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Original Research Article

Economics of Wheat Cultivation in Basti District of Eastern Uttar Pradesh

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A B S T R A C T

Wheat is one of the important crops in U.P. as well as in India. It ranks II[nd] in production in the world. India has been second largest producer of wheat after china. Globally wheat is grown in 122 countries over an area of 222.6 million hectare and producing nearly 716.1 million tonnes during 2013-14. In India it produces about 95.91 million tonnes of wheat from an area of 31.2 million hectares with an average yield of 3.08 tonnes /ha (2013-14). Uttar Pradesh ranks first in terms of both area and production of wheat contributing about 34.42 per cent of national production (30.24 million tonnes) having the area 99.56 million hectare is much lower as compared to Punjab and Haryana, (2014). District Basti was purposively selected and the block Sadar having highest acreage under wheat was selected purposively for the study. List of the villages from selected block were prepared along with acreage under wheat cultivation and 5 villages were selected randomly for study. In all 100 number of farmers were selected proportionally from each category of farmers and classified into three categories i.e. marginal (below 1 ha), small (1-2 ha), medium (2-4 ha). The period of enquiry pertain to the agricultural year 2014-15. Per hectare cost of cultivation shows positive relation with size of holding as it was maximum of Rs. 37073.65 on medium farm. Per quintal cost of production was found to be Rs. 1270.00 and productivity was 28.73 quintal per hectare. Input-output ratio over all farms came to 1: 2.18 to 1: 1.33. Income measures show inverse relationship with size of holding. Four variables namely, seed, manure & fertilizer, irrigation charges and human labour were considered to work out the resource use efficiency.

Keywords

Wheat Cultivation, Costs and returns of wheat

Introduction

In India, wheat covers an area of 31.2 million hectares having a production of 95.91 million tonnes with a productivity of 3.08 tonnes per hectare. Wheat contributes about 35.50 per cent of the total food grain production of the country (Pratiyogita Darpan, 2013-14). Uttar Pradesh is the highest wheat producing state followed by Punjab and Haryana. During, 2013-14, area under wheat in U.P. was 99.56 million hectares and production was 30.24 million tonnes while productivity was 3.29 tonns/ha. (Ministry of consumer Affaires, Food and Public Distribution, Government of India 2013-14).

Basti district is also an important wheat producing district of U.P. in the year, 2012-2013 The area under wheat in the district was reported as 118745 hectare with production of 345612 metric tonnes, while productivity was 29.11 q/ha. (Shankhyakiya

Patrika Janapad Basti, 2014). The study entitled "Economics of wheat cultivation in Basti district of Eastern Uttar Pradesh" following objectives :

(i) To work out the cost of cultivation and input: output relationship in production of wheat crop;
(ii) To estimate resource use efficiency in wheat cultivation.
(iii) To standardize value added products based on wheat.

Materials and Methods

Sampling design

The study was purposely under taken in Basti in order to avoid operational inconvenience and constraints of money and time of the investigator. Three stage stratified random sampling design was used to select the block in first, village in second and cultivators in the ultimate stage of study. At first, a list of all 16 blocks of Basti district of eastern Uttar Pradesh along with area of wheat was undertaken block wise and then one of the block namely Sadar was selected randomly for this study.

A list of all the villages following under Sadar block were prepared and arranged in ascending order to the area covered under wheat crop and 5 villages were selected randomly from this list. A separate list of respondents was prepared along with their size of holding from each selected village and classified in to three categories i.e. Marginal ie below 1 ha, Small - 1 to 2 ha, Medium -2 to 4 ha.

Method of enquiry

Period of study

The data was pertain to the agriculture year 2014-2015.

Analytical tools

Tabular analysis

The formula to estimate this average is given below:

$$\text{(a) Weighted mean} = \frac{\sum W\,Xi}{\sum W}$$

Where,
W = Weight of Xi
Xi = Variable

$$\text{(b) Arithmatic mean} = \frac{\sum X}{N}$$

(c) Percentage = Simple comparisons have been made on the basis of percentage.

Regression analysis

The form of Cobb-Douglas production function used for analysis is :

$$Y = ax_1^{b_1}\, x_2^{b_2} \ldots\ldots x_n^{b_n}$$

Where,

Y = Dependent variable (output values in Rs./ha.)
Xi = i^{th} independent variable (input values in Rs./ha.)
X_1= Seed (input values in Rs./ha.)
X_2 = Manure & fertilizer (input values in Rs./ha.)
X_3 = Irrigation (input values in Rs./ha.)
X_4 = Human labour (input values in Rs./ha.)
a = Constant
bi = Production elasticity with respect to Xi

Estimation of marginal value product

The geometric mean level of inputs.

$$(MVP)bi = \frac{bi\,\bar{y}}{Xi}$$

Where,
bi = production elasticity with respect to Xi
$\bar{y}$ = geometric mean of y (output values in Rs./ha.)
Xi = geometric mean of Xi (input values in Rs./ha.)
(MVP)bi = marginal value product of i^{th} impact
I = 1, 2, 3, 4 etc.

Significance t-Test of the sample regression coefficients

Having estimated the elasticity coefficient; it is desirable to ascertain. The reliability of these estimates. The most commonly used "t" Test was applied to ascertain whether the sample production elasticity coefficient, b_j is significantly different from zero or not at some specified probability level.

"t" cal . = b_j /standard error of b_j

If cal "t" value is greater than the table value of "t" at specified probability level and "n-k-1" degree of freedom, b_j is said said to be statistically significantly different from zero (k is number of independent factors and n is sample size).

Standard error of b_j equals $=\sigma\sqrt{Cii}$

Cii is the diagonal element of matrix of correct sum of cross product of independent variable. Is the estimated variance of the error term of the equation under estimation.

F- test was used to test the significance of regression as a whole

$$F = \frac{\text{regression mean square}}{\text{error mean square}} = \frac{\frac{SSR}{K}}{\frac{\sum e^2}{n} - K - 1}$$

Where,
SSR = sum of square due to regression; and
$\sum e^2$ = sum of square of error term.

Results and Discussion

The per hectare cost on various input factors in wheat production was worked out and its details are presented in the Table 1. This Table indicated that on an average per hectare cost of cultivation of wheat was Rs. 34992.16. The cost of cultivation was observed higher on medium farm (Rs. 37073.65) followed by marginal farm (Rs. 34273.83) and small farm (Rs. 33354.06) respectively.

The total cost on medium farm was maximum due to heavy expenditure use of manures & fertilizers. The study further revealed that in case of small farm, cost incurred on manure and fertilizer was 14.79 per cent followed by irrigation 12.52 per cent respectively, and marginal farm, cost incurred on irrigation, Manure and fertilizers and seed (13.47), (13.29) and 12.53 per cent, respectively.

The further distribution of the costs on over all farm average showed that the maximum expenditure on manure and fertilizer. 15.51 per cent followed by irrigation 13.04 per cent. The expenditure on total, seed, total human labour, tractors charges, weed protection and interest on fixed capital, corresponding to 11.15, 8.26, 7.06, 1.56 and 1.55 per cent, respectively.

Measures of costs and returns of wheat crop

Per hectare costs and income from the cultivation of wheat crop on different categories of farms were worked out and presented in Table 2.. It is depicted from the table that, on an average the total cost of cultivation (C_3) incurred to Rs. 30456.73 per hectare and maximum was found to Rs.

33285.88 on marginal farm followed by small, medium farms corresponding to Rs. 30126.12 and Rs. 28253.45, respectively.

As far as the income measure are concerned, it is observed from the table that the gross income per hectare was found maximum to Rs.37769.23 on medium farm followed by marginal and small farms to Rs. 36073.59 and Rs. 34852.88 respectively. Whereas on an average gross income on over all farms incurred to Rs. 36091.42 Other income measures like net income, farm income, and family labour income were also worked out and presented in the table showing same trend as gross income, As size of farm increases, the various measures of income decreases.

It displayed in the table that cost of production per quintal on the basis of cost C_3 was highest to Rs. 1318.51 on marginal farm followed by small and medium farms to Rs.1244.18 and Rs.1232.63, respectively, where as it was Rs. 1270.00 per quintal on all over farms.

The input-output analysis was also done on the basis of cost A_1 to cost C_3. It varied from 1:2.21 to 1:1.35 in case of marginal farm size group, 1: 2.20 to1:1.31 on small farm and 1:2.12 to 1:1.29 on medium farm size groups. The overall average of the input: output ratio on the basis of various costs varies from 1:2.18 to 1:1.33.

Resource use efficiency

The Cobb–Douglas production function was applied to find out the efficiency of various resources used in the production of wheat.

The value of elasticity of production, standard error, co–efficient of multiple determination and return to scale for wheat production on different size group of farms are presented in Table 3. The high value of R^2 of the fitted function indicated that sufficient and large proportion of the total variation in the depended variable is explained by the input included in the function. The table further indicated that four variables viz. seed, manure fertilizer, human labour and irrigation jointly explained 0.915736, 0.948572, and 0.883402 per cent variation of the dependent variable on marginal, small and medium farms respectively.

Standardization of wheat Based Products:

1. Missi Roti

Ingredients

Wheat flour - 100 gm
Bengal Gram Flour - 100gm
Pearl Millet flour - 50gm
Real Chilli Powder - 1tbsp
Ajwain - 1/4tbsp
Salt - According to taste
Ghee - 2 tbsp

Method- Mixed all ingredients. Added one table spoon ghee and rubbed with palms. Kneaded well using required amount of water. Made small balls and rolled on rolling board using rolling pin. Roasted this roti on a hot griddle and applied ghee before serving.

2. Palak- Methi Paratha

Ingredients

Wheat Flour - 100gm
Curd - 50gm
Coriander Powder - 1tsp
Ajwain - 1/4tbsp
Cumin Seeds - 1/2 tbsp
Red Chilli Powder - 1/2 tbsp
Turmeric Powder - 1/2tbsp

Asafoetida - a pinch
Fenugreek Leaves - 100gm
Spinach - 50gm
Oil - 4tbsp

Method- Washed and cut fenugreek and spinach leaves . Mixed all other ingredients except ghee and kneaded well using required amount of water. Left the dough aside for half an hour. Made small balls and rolled on rolling pin and board. Roasted on hot griddle and applied ghee on both sides. Served hot.

3. Spicy Chilla-

Ingredients

Wheat Flour - 200gm
Grated cheese - 50gm
Coriander leaves - Few springs
Onion - One
Green Chilies - According to taste
Tomato, onion spinach paste- 50gm
Salt - According to taste

Method- Mixed all the ingredients and made a thick batter. Headed a non stick pan and spread batter on it and cooked from both sides till golden brown.

4. Meetha Paratha-

Ingredients

Wheat - 150gm
Jaggery - 50gm
Bengal Gram Dal - 50gm
Small Cardamom - 3-4
Refined Oil - For frying

Method- Soaked dal.

Boiled soaked dal in sufficient amount of water till done. Cooled ,added jaggery and mashed well. Kept aside to cool. Kneaded flour using sufficient amount of water to make a soft and easily pliable dough. Made small balls. Filled small amount of dal and jaggery mixture in it. Rolled on using rolling pin and board. Shallow fried on hot griddle.

Table.3 Resource use efficiency in wheat on different size of sample farms

Size group of sample farms (ha)	Production elasticities				Sum of elasticities	R^2
	X_1	X_2	X_3	X_4		
Marginal	0.217444* (0.82666)	0.394828** (0.034121)	0.112312 (0.336767)	0.067233 (0.154071)	0.791818	0.915736
Small	0.267076* (0.11327)	0.362095** (0.0653527)	0.174634 (0.396016)	0.063619 (0.04651)	0.867424	0.948572
Medium	0.229765 (0.403851)	0.480668* (0.14784)	0.118202 (0.889215)	0.022151 (0.08837)	0.850787	0.883402

(**Note**: Figures in parenthesis denotes standard error of respective variables)
** Significant at 1percents level
*Significant at 5percents level
X_1, X_2, X_3, and X_4denotes for seed, manure and fertilizer, irrigation charges and human labour cost respective.

Table.1 Per hectare cost of cultivation of wheat crop on different size group of sample farms

(Rs.)

S.No.	Particulars	Size group of sample farms			Overall
		Marginal	Small	Medium	
1.	Family labour	1617.74 (5.58)	862.5 (3.03)	662.82 (2.18)	1103.35 (3.78)
2.	Hired labour	794.37 (2.74)	1548.07 (5.45)	1740.38 (5.73)	1305.87 (4.48)
3.	Total human labour	2412.12 (8.32)	2410.57 (8.48)	2403.15 (7.91)	2409.22 (8.26)
4.	Tractor charges	2063.63 (7.12)	2069.85 (7.28)	2032.69 (6.69)	2057.69 (7.06)
5.	Seed	3631.25 (12.53)	3056.15 (10.76)	2941.92 (9.68)	3249.47 (11.15)
6.	Manure & fertilizer	3850.69 (13.29)	4200.70 (14.79)	5933.14 (19.54)	4518.98 (15.51)
7.	Irrigation	3902.16 (13.47)	3557.69 (12.52)	3969.23 (13.07)	3799.32 (13.04)
8.	Threshing	1318.15 (2.85)	812.15 (1.57)	718.15 (1.55)	822.72 (1.94)
9.	Combine	873.26 (1.89)	1115.74 (2.53)	2551.26 (6.25)	1855.63 (4.39)
10.	Weed control	404.32 (1.39)	503.84 (1.77)	469.87 (1.54)	456.29 (1.56)
11.	Interest on working capital	209.07 (0.72)	180.05 (0.63)	172.26 (0.56)	189.27 (0.64)
12.	Rental value of owned land	12000 (41.42)	12000 (42.26)	12000 (39.52)	12000 (41.19)
13.	Interest on fixed capital	493.58 (1.70)	414.84 (1.46)	441.61 (1.45)	452.42 (1.55)
14.	**Sub Total**	**31158.23 (90.91)**	**30321.58 (90.91)**	**33703.37 (90.91)**	**31811.01 (90.91)**
15.	Managerial charge	3115.60 (9.09)	3032.48 (9.09)	3370.28 (9.09)	3181.15 (9.09)
Grand total		**34273.83 (100)**	**33354.06 (100)**	**37073.65 (100)**	**34992.16 (100)**

Table.2 Per hectare costs and returns from the production of wheat on the basis at various costs concepts

(Rs.)

S. No.	Item	Size group of farms			Overall
	Costs	**Marginal**	**Small**	**Medium**	
1.	Cost A_1/A_2	16264.19	15798.70	17750.06	16481.03
2.	Cost B_1	16757.77	16213.54	18191.67	16943.46
3.	Cost B_2	28757.77	28213.54	30191.67	28943.46
4.	Cost C_1	18375.51	17076.04	18854.49	18046.82
5.	Cost C_2	30375.51	29076.04	30854.49	30046.82
6.	Cost C_3	33285.52	30126.12	28253.45	30456.73
7.	Gross income	36073.59	34852.88	37769.23	36091.42
8.	Net income	7106.77	6459.32	7405.67	6958.80
9.	Family labour income	19315.82	18639.34	19577.56	19147.96
10.	Farm business income	19809.4	19054.81	20019.17	19600.38
11.	**Cost of production/Qt**				
a.	Yield Qt./ha	27.35	28.94	30.53	28.73
b.	Cost of production (Rs./Qt.)	1318.51	1244.18	1232.63	1270.00
12.	**Input-output ratio**				
I.	A_1/A_2basis	1:2.21	1:2.20	1:2.12	1:2.18
II.	B_1 basis	1:2.15	1:2.14	1:2.07	1:2.12
III.	B_2 basis	1:1.25	1:1.23	1:1.25	1:1.24
IV.	C_1 basis	1:1.96	1:2.04	1:2.00	1:1.99
V.	C_2 basis	1:1.87	1:1.19	1:1.22	1:1.46
VI.	C_3 basis	1:1.35	1:1.31	1:1.29	1:1.33

Table 3 clearly indicated that during both the years, percent disease incidence was 34.1 and 32.2 respectively. The mean PDI of all treatments (biofertilizer) was significantly reduced as compared to control.

The maximum PDI, among treatment of 15.85 percent and 12.8 percent was recorded in recommended doses of fertilizer and Vermicompost respectively. Minimum PDI of 5.5 and 6.8 was observed in FYM and RDF + FYM. Maximum increase in yield was recorded in FYM and RDF + FYM. After the application of biofertilizer, maximum yield (7.86 q/ha) and % disease incidence over control was observed for FYM (5.5%) followed by RDF+ FYM and least yield and % disease over control by RDF followed by Vermicompost.

Evaluation of seven amendments of biofertilizers for management of disease under field conditions revealed that maximum yield (q/ha) and minimum % disease incidence was recorded in FYM (7.862 and 5.5) followed by RDF+ FYM (7.234 and 6.8) whereas low yield coupled with low percent disease incidence was recorded in RDF (5.717 and 15.8).

Effect of organic manures and biofertilizers in control of diseases caused by *A.alternata* have been reported in different (Jayathilake *et al.*, 2002; Mughrabi, 2006).

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