ASSESSMENT OF TECHNO-ECONOMIC AND ALLOCATIVE EFFICIENCIES OF PEARL MILLET IN WESTERN MAHARASHTRA THROUGH DATA ENVELOPMENT ANALYSIS

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Abstract: Agriculture continues to dominate the economic scene of India, accounting for about one-third of Gross Domestic Product and one-fifth of foreign exchange. The present investigation was conformed to the database of the CPMCC scheme. The sample farms in different villages spread over 10 districts consisting of 30 farmers from small size group (upto 2.00 ha), 30 farmers from medium size group (2.01 to 4.00 ha) and 30 sample farmers from large size group of holdings (4.01 and above) of Western Maharashtra were considered for the present study. The proportionate gap between the actual and recommended use levels of organic manures was maximum and it was 88.66 per cent at the overall level, it was mainly due to unavailability of FYM. The net returns per rupee invested were in the range of 1.13 to 1.18 which were increased as increase in size of farms. Technical efficiencies on small, medium and large pearl millet farms were 0.985, 0.970 and 0.981, respectively. Allocative and economic efficiency showed that, only one farm was economically and allocative efficient. Cost minimizing input quantities revealed that small, medium and large pearl millet farms could reduce its cost by 56.30, 65.40 and 55.00 per cent, respectively by choosing a more cost efficient input mix for allocatively efficient farms. The mean extent of reduction in input cost of production on small pearl millet farms was Rs.2935.69, while on medium farms it was Rs.3248.81 and on large farms it was Rs.2622.61 by using a new cost efficient input mix.

Keywords: Technical, Allocative and Economic efficiency, pearlmillet, cost minimization etc.

Introduction: Agriculture continues to dominate the economic scene of India, accounting for about one-third of Gross Domestic Product and one-fifth of foreign exchange. Reform measures implemented in the industrial, financial and trade sectors would definitely contribute to the agricultural growth through agricultural prices and income. However, various non-price institutional and organizational factors are also important for the sustainability of agricultural growth. The Government of Maharashtra started the scheme for 'Creating Permanent Machinery for studying the Cost of Cultivation of Principal Crops in Maharashtra state' in the year 1979. The present investigation viz., "Assessment of Techno-economic and Allocative Efficiencies of Pearl millet in Western Maharashtra through Data Envelopment Analysis" is an attempt to study the resource use structure, resource use gap and costs and returns structure , to estimate the economic, technical, and allocative efficiencies, to estimate the extent of reduction in level of inputs at existing levels of output and to estimate the extent of reduction in input cost of production at existing levels of output.

Costs and returns structure on pearl millet farms: At the overall level, the per hectare returns over Cost 'C' was Rs.2203.26, Rs.2561.26 and Rs.2614.11, on small, medium and large farms, respectively, while at the overall level net profit was Rs.2513.92. The net returns per rupee invested were in the range of 1.13 to 1.18 which were increased as increase in size of farms. It is inferred from these results that, pearl millet cultivation on small size farms was less profitable as compared to those on medium and large sized farms.

Table I Costs and returns structure on pearl millet farms. (Per ha)

Sr. No.	Particulars	Size group			
		Small	Medium	Large	Overall
1	Total cost				
	i) Cost 'A'	10578.43	10335.89	9292.72	9874.57
	ii) Cost 'B'	14627.45	14094.49	12702.42	13521.69
	iii) Cost 'C'	17230.46	16087.27	14679.20	15631.45
2	Profit at				
	i) Cost 'A'	8855.28	8312.63	8000.59	8270.80
	ii) Cost 'B'	4806.26	4554.03	4590.90	4623.68
	iii) Cost 'C'	2203.26	2561.26	2614.11	2513.92
4	Gross income	19433.72	18648.52	17293.32	18145.37

5	B:C ratio				
	i) Cost 'A'	1.84	1.80	1.86	1.84
	ii) Cost 'B'	1.33	1.32	1.36	1.34
	iii) Cost 'C'	1.13	1.16	1.18	1.16

Input slacks under constant returns to scale assumption: The detailed summary of input slacks on small, medium and large farms of pearl millet under constant returns to scale assumption is presented in Table II . The average technical efficiencies of all categories on pearl millet farms for the three years of study period were in the range of 0.970 to 0.986 and these figures of technical efficiencies indicated that resources were used slightly excessive, this picture depicted in the result. The inputs like seed organic manure and potassic fertilizer were used optimally as there was no excess use of these two inputs on selected farms

Table II Input slacks on pearl millet farms under constant returns to scale assumption.

Sr. No.	Inputs	Size group		
		Small	Medium	Large
1	Technical efficiency	0.986	0.970	0.981
2	Hired human labour			
	a) Male	1.16	4.97	1.23
	b) Female	0.49	6.88	1.70
3	Bullock labour	0.57	1.15	2.97
4	Machine labour	0.17	0.47	0.11
5	Seed	0.04	0.04	0.05
6	Organic manure	0.17	0.69	0.61
7	Fertilizers			
	a) N	1.46	1.40	2.10
	b) P	1.05	1.94	0.36
	c) K	0.40	0.91	0.32
8	Family human labour			
	a) Male	1.52	1.35	1.81
	b) Female	2.91	1.18	1.61

Allocative and economic efficiencies on pearl millet farms.

Table III Allocative and economic efficiencies on Pearl millet farms.

Year/Crop	Size group								
	Small Farm			Medium Farm			Large Farm		
	TE	AE	CE	TE	AE	CE	TE	AE	CE
Pearl millet	0.986	0.437	0.430	0.970	0.346	0.337	0.981	0.450	0.442

Note: TE = Technical efficiency, CE = Cost efficiency (Economic efficiency), AE = Allocative efficiency = CE/TE.

It was observed from Table III that all the pearl millet farms were technical efficient, and due to improper allocation of that resources the average allocative and economic efficiency of all the pearl millet farms were below 0.501 means it was inefficient.

Estimated possible reduction in cost by using optimal input quantities on pearl millet farms: The reduction in cost of production of pearl millet is possible on farms, which are allocatively inefficient. The estimated figures of reduction in cost by using optimal input quantities for obtaining a given level of output on pearl millet farms for the year 2009-10 to 2011-12 are given in Table IV. Among the three size groups of holdings, mean extent of reduction in input cost of production or cost minimization on small pearl millet farms has been found to be Rs.2935.69 (16.26%) by using a new cost efficient input mix.

While on medium farms and the mean extent of reduction in input cost of production found to be Rs.3248.81 (20.08%) and on large peal millet farms

the mean extent of reduction in input cost of production was Rs.2622.61(16.90%). The results of extent of reduction in input cost on pearl millet farms were in the range of 16.26 to 20.08 per cent it means there was scope of reduction in input cost up to 20 per cent in the pearl millet farms, so if farmers have used the inputs allocatively, the per cent cost reduction was 20 per cent means 20 per cent income should be increased in the pearl millet farms.

Table-IV Estimated possible reduction in cost by using optimal input Quantities on pearl millet farms.(Per Rs./**ha)**

Sr. No.	Input	Size group		
		Small	**Medium**	**Large**
1	Allocative efficiency	0.437	0.346	0.45
2	Area	119.55	456.74	144.43
3	Total hired labour	2256.48	1692.82	1901.59
	a) Male	440.94	634.41	785.81
	b) Female	1815.54	1058.41	1115.78
4	Bullock labour	244.07	1377.74	772.68
5	Machine labour	30.75	15.37	33.85
6	Seed	17.73	31.66	57.49
7	Organic manure	-314.57	209.57	-201.43
8	Fertilizers			
	a) N	-83.02	294.65	98.88
	b) P	66.49	205.14	-6.81
	c) K	164.93	40.67	30.24
9	Total family labour	161.72	-1075.56	-208.3
	a) Male	-181.61	-174.81	-292.58
	b) Female	343.33	-900.75	84.28
10	Total human labour	2418.2	617.26	1693.29
11	**Total Cost reduction**	**2935.69**	**3248.81**	**2622.61**
	Percentage cost reduction	16.26	20.08	16.90

Summary and conclusion: At the overall level, the use of total family labour, bullock labour, machine labour, seed, organic manure and output was decreased over the different size group of holdings on pearl millet farms. It is because of the economies of scale in cultivation of pearl millet. The use of hired labour i.e. both male and female labour was more on medium farms, also the higher use of nitrogenous and potash fertilizers was more on medium farms.

The cost of cultivation of pearl millet was Rs.15631.45/ha while gross were Rs.18145.37/ha. The net profit at Cost 'C' was Rs.2513.92/ha and B:C ratio was 1.16.

Technical efficiencies on small, medium and large pearl millet farms were 0.985, 0.970 and 0.981, respectively. Allocative and economic efficiency showed that, only one farm was economically and allocative efficient. Cost minimizing input quantities revealed that small, medium and large pearl millet farms could reduce its cost by 56.30, 65.40 and 55.00 per cent, respectively by choosing a more cost efficient input mix for allocatively efficient farms. The mean extent of reduction in input cost of production on small pearl millet farms was Rs.2935.69, while on medium farms it was Rs.3248.81 and on large farms it was Rs.2622.61 by using a new cost efficient input mix

References:

1. Kadasiddappa Malamasuri, Praveen Rao V, Srinivas A, Harshad Thakur, Prioritizing the Order of Requirement of Nutrient, ; Life Sciences International Research Journal , ISSN 2347-8691, Volume 1 Issue 1 (2014): Pg 298-300
2. Ahmad, M., G. M. Chaudhry and M. Iqbal (2002). Wheat productivity, efficiency and sustainability: A stochastic production frontier analysis. *The Pakistan Development Review*. 4:643–663.
3. P.Ashalathaand K.Sarjan Rao, Body Condition Score (BCS) System As A tool for A.Anitha; Life Sciences International Research Journal , ISSN 2347-8691, Volume 1 Issue 1 (2014): Pg 342-347
4. Baravkar, S. N. (2014). Assessment of techno-economic and allocative efficiencies of cotton, onion and sugarcane growers of western Maharashtra through Data Envelopment Analysis.

Unpublished Ph.D. Thesis submitted to MPKV, Rahuri.

5. *Sonawane Shrikant, Shete Pranali,* "Isolation of Prodigiosin Producers From Aquatic Environment and Study of It's Applications." ; Life Sciences International Research Journal , ISSN 2347-8691, Volume 2 Spl Issue (2015): Pg 205-210
6. Chavas, J. P., and M. Aliber (1993). An analysis of economic efficiency in agriculture: A nonparametric approach. *Journal of Agricultural and Resource Economics*. 18:1-16.
7. *Deppendra Singh, Reddy, P.B,* Assessment of Toxic Stress of Water Pollution ; Life Sciences international Research Journal , ISSN 2347-8691, Volume 2 Issue 1 (2015), Pg 440-444
8. *Praveen Patidar, Darshan Dubey, Kamlesh Dashora,* Standardization of Astangavaleha; Life Sciences international Research Journal , ISSN 2347-8691, Volume 2 Issue 1 (2015), Pg 428-431
9. Chen, L. N., and Y. L. Xie (2000). Application of DEA on evaluating agricultural comprehensive productivity. *J. Zhejiang Univ. Agric. and Life Sci*. 26(4) : 447-450.
10. *S.D.Patole, Kumbhar J.S, Pawar P.P, D.B.Yadav,* Comparative Economics of Major Pulses in Western Maharashtra; Life Sciences International Research Journal , ISSN 2347-8691, Volume 2 Issue 2 (2015): Pg 189-192
11. Deshmukh, D. S. (2009). Economics of production and marketing of pearl millet in Beed district. Unpublished M.Sc.(Agri) thesis submitted to MAU, Parbhani.
12. Bhuvaneswari,M.Subbarao,K.V.M.Krishna Murthy, P.Rajasekhar,Y.Koteswararao, Transmission Studies of Cucumber Mosaic Virus V. ; Life Sciences International Research Journal , ISSN 2347-8691, Volume 1 Issue 1 (2014): Pg 288-297
13. Goksel Armagan (2008). Determining the factors affecting efficiency score in Agriculture. International journal of agricultural research 3 (4): 325-330.
14. *P.B.Reddy, Poornima Lodwal,* Evaluation of Research in Agricultural and Life Sciences ; Life Sciences international Research Journal , ISSN 2347-8691, Volume 2 Issue 1 (2015), Pg 434-439

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