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Study on farm structure, cropping pattern and cropping intensity of Lentil growing sample farms in Lakhimpur Kheri District of U.P., India

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Abstract
The study was conducted in Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.). The enquiry pertained to the agricultural year 2027-18. Lentil is an important crop with the view of food and nutritional value and income & employment generation ability, possibility to raise the cropping intensity due to its nature of best fit with food grain production system. Keeping in view the importance of the Lentil a study on cultivation of Lentil was conducted in Mitauli block of Lakhimpur (Kheri) District. A sample of 100 farmers from, marginal, small and medium holding size were drawn through the proportionate random sampling technique, from five selected villages of Mitauli block, data were collected through personal interview method with the help of pre-structured schedule and secondary data were collected from district offices. More than 50% of the sample farmers were of marginal holding, very less number of medium size farmers was found. Overall average holding size was found to 0.419 hectare. Paddy, wheat and sugarcane were the major crops of kharif, rabi and zaid season respectively. Lentil under study was also allotted considerable acreage in cropping pattern; cropping intensity was inversely related with farm size. Similarly per farm and per hectare investment on building and livestock were also inversely related with farm size.

Keywords: Cropping pattern, cropping intensity, holding size and investment

Introduction

Pulses are very important source of protein in the Indian diets as majority of population is vegetarian. However the production of pulses is not keeping pace with the growing population in the country. India is the largest producer, importer and consumer of pulses in the world accounting for 25% of the global production, 15% trade and 27% consumption. Sizeable population in the country still depends on vegetarian diet to meet their protein requirements. Lentil is one of the important *Rabi* pulses. Which is equally oldest and the most nutritious also. It has the potential to cover the risk of dry land agriculture. It is also used as a cover crop to check the soil erosion in problem areas. It is mostly eaten as "dal'' by converting into split pulse or "dal'' by the removal of the skin and the separation of the fleshy cotyledons. Due to shortage of pulses in the country the prices have increased considerably and the consumer is hard hit to buy his requirement. Thus the availability of pulses per capita has proportionately declined from 71 g (1955) to 44.4 g (1978) against the minimum requirement of 160 g per capita per day. Pulses play an equally important role in irrigated agriculture, by improving physical, chemical and biological properties of soil and are considered excellent crops for natural resource management, environmental security, crop diversification and consequently for viable agriculture. Since, there is not much possibility to import the pulses in the country, the productivity of pulses have to be increased internally to meet the demand. In India, it is grown over an area of 1.47 million hectares with total production of about 1.04 million tonnes and productivity 705 kg /hec. (Directorate of economics and statistics, Department of agriculture and cooperation, 2016). Uttar Pradesh, Bihar, West Bengal, Rajasthan and Assam are the leading states growing lentil on large scale. Uttar Pradesh acreage and production 0.44 million hectare, 3.08 million tonnes and yield 537 kg/ha.

(Directorate of economics and statistics, Department of agriculture and cooperation, 2016). In Lakhimpur district of Uttar Pradesh lentil occupies an area of 15579 hectares and its productivity was 8.79 q/ha. The total production was 13694 metric tonnes. (District statistical bulletin 2013-14).

1. To study the farm structures on Lentil growing farms of the study area.
2. To study the cropping pattern, cropping intensity on Lentil growing farms.

Materials and Methods
Sampling Technique
The multistage stratified, purposive cum random sampling procedure was used for the selection of district, block, village and respondents.

The study was purposively undertaken in Lakhimpur Kheri district in order to avoid operational inconvenience of the investigator. At first, a list of all 15 blocks of Lakhimpur (Kheri) district of Uttar Pradesh along with acreage of Lentil cultivation were prepared and arranged in descending order. The block namely "Mitauli" having highest area covered under Lentil cultivation was selected purposively for this study. A list of all the villages falling under Mitauli block was prepared, and five villages were selected randomly from this list.

A separate list of Lentil growers of five selected villages was prepared along with their size of holding and stratified into three categories i.e.

1. Marginal – (Below 1 ha)
2. Small – (1 to 2 ha)
3. Medium – (2 to 4 ha)

From this list, a sample of 100 respondents was drawn following the proportionate random sampling technique.

Methods of enquiry
The primary data were collected by survey method through personal interview with use of pre-structured and pre-tested schedule, while secondary data were collected from block head quarter and district offices etc.

Period of enquiry
The data was pertained to the agricultural year 2016-2017.

Methods and techniques of analysis
The data collected from the sample farmers were analyzed and estimated with certain statistical tools.

Average
The simplest and important measures of average which have been used into statistical analysis were the weighted average. The formula used to estimate the average is as below-

$$W.\ A. = \frac{\sum Wi\ Xi}{\sum Wi}$$

Where,
W. A. = Weighted average
X_i = Variable
W_i = weights of X_i

Sampling design used for selection of respondents
Structure of farms
The study on the structure of sample farms has its importance as this influence the resource use pattern on farms. The structure of sample farms highlights overall conditions within

and around the farms, such as size of holding, cropping pattern and cropping intensity etc. The character existing on sample farms are discussed below.

Average holding size of sample farms
Land is the base for any agricultural enterprise. The availability of land on sample farms of different size groups are presented in table-1. It is depicted from the table that overall average size of holding was 0.419hectare in the study area which was found to 0.292, 1.463 and 3.548 hectares on marginal, small and medium size group of sample farms, respectively. The total cultivated area at all categories of sample farms were found in irrigated condition.

Table 1: Average holding size of sample farms:

Sl. No.	Size groups of farmers	No. of farmers	Net cultivated area (ha)	Average size of farms
1.	Marginal	91	26.646 (63.59)	0.292
2.	Small	8	11.706 (27.93)	1.463
3.	Medium	1	3.548 (8.46)	3.548
	Grand Total	100	41.90 (100)	0.419

*Indicate overall average

Farm assets at sample farms of the study area
Description of the investment on farm assets is given in two ways,
(i) Per farm investment & (ii) Per ha investment.

(i) Per farm investment
Per farm investment on different size group of sample farm is presented in table-2. The total farm assets available at the sample farms are categories as buildings, machinery & implements and livestock. It is depicted from the table that the maximum share of the total farm investment i.e. 63.53% was occurred on building followed by machinery & implements 27.17% and Livestock 9.29% on an overall average. The situation emphasizes the system of custom hiring of farm machineries in study area. It is revealed from the table that per farm total investment was Rs. 553985.50 an overall farm, which was maximum on medium farms i.e. Rs. 926333.70 followed by small Rs. 788523.10 and marginal Rs. 529275.10, respectively. Per farm total investment on marginal size of farms shared as higher percent on building (64.57) followed by machinery & implements (25.76) and livestock 9.66%. Similar trend of per farm investment was found on small and medium size group of farms. It is concluded that per farm investment on sample farms was having positive relationship with farm size.

(ii) Per hectare investment
The per hectare investment on sample farms are presented in table-3. It is depicted from the table that the major percent share of the total investment was spent on building i.e. 63.53% on an overall farms, followed by the expenditure on farm machinery & implements and livestock which accounted for 27.17 and 9.29% respectively. It is revealed from the table that per hectare total investment was Rs. 1695182 an overall farm, which were maximum on marginal farms i.e. Rs. 1812586 followed by small Rs. 538976.80 and medium Rs. 261086.20, respectively. Per hectare total investment on marginal size of farms shared as higher percent on building (64.57) followed by machinery & implements (25.76) and livestock (9.66) group similar trend of the per hectare investment was found on small and medium size group of farms. It may be concluded that per farm investment had the direct relation with farm size, whereas per hectare of that was inversely related.

Table 2: Per farm investment on different size group of farms (Rs)

S. No.	Particulars	Size of farms			
		Marginal	Small	Medium	Overall average
1.	Buildings	341767.50 (64.57)	442009.80 (56.05)	560785.80 (60.54)	351977.10 (63.53)
2.	Residential	328135.20 (62.00)	420860.60 (53.37)	512785.80 (55.36)	337399.70 (60.90)
3.	Kachcha	14381.14 (2.72)	3040.40 (0.38)	5020.40 (0.54)	13380.27 (2.41)
4.	Pacca	313754 (59.28)	417820.20 (52.99)	507765.40 (54.81)	324019.40 (58.49)
5.	Cattle shed	9470.67 (1.79)	12000 (1.52)	12000 (1.29)	9698.028 (1.75)
6.	Kachcha	3700.36 (0.70)	2000 (0.25)	-	3527.328 (0.64)
7.	Pacca	5770.00 (1.09)	10000 (1.27)	12000 (1.29)	6170.70 (1.11)
8.	Godowon	4161.96 (0.79)	9149.15 (1.16)	36000 (3.89)	4879.316 (0.88)
9.	Kachcha	885.68 (0.17)	-	-	805.9688 (0.14)
10.	Pacca	3276.28 (0.62)	9149.15 (1.16)	36000 (3.89)	4073.347 (0.73)
11.	Livestock	51146.17 (9.66)	58773.27 (7.45)	225447.91 (2.43)	51470.36 (9.29)
12.	Cow	1989.04 (0.37)	1537.67 (0.19)	-	1933.04 (0.35)
13.	Buffalo	43885.53(8.29)	57235.60 (7.26)	225447.91 (2.43)	44721.96 (8.07)
14.	Goat	5291. 60 (1.00)	-	-	4815.356 (0.87)
15.	Machinery and Implements	136361.40 (25.76)	287740.10 (36.49)	343000 (37.03)	150538.10 (27.17)
16.	Major Implements	135584.30 (25.62)	284085.80 (36.03)	240400 (25.95)	148512.60 (26.81)
17.	Minor Implements	777.11 (0.15)	3654.27 (0.46)	102600 (11.07)	2025.512 (0.36)
18.	Grand Total	529275.10 (100)	788523.10 (100)	926333.70 (100)	553985.50 (100)

(Figures in parenthesis indicate percentage to the total)

Table 3: Per hectare investment on different size group of farms (Rs.)

S. No.	Particulars	Size of farms			
		Marginal	Small	Medium	Overall average
1.	Buildings	1170437 (64.57)	302125.6 (56.05)	158056.9 (60.54)	1090848 (63.53)
	Residential	1123751 (62.00)	287669.6 (53.37)	144528.1 (55.36)	1047072 (60.90)
	Kachcha	49250.48 (2.72)	2078.195 (0.38)	1414.994 (0.54)	44998.34 (2.41)
	Pacca	1074500 (59.28)	285591.4 (52.99)	143113.1 (54.81)	1002074 (58.49)
II.	Cattle shed	32432.74 (1.79)	8202.324 (1.52)	3382.187 (1.29)	30203.8 (1.75)
	Kachcha	12672.47 (0.70)	1367.054 (0.25)	-	11641.31 (0.64)
	Pacca	19760.27 (1.09)	6835.27 (1.27)	3382.187 (1.29)	18562.49 (1.11)
III.	Godowon	14253.29 (0.79)	6253.691 (1.16)	10146.56 (3.89)	13572.25 (0.88)
	Kachcha	3033.151 (0.17)	-	-	2760.167 (0.14)
	Pacca	11220.14 (0.62)	6253.691 (1.16)	10146.56 (3.89)	10812.09 (0.73)
2	Livestock	175158.1 (9.66)	40173.12 (7.45)	6355.104 (2.43)	162671.3 (9.29)
a.	Cow	6811.781 (0.37)	1051.039 (0.19)	-	6282.804 (0.35)
b.	Buffalo	150224.4 (8.29)	39122.08 (7.26)	6355.104 (2.43)	139897.5 (8.07)
c.	Goat	18121.92 (1.00)	-	-	16490.95 (0.87)
3.	Machinery and Implements	466991.1 (25.76)	196678.1 (36.49)	96674.18 (37.03)	441662.9 (27.17)
a.	Major Implements	464329.8 (25.62)	194180.3 (36.03)	67756.48 (25.95)	438752.1 (26.81)
b.	Minor Implements	2661.336 (0.15)	2497.792 (0.46)	28917.7 (11.07)	2910.816 (0.36)
	Grand Total	1812586 (100)	538976.8 (100)	261086.2 (100)	1695182 (100)

(Figures in parenthesis indicate percentage to the total)

Table 4: Cropping pattern under different size group of farms (ha)

Sl. No.	Crop	Categories of sample farms			Overall Average
		Marginal	Small	Medium	
A.	Kharif	0.292 (41.65)	0.889 (27.10)	2.512 (35.58)	0.36196 (37.28)
1.	Paddy	0.223 (31.81)	0.837 (25.51)	1.50 (21.24)	0.28489 (29.34)
2.	Maize	0.044 (6.27)	-	0.70 (9.91)	0.04704 (4.84)
3.	Chari	0.006 (0.85)	0.052 (1.58)	0.20 (2.83)	0,01162 (1.19)
4.	Urd	0.006 (0.85)	-	0.112 (1.58)	0.00658 (0.67)
5.	Moong	0.001 (0.142)	-	-	0.00091 (0.093)
B.	Rabi	0.292 (41.65)	1.463 (44.60)	3.548 (50.25)	0.41824 (43.07)
1.	Wheat	0.128 (18.25)	0.479 (14.60)	1.00 (14.16)	0.1648 (16.97)
2.	Lentil	0.107 (15.26)	0.675 (20.57)	1.00 (14.16)	0.16137 (16.62)
3.	Mustard	0.006 (0.85)	0.145 (4.42)	0.548 (7.76)	0.02254 (2.32)
4.	Sugarcane	0.049 (6.99)	0.162 (4.93)	1.00 (14.16)	0.06755 (6.95)
C.	Zaid	0.117 (16.69)	0.928 (28.29)	1.00 (14.16)	0.19071 (19.64)
1.	Sugarcane	0.111 (15.83)	0.928 (28.29)	1.00 (14.16)	0.18525 (19.08)
2.	Urd	0.001 (0.142)	-	-	0.00091 (0.093)
3.	Moong	0.005 (0.071)	-	-	0.00455 (0.46)
	Total (a + b + c)	0.701 (100)	3.28 (100)	7.06 (100)	0.97091 (100)

Cropping pattern: It indicates the yearly sequence and spatial arrangement of crops followed in a particular area. The cropping pattern followed by the sample farmers presented in Table -4. It is depicted from the table that among the various

crops grown by the sample farmers of the study area paddy occupied first place of gross cropped area which covered 29.34% and second place was occupied by Maize crop i.e. 4.84% of the Kharif season. In Rabi season wheat had occupied maximum area i.e. 16.97% and second place occupied Lentil 16.62% area on an overall average. During zaid season on overall average sugarcane had covered maximum area i.e. 19.08% followed by moong crop 0.46%. It may be concluded that being low input and high price crop Lentil had accepted by the farmers next to the food grain crops.

Cropping intensity on sample farms

The intensity of cropping refers to the number of crops grown on a farm during a year. It is calculated as gross cropped area divided by net cultivated area multiplied by hundred. Cropping intensity is presented in terms of percentage. Cropping intensity on the different size of sample farms is presented in Table-5. On an overall average cropping intensity came to 233.17 per cent. The table shows that the cropping intensity was 240.06, 224.19 and 198.98% marginal, small and medium size group of farms respectively. Cropping intensity was higher on marginal size group of sample farms due to awareness of the sample farmers regarding better utilization of little land with optimum use of family labour.

Table 5: Cropping intensity of different size group of farms

S. No.	Size group of farms	No. of farms	Net Cultivated area (ha)	Gross Cropped area (ha)	Cropping intensity
1.	Marginal	91	0.292	0.701	240.06
2.	Small	8	1.463	3.28	224.19
3.	Medium	1	3.548	7.06	198.98
	Average	100	0.416	0.970	233.17

Conclusion

Seeing the importance of the crop with regard of human nutrition, generating income & employment to the farm families the necessities of studying the present of Lentil economics was felt of most importance. Thus a sample study was conducted in Lakhimpur (Kheri) district of Uttar Pradesh. The study revealed that Lentil had occupied a prominent place in cropping pattern just after food grain crops. Present study was mainly covered the objectives of farm structure, cropping pattern and cropping intensity on sample farms. Per farm investment on different size group of sample farm is presented in table-2. The total farm assets available at the sample farms are categories as buildings, machinery & implements and livestock. It is depicted from the table that the maximum share of the total farm investment i.e. 63.53% was occurred on building followed by machinery & implements 27.17% and Livestock 9.29% on an overall average. The per hectare investment on sample farms are presented in table-3. It is depicted from the table that the major percent share of the total investment was spent on building i.e. 63.53% on an overall farms, followed by the expenditure on farm machinery & implements and livestock which accounted for 27.17 and 9.29% respectively. On an overall average cropping intensity came to 233.17%. The table shows that the cropping intensity was 240.06, 224.19 and 198.98 per cent marginal, small and medium size group of farms respectively.

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