



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2020; SP-9(7): 258-266

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www.thepharmajournal.com

Received: 21-05-2020

Accepted: 22-06-2020

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An economic comparison of organic and conventional wheat crop in Haryana

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Abstract

Wheat is an important cereal crops grown on around 25.53 lakh ha in Haryana and the total production in the state is 125.73 LMT. Wheat is mainly cultivated with usage of HYVs seed coupled with chemical fertilizers in irrigated areas of the country but now, people are aware about ill-effect of increased agro-chemicals and prefer to consume organic product. This paper was attempted to examine costs involved, returns attained, resource use efficiency, various marketing channels and to identify various constraints in organic cultivation of wheat crop in Haryana. The relevant information was collated from wheat growers of Hisar and Sonipat districts of Haryana by survey method. The total cost of cultivation in organic wheat worked out was ₹71852 ha⁻¹ and ₹78493 ha⁻¹ for Hisar and Sonipat districts, respectively. Further, the corresponding figures for net returns were ₹10782 ha⁻¹ and ₹13928 ha⁻¹. Human labour and FYM + Jeevamrit were noted their under-utilization in cultivation of organic wheat and channel-IV was found the most efficient among all the marketing channels in disposal of wheat produce. Low production in initial years, need of certification for sale of organic products, high certification charges and lack of knowledge of recommended package of practices etc. are some of the major limitations impelling organic cultivation of crops in the state.

Keywords: Resource, efficiency, marketing, cost

Introduction

Green revolution was triggered in India in late sixties with introduction of high yielding varieties (HYVs). The faster adoption of HYVs seed coupled with increased use of agro-chemicals and expanded irrigation facilities resulted into tremendous increase in food grains production in India. At present, country has achieved self-sufficiency in food grains and is in a position to export food grains especially for wheat and rice. However, the persistent adoption of modern technologies with augmented use of chemical fertilizers and plant protection chemicals has impinged into various negative effects like deterioration of soil health, heavy weeds infestation, severe incidence of insect-pests and diseases, depletion and contamination of ground water etc. In this context, organic farming is one of the viable options to avoid or largely exclude the use of synthetically manufactured fertilizers, pesticides, growth regulators and relies on green manure, crop rotations, crop residues, animal manures, bio-fertilizers, bio-pesticides etc. for improving soil health and sustaining crop productivity. India has the largest number of organic producers in the world, with 1.09 million certified organic producers, it is home to more than 35.11 per cent of total number of organic producers (3.10 million) in the world (APEDA, 2019). However, when it relates to area under certified organic cultivation, India contributes only 2.54 per cent (1.80 million ha) of the total (69.80 million ha) coverage at global level. India is one leading country for export of organic products to various destinations in world. Organic farming has been received considerable attention in Haryana in the recent years. This may be due to declining soil fertility, indiscriminate usage of agro-chemicals and increasing demand of organic products in Metropolitan city Delhi due to increased income level and exportable opportunities of organic products. Awareness about organic farming is increasing in Haryana and even small number of farmers have converted and started organic farming. But majority of the farmers in the state are still engaged in commercial agriculture and adoption rate of organic farming practice is very low. Therefore, an attempt has been made to study economics of organic farming *vis-à-vis* inorganic wheat cultivation in Haryana along with disposal pattern of wheat produce and constraints hindering in adoption of organic cultivation of wheat.

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Methodology

The cost of cultivation of both organic and inorganic wheat was worked out on the basis of various owned and purchased inputs used along with their prevailing market prices. The interest on working expenses was calculated @ 7% per annum taking into consideration rate of interest charged by financial institutions. The rental value of land was taken on the basis of prevailing prices in study area. The gross returns were computed by multiplying crop produce with post-harvest prices. Benefit-cost ratio (B: C) was computed by dividing gross returns with total expenses incurred in cultivation of crops. Further, to examine the resource use efficiency in organic as well as inorganic cultivation of wheat, various production functions were tested and Cobb-Douglas Production Function was found best fitted. The production function used to determine the contribution of different factors of production and also to estimate the efficiency in production of organic as well as inorganic wheat is as under: The following form of Cobb- Douglas Production Function was used in the present study:

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6}$$

Where,

Y = Gross Returns (Rs/ha)

X₁ = Human Labour (Rs/ha)

X₂ = Machine labour (Rs/ha)

X₃ = Seed (Rs/ha)

X₄ = FYM +Jeevamrit (Rs/ha)

X₅ = Vermi-compost (Rs/ha)

X₆ = Irrigation (Rs/ha)

X₇ = Organic pesticides (Rs/ha)

'a' is the constant term

b₁, b₂b₆ are the estimated regression coefficients in case of organic crops

Cobb-Douglas production function was used for the calculation of return to scale from organic and inorganic crops, using formula;

$$RTS = \sum b_i$$

Where,

RTS = Return to scale

b_i = regression coefficient of ith variable.

The sum of b_i's indicates the nature of return to scale.

The return to scale (RTS) is explained as:

RTS<1: Decreasing return to scale,

RTS=1: Constant return to scale,

RTS>1: Increasing return to scale

Marginal Value Productivity

The term "marginal productivity" refers to the extra output gained by adding one unit of any input; all other inputs are held constant. The marginal value productivity (MVP) of input X₁, X₂.....X₆ for Cobb- Douglas production function was computed as follows:

$$MVP_i = b_i \cdot \frac{\bar{Y}}{\bar{X}}$$

Where,

b_i = Estimated regression coefficient of input X_i,

\bar{Y} = Geometric mean value of output,

\bar{X} = Geometric mean value of input being considered.

Resource use efficiency

Resource use efficiency (fertilizer, water etc) is the output of any crop or anything else per unit of the resource applied under a specified set of soil and climatic conditions. If inputs are used to the extent so that its MVP is equal to its price, there exist efficient use of resources. Mathematically,

If, MVP = P_i

Where,

P_i = Unit price of input X_i

Any deviation of MVP of variable input X_i from its unit price, may be called as the resource use inefficiency. The higher the difference between these two, the higher is the inefficient use of resource and vice-versa.

The different market functionaries (contractors, commission agents, retailers and consumers) were interviewed from identified markets study area to estimate the marketing costs and margins involved in various marketing channels. The absolute and per cent margins were computed using the formulae as under Absolute margin = P_{Ri} - (P_{Pi} + C_{Mi})

$$\text{Percentage margin} = \frac{P_{Ri} - (P_{Pi} + C_{Mi})}{P_{Ri}} \times 100$$

Where,

P_{Ri} = Total value of receipts (sale price)

P_{Pi} = Total purchase value of goods (purchase price), and

C_{Mi} = Cost incurred in marketing

Producer's share in consumer's rupee

The producer's share in the consumer's rupee was worked out as under:

$$Ps = \frac{P_F}{P_C} \times 100$$

Where,

P_s = Producer's share in consumer's rupee,

P_F = Price of the produce received by the farmer and

P_c = Price of the produce paid by the consumer

Further marketing efficiency of various channels involved in disposal of wheat produce was worked out using the following methods are as under:

Conventional method

ME = [O/I] × 100

Where

O = Output is the value added

I = Input is the real cost of marketing

ME = Marketing efficiency

Shepherd's method

ME = RP ÷ MC

Where

RP = Retailer's sale price or consumer's purchase price

MC = Total marketing costs

Acharya's method (Acharya and Agarwal, 2011)

$$\text{MME} = \text{FP} \div (\text{MC} + \text{MM})$$

Where,

FP = Net price received by farmer

MC = Total marketing costs

MM = Total net margins of intermediaries

The information pertaining to various constraints in organic cultivation of wheat in the study area was ascertained through interaction with cultivators.

Results and discussion

A. Cost and returns of organic and inorganic cultivation in wheat

The organic cultivation of wheat is practiced with usage of bio-fertilizers, manures, vermi-compost, bio-pesticides and organic pesticides. The organic pesticides used in cultivation of organic wheat were prepared by the mixture of many products like awk, sambola, onion, chilli, neem, etc. costing ` 568 and ` 677 per ha in Hisar and Sonipat district, respectively. The jeev-amrit was prepared by mixing the urine (10 litres) of cows, especially of indigenous breeds, with dung

(10 kg) and it was applied with irrigation to the crop after a week of preparation. The average cost for supplement of nutrients through Farm Yard Manure (FYM) plus jeev-amrit in organic wheat cultivation worked out was `3528ha⁻¹ and `3786ha⁻¹ in Hisar and Sonipat, respectively (Table 1). The total expenses incurred on various inputs used in organic cultivation of wheat worked was `3893 and `4120 for Hisar and Sonipat, respectively. In the case of inorganic wheat, a considerable amount was spent on chemical fertilizers (Urea, DAP, Zinc sulphate) and plant protection chemicals (herbicides). The expenses incurred on chemical fertilizers including in inorganic cultivation of wheat worked was ` 7917ha⁻¹ and `6521ha⁻¹ for Hisar and Sonipat, respectively. The expenses incurred for plant protection chemicals used to protect the crop from insect-pests, diseases and to reduce weed infestation were `2240ha⁻¹ and `2385ha⁻¹, respectively. The total cost incurred for nutrients use and crop protection resources under organic and inorganic wheat cultivation was `5352ha⁻¹ and `5477ha⁻¹ in Hisar district, respectively and corresponding figures for Sonipat district were ` 11361ha⁻¹ and Rs 9908ha⁻¹.

Table 1: Cost incurred on nutrients and plant protection chemicals under organic and inorganic wheat cultivation in Haryana: 2018-19 (Rs./ha)

Sr. No.	Inputs	Organic		Inputs	Inorganic	
		Hisar	Sonipat		Hisar	Sonipat
1	Organic fertilizer			Fertilizer Nutrients		
	FYM + Jeevamrit	3528 (5.05)	3786 (4.37)	(a) Urea (Kg)	1673 (2.30)	1690 (1.93)
	Vermi-compost (q)	365 (0.52)	334 (0.38)	(b) DAP (Kg)	3333 (4.58)	3134 (3.59)
				(c) Potash (Kg)	176 (0.24)	189 (0.21)
				(d) Zinc Sulphate (Kg)	195 (0.26)	195 (0.22)
				FYM (qtls)	2540 (3.49)	1342 (1.53)
2	FYM +Jeevamrit and Vermi-compost	864 (1.23)	680 (0.78)	Fertilizer application	550 (0.75)	523 (0.59)
3				Chemical weeding	1542 (2.12)	1632 (1.87)
4				Weedicides	654 (0.89)	450 (0.51)
5	Organic pesticides	568 (0.81)	677 (0.78)	Pesticides	698 (0.95)	753 (0.86)
	Total	5325	5477		11361	9908

Figures in the parenthesis represents per cent share to the total cost

Cost of cultivation of organic and inorganic wheat in Haryana

Per hectare total cost of cultivation in inorganic wheat worked out was Rs 86536 and `87175 for Hisar and Sonipat districts, respectively (Table 2). The corresponding figures for organic wheat were `69789 for Hisar and `72716 in case of Sonipat. The total cost involved in cultivation of inorganic wheat was found higher than organic wheat in both districts. The share of

variable cost as well as fixed cost in total cost of organic wheat in Hisar district found was 38.76 per cent (`27050/ha) and 61.24 per cent (`42739/ha), respectively and for Sonipat district, the share was 39.00 and 61.00 per cent for variable and fixed cost, respectively. In case of inorganic wheat, the share of variable cost as well as fixed cost were found to be 46.90 per cent (`40589/ha) and 53.10 per cent (`45947/ha) for Hisar.

Table 2: Cost of wheat cultivation in Haryana: 2018-19 (/ha.)

Sr. No.	Inputs	Hisar		Sonipat	
		Organic	Inorganic	Organic	Inorganic
1	Land preparation	6532 (9.36)	6673 (7.71)	6741 (9.27)	5937 (7.96)
2	Seed & sowing	4267 (6.11)	4174 (4.82)	4240 (5.83)	4316 (4.95)
3	Chemical Fertilizer/ organic fertilizer	3893 (5.58)	7917 (9.15)	4120 (5.67)	6521 (7.48)
4	Irrigation	3606 (5.17)	3537 (4.09)	3755 (5.16)	3817 (4.38)
5	Plant protection	568 (0.81)	2240 (2.59)	677 (0.93)	2385 (2.74)
6	Harvesting & Threshing	4773 (6.84)	11306 (13.07)	5474 (7.53)	11365 (13.04)
7	Total Variable cost	27049 (38.76)	40589 (46.90)	28357 (39.00)	39819 (45.68)
8	Management charges & Risk factor	5410 (7.75)	8118 (9.38)	5671 (7.80)	7964 (9.14)
9	Rental value of land	36194 (51.86)	36553 (42.24)	37531 (51.61)	38125 (43.73)
10	Total cost	69789 (100.00)	86536 (100.00)	72716 (100.00)	87175 (100.00)

Note: Figure in the parenthesis represents per cent share to the total cost

In case of organic wheat, for Hisar district, land preparation (includes preparatory tillage, pre sowing irrigation and ridging cost) shared maximum i.e. 9.36 percent of total cost followed

by harvesting and threshing (6.84%), organic fertilizer (5.58%), while in fixed cost, maximum cost incurred on rental value of land i.e. 51.86 per cent (`36194/ha) followed by risk

factor and management charges which was 7.75 per cent (₹3116/ha) of total cost. In case of inorganic wheat, maximum cost incurred on wheat straw making 13.07 per cent of total expenses followed by total fertilizer investment (9.15%), and land preparation (7.71%). Whereas, in fixed cost, highest share were incurred on rental value of land *i.e.* 42.24 per cent (₹36553/ha) followed by risk factor and management charges *i.e.* 9.38 per cent (₹8118/ha). In case of organic wheat, for Sonipat district, land preparation shared maximum *i.e.* 9.27 percent of total cost followed by harvesting and threshing (7.53%), organic fertilizer (5.67%), while in fixed cost, maximum cost incurred on rental value of land *i.e.* 51.61 per cent followed by risk factor and management charges which was 7.80 per cent of total cost. In case of inorganic wheat, maximum cost incurred on wheat straw making 13.04 per cent of total expenses followed by total fertilizer investment (7.48%), and land preparation (7.96%). Whereas, in fixed cost, highest share were incurred on rental value of land *i.e.* 43.73 per cent followed by risk factor and management charges *i.e.* 9.14 per cent. The threshing/harvesting and transportation cost in organic wheat is slightly low in comparison of inorganic wheat. It may be due to less quantity

of produce and straw of wheat.

Returns from wheat cultivation in Haryana

Profitability from wheat cultivation in Hisar and Sonipat district of Haryana is presented in table 3. In Hisar district, per ha gross returns estimated were to be lower (₹86169) in organic wheat as compared to inorganic wheat (₹103573) and net returns per ha were also found to be higher in case of inorganic wheat (₹17037) in comparison to organic wheat (₹16380/ha) due to lower yield of organic wheat. Same in case of Sonipat, the per ha gross returns were also estimated to be lower (₹92421) in organic wheat as compared to inorganic wheat (₹107736) and net returns per ha were also found to be lower in case of organic wheat (₹19705) in comparison to inorganic wheat (₹20561/ha) due to lower yield of organic wheat. The low returns from organic wheat cultivation are mainly due to low yield in both districts. As far as benefit-cost (B-C) ratio is concerned, the values of B-C ratio was found higher in organic wheat and it was observed that organic wheat cultivation was more profitable in both the districts, Hisar (1.23) and Sonipat (1.27) over inorganic wheat in Hisar (1.20) and Sonipat (1.24), respectively.

Table 3: Returns from wheat cultivation in Haryana: 2018-19 (₹/ha.)

Sr. No.	Particulars	Hisar		Sonipat	
		Organic wheat	Inorganic wheat	Organic wheat	Inorganic wheat
1	Fixed cost	42739	45947	44358	47356
2	Variable cost	27050	40589	28357	39819
3	Total cost	69789	86536	72716	87175
4	Main Product (Q/ha)	22.81	49.04	24.30	50.54
5	By product (₹)	6334	13340	7371	14743
6	Price (₹/q)	3500	1840	3500	1840
7	Gross Returns	86169	103573	92421	107736
8	Net returns	16380	17037	19705	20561
9	B:C Ratio	1.23	1.20	1.27	1.24

The average yield in Hisar district for organic and inorganic wheat was 22.81 and 49.04 quintals, respectively, while the average yield of wheat in Sonipat district was 24.30 and 50.54 quintal for organic and inorganic cultivation, respectively. The average yield of inorganic wheat (49.04 q/ha) was more than twice that of organic wheat (22.81 q/ha) in both the districts. However, this difference in input costs is fully mitigated by gap in their respective yield. Similarly, the profitability of organic wheat is not much lower than inorganic wheat as higher price offered for organic produce. The market price of produce of organic wheat is almost double to inorganic wheat. For Hisar district, the net returns per ha for organic wheat was ₹16380 and for inorganic wheat it was estimated to be higher (₹17037). Similarly for Sonipat district, the net returns were higher for inorganic wheat (₹20561) as compared to organic wheat (₹19705).

B. Resource use efficiency of organic and inorganic wheat cultivation in Haryana

In this part resource use efficiency with respect to various explanatory variables of cost of cultivation in wheat cultivated under organic and inorganic conditions is worked out. Regression analysis was done using monetary term and results are presented as follows.

Input-output relationship of organic and inorganic wheat cultivation in Haryana

Regression analyses of organic and inorganic wheat

cultivation in Haryana was estimated and presented in Table 4. All explanatory variables were regressed with dependent variables in monetary value term with gross returns attained from sale of wheat produce. The results revealed that in case of organic cultivation of wheat in Hisar district, among the seven (7) explanatory variables namely human labour, machine labour, seed, FYM +Jeevamrit, irrigation, vermi-compost, organic pesticide, regression coefficient of human labour and FYM +jeevamrit were found to be positive with significant impact on yield of organic wheat. The value indicates that keeping all other factors constant one per cent increase in the human labour cost will increase the gross income by 1.452 per cent while one per cent extra expenses on the FYM +Jeevamrit, increase the gross income by 1.116 per cent. However, the regression coefficients of machine labour, seed and vermi-compost were found to be positive but non-significant impact on wheat yield. This showed that it would not be profitable to further increase in the expenses of these resources. The organic pesticide and irrigation were found to be negative and non-significant on wheat yield which indicates that there is need to reduce the expenditure on this resource. The sum of elasticity coefficients with 0.761 showed decreasing returns to scale. A decreasing returns to scale occurs when the proportion of output is less than the desired increased input during the production process. The value of coefficient of determination (R^2) indicates that 65.52 per cent of the variation in gross income in organic wheat cultivation was explained by the seven independent variables

included in the model. In case of inorganic cultivation of wheat in Hisar district, value of R^2 indicates that 65.91 per cent variation in gross income was explained by the independent variables. It was clear from the table that coefficient of machine labour have positive and significant impact on the yield of wheat. The value indicates that keeping all factors constant 1 per cent increase in the machine labour cost will increase gross income by 0.125 per cent, which is significant at 5 per cent level. However, human labour, seed cost and irrigation have positive but non-significant effect, which indicates that it would not be profitable to further increase the expenses on these resources. The fertilizer and

plant protection was observed non-significant and negative impact on yield indicating that there is need to reduce the expenditure on these resources. Return to scale was found 1.13 revealing the inorganic wheat cultivation was found profitable in the area.

In case of Sonipat district, for organic wheat the coefficient of irrigation, human labour, FYM +Jeevamrit, vermi-compost and organic pesticide have positive but non-significant effect. Machine labour and seed have negative and non-significant effect, therefore, there is need to reduce the expenditure on these resources. The sum of elasticity of coefficients with 0.687 showed the decreasing return to scale.

Table 4: Regression coefficient and standard error of wheat cultivation in Haryana

Parameters	Hisar		Sonipat	
	Organic	Inorganic	Organic	Inorganic
Co-efficients	23.54 (7.230)	8.353 (2.300)	16.522 (3.972)	8.765 (1.125)
Machine Labour	0.078 (0.331)	0.125** (0.191)	-0.014 (0.240)	0.105** (0.132)
Human Labour	1.452* (0.676)	0.283 (0.157)	0.563 (0.284)	0.264 (0.134)
Seed	0.042 (0.164)	0.103 (0.073)	-0.024 (0.070)	0.090*** (0.065)
Irrigation	-0.032 (0.141)	0.034 (0.134)	0.105 (0.173)	0.093* (0.093)
FYM + Jeevamrit	1.116** (0.218)	-	0.946 (0.202)	-
Fertilizer cost	-	-0.029 (0.036)	-	-0.027 (0.031)
Vermi-compost	0.203 (0.282)	-	0.587 (0.304)	-
Organic pesticide	-0.292 (0.131)	-	0.240 (0.123)	-
Plant protection	-	-0.122 (0.091)	-	0.231 (0.073)
Return to Scale	0.761	1.138	0.687	1.087
	Decreasing	Increasing	Decreasing	Increasing
$R^2\%$	65.52	65.91	64.90	67.17

*Significance at 1 per cent level, **Significance at 5 per cent level, ***Significance at 10 per cent level. Figures in parenthesis represent standard error.

The coefficient of determination (R^2) revealed 64.90 per cent variation in the gross income from organic wheat as explained by independent variables. In case of inorganic cultivation of wheat in Sonipat district, machine labour, seed and irrigation were found to be significant and positive impact on the yield of wheat. The value indicates that keeping all other factors constant one per cent increase in the machine labour cost will increase the gross income by 0.11 per cent while extra expenses on seed will increase the gross income by 0.09 per cent. and 1 per cent increase in irrigation cost will increase the gross income by 0.09 per cent.. However, human labour and plant protection has positive but non-significant effect, whereas, fertilizers were observed non-significant and negative impact on yield. The elasticity of production was noted to be increasing indicating that one per cent increase in all the factors of production simultaneously would result in an average increase of gross return by 1.08 per cent. The value of R^2 reveals that about 67.17 per cent variation in wheat yield was attributed due to independent variables.

Marginal value of productivity of different inputs used in organic and inorganic wheat cultivation in Haryana

In order to examine the resource use efficiency in organic and inorganic wheat in Hisar and Sonipat districts of Haryana, the marginal value productivity (MVP) of various inputs was worked out for regression coefficients in the estimated wheat production function. The estimated MVP of different inputs used in organic wheat cultivation in Hisar district is presented in table 5. The results reveal that ratio of MVP to MFC for Human labour and FYM +Jeevamrit were positive and greater than one, indicated under-utilization and their D value indicates that for optimum allocation of human labour and

FYM +Jeevamrit, expenditures are required to increase by 41.01 and 47.97 per cent as these resources were not fully utilized in the production process. It implies that higher profit could be accrued by increasing usage level of these resources. The analysis showed that the efficiency ratio for vermi-compost was near to one revealing that it is optimally utilized in practical sense. For seed, machine labour and irrigation the ratio of MVP to MFC were less than one which indicates over-utilization of these resources. In case of inorganic wheat of Hisar district, the ratio of MVP to MFC for machine labour was positive and greater than one, indicated under-utilization and D value indicates that for optimum allocation of machine labour its use is required to increase by 71.09 per cent as this resource was under-utilized in the production process. The efficiency ratio for human labour and seed was near to one indicating that it is optimally utilized. The efficiency ratio for irrigation, fertilizer and plant protection were less than one which indicates over utilization of these resources. In case of Sonipat district for organic wheat, the efficiency ratio for irrigation, human labour, FYM +Jeevamrit, vermi-compost and organic pesticide cost were near to one indicated that they were optimally utilized in practical sense. For seed and machine labour, the ratio of MVP to MFC were less than one which indicates their over-utilization. For inorganic wheat, the efficiency ratio for machine labour, seed and irrigation was found greater than one which indicates their under-utilization and their D value indicates that for optimum allocation of machine labour, seed and irrigation, expenses on these resources are required to increase by 40.20, 72.11 and 61.71 per cent as these resources were under-utilized in the production process.

Table 5: Marginal value of productivity (MVP) of various inputs in wheat cultivation in Haryana

Inputs	Organic (Hisar) N=15								
	Machine Labour	Human Labour	Seed	Irrigation	FYM+ Jeevamrit	Vermi compost	Organic pesticide	Fertilizer cost	Plant protection
MVP	0.055	1.697	0.817	-0.894	4.240	0.927	-0.992	-	-
Price(MFC)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	-
r(MVP/MFC)	0.055	1.697	0.817	-0.894	4.240	0.927	-0.992	-	-
Difference	-30.75	41.01*	-39.108	30.91	47.97**	53.013	61.009	-	-
SE of MVP	0.331	0.676	0.164	0.141	0.218	0.282	0.131	-	-
Inorganic (Hisar) N=15									
MVP	1.391	0.991	0.957	0.096	-	-	-	0.443	-3.936
Price(MFC)	1.000	1.000	1.000	1.000	-	-	-	1.000	1.000
r(MVP/MFC)	3.391	0.991	0.957	0.096	-	-	-	0.443	-3.936
Difference	71.095*	60.099	-22.965	65.954	-	-	-	-23.532	0.827
SE of MVP	0.109	0.175	0.448	0.563	-	-	-	0.065	0.061
Organic (Sonipat) N=15									
MVP	-0.743	0.973	-0.856	0.984	0.962	0.910	0.982	-	-
Price(MFC)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	-
r(MVP/MFC)	-0.743	0.973	-0.856	0.984	0.962	0.910	0.982	-	-
Difference	34.58	6.320	-16.886	62.74	82.16	71.48	66.98	-	-
SE of MVP	0.240	0.284	0.070	0.173	0.202	0.304	0.123	-	-
Inorganic (Sonipat) N=15									
MVP	1.087	0.306	3.57	2.117	-	-	-	-0.752	0.99
Price(MFC)	1.000	1.000	1.000	1.000	-	-	-	1.000	1.000
r(MVP/MFC)	1.087	0.306	3.57	2.117	-	-	-	-0.752	0.299
Difference	40.206*	21.054	72.113**	61.717*	-	-	-	-15.752	20.299
SE of MVP	0.099	0.055	0.079	0.123	-	-	-	0.139	0.104

*Significance at 1 per cent level, **Significance at 5 per cent level, ***Significance at 10 per cent level

C. Marketing cost and margin in disposal of organic wheat in Hisar district:

Before studying the marketing costs and margin, it is essential to know the channels through which produce passes to the ultimate consumer. This involves many market functionaries which ultimately reduce the producer's share in consumer's rupee. Following four major marketing channels were identified in the study area in marketing of organic wheat and basmati paddy.

I. Producer → Pre-harvest contractor → Commission agent → Wholesaler → Retailer → Consumer

II. Producer → Commission agent → Wholesaler → Retailer → Consumer

III. Producer → Commission agent → Retailer → Consumer

IV. Producer → Consumer

The organic wheat was sold through four marketing channels in Hisar district. The most prominent market channel in sale of wheat was found channel-I. However, wheat was also sold through other three channels. The price per quintal as paid by the consumer varied in all four marketing channels and it was highest in marketing channel-I (₹4018) and lowest in channel-IV (₹3514). The share of producer in consumer's price was found uppermost (97.26%) in channel-IV (₹3516) as there was no market intermediaries and producer sold directly produce to consumer and lowest was found in channel-I (₹3085) which is 76.78 percent of the consumer's price. The net price received by the producer in channel-II was ₹3189 and in channel-III was ₹3300 and their share in consumer's price were 81.64 percent and 92.23 percent in both the channels respectively. Producer had to bear the various expenses like packing material, transportation, loading and unloading charges, spoilage and losses in marketing of produce in all channels except channel-I. The expenses for various items are almost equal for channel-II, Channel-III and Channel-IV. The total expenses borne by the producer varied ₹97.49 per quintal

in channel-II, ₹98.41 in channel-III and ₹96.46 per quintal in channel IV. The share of total expenses incurred by producer was 2.50 percent in channel-II, 2.75 percent in channel-III and 2.74 percent in channel-IV of price paid by the consumer. Item wise per quintal cost of marketing of organic wheat incurred by producer in different channels in Hisar was calculated and presented in table 6. It was observed that, the proportionate share in the purchase price of consumer was highest for loading and unloading charges (0.72%) followed by packaging charges (0.64%), transportation charges (0.58%) and spoilage and losses (0.55%) in channel II. In channel-III, maximum share was on packaging charges (0.76%) followed by loading and unloading charges (0.74%), transportation charges (0.65%) and spoilage and losses (0.60%). In channel IV, maximum share in purchase price of consumer was on loading and unloading charges (0.79%) followed by packaging charges (0.71%), transportation charges (0.63%) and spoilage and losses (0.61%). Per quintal marketing cost of organic wheat incurred by pre-harvest contractor with respect to various items in marketing channel-I was ₹85.39 and the proportionate share in the purchase price of consumer was found highest for loading and unloading charges (0.62%) followed by packaging charges (0.54%), transportation charges (0.53%) and spoilage and losses (0.43%) in channel-I. The net margin of the pre harvest contractor calculated was as ₹129.61 which was 3.23 per cent of the consumer rupee. In regard to marketing cost incurred by wholesaler in channel-I and II, it was ₹318.83 and ₹316.99 per quintal. Proportionate share in consumer's rupee, as commission charge was found upmost as 6.57 per cent, followed by loading and unloading (0.66%), storage charge (0.40%), losses (0.30%) in channel-I. In channel-II, proportionate share was highest as (6.73%) on commission charge, followed by loading and unloading (0.70%), storage charge (0.40%), losses (0.28%). The net margin of wholesaler in channel-I and-II were ₹101.17 and ₹71.52 respectively,

which were 2.52 and 1.83 per cent of the consumer's purchase price. Per quintal cost incurred by retailer in channel-I, channel-II and channel-III was calculated and presented in

table 4.41. The result revealed that highest cost incurred by wholesaler was `81.23 in channel-III followed by `73.73 in channel-II and `69.56 in channel-I.

Table 6: Marketing costs and margins involved in disposal of organic wheat in Hisar district of Haryana

Sr. No.	Particulars	Channel-I	ChannelII	Channel III	Channel IV
1	Net price received by producer	3085 (76.78)	3189 (81.64)	3300 (92.23)	3418 (97.26)
2	Costs inurred by the producer	-	97.49 (2.5)	98.41 (2.75)	96.46 (2.74)
	i. Packing material	-	25 (0.64)	27.25 (0.76)	25.12 (0.71)
	ii. Transportaion	-	22.78 (0.58)	23.18 (0.65)	22.05 (0.63)
	iii. Loading and unloading charges	-	28.3 (0.72)	26.62 (0.74)	27.9 (0.79)
	iv. Spoilage and losses	-	21.41 (0.55)	21.36 (0.6)	21.39 (0.61)
3	Sale price of producer/purchase price of pre-harvest contractor	3085 (76.78)	-	-	-
4	Cost incurred by pre-harvest contractor	85.39 (2.13)	-	-	-
	i. Packing material	21.69 (0.54)	-	-	-
	ii. Loading and unloading charges	25.05 (0.62)	-	-	-
	iii. Transportation	21.43 (0.53)	-	-	-
	iv. Spoilage and losses	17.22 (0.43)	-	-	-
5	Net margin of pre-harvest contractor	129.61 (3.23)	-	-	-
6	Sale price of pre-harvest contractor/purchase price of wholesaler	3300 (82.13)	3286.49 (84.14)	-	-
7	Cost incurred by wholesaler	341.28 (8.49)	337.37 (8.64)	-	-
	i. Commission (@ 8 per cent)	264 (6.57)	262.92 (6.73)	-	-
	ii. Loading and unloading charges	26.65 (0.66)	27.43 (0.7)	-	-
	iii. transportation	22.45 (0.56)	20.38 (0.55)	-	-
	iv. Storage charges	16 (0.4)	15.64 (0.4)	-	-
	v. Spoilage and losses	12.18 (0.3)	11 (0.28)	-	-
8	Net margin of wholesaler	78.72 (1.96)	51.1408 (1.31)	-	-
9	Sale price of wholesaler /purchase price of retailer	3720 (92.58)	3675 (94.09)	3398.41 (94.98)	-
10	Cost incurred by the retailer	59.56 (1.48)	63.73 (1.63)	71.23 (1.99)	-
	i. Transportation	12.92 (0.32)	16.44 (0.42)	20.88 (0.58)	-
	ii. packing material	20.23 (0.5)	20 (0.51)	20.35 (0.57)	-
	iii. Spoilage and losses	26.41 (0.66)	27.29 (0.7)	30 (0.84)	-
11	Net margin of retailer	238.44 (5.93)	167.27 (4.28)	108.36 (3.03)	-
12	Sale price of retailer/purchase price of consumer	4018 (100)	3906 (100)	3578 (100)	3514.46 (100)

Note: Figure in parenthesis is the percentage to the consumer's price

The share of transportation charges in consumer's rupee was uppermost as 0.86 per cent in channel-III followed by channel-II (0.68%) and (0.57%) in channel-I. The losses in movement of produce from farm gate to ultimate consumer in case of wheat was highest (0.84%) of consumer's rupee in channel-III followed by channel-II (0.70%) and channel I (0.66%). The packaging charges were found highest (0.57%) in channel-III as compared to channel- II (0.51%) and channel I (0.50%). The net margin of retailer in channel-I was maximum with `228.44 followed by `157.27 in channel II and `98.36 in channel-III. The per cent share of retailer's margin in consumer's purchase price was 5.69, 4.03 and 2.75 per cent in channel-I, II and III, respectively.

Marketing efficiency in trading of organic wheat in Hisar district

The marketing efficiency of organic wheat in different marketing channels was computed by using three methods i.e. Acharya's method, conventional method and Shepherd's method. According to Acharya's method, marketing efficiency under different marketing channels i.e. channel-I,

channel-II, channel-III and channel-IV were 3.31, 4.45, 11.87 and 35.43 and 13.38, respectively. From this efficiency index, it is clear that channel-IV was the most efficient among all marketing channels. This was because of the fact that in channel-IV, intermediaries were not involved and hence this channel was most efficient than all other channels. Moreover, marketing efficiency increased with the drop in number of market intermediaries between producer and consumer. The marketing efficiency according to conventional method under different marketing channels i.e. channel-I, channel-II, channel-III and channel-IV was 1.92, 1.44, 1.64 and 1.00 respectively. From this efficiency index, it is evident that channel-I was the most efficient among all marketing channels. Why channel -I in efficient while other methods channel-IV is efficient. The marketing efficiency according to Shepherd's method under different marketing channels i.e. channel-I, channel-II, channel-III and channel-IV and were 8.26, 7.83, 21.09 and 36.43 respectively. From this efficiency index, it is concluded that channel-IV was the most efficient among all the marketing channels.

Table 7: Marketing efficiency of organic wheat in different marketing channels in Hisar

Sr. No.	Particulars	Unit	Channel-I	Channel-II	Channel-III	Channel-IV
1.	Consumer purchase price(RP)	`/Q	4018.00	3906.00	3578	3514.46
2.	Total marketing cost (MC)		486.23	498.59	169.64	96.46
3.	Total net margin of intermediaries (MM)		446.77	218.41	108.36	0
4.	Net price received by farmers (FP)		3085.00	3189.00	3300	3418.00
5.	Value added (1-4)		933.00	717.00	278	96.46

Index of marketing efficiency						
A	Acharya's method (MME) (4÷2+3)	Ratio	3.31	4.45	11.87	35.43
B	Conventional method (E) (5÷2)		1.92	1.44	1.64	1.00
C	Shepherds method (ME) (1÷2)		8.26	7.83	21.09	36.43

Marketing cost and margin in disposal of organic wheat in Sonipat district

The price per quintal as paid by the consumer varied in all four marketing channels and it was highest in marketing channel-I (₹3958) followed by channel-II (₹3899), channel-III (₹3613) and lowest in channel-IV (₹3595). The share of price received by producer in consumer's price was found uppermost (97.23%) in channel-IV (₹3495.28) as there was no market intermediaries and producer sold directly produce to consumer, followed by channel-III (92.19%), channel-II (81.79%) and the lowest was found in channel-I (₹3115) which is 78.70 percent of the consumer's price. Item wise per quintal cost of marketing of organic wheat incurred by producer in different channels in Sonipat district was calculated and presented in table 8. Producer had to bear the various expenses in marketing of the organic produce in all channels except channel-I. The cost incurred by the producer was ₹100.59 per quintal in channel-II, ₹98.07 in channel-III and ₹99.72 per quintal in channel IV. It was observed that, the proportionate share in the purchase price of consumer was highest for loading and unloading charges (0.77%) followed by packaging charges (0.63%), transportation charges (0.59%) and spoilage and losses (0.58%) in channel II. In channel-III, maximum share was on loading and unloading charges (0.83%) followed by packaging charges (0.64%),

followed by transportation charges (0.64%) and spoilage and losses (0.60%). In channel IV maximum share was on loading and unloading charges (0.83%) followed by packaging charges (0.67%), transportation charges (0.66%) and spoilage and losses (0.61%). Per quintal marketing cost of organic wheat incurred by pre harvest contractor with respect to various items in marketing channel I was ₹95.3 and the proportionate share in the purchase price of consumer was highest loading and unloading charges (0.72%) followed by packaging charges (0.61%), transportation charges (0.58%) and spoilage and losses (0.51%) in channel I. The net margin of the pre harvest contractor was calculated as ₹79.7 which was 2.01 per cent of the consumer rupee. In regard to marketing cost incurred by wholesaler in channel-I and II, it was ₹339.53 and ₹338.61 per quintals. Proportionate share in consumer's rupee, on commission charge was the highest as (6.65%), followed by loading and unloading (0.72%), transport (0.51%), storage charge (0.42%), losses (0.27%) in channel-I. In regard to proportionate share in channel-II, it was ₹263.17 per quintals on commission charge was the highest as (6.75%), followed by loading and unloading (0.71%), transport (0.56%), storage charge (0.41%), losses (0.26%). The net margin of wholesaler in channel I and II were ₹108.47 and ₹83.80 respectively, which were 2.74 and 2.15 per cent of the consumer's purchase price.

Table 8: Price spread in organic wheat marketing in Sonipat district of Haryana

Sr. No.	Particulars	Channel-I	Channel-II	Channel-III	Channel-IV
1	Net price received by producer	3115 (78.7)	3189 (81.79)	3330.93 (92.19)	3495.28 (97.23)
2	Costs incurred by the producer	-	100.59 (2.58)	98.07 (2.71)	99.72 (2.77)
	i. Packing material	-	24.74 (0.63)	23.22 (0.64)	24 (0.67)
	ii. Transportation	-	23.17 (0.59)	23 (0.64)	23.65 (0.66)
	iii. Loading and unloading charges	-	30(0.77)	30(0.83)	30(0.83)
	iv. Spoilage and losses	-	22.68 (0.58)	21.85 (0.6)	22.07 (0.61)
3	Sale price of producer/purchase price of pre-harvest contractor	-	-	-	-
4	Cost incurred by pre-harvest contractor	95.3 (2.41)	-	-	-
	i. Packing material	23.95 (0.61)	-	-	-
	ii. Loading and unloading charges	28.32 (0.72)	-	-	-
	iii. Transportation	22.78 (0.58)	-	-	-
	iv. Spoilage and losses	20.25 (0.51)	-	-	-
5	Net margin of pre-harvest contractor	79.7 (2.01)	-	-	-
6	Sale price of pre-harvest contractor/purchase price of wholesaler	3290 (83.12)	3289.59 (84.37)	-	-
7	Cost incurred by wholesaler	339.53 (8.58)	338.61 (8.68)	-	-
	i. Commission (@ 8 per cent)	263.2 (6.65)	263.17 (6.75)	-	-
	ii. Transportation	20.22 (0.51)	21.85 (0.56)	-	-
	iii. Loading and unloading charges	28.65 (0.72)	27.66 (0.71)	-	-
	iv. Storage charges	16.77 (0.42)	15.93 (0.41)	-	-
	v. Spoilage and losses	10.69 (0.27)	10.00 (0.26)	-	-
8	Net margin of wholesaler	108.47 (2.74)	83.8 (2.15)	-	-
9	Sale price of wholesaler /purchase price of retailer	3738 (94.44)	3712 (95.2)	3429 (94.91)	-
10	Cost incurred by the retailer	66.55 (1.68)	61.19 (1.57)	61.08 (1.69)	-
	i. Packing material	18.76 (0.47)	19.2 (0.49)	19 (0.53)	-
	ii. Transportation	19.05 (0.48)	16.99 (0.44)	12.45 (0.34)	-
	iii. Spoilage and losses	28.74 (0.73)	25.00 (0.64)	29.63 (0.82)	-
11	Net margin of retailer	153.45 (3.88)	125.81 (3.23)	122.92 (3.4)	-
12	Sale price of retailer/purchase price of consumer	3958 (100)	3899 (100)	3613 (100)	3595 (100)

(Figure in parenthesis is the percentage to the consumer's price)

Per quintal cost incurred by retailer in channel-I, channel-II and channel-III was calculated and presented in table 8. The result revealed that highest cost incurred by retailer was

₹66.55 in channel-I followed by ₹61.19 in channel-II and ₹61.08 in channel-I. In which share in consumer's rupee of transportation charges was high as 0.48 per cent in channel-I

followed by channel-II i.e. 0.44 per cent and 0.34 per cent in channel III, losses of wheat was high i.e. 0.84 per cent in consumer's rupee in channel-III followed by channel-I (0.73%) and channel II (0.64%), packaging charges was high as 0.53 per cent in channel-III as compared to channel- II (0.49%) and channel I (0.47%). The net margin of retailer in channel I was high with `153.45 followed by `125.81 in channel II and `122.92 in channel III. The per cent share of retailer's margin in consumer's purchase price were 3.88, 3.23 and 3.40 per cent in channel I, II and III respectively.

Marketing efficiency of organic wheat in different channels in Sonipat

Table 9: Marketing efficiency of organic wheat in different marketing channels in Sonipat

Sr. No.	Particulars	Unit	Channel-I	Channel-II	Channel-III	Channel-IV
1.	Consumer purchase price(RP)		3958	3899	3613	3595
2.	Total marketing cost (MC)		501.38	500.38	159.15	99.72
3.	Total net margin of intermediaries (MM)	∕Q	341.62	209.61	122.92	0
4.	Net price received by farmers(FP)		3115.00	3189.00	3330.93	3495.28
5.	Value added (1-4)		843	710	282.07	99.72
Index of marketing efficiency						
A	Acharya's method (MME) (4÷2+3)		3.70	4.49	11.81	35.05
B	Conventional method (E) (5÷2)	Ratio	1.68	1.42	1.77	1.00
C	Shepherds method (ME) (1÷2)		7.89	7.79	22.70	36.05

D. Constraints faced in adoption of organic cultivation of crops in Haryana.

Among all the constraints faced in the organic cultivation of crops, the important constraints were low production in initial years, need of certification for sale of organic product, distant location of certification agencies and high certification charges, as all the sampled organic growers in the area had no certification for their produce and some farmers were under process for their produce. The investigation further revealed that non-remunerative price of organic products, lack of demarcated place for sale of organic products in regulated markets, lack of proper guidance and training, lack of marketing news, inadequate input supply centres, slow process of organic manure preparation and lack of knowledge of recommended package of practices were also the major issue for organic products in the sample area.

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The marketing efficiency of organic wheat in different marketing channels has been calculated and shown in the table 9. Marketing efficiency, according to Acharya's method, under different marketing channels i.e. channel-I, channel-II, channel-III and channel-IV were 3.70, 4.49, 11.81 and 35.05, respectively. The marketing efficiency according to conventional method under different marketing channels i.e. channel-I, channel-II, channel-III and channel-IV were 1.68, 1.42, 1.77 and 1.00, respectively. The marketing efficiency according to Shepherd's method under different marketing channels i.e. channel-I, channel-II, channel-III and channel-IV were 7.89, 7.79, 22.70 and 36.05, respectively.

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