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Study of the Farm, Structure, Cropping Pattern and Cropping Intensity on potato Growing Sample Farm in Gorakhpur District of Uttar Pradesh, India

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ABSTRACT

Potato is one of the most important cash crops of the country in a place of pride in the vegetable kingdom. The present study on farm structure, cropping pattern, cropping intensity was conducted in Campiireganj block of Gorakhpur district of eastern Uttar Pradesh. The district was selected purposively. 60 farmers were selected by simple random sampling method. There are 28 marginal 18 small, 8 medium and 6 large farmers from five selected villages of the one block of the district. The farm level data and required information of potato growing farmers pertaining to crop year 2019-2020. The average size of holding at the overall level for all the groups worked out 2.02 hectare.

On an average, area in Kharif season was observed to be 1.94 ha, Rabi season 1.86 ha and zaid season 0.072 ha. Overall area under potato was observed to be 0.841 ha./farm The cropping intensity at the overall level was worked out 192.82 percent. It was highest in marginal size was (194.23 percent) followed by small (193.80 percent), medium (192.20 percent) and large (191.07 percent), respectively. At overall per farm total value of farm implements and machinery was observed to be Rs.365012.70. At overall level, livestock value in farm was worked out Rs.66182.92. On overall farm per farm investment was positively related with holding size

Keywords: farm structure, land utilization pattern, cropping pattern, cropping intensity

INTRODUCTION

The potato is the world's most important root and tuber crop worldwide. It is grown in more than 125 countries and consumed almost daily by more than a billion people. Hundreds of millions of people in developing countries depend on potatoes for their survival. Potato cultivation is expanding strongly in the developing world, where the potato's ease of cultivation and nutritive content has made it a valuable food security and cash crop for millions of farmers. Developing countries are now the world's biggest producers – and importers – of potatoes and potato products. In addition to the income and employment generated by the adoption of potato based multiple cropping sequence, there is also considerable employment potential at the post harvest stage during assembling, packaging, storage, transportation and marketing because of its bulky and perishable nature. Therefore, production of potato requires development of other subsidiary industries, like cold storage, processing and transportation etc.

Potato (*Solanum tuberosum*) is the most important food crop of the world. Potato is a temperate crop grown under subtropical conditions in India. The potato is a crop which has always been the 'poor man's friend'. Potato is being cultivated in the country for the last more than 300 years. Potatoes are an economical food; they provide a source of low cost energy to the human diet. Potatoes are a rich source of starch, vitamins especially C and B1 and minerals. They contain 20.6 per cent carbohydrates, 2.1 per cent protein, 0.3 per cent fat, 1.1 per cent crude fibre and 0.9 per cent ash. They also contain a good amount of essential amino acids like leucine, tryptophane and isoleucine.

Potato popularly known as 'The king of vegetables', has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato. Because, the dry matter, edible energy and edible protein content of potato makes it nutritionally superior vegetable as well as staple food not only in our country but also throughout the world. Now, it becomes as an essential part of breakfast, lunch and dinner worldwide. Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in lesser duration of time than cereals like rice and wheat. Hence, potato may prove to be a useful tool to achieve the nutritional security of the nation.

India is an agrarian country. Agriculture is the most important occupation for more than 58% population either directly or indirectly. It is the backbone of our economic system. In India agriculture contributes 16% of total GDP and 10% of total exports (Economic survey, 2018- 2019). Potato is an economically important staple crop in both developed and developing countries. Potato is grown about 150 countries throughout the world. China ranks 1st followed by India and Russia. India's ranks 3rd in area and it are the 2nd largest country in the world in potato production (*Potatopro.com*). In Uttar Pradesh there has been steady and continuous increase in the area and production of potato during recent years. The acreage has gone up from 1992200 hectare during 2013 to 2179000 ha during 2016 -2017. The major Potato producing states are Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh, Punjab, Assam, Haryana, Jharkhand and Chhattisgarh.

Overall average holding size was found to 0.67 hectare. Paddy, wheat and onion were the major crops of *kharif*, *rabi* and *zaid* season respectively. Pulses under study were also allotted considerable acreage in cropping pattern and cropping intensity was inversely related with farm size. Investment per farm and per hectare on building and livestock were inversely related with farm size where as it were having direct association in case of farm machinery and implement (**Singh et al. 2017**). The average size of farm was found i.e. 0.98. On an average, per farm and per hectare investment on fixed assets came to Rs. 2191496.00 and Rs.655002.30, respectively. And overall average gross cropped area 1.87 ha. Cropping intensity witnessed 160.20 per cent

(**Mishra et al.2017**). More than 50% of the sample farmers were found from marginal categories where as 48% comes under small and medium size of farms. Per farm investment was inversely related with size of holding. The rice, wheat and maize, and sugarcane were the main crops of cropping pattern, cropping intensity was highest on marginal farms followed by small and medium size of farms (**Chaudhary et al. 2017**).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 (**Shankar et al. 2019**).

MATERIAL AND METHODS

Uttar Pradesh is divided into four economic regions viz. Eastern, Western, Central and Bundelkhand. The study was confined to eastern Uttar Pradesh which comprises five divisions viz. Varanasi, Gorakhpur, Azamgarh, Mirzapur and Basti. Gorakhpur district was selected purposively. A list of all 19 blocks was prepared on the basis of potato growing area. One block namely Campiireganj block was purposively selected for the study where area under potato cultivation was higher in comparison to other blocks. From the selected block, a list of all villages was prepared and five villages were randomly selected on the basis of maximum coverage of area under potato crop. From the selected villages the list of farmers growing potatoes was prepared and further classified into four size groups based on their size of holdings viz. marginal farmer (having <1 ha.) small farmer (having 1-2 ha.) medium farmer (having 2-4 ha.) and large farmer (having > 4 ha.). From each size group farmers were selected randomly. Thus ultimate sample size was 60 potato growers which comprised of marginal, small, medium and large farmer. There are 28 marginal, 18 small, 8 medium and 6 large farmers from five selected villages of the one block of the district. After the preparation of the schedules, data were collected from potato growers by personal interview. The information regarding the potato growers was collected from socio-economic characteristics, cropping patterns, land holdings, asset position, income, education, occupation, number of family members available for farm work, types of machinery and implements. The farm level data and required information of potato growing farmers pertaining to crop year 2019-2020, was during March-April by personal survey method. The collected data were compiled and analyzed with a tabular method of analysis, simple statistical tools such as arithmetical averages and percentages were worked out for the purpose of interpretation of results.

RESULT AND DISCUSSION

The result of the present study as well as relevant discussion has been presented under following sub heads:

Land utilization pattern

Land utilization indicates the area of land actually utilized in different purposes like crop production, irrigated, leased etc. It is revealed from Table 1 that the average size of holding in respect of marginal, small, medium and large size was 0.52 ha, 1.13 ha, 2.18 ha and 4.26 ha respectively. The average size of holding at the overall level for all the groups worked out 2.02 hectare. The percentage net cultivated area to the total holding in respect of marginal, small, medium and large size was 98.00 percent, 96.46 percent, 95.41 percent and 96.47 percent, respectively. The percentage of area sown more than once to the total area at the overall level was 95.54 percent; it was highest in small size category (97.34 percent) followed by medium (96.78 percent), marginal (96.15 percent) and large (94.60 percent) size categories. The percentage of irrigated area to total area at the overall level was 91.08 percent. It was highest in large size (95.07 percent) followed by small (90.26 percent), marginal (86.53 percent) and medium farmers (84.86 percent) respectively. The cropping intensity at the overall level was worked out 192.82 percent. It was highest in marginal size (194.23 percent) followed by small (193.80 percent), medium (192.20 percent) and large (191.07 percent), respectively.

Table 1: Land utilization pattern of the selected farmers

(Area in ha)

Sl. No.	Particulars	Size group of holding				Overall
		Marginal	Small	Medium	Large	
1.	Size of land holding	0.52 (100.00)	1.13 (100.00)	2.18 (100.00)	4.26 (100.00)	2.02 (100.00)
2.	Permanent fallow area	0.01 (1.92)	0.04 (3.54)	0.10 (4.58)	0.15 (3.52)	0.07 (3.46)
3.	Net cultivated area	0.51 (98.00)	1.09 (96.46)	2.08 (95.41)	4.11 (96.47)	1.94 (96.03)
4.	Area under irrigated	0.45 (86.53)	1.02 (90.26)	1.85 (84.86)	4.05 (95.07)	1.84 (91.08)
5.	Area sown more than once	0.50 (96.15)	1.10 (97.34)	2.11 (96.78)	4.03 (94.60)	1.93 (95.54)
6.	Gross cropped area	1.01 (194.23)	2.19 (193.80)	4.19 (192.20)	8.14 (191.07)	3.88 (192.82)
7.	Cropping intensity (%)	194.23	193.80	192.20	191.07	192.82

(Figures in parentheses indicate percent to total number of farmers)

Cropping pattern

Cropping pattern is the proportion of area under various crops at a point of as it changes over space and time. The cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors patterns of crop land use of a region are manifestation of combined influence of physical and human environment. The cropping pattern of the selected cultivators in different size groups is presented in table. 2. The table revealed that, crops grow during Kharif, Rabi and Zaid season on sample farmers are varying.

Table 2: Cropping pattern of the selected farmers.

(Area in ha)

Sl. No.	Season/Crops	Size Group of holding				
		Marginal	Small	Medium	Large	Overall
A. Kharif Crops						
1.	Paddy	0.223 (43.55)	0.681 (62.47)	1.528 (73.46)	3.203 (77.91)	1.408 (64.34)
2.	Bajra	0.003 (0.58)	0.004 (0.36)	0.007 (0.33)	0.015 (0.36)	0.007 (0.40)
3.	Maize	0.053 (10.35)	0.084 (7.70)	0.167 (8.02)	0.334 (8.12)	0.159 (8.54)
4.	Groundnut	0.065 (12.69)	0.069 (6.33)	0.074 (3.55)	0.097 (2.35)	0.076 (6.23)
5.	Arhar	0.060 (11.71)	0.067 (6.14)	0.072 (3.46)	0.089 (2.16)	0.072 (5.86)
6.	Sugarcane	0.023 (4.49)	0.059 (5.41)	0.071 (3.41)	0.097 (2.35)	0.062 (3.91)
7.	Other cereals	0.008 (1.56)	0.012 (1.10)	0.018 (0.86)	0.033 (0.80)	0.018 (1.08)
8.	Other pulses	0.012 (2.34)	0.018 (1.65)	0.021 (1.00)	0.033 (0.80)	0.021 (1.44)
9.	Other oilseeds	0.009 (1.75)	0.023 (2.11)	0.032 (1.53)	0.043 (1.04)	0.027 (1.60)
10.	Vegetable	0.052 (10.15)	0.067 (6.14)	0.091 (4.37)	0.133 (3.23)	0.085 (5.97)
	others	0.004 (0.78)	0.006 (0.55)	0.010 (0.48)	0.034 (0.82)	0.013 (0.65)
	Total	0.512 (100)	1.090 (100)	2.080 (100)	4.111 (100)	1.948 (100)
B . Rabi						
	Wheat	0.173 (35.59)	0.457 (42.71)	0.817 (40.08)	1.907 (49.46)	0.838 (41.96)

	Potato	0.237 (48.76)	0.478 (44.67)	0.991 (48.62)	1.659 (42.76)	0.841 (46.20)
	Barley	0.008 (1.64)	0.024 (2.24)	0.040 (1.96)	0.056 (1.44)	0.032 (1.82)
	Mustered	0.034 (6.99)	0.043 (4.01)	0.086 (4.21)	0.096 (2.47)	0.065 (4.42)
	Pea	0.018 (3.70)	0.032 (2.99)	0.046 (2.25)	0.064 (1.64)	0.040 (2.64)
	Gram	0.007 (1.44)	0.013 (1.21)	0.011 (0.53)	0.024 (0.62)	0.013 (0.95)
	Vegetables	0.005 (1.02)	0.012 (1.12)	0.024 (1.17)	0.037 (0.95)	0.019 (1.06)
	Others	0.004 (0.82)	0.011 (1.02)	0.023 (1.12)	0.036 (0.92)	0.018 (0.97)
	Total	0.486 (100)	1.070 (100)	2.038 (100)	3.879 (100)	1.868 (100)
C. Zaid /Summer						
	Maize	0.012 (60.00)	0.017 (44.73)	0.023 (31.94)	0.061 (39.10)	0.028 (39.43)
	Chari	0.004 (20.00)	0.009 (23.68)	0.013 (18.06)	0.024 (15.38)	0.012 (16.90)
	Others	0.004 (20.00)	0.012 (31.57)	0.036 (50.00)	0.071 (45.51)	0.031 (43.67)
	Total	0.020 (100)	0.038 (100)	0.072 (100)	0.156 (100)	0.071 (100)
	Gross Cropped Area	1.01	2.19	4.19	8.14	3.88
	Cropping Intensity (%)	194.23	193.80	192.20	191.07	192.82

(Figures in parentheses indicate percent to total number of farmers)

At the overall level, the average gross cropped area of potato growers was 3.88 hectares. The total gross cropped area is observed to be 1.01 ha. 2.19 ha and 4.19 ha for marginal, small, medium and large farmers. The area under different crops in Kharif season was observed to be 0.51 ha 1.09 ha. 2.08 ha 4.11 ha and 1.94 ha for marginal, small, medium, large and overall farmers. The area under different crops in Rabi season was observed to be 0.48 ha., 1.07 ha., 2.03 ha., 3.87 ha and 1.86 ha for marginal, small, medium, large and overall farms. The area under potato was observed to be 0.237 ha./farm, 0.478 ha./farm, 0.991 ha./farm, 1.659 ha./farm and 0.841 ha./farm for marginal, small, medium, large and overall farmers. In case of Zaid area under different crops was observed to be 0.020 ha. 0.038 ha., 0.072 ha., 0.156 ha. and 0.071 ha. for marginal, small, medium, large and overall farmers. On an average cropping intensity was observed 194.23 percent, 193.80 percent, 192.20 percent, 191.07 percent and 192.82 percent for marginal, small, medium and large farmers.

Farm assets and investment of potato growers

The fixed capital assets play an importance role in any business. The capital assets and investment is presented in table 3. It can be observed that per farm total value of farm implements and machinery was worked out to Rs.217905.70, Rs. 275765.30, Rs.437616.60, Rs. and 522156.60 for marginal, small, medium, and large size group respectively. At overall level was worked out and Rs.365012.70. In marginal size group per farm investment on residential building 71.84 percent, cattle shed 2.13 percent, well and tube wells 1.88 percent, electric motors 0.89 percent, pumping set 1.74 percent, spray pump 1.28 percent, tractors 13.00 percent, thresher 4.07 percent, plough 1.95 percent, harrow 0.82 percent and seed drill 0.29 percent. In small size group per farm investment on residential building 66.57 percent, cattle shed 2.31 percent, well and tube wells 1.02 percent, electric motors 0.84 percent, pumping set 1.52 percent, spray pump 1.63 percent, tractors 18.00 percent, thresher 5.28 percent, plough 1.63 percent, harrow 0.77 percent and seed drill 0.28 percent. In medium size group per farm investment on residential building 55.02 percent, cattle shed 1.66 percent, well and tube wells 0.82 percent, electric motors 0.61 percent, pumping set 1.51 percent, spray pump 1.38 percent, tractors 34.27 percent, thresher 4.19 percent, plough 1.29 percent, harrow 0.56 percent and seed drill 0.18 percent. In large size group per farm investment on residential building 50.30 percent, cattle shed 1.58 percent, well and tube wells 0.74 percent, electric motors 0.57 percent, pumping set 1.38 percent, spray pump 1.32

percent, tractors 38.30 percent, thresher 3.92 percent, plough 1.63 percent, harrow 0.54 percent and seed drill 0.17 percent. At overall level per farm investment on residential building 57.78 percent, cattle shed 1.81 percent, well and tube wells 0.88 percent, electric motors 0.68 percent, pumping set 1.49 percent, spray pump 1.28 percent, tractors 29.45 percent, thresher 4.26 percent, plough 1.40 percent, harrow 0.64 percent and seed drill 0.21 percent.

Table 3: Farm assets and investment of potato growers

(Value of Assets in Rs)

Sl. No.	Particulars	Size of group of holding				
		Marginal	Small	Medium	Large	Overall
1.	Residential Building	156553.33 (71.84)	183566.00 (66.57)	240802.10 (55.02)	262666.23 (50.30)	210896.91 (57.78)
2.	Cattle Sheds	4652.54 (2.13)	6384.53 (2.31)	7256.66 (1.66)	8272.33 (1.58)	6641.51 (1.81)
3.	Well and Tube wells	2582.00 (1.88)	2833.33 (1.02)	3588.23 (0.82)	3866.67 (0.74)	3217.56 (0.88)
4.	Electric Motors	1952.32 (0.89)	2323.33 (0.84)	2688.45 (0.61)	2966.67 (0.57)	2482.69 (0.68)
5.	Pumping Set	3800.00 (1.74)	4200.00 (1.52)	6606.66 (1.51)	7233.33 (1.38)	5459.99 (1.49)
6.	Spray Pumps	2800.00 (1.28)	4500.00 (1.63)	6066.66 (1.38)	6899.99 (1.32)	5066.66 (1.38)
7.	Tractor	30000.00 (13.00)	50000.00 (18.00)	150000.00 (34.27)	200000.00 (38.30)	107500.00 (29.45)
8.	Thresher	8865.55 (4.07)	14566.67 (5.28)	18342.43 (4.19)	20456.66 (3.92)	15557.83 (4.26)
9.	Plough	4243.33 (1.95)	4488.08 (1.63)	5642.20 (1.29)	6068.30 (1.63)	5110.48 (1.40)
10.	Harrow	1806.67 (0.82)	2126.67 (0.77)	2440.00 (0.56)	2842.20 (0.54)	2303.88 (0.64)
11.	Seed drill	650.00 (0.29)	776.66 (0.28)	789.90 (0.18)	884.20 (0.17)	775.19 (0.21)
	Total	217905.70 (100)	275765.30 (100)	437616.60 (100)	522156.60 (100)	365012.70 (100)

(Figures in parentheses indicate percentage to the respective total)

Livestock position of potato growers

The livestock are secondary agriculture allied activities play an important role in economic development. The livestock value per farm presented in table 5.8. It can be observed that per farm total value of livestock was worked out to Rs.59000.00, Rs. 63866.67, Rs.67800.00, Rs. and 74065.00 for marginal, small, medium large size group respectively. At overall level, livestock value in farm was worked out Rs.66182.92. In marginal size group per farm value of buffalo were Rs.36000.00 (61.02 percent), cow Rs.18666.67 (31.64 percent) and goat/sheep Rs.4333.33 (7.34 percent), respectively. In small size group per farm value of buffalo were Rs.38666.67 (60.54 percent), cow Rs.21333.33 (33.40 percent) and goat/sheep Rs.3866.67 (6.05 percent), respectively. In medium size group, per farm value of buffalo were Rs.43333.33 (63.91 percent), cow Rs.22800.00 (33.63 percent) and goat/sheep Rs.1666.67 (2.45 percent), respectively. In large size group, per farm value of buffalo were Rs.46533.33 (62.83 percent), cow Rs.26666.67 (36.00 percent) and goat/sheep Rs.865.00 (1.17 percent), respectively. At overall level, per farm value of buffalo were Rs.41133.33 (62.15 percent), cow Rs.22366.67 (33.80 percent) and goat/sheep Rs.2682.92 (4.05 percent), respectively.

Table 4: livestock position of potato growers

(Value of Assets in Rs.)

Sl. No.	Particulars	Size of group of holding				
		Marginal	Small	Medium	Large	Overall
1.	Buffalo	36000.00 (61.02)	38666.67 (60.54)	43333.33 (63.91)	46533.33 (62.83)	41133.33 (62.15)
2.	Cow	18666.67 (31.64)	21333.33 (33.40)	22800.00 (33.63)	26666.67 (36.00)	22366.67 (33.80)
3.	Goat/ sheep	4333.33 (7.34)	3866.67 (6.05)	1666.67 (2.45)	865.00 (1.17)	2682.92 (4.05)
	Total	59000.00 (100)	63866.67 (100)	67800.00 (100)	74065.00 (100)	66182.92 (100)

(Figures in parentheses indicate percentage to the respective total)

Conclusion

The potato is the world's most important tuber crop with regard of human nutrition, generating income & employment to the farm families. The major components *i.e.* Land utilization pattern, cropping pattern, farm building, machinery & implements and livestock position of per farm were considered. It was found that maximum investment on the farm building followed by machinery implements and livestock. On overall farm per farm investment was positively related with holding size but per hectare investment was inversely related. In the cropping pattern paddy in Kharif, potato in Rabi and maize in Zaid season stood on first rank among all the crops. Cropping intensity was highest on marginal farms followed by small and medium size of farms.

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