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A study of the farm structure, cropping pattern and cropping intensity on Pulse growing sample farms in Azamgarh District of Uttar Pradesh India

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Abstract

Pulses are important with the view of their food and nutritional security and also income and 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 pulses a study on production and marketing of pulses was conducted in Thekma block of Azamgarh District. A sample of 100 farmers belonging to marginal, small and medium holding size were drawn through purposive cum proportionate random sampling technique, from five selected villages of Thekma block, personal interview method with the help of prestructured schedule was applied to collect the primary and secondary data were collected from block and district offices. Tabular and functional analysis was done to analyse the data and presentation of the result. Population and education status of the respondents were inversely and directly related with farm size. More than 50% of the sample farmers were owner of marginal holding very less number of medium size farmers were found. 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, 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.

Keywords: Weighted mean and Tabular analysis

Introduction

Pulses play a vital role in our lives. The word "Pulse" is derived from the Latin word "Puls" meaning pottage i.e. seeds boiled to make porridge or thick soup. Pulses are the cheapest source of dietary proteins. The high content of protein in pulses makes the diet more nutritive for vegetarian when taken with other cooked food items. Pulses contain the same amount of calories as cereals but the protein content varies. The protein content of pulses are twice that of cereals (20 - 25%) and almost equal to that of meat and poultry. But the quality of protein content is inferior to animal protein. They provide the same amount of calories as cereals, which are staple food all over the world. If we take 100g of dry pulses, it would contain about 350Kcal of energy.

Pulses are good sources of proteins and commonly called the poor man's meat (Reddy 2010). The frequency of pulses consumption is much higher than any other source of protein; about 89.00 percent population consume pulses at least once a week, while only 35.40 percent of persons consume fish or chicken/meat at least once a week in India (IIPS, ORC Macro, 2007). At the world level pulses are grown in an area of 78 million hectares with an annual production of 70 million tonnes (MT) and productivity of 908 kg/hectare (FAO & Agricultural org. 2012). In India pulses are grown on 22.23 million hectares of area with an annual production of 13.15 million tonnes (MT). India accounts for 33% of the world's area under pulses and 22% of the world production of pulses. About 90.00% of the global pigeonpea, 65.00% of chickpea and 37.00% of lentil area falls in India, corresponding to 93.00, 68.00 and 32.00 percent; of the global production, respectively (FAO Stat 2011).

Pulses are grown globally covering large dimension of about 70.50 million hectares in area with a total production of 57.27 million tonnes. Among different pulse producing countries, India ranks first having 29.96% of the total pulse acreage (2003-2004) though it contributes only 22.52% of the global pulse production. Over a dozen pulse crops are grown in the country and among these, Chickpea(Chana), Pigeon pea (Arhar), Mungbean (Moong) and Urdbean (Urd) are the most important, contributing total 86.00% (45.00% of chickpea, 20.00% of pigeon pea, 10.00% of mungbean and 11.00% of urdbean) of the total pulses production

(<http://www.iipr.res.in/pe/introduction.asp>). India is the world's largest producer and the largest consumer of pulses. Pakistan, Canada, Burma, Australia and the United States, in that order, are significant exporters and are India's most significant suppliers. In spite of this, the net per capita availability of pulses has come down over years from 61.00 grams per day per person in 1951 to 32 grams per day per person in 2010. Thus the availability of pulse per capita per day has proportionately declined from 71.00 g (1955) to 36.90 g (1998) against the minimum requirement of 70.00 g per capita per day. There is not much possibility of the import of pulses in the country. The production of pulses has to be increased internally to meet the demand (Singh, 2012).

The trend in cross-border trade across the world is a major factor that influences pulses prices. Global trade in pulses increased almost six fold over the past three decades, from 1.70 million tonnes in 1981 to 12.40 million tonnes in 2011. With the value of global exports increasing more than 11 times over the same period, the unit value of exports increased almost four times from \$133.8 in 1961 to \$654.6 in 2011, representing an annual average increase of 7.60%. On the other hand, the total production globally increased by just around 69.00% over the same half a century, from 40.35 million tonnes to 68.20 million tonnes.

Pulses are grown across the country with the highest share coming from Madhya Pradesh (24.00%), Uttar Pradesh (16.00%), Maharashtra (14.00%), Andhra Pradesh (10.00%), Karnataka (7.00%) and Rajasthan (6.00%), which together share about 77.00% of the total pulse production, while the remaining 23.00% is contributed by Gujarat, Chhattisgarh, Bihar, Orissa and Jharkhand. Kumar (1998) projected pulses demand to be 30.90 MT, while Mittal (2006) projected 42.50 MT by 2020 and Indian Institute of Pulses Research (IIPR) in its vision 2030 projected pulses demand to be 32.00 MT by the year 2030. The projected domestic production from this study is 20.00 MT by 2020. As per Mittal, the required growth in domestic production (supply) of pulses is 6.51% per annum, while IIPR (2011) estimated the required growth rate in production to be 4.20% per annum to meet the growing demand. All these estimates indicate that, to bridge the gap between demand and supply, pulses production should grow at least 4-6% per annum. However, the current growth rate is only 3.35% per annum (<http://www.iipr.res.in/pe/introduction.asp>).

Area production and productivity of pulses in India were 23.47 million hectare, 18.34 million tonnes, and 781 kg/ha respectively (National Council of Applied Economic Research New Delhi 2012-13). While area, production, and productivity in Uttar Pradesh were 2.31 million hectare, 1.71 million tones and 742.00 kg/hectare respectively (Directorate of Economics and Statistics, Department of Agriculture and cooperation 2013-14). Area, production, and productivity of pulse crops in Azamgarh district were 18533.00 hectare, 22352 metric tonnes, and 12.6 Q/ha respectively during the period 2011-2012. (Statistical Report District Azamgarh 2011-12). Area, production and productivity of major pulse crop Gram, Pea and Pigeonpea in Azamgarh district were 3213.00, 6546.00 and 8397.00 hectare, 4220.00, 8922.00 and 8914.00 metric tonnes and 13.13, 13.63, and 10.62 Q/ha respectively during the period 2011-12. (Statistical Report District Azamgarh 2011-12).

Materials and methods

Sampling technique: The purposive com random sampling design was used for the selection of district, block, villages

and respondents.

Selection of District: Azamgarh district of eastern U.P. was selected purposively to avoid the operational inconvenience of the investigator.

Selection of Block: Out of twenty two blocks of selected district, one block namely Thekma having highest area under gram, pea and Pigeonpea was selected purposively.

Selection of village: A list of all the villages falling under selected block was prepared and arranged in ascending order according to area covered by gram, pea and Pigeonpea crop and five villages were selected randomly from the list. (Table 3.1)

Selection of respondents: A lists of gram, pea and Pigeonpea growers of selected villages were prepared alongwith their size of holding. Thus, the farm holding categorised into three size groups (1) Marginal: (Below 1.0 ha;) (2) Small: (1.0-2.0 ha) (3) Medium: (2.0-4.0 ha). From this list a sample of 100 respondents were selected following the proportionate random sampling technique.

Collection of Data: Primary data were collected through personal interview method on well pre-structured schedule specially designed for this study, while secondary data were collected from published/ unpublished record of district and blocks, headquarters, books, journals, periodicals, and news bulletins etc. among different pulses grown in Azamgarh district, three crops i.e. Gram, Pea, Pigeonpea (Arhar) had covered the highest are i.e. 3213.00, 6546.00, and 8397.00hectare respectively. Thus these three crops of pulse were considered for study.

Period of study: The data pertained for the agriculture year 2015-2016.

Analytical Tools: Analytical tools used for the analysis and interpretations of the data are given below.

Tabular analysis: Tabular analysis was used to compare the different parameters among marginal, small and medium size group of the farmers. Family composition, investment pattern; crop-wise costs and returns etc. were computed and presented in tabular forms. In this computation weighted average was used.

$$W.A. = \frac{\sum W_i X_i}{\sum W_i}$$

Where,

W.A. = Weighted average

X_i = Variable

W_i =Weight of variable

Sampling design used for selection of respondents

Structure of farms: The study on the structure of sample farms and family is of significant 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, family size, cropping pattern and intensity of cropping etc. The character existing on sample farms are discussed below.

Average holding size of sample farms

Land is the base for any agricultural enterprise. Agriculture including crops, livestock and fruit & vegetable on any agricultural business never been conducted without land. The availability of land on sample farms of different size groups are presented in table 4.3. It is depicted from the table that overall average size of holding was 0.67 hectare in the study area which was found to 0.44, 1.57 and 3.24 hectares on marginal, small and medium size group of farms, respectively. It is also revealed from the table that 57.19 per cent of total cultivated land was possessed by 87%, of marginal farms, whereas 18.70 and 24.11 per cent were in possession of 8% and 5% of the farm population belongs to small and medium categories. It shows the uneven distribution of per capita land on different size of sample farms.

Cropping pattern and cropping intensity

Cropping pattern shows the area devoted to the various crops

during the given period, conventionally in single years. 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 4.4. 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 grass cropped area which covered 38.25 percent and second place was occupied by Maize crop i.e. 5.41 percent of the kharif season. In rabi season wheat had occupied maximum area i.e. 33.33 per cent and second place occupied Gram 5.00 per cent area. by sugarcane i.e. 2.25 and 0.83 percent respectively.

During zaid season on an overall average onion had covered maximum area followed. The major pulse crops included under study i.e. Arhar, Gram and pea were occupied an area of 2.83, 5.00 and 4.16 per cent respectively of the grass cropped area. It may be calculated that being low input and high price crop pulses are accepted by the farmers next to the food grain crops.

Table 1: Cropping pattern under different size group of farms (ha)

Sl. No.	Crop	Average size of sample farms			Overall Average
		Marginal	Small	Medium	
A.	Kharif	0.44 (53.01)	1.31 (44.61)	1.78 (36.25)	0.58 (48.33)
1.	Arhar	0.08 (9.63)	0.12 (4.08)	0.17 (3.46)	0.034 (2.83)
2.	Paddy	0.30 (36.14)	1.02 (34.74)	1.30 (26.47)	0.45 (38.25)
3.	Maize	0.06 (7.22)	0.10 (3.40)	0.10 (2.03)	0.065 (5.41)
4.	Bajra	0.003 (0.36)	0.06 (2.04)	0.21 (4.27)	0.017 (1.41)
5.	Blackgram	0.001 (0.12)	0.01 (0.34)	0.00 (0.00)	0.001 (0.08)
B.	Rabi	0.36 (43.37)	1.45 (49.38)	3.08 (62.72)	0.58 (48.33)
1.	Gram	0.04 (4.81)	0.09 (3.06)	0.13 (2.64)	0.06 (5.00)
2.	Pea	0.05 (6.02)	0.11 (3.74)	0.14 (2.85)	0.05 (4.16)
3.	Wheat	0.23 (27.71)	1.07 (36.44)	2.35 (47.86)	0.40 (33.33)
4.	Potato	0.02 (2.40)	0.04 (1.36)	0.21 (4.27)	0.03 (2.52)
5.	Mustard	0.009 (1.08)	0.09 (3.06)	0.15 (3.05)	0.02 (1.66)
6.	Barseem	0.01 (1.20)	0.04 (1.36)	0.05 (1.01)	0.01 (0.83)
7.	Vegetable	0.0004 (0.04)	0.007 (0.23)	0.05 (1.01)	0.003 (0.25)
8.	Garlic	0.0006 (0.07)	0.003 (0.10)	0.002 (0.04)	0.001 (0.08)
C.	Zaid	0.030 (3.61)	0.176 (5.99)	0.05 (1.01)	0.042 (3.50)
1.	Onion	0.02 (2.40)	0.11 (3.74)	0.03 (0.61)	0.027 (2.25)
2.	Vegetable	0.003 (0.36)	0.006 (0.20)	0.02 (0.40)	0.004 (0.33)
3.	Sugarcane	0.007 (0.84)	0.060 (2.04)	0.00 (0.00)	0.010 (0.83)
Gross cropped area		0.83 (100)	2.936 (100)	4.91 (100)	1.20 (100)

(v) 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 4.5. The table shows that the cropping

intensity was 188.63, 187.00 and 151.44 per cent marginal, small and medium size group of farms respectively. On an overall average cropping intensity came to 179.10 percent. Cropping intensity was higher on marginal size group of farms due to reason of awareness of the sample farmers regarding better utilization of land with optimum use of family labour.

Table 2: 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	87	0.44	0.830	188.63
2.	Small	8	1.57	2.936	187.00
3.	Medium	5	3.25	4.910	151.44
	Average	100	0.67	1.200	179.10

Farm assets at sample farms of the study area

Description of the investment on farm assets are given in two ways. 1-Per farm investment & 2-Per ha investment.

Per farm investment

Per farm investment on different size group of farm presented in Table 4.6.a. The total farm assets available at the sample

farms are categories as buildings, machinery and implements and livestock. It is depicted from the table that the maximum share of the total farm investment i.e. 79.27 per cent was occurred on building followed by machinery and implements 13.09 per cent and Livestock 7.64 per cent on an overall average. The expenditure on building had the inverse association with size of holding as it were 82.46, 73.76, and

70.72 per cent of total investment on marginal, small and medium size group of farms respectively. But in case of machinery and implements per farm investment showed the direct association with size of farm as it were 8.96, 20.74 and 23.35 of total investment on marginal, small and medium size group of farms respectively. The situation emphasizes the system of custom hiring of farm machineries in study area. Unlike the farm machineries. The investment on livestock was found in opposite association with holding size, as it were decreases with increases in size of the farms, which accounted

for 8.57, 5.49 and 5.93 percent respectively of the total per farm investment. The per farm total investment on sample farms was found to Rs. 457551.40 on overall farm, which was Rs. 357116.90, 1076609.28 and 1214619.00 on marginal, small and medium size group of farms respectively. It had direct association with size of farms. It is concluded from the data that marginal farmers adopted dairy farming as supporting enterprise to their family along with crop production.

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

S. No.	Particulars	Size of farms			
		Marginal	Small	Medium	Overall average
1.	Buildings	294485.75 (82.46)	794144.65 (73.76)	859000.00 (70.72)	362684.17 (79.27)
a.	Residential	286189.66 (80.14)	727857.15 (67.61)	820000.00 (67.51)	348213.60 (76.10)
b.	Cattle shed	8296.09 (2.32)	66287.50 (6.16)	39000.00 (3.21)	14470.60 (3.16)
2.	Machinery and Implements	32025.36 (8.96)	223339.63 (20.74)	283619.00 (23.35)	59910.18 (13.09)
a.	Major Implements	31644.92 (8.86)	220700.13 (20.50)	280660.00 (23.11)	59220.09 (12.94)
b.	Minor Implements	380.44 (0.11)	2639.50 (0.24)	2959.00 (0.24)	690.09 (0.15)
(3)	Live stock	30605.79 (8.57)	59125.00 (5.491)	72000.00 (5.927)	34957.04 (7.64)
a.	Buffalo	10652.17 (2.98)	17500.00 (1.62)	27000.00 (2.22)	12017.39 (2.63)
b.	Cow	17852.17 (5.00)	41250.00 (3.83)	45000.00 (3.70)	21081.39 (4.61)
c.	Goat	2101.45 (0.59)	375.00 (0.03)	0.00	1858.26 (0.41)
(4)	Grand total	357116.90 (100)	1076609.28 (100)	1214619.00 (100)	457551.40 (100)

(Figures in parenthesis indicate percentage to the total)

(b) Per Hectare investment

Investment on farm assets play an important role in economics of crop production. The per hectare investment on sample farms are presented in table 4.7. it is depicted from the table that the major percent share of the total investment was spent on building i.e. 73.54 per cent on an overall farms, followed by the expenditure on farm machinery and implements and livestock which accounted for 20.35 and 6.11 per cent respectively. The per hectare investment on different size group of farms are also presented in the table. It is revealed from the table that per hectare total investment was

Rs. 503487.70 an overall farm, which were maximum on marginal farms i.e. Rs.811629.31 followed by small Rs.685738.39 and medium Rs. 373728.92, respectively. The per hectare total investment on marginal size of farms shared the as higher percent on building (82.46) followed by machinery and implements (8.96) and livestock (8.57) group similar trend of the per hectare investment was found on small and medium size group of farm. It may be calculated that per farm investment had the direct relation with farm size where as per hectare of that was inversely related.

Table 4: Per hectare investment on different size group of farms (Rs.)

S. No.	Particulars	Size of farms			
		Marginal	Small	Medium	Overall average
1.	Buildings	669285.73 (82.46)	505824.62 (73.76)	264307.70 (70.72)	370271.99 (73.54)
a.	Residential	650431.00 (80.13)	463603.28 (67.60)	252307.70 (67.51)	348678.10 (69.25)
b.	Cattle shed	18854.75 (2.32)	42221.34 (6.15)	12000.00 (3.21)	21593.83 (4.28)
2.	Machinery and Implements	72784.90 (8.96)	142254.54 (20.74)	87267.38 (23.35)	102468.48 (20.35)
a.	Major Implements	71920.27 (8.861)	140573.33 (20.49)	86356.923 (23.10)	101331.80 (20.12)
b.	Minor Implements	864.63 (0.10)	1681.21 (0.24)	910.461 (0.24)	1136.68 (0.22)
(3)	Live stock	69558.61 (8.57)	37659.23 (5.49)	22153.85 (5.92)	30747.30 (6.11)
a.	Buffalo	24209.480 (2.98)	11146.49 (1.62)	8307.692 (2.22)	10485.200 (2.082)
b.	Cow	40573.110 (4.998)	26273.885 (3.831)	13846.153 (3.70)	19791.290 (3.930)
c.	Goat	4776.02 (0.59)	238.85 (0.03)	0.0 (0.0)	470.80 (0.09)
(4)	Grand total	811629.31 (100)	685738.39 (100)	373728.92 (100)	503487.70 (100)

(Figures in parenthesis indicate percentage to the total)

Conclusion

The importance of pulses can be judges from the fact that majority of Indian population is vegetarian. Pulses are the main source of cheap protein and an important ingredient of vegetarian diet of Indian population. Since both food and nutritional security are important requirement, thus special efforts on intensification of production and supply of pulses are necessary. Pulse crop provide the sustainability to crop production system by enriching the soil through biological nitrogen fixation and their varied uses as feed and fodder. These crops also fit in the various cropping system without

disturbing the main cereals crops.

India is the largest producer, importer and consumers of pulses in the world accounting for 25 per cent of the global production, 15 per cent trade, and 27 per cent of consumption during the present economic days farmers are interested to esquire maximum profit from minimum costs which can be managed by increasing the area under pulses.

The study was conducted in Thekma block of Azamgarh District. One hundred sample farmers for from marginal, small and medium categories of farm holding were selected from 5 selected villages of the block through purposive cum

proportionate random sampling technique. Personal interview was conducted with pre structured schedule to collect the primary data. Secondary data were collected from official records of the block and district offices. Tabular and function analysis were applied to draw the inferences and presentation of the results.

Farm labour as a major input factor come out from the population, was distributed as 81.08, 9.73 and 9.17 per cent on marginal, small and medium size group of farm, it showed opposite trend of population with size of farm. Education of respondents is another factor which have direct bearing on improved cultivation of any crops. It was found of direct trend with size of farm. Hence it may be concluded that population and their education were having negative and positive trend with farm size. Overall average holding size was 0.67 hectare which were 0.44, 1.57 and 3.24 hectare on marginal, small and medium size of farms. In cropping pattern paddy in kharif, wheat in rabi and onion in Zaid season stood on first rank. Pulse crops under study were arhar in kharif, and gram and pea in rabi season had occupied 2.83, 5.00, and 4.16 per cent of grass cropped area respectively. Average grass cropped area were came to 0.83, 2.93 and 4.91 hectare on marginal, small and medium size group of farms respectively, which were 1.20 hectare on over all farm average. Similarly the cropping intensity was found of opposite trend with size of holding which varied from 188.63% on marginal, 187.00% on small and 151.44 per cent on medium size group of farm and it was 179.10 per cent on over all farm. It may be concluded that cropping intensity decreases with an increase in size of holding. Per farm investment on overall farms were Rs. 457551.40 which was distributed as 79.27% on building 13.05 per cent on machines and 7.64% on livestock. Investment on building and livestock was found in inverse relation with farm size where as investment on farm machinery had positive trend. Similar trend was also recorded in case of per hectare investment. Per hectare total cost of cultivation and gross income of gram were Rs. 33431.35 and Rs. 75843.67 and Rs. 36115.08 and Rs. 52098.96 in pea, likewise it was Rs. 28794.27 and 87499.68 in case of arhar respectively.

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