journal of Root Crops **33:** 57-61.