

## Original Research Article

# A Study the Cost and Returns of Major Pulse (Gram, Pea and Pession pea) Production on Different Size Group of Farms in Azamgarh District of Eastern 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 pre-structured 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. Cost and income analysis of these crops shows that arhar was most profitable then rest of two crops i.e. gram and pea.

### Keywords

Weighted mean, Tabular analysis, Functional 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.

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.

### **Selection of respondents**

A lists of gram, pea and Pigeonpea growers of selected villages were prepared along

with 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. 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

### Regression analysis

To study the effect of various independent variables on the dependent variables, various form of production function have been explored. However, Cobb-Douglas production function, has been found best fit for analysis of data.

The mathematical form of Cobb-Douglas function (power function) is as follows:

$$Y = aX_1^{b_1} \cdot X_2^{b_2} \cdot X_3^{b_3} \cdot X_4^{b_4} \cdot X_5^{b_5} \cdot e_u$$

Where,

$Y$  = Dependent variable (output value in rupees/hectare)

$X_1$ -  $X_4$  independent variable (input value rupees/hectare)

$a$  = Constant

$b_1$  -  $b_4$  Production elasticity with respect to  $X_i$ 's

The value of the constant ( $a$ ) and coefficient ( $b_i$ ) in respect of independent variable in the function have been estimated by using the method of least square. The Cobb-Douglas production function in log form is as follows:

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + \dots + u \log e$$

Where,

$Y$  = Value of gross returns of crops (Rs./ha)

$X_1$  = Expenditure on human labour (Rs./ha)

$X_2$  = Expenditure on seed (Rs./ha)

$X_3$  = Expenditure on manure and fertilizer (Rs./ha)

$X_4$  = Expenditure on irrigation (Rs./ha)

$e$  = Random factor

$a$  = Intercept

$b_j$ : ( $j = 1, 2, \dots, 4$ ) are the elasticity coefficient of the  $j^{\text{th}}$

### Marginal value product (MVP)

The marginal value product of inputs were estimated by following formula:

$$(\text{MVP}) X_j = b_j \frac{\bar{Y}}{\bar{X}_j}$$

Where,

$b_j$  = Production elasticity with respect to  $X_j$

$\bar{Y}$  = Geometric mean of the dependent variable  $Y$

$\bar{X}_j$  = Geometric mean value of  $X_j$

MVP = Marginal value product of  $j^{\text{th}}$  input

### Test of Significance

Having estimates of the elasticity coefficients, 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 or  $b_j$

If cal. 't' is greater than table value of t-distribution at (n-k-1) degree of freedom and specified probability level of significance,  $b_j$  is said to be statistically significant from zero (K is number of independent variable and n is sample size).

## **Results and Discussion**

This study deals with the findings of present investigation. cost of cultivation and measure of costs and farm profits of pulse crop in Azamgarh district of study area.

### **Per hectare costs and income measures of pulses in Azamgarh district**

Cost of different input used and operational cost of different farm operations involved in pulse cultivation was analysed and presented in table 4.8 to 4.13.

#### **Per hectare costs of cultivation of Gram**

The per hectare costs of gram in study area is presented in Table a. it is revealed from the table that the total overall average per hectare cost of cultivation of gram is accounted for Rs. 33431.35. The maximum per cent share of the costs is constituted by seed i.e. 23.70 per cent followed by human labour, machinery charges, and fertilizer corresponding to 23.34, 13.37, and 7.26 per cent, respectively on overall farms.

The average costs of cultivation of gram on different categories of farms are also mentioned in the table which was maximum of Rs. 34016.20 on small farm followed by marginal and medium size of farm corresponding to Rs. 33657.33 and 32470.80 respectively. Average cost of production per quintal was recorded as Rs. 1497.94. The higher per hectare cost of cultivation on marginal farm was found due to heavy expenditure on human labour and fertilizer

as compared to other categories of farms. It may be concluded that costs of cultivation per hectare had the indirect association with the size of farms.

#### **Per hectare income measures of gram**

The per hectare income measures of gram are presented in Table b. It is depicted from the table that the per hectare gross income on overall farms was found to 75843.67. It was maximum of Rs. 81678.00 small size of farms followed by medium and marginal categories of farms corresponding to Rs. 73980.50 and Rs.72253.50 respectively.

The overall net income per hectare was found to 42412.00. It was maximum of Rs. 47661.85 on small size of farms followed by medium and marginal categories of farms corresponding to Rs. 41509.66 and 38596.17 respectively. The overall family labour and farm business income accounted for 51025.12 and 57659.77 respectively. The output-input ratio came to 1:2.26 on overall farm which was highest on small farms i.e. 1:2.40 followed by medium and marginal farms corresponding to 1:2.27 and 1:2.14 respectively. It may be calculated that gram cultivation was more profitable on small farms of the study area due to high cost and higher yield per hectare. It may be concluded that Gram cultivation had the scope to increase the additional input to receive the additional income.

#### **Per hectare costs of Pea (matar)**

Per hectare costs of Pea (matar) in the study area is presented in Table c. It is revealed from table that per hectare overall average costs came to Rs. 36115.08. The per cent share of different components of the costs shows that the maximum expenditure occurred on human labour 28.98 per cent followed by, machinery charges, seed,

fertilizer, and Irrigation which accounted for corresponding per cent share of 15.48, 11.31, 7.91 and 4.98 respectively. The average total cost of cultivation per hectare of pea on various categories of farms were also analysed and it were accounted for Rs.37584.30 on marginal size of farms followed by medium and small size group of farms corresponding to Rs.32606.24 and 31798.45 respectively. The highest cost of cultivation per hectare on marginal farm was occurred due to heavy expenditure on human labour.

### **Per hectare income measures of pea**

Details of per hectare income measures of pea are presented in table d. It is depicted from the table that a hectare of pea yielded 17.88 quintals of grain which offered the gross income of Rs. 52098.96 at the rate of sale Rs.2913.81 per quintal. The per hectare net income, family labour income and farm business income are also presented in the table which corresponded the amount of Rs. 15983.88, Rs. 27028.76, and Rs. 33811.82 respectively. The cost of production per quintal was recorded as Rs. 1607.76 and input-output ratio was found to 1:1.44 on overall farm. The net income measures per hectare were maximum on medium Rs. 18225.76 followed by small and marginal size of farms corresponded to Rs. 16535.55 and Rs.15507.70 respectively. It is concluded from the table that costs of cultivation per hectare did not have any definite relation with size of farms and the income measures were also found to have the same trend.

### **Per hectare costs of Pigionpea (Arhar)**

The per hectare costs of pigeonpea (Arhar) in the study area is presented in Table e. It is depicted from the table that the per hectare total costs of Pigeonpea on an overall farms

came to Rs. 28794.27. Comparison of different items of cost revealed maximum for human labour 18.04 per cent followed, fertilizer costs 10.84 per cent, machinery charge 6.76 per cent and seed cost 2.36 per cent. The average total costs per hectare on various categories of farms were found to highest small size of farms Rs. 29184.45 followed by marginal Rs.28688.92 and medium Rs. 26453.20 respectively. Higher per hectare costs of cultivation occurred on small size of farms due to comparatively more expenditure on machinery charges.

It may be concluded that the per hectare costs of Pigeonpea (Arhar) did not have any definite association with size of farms.

### **Per hectare income measures of Pigeonpea**

Per hectare income measures of Pigeonpea is presented Table f. It is depicted from the table that a hectare of Pigeonpea yielded 17.66 quintals of main product and 49.12 quintals of by product with correspond gross income Rs. 87499.68 with the average sale rate of Rs. 4398.39 main product and Rs. 200 by product per quintal.

The net return per hectare was found to Rs. 58525.01 and cost of production was Rs. 1439.13 per quintal on overall farms. The family labour income, and farm business income were recorded as Rs. 64280.56, and Rs. 76612.95 on overall farms. The input-output ratio on overall farms came to 1:3.01 which was maximum 1:3.38 on small farms followed by medium and marginal (1:3.02 and 1:2.75) size of farms respectively. It is concluded from the table that per hectare yield output input ratio on small farms were maximum, followed by medium and marginal farms than the medium and marginal farms because of costs of cultivation per hectare on these farm groups.

**Table.1** Per hectare costs of different inputs used in Gram production (Rs.)

| S. No              | Particulars                       | Size group of farms             |                                |                                 |                                 |
|--------------------|-----------------------------------|---------------------------------|--------------------------------|---------------------------------|---------------------------------|
|                    |                                   | Marginal                        | Small                          | Medium                          | Overall average                 |
| 1.                 | Human Labour                      | 10342.87<br>(30.72)             | 6400.01<br>(18.81)             | 6037.74<br>(18.59)              | 7803.29<br>(23.34)              |
| 2.                 | Machinery Charges                 | 3771.44<br>(11.20)              | 5100.01<br>(14.99)             | 4679.26<br>(14.41)              | 4469.96<br>(13.37)              |
| 3.                 | Seed                              | 6205.72<br>(18.44)              | 9166.67<br>(26.95)             | 8784.91<br>(27.05)              | 7923.50<br>(23.70)              |
| 4.                 | Fertilizer                        | 2603.42<br>(7.74)               | 2364.58<br>(6.96)              | 2273.20<br>(7.00)               | 2429.47<br>(7.26)               |
| 5.                 | Total working capital             | 22923.45<br>(68.10)             | 23031.27<br>(67.70)            | 21775.11<br>(67.06)             | 22626.22<br>(67.68)             |
| 6.                 | Interest on working capital       | 1146.17<br>(3.40)               | 1151.57<br>(3.38)              | 1088.75<br>(3.35)               | 1131.31<br>(3.38)               |
| 7.                 | Rental value of land              | 6000.00<br>(17.83)              | 6000.00<br>(17.63)             | 6000.00<br>(18.48)              | 6000.00<br>(17.94)              |
| 8.                 | Interest on fixed capital         | 528.01<br>(1.57)                | 714.01<br>(2.09)               | 655.09<br>(2.01)                | 625.79<br>(1.87)                |
| 9.                 | Sub total                         | 30597.63<br>(90.90)             | 30923.90<br>(90.90)            | 29518.95<br>(90.90)             | 30392.19<br>(90.90)             |
| 10.                | Managerial Cost @10% of sub-total | 3059.76<br>(9.09)               | 3092.30<br>(9.09)              | 2951.89<br>(9.09)               | 3039.18<br>(9.09)               |
| <b>Grand total</b> |                                   | <b>33657.33</b><br><b>(100)</b> | <b>34016.2</b><br><b>(100)</b> | <b>32470.80</b><br><b>(100)</b> | <b>33431.35</b><br><b>(100)</b> |

(Figures in parentheses indicate the percentage to total)

**Table.2** Measures of Per hectare cost and profit of Gram (Rs.)

| S. No | Particulars                | Size group of farms |                 |                 |                 |
|-------|----------------------------|---------------------|-----------------|-----------------|-----------------|
|       |                            | Marginal            | Small           | Medium          | Overall average |
| 1.    | Cost A1/A2                 | 14412.47            | 20316.17        | 20750.65        | 18183.76        |
| 2.    | Cost B1                    | 14940.48            | 21057.18        | 21405.74        | 18818.41        |
| 3.    | Cost B2                    | 20940.48            | 27057.18        | 27405.74        | 24818.41        |
| 4.    | Cost C1                    | 24597.63            | 24923.85        | 23518.95        | 24392.18        |
| 5.    | Cost C2                    | 30597.63            | 30923.85        | 29518.95        | 30392.18        |
| 6.    | Cost C3                    | 33657.33            | 34016.15        | 32470.84        | 33431.35        |
| 7.    | Yield q/ha.                |                     |                 |                 |                 |
| a.    | M.P                        | 18.94               | 21.20           | 19.22           | 19.76           |
| b.    | B.P                        | 36.92               | 45.34           | 40.76           | 40.79           |
| 8.    | Grass Income               | <b>72253.50</b>     | <b>81678.00</b> | <b>73980.50</b> | <b>75843.67</b> |
| a.    | M.P                        | 64869.50            | 72610.00        | 65828.50        | 67685.11        |
| b.    | B.P                        | 7384.00             | 9068.00         | 8152.00         | 8158.55         |
| 9.    | Net return over cost C3    | 38596.17            | 47661.85        | 41509.66        | 42412           |
| 10.   | Family labour Income       | 51313.02            | 54620.82        | 46574.26        | 51025.12        |
| 11.   | Farm Business income       | 57841.03            | 61361.83        | 53229.35        | 57659.77        |
| 12.   | Cost of production (Rs/q.) |                     |                 |                 |                 |
| a.    | On Cost C3 basis           | <b>1599.31</b>      | <b>1403.96</b>  | <b>1501.71</b>  | <b>1497.94</b>  |
| 13.   | <b>Input-Output ratio</b>  |                     |                 |                 |                 |
| a.    | On the basis of cost A1    | 1:5.01              | 1:4.02          | 1:3.56          | 1:4.26          |
| b.    | On the basis of cost B1    | 1:4.83              | 1:3.87          | 1:3.45          | 1:4.11          |
| c.    | On the basis of cost B2    | 1:3.45              | 1:3.01          | 1:2.69          | 1:3.08          |
| d.    | On the basis of cost C1    | 1:2.93              | 1:3.27          | 1:3.14          | 1:3.10          |
| e.    | On the basis of cost C2    | 1:2.36              | 1:2.64          | 1:2.50          | 1:2.4           |
| f.    | On the basis of cost C3    | 1:2.14              | 1:2.40          | 1:2.27          | 1:2.26          |

(Figures in parentheses indicate the percentage to total)

**Table.3** Per hectare costs of different inputs used in Pea production (Rs.)

| S. No              | Particulars                       | Size group of farms             |                                 |                                 |                                 |
|--------------------|-----------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                    |                                   | Marginal                        | Small                           | Medium                          | Overall average                 |
| 1.                 | Human Labour                      | 11682.40<br>(31.08)             | 7123.29<br>(22.40)              | 7285.72<br>(22.34)              | 10468.71<br>(28.98)             |
| 2.                 | Machinery Charges                 | 5642.48<br>(15.01)              | 5265.75<br>(16.55)              | 5714.28<br>(17.52)              | 5593.11<br>(15.48)              |
| 3.                 | Seed                              | 3857.57<br>(10.26)              | 4471.00<br>(14.06)              | 5000.00<br>(15.33)              | 4085.35<br>(11.31)              |
| 4.                 | Fertilizer                        | 2996.09<br>(7.97)               | 2545.12<br>(8.01)               | 2425.72<br>(7.43)               | 2860.09<br>(7.91)               |
| 5.                 | Irrigation                        | 1895.36<br>(5.04)               | 1709.58<br>(5.37)               | 1328.58<br>(4.07)               | 1800.38<br>(4.98)               |
| 6.                 | Total working capital             | 26073.90<br>(69.37)             | 21114.74<br>(66.40)             | 21754.30<br>(66.71)             | 24819.75<br>(68.72)             |
| 7.                 | Interest on working capital       | 1303.70<br>(3.46)               | 1055.74<br>(3.32)               | 1087.72<br>(3.33)               | 1240.99<br>(3.43)               |
| 8.                 | Rental value of land              | 6000.00<br>(15.96)              | 6000.00<br>(18.86)              | 6000.00<br>(18.40)              | 6000.00<br>(16.61)              |
| 9.                 | Interest on fixed capital         | 789.95<br>(2.10)                | 737.21<br>(2.31)                | 799.99<br>(2.45)                | 783.42<br>(2.16)                |
| 10.                | Sub total                         | 34167.55<br>(90.90)             | 28907.69<br>(90.90)             | 29642.04<br>(90.90)             | 32831.90<br>(90.90)             |
| 11.                | Managerial Cost @10% of sub-total | 3416.75<br>(9.09)               | 2890.76<br>(9.09)               | 2964.20<br>(9.09)               | 3283.18<br>(9.09)               |
| <b>Grand total</b> |                                   | <b>37584.30</b><br><b>(100)</b> | <b>31798.45</b><br><b>(100)</b> | <b>32606.24</b><br><b>(100)</b> | <b>36115.08</b><br><b>(100)</b> |

(Figures in parentheses indicate the percentage to total)

**Table.4** Measures of Per hectare cost and profit of Pea (Rs.)

| S. No. | Particulars                | Size group of farms |          |          | Overall average |
|--------|----------------------------|---------------------|----------|----------|-----------------|
|        |                            | Marginal            | Small    | Medium   |                 |
| 1.     | Cost A1/A2                 | 17843.29            | 18992.39 | 20127.76 | 18287.14        |
| 2.     | Cost B1                    | 18633.24            | 19729.60 | 20927.75 | 19070.20        |
| 3.     | Cost B2                    | 24633.24            | 25729.60 | 26927.75 | 25070.20        |
| 4.     | Cost C1                    | 28167.55            | 22907.69 | 23642.04 | 26831.90        |
| 5.     | Cost C2                    | 34167.55            | 28907.69 | 29642.04 | 32831.90        |
| 6.     | Cost C3                    | 37584.30            | 31798.45 | 32606.24 | 63115.08        |
| 7.     | Yield q/ha.                |                     |          |          |                 |
| a.     | M.P                        | 18.26               | 16.44    | 17.43    | 17.88           |
| b.     | B.P                        | 46.34               | 44.39    | 45.00    | 45.88           |
| 8.     | Grass Income               | 53092.00            | 48334.00 | 50832.00 | 52098.96        |
| a.     | M.P                        | 43824.00            | 39456.00 | 41832.00 | 42922.07        |
| b.     | B.P                        | 9268.00             | 8878.00  | 9000.00  | 9176.89         |
| 9.     | Net return over cost C3    | 15507.70            | 16535.55 | 18225.76 | 15983.88        |
| 10.    | Family labour Income       | 28458.76            | 22604.40 | 23904.25 | 27028.76        |
| 11.    | Farm Business income       | 35248.71            | 29341.61 | 30704.24 | 33811.82        |
| 12.    | Cost of production (q/ha.) |                     |          |          |                 |
| a.     | On Cost C3 basis           | 1698.45             | 1579.31  | 1539.59  | 1607.76         |
| 13.    | Input-Output ratio         |                     |          |          |                 |
| a.     | On the basis of cost A1    | 1:2.97              | 1:2.54   | 1:2.52   | 1:2.85          |
| b.     | On the basis of cost B1    | 1:2.84              | 1:2.44   | 1:2.42   | 1:2.72          |
| c.     | On the basis of cost B2    | 1:2.15              | 1:1.87   | 1:1.88   | 1:2.07          |
| d.     | On the basis of cost C1    | 1:1.88              | 1:2.10   | 1:2.15   | 1:1.94          |
| e.     | On the basis of cost C2    | 1:55                | 1:1.67   | 1:1.71   | 1:1.58          |
| f.     | On the basis of cost C3    | 1:41                | 1:1.52   | 1:1.55   | 1:1.44          |



**Table.5** Per hectare costs of different inputs used in Pigeonpea production (Rs.)

| S. No              | Particulars                       | Size group of farms              |                                  |                                  |                                  |
|--------------------|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
|                    |                                   | Marginal                         | Small                            | Medium                           | Overall average                  |
| 1.                 | <b>Human Labour</b>               | <b>6456.82</b><br><b>(15.59)</b> | <b>6129.88</b><br><b>(11.75)</b> | <b>6266.67</b><br><b>(23.96)</b> | <b>6332.39</b><br><b>(18.04)</b> |
| a.                 | Family Labour                     | 3552.36<br>(8.58)                | 2805.20<br>(5.37)                | 2400.00<br>(9.17)                | 3121.50<br>(8.89)                |
| b.                 | Hired Labour                      | 2904.46<br>(7.01)                | 3324.68<br>(6.37)                | 3866.67<br>(14.78)               | 3210.89<br>(9.15)                |
| 2.                 | <b>Machinery Charges</b>          | 1949.05<br>(4.70)                | 2909.10<br>(5.57)                | 2800.01<br>(10.70)               | 2374.16<br>(6.76)                |
| 3.                 | <b>Seed</b>                       | 772.49<br>(1.87)                 | 831.17<br>(1.59)                 | 973.34<br>(3.72)                 | 828.85<br>(2.36)                 |
| 4.                 | <b>Fertilizer</b>                 | 3972.08<br>(9.59)                | 3581.31<br>(6.86)                | 3658.67<br>(13.98)               | 3805.75<br>(10.84)               |
| 5.                 | Total working capital             | 13150.44<br>(31.76)              | 13451.46<br>(25.79)              | 13698.69<br>(52.37)              | 13341.17<br>(38.02)              |
| 6.                 | Interest on working capital       | 657.53<br>(1.58)                 | 672.58<br>(1.29)                 | 684.94<br>(2.61)                 | 667.07<br>(1.90)                 |
| 7.                 | Rental value of land              | 12000.00<br>(28.98)              | 12000.00<br>(23.01)              | 12000.00<br>(45.88)              | 12000.00<br>(34.20)              |
| 8.                 | Interest on fixed capital         | 272.87<br>(0.65)                 | 407.28<br>(0.78)                 | 392.01<br>(1.49)                 | 332.39<br>(0.94)                 |
| 9.                 | Sub total                         | 26080.84<br>(90.00)              | 26531.32<br>(90.90)              | 26775.64<br>(90.00)              | 26340<br>(90.00)                 |
| 10.                | Managerial Cost @10% of sub-total | 2608.08<br>(9.09)                | 2653.13<br>(9.09)                | 2677.56<br>(9.09)                | 2634.05<br>(9.09)                |
| <b>Grand total</b> |                                   | <b>28688.92</b><br><b>(100)</b>  | <b>29184.45</b><br><b>(100)</b>  | <b>26453.20</b><br><b>(100)</b>  | <b>28794.27</b><br><b>(100)</b>  |

(Figures in parentheses indicate the percentage to total)

**Table.6** Measures of Per hectare cost and profit of Pigeonpea (Rs.)

| S. No | Particulars                       | Size group of farms |          |          | Overall average |
|-------|-----------------------------------|---------------------|----------|----------|-----------------|
|       |                                   | Marginal            | Small    | Medium   |                 |
| 1.    | <b>Cost A1/A2</b>                 | 10255.61            | 11318.84 | 11983.62 | 10886.73        |
| 2.    | <b>Cost B1</b>                    | 10528.48            | 11726.12 | 12375.64 | 11219.12        |
| 3.    | <b>Cost B2</b>                    | 22528.48            | 23726.12 | 24375.64 | 23219.12        |
| 4.    | <b>Cost C1</b>                    | 14080.84            | 14531.32 | 14775.64 | 14340.62        |
| 5.    | <b>Cost C2</b>                    | 26080.84            | 26531.32 | 26775.63 | 26340.62        |
| 6.    | <b>Cost C3</b>                    | 29497.59            | 29184.45 | 29453.19 | 28974.68        |
| 7.    | <b>Yield q/ha.</b>                |                     |          |          |                 |
| a.    | M.P                               | 16.27               | 20.25    | 17.94    | 17.66           |
| b.    | B.P                               | 48.94               | 48.31    | 50.67    | 49.12           |
| 8.    | <b>Grass Income</b>               | 81376.00            | 98762.00 | 89070    | 87499.68        |
| a.    | M.P                               | 71588.00            | 89100.00 | 78936    | 77674.07        |
| b.    | B.P                               | 9788.00             | 9662.00  | 10134    | 9825.61         |
| 9.    | <b>Net return over cost C3</b>    | 51878.41            | 69577.55 | 59616.81 | 58525.01        |
| 10.   | <b>Family labour Income</b>       | 58847.52            | 75035.88 | 64694.37 | 64280.56        |
| 11.   | <b>Farm Business income</b>       | 71120.39            | 87443.16 | 77086.38 | 76612.95        |
| 12.   | <b>Cost of production (Rs./q)</b> |                     |          |          |                 |
| a.    | <b>On Cost C3 basis</b>           | 1594.83             | 1300.18  | 1454.77  | 1439.13         |
| 13.   | <b>Input-Output ratio</b>         |                     |          |          |                 |
| a.    | <b>On the basis of cost A1</b>    | 1:7.93              | 1:8.72   | 1:7.43   | 1:8.03          |
| b.    | <b>On the basis of cost B1</b>    | 1:7.72              | 1:8.42   | 1:7.19   | 1:7.79          |
| c.    | <b>On the basis of cost B2</b>    | 1:3.61              | 1:4.16   | 1:3.65   | 1:3.76          |
| d.    | <b>On the basis of cost C1</b>    | 1:5.77              | 1:6.79   | 1:6.02   | 1:6.08          |
| e.    | <b>On the basis of cost C2</b>    | 1:3.12              | 1:3.72   | 1:3.32   | 1:3.31          |
| f.    | <b>On the basis of cost C3</b>    | 1:2.75              | 1:3.38   | 1:3.02   | 1:3.01          |

**Table.7** Inter Compression of Per hectare costs of different inputs used in Major pulses production (Rs.)

| S. No | Particulars                       | Measure pulses           |                          |                          |
|-------|-----------------------------------|--------------------------|--------------------------|--------------------------|
|       |                                   | Gram                     | Pea                      | Pigeonpea                |
| 1.    | Human Labour                      | 7803.29<br>(23.34)       | 10468.71<br>(28.98)      | 6332.39<br>(18.04)       |
| 2.    | Machinery Charges                 | 4469.96<br>(13.37)       | 5593.11<br>(15.48)       | 2374.16<br>(6.76)        |
| 3.    | Seed                              | 7923.50<br>(23.70)       | 4085.35<br>(11.31)       | 828.85<br>(2.36)         |
| 4.    | Fertilizer                        | 2429.47<br>(7.26)        | 2860.09<br>(7.91)        | 3805.75<br>(10.84)       |
| 5.    | Total working capital             | 22626.22<br>(67.68)      | 24819.75<br>(68.72)      | 13341.17<br>(38.02)      |
| 6.    | Interest on working capital       | 1131.31<br>(3.38)        | 1240.99<br>(3.33)        | 667.07<br>(1.90)         |
| 7.    | Rental value of land              | 6000.00<br>(17.94)       | 6000.00<br>(16.61)       | 12000.00<br>(34.20)      |
| 8.    | Interest on fixed capital         | 625.79<br>(1.87)         | 783.42<br>(2.16)         | 332.39<br>(0.94)         |
| 9.    | Sub total                         | 30392.19<br>(90.90)      | 32831.90<br>(90.90)      | 26340<br>(90.00)         |
| 10.   | Managerial Cost @10% of sub-total | 3039.18<br>(9.09)        | 3283.18<br>(9.09)        | 2634.05<br>(9.09)        |
|       | <b>Grand total</b>                | <b>33431.35</b><br>(100) | <b>36115.08</b><br>(100) | <b>28794.27</b><br>(100) |

(Figures in parentheses indicate the percentage to total)

**Table.8** Inter Compression measures of per hectare cost and profit of Gram, Pea and Pigeonpea (Rs.)

| S. No | Particulars                | Size group of farms |          |           |
|-------|----------------------------|---------------------|----------|-----------|
|       |                            | Gram                | Pea      | Pigeonpea |
| 1.    | Cost A1/A2                 | 18183.76            | 18287.14 | 10886.73  |
| 2.    | Cost B1                    | 18818.41            | 19070.20 | 11219.12  |
| 3.    | Cost B2                    | 24818.41            | 25070.20 | 23219.12  |
| 4.    | Cost C1                    | 24392.18            | 26831.90 | 14340.62  |
| 5.    | Cost C2                    | 30392.18            | 32831.90 | 26340.62  |
| 6.    | Cost C3                    | 33431.35            | 63115.08 | 28974.68  |
| 7.    | Yield q/ha.                |                     |          |           |
| a.    | M.P                        | 19.76               | 17.88    | 17.66     |
| b.    | B.P                        | 40.79               | 45.88    | 49.12     |
| 8.    | Grass Income               | <b>75843.67</b>     | 52098.96 | 87499.68  |
| a.    | M.P                        | 67685.11            | 42922.07 | 77674.07  |
| b.    | B.P                        | 8158.55             | 9176.89  | 9825.61   |
| 9.    | Net return over cost C3    | 42412               | 15983.88 | 58525.01  |
| 10.   | Family Income              | 51025.12            | 27028.76 | 64280.56  |
| 11.   | Farm investment income     | 52085.99            | 26050.12 | 73491.45  |
| 12.   | Farm Business income       | 57659.77            | 33811.82 | 76612.95  |
| 13.   | Cost of production (Rs./q) |                     |          |           |
| a.    | Cost C3                    | <b>1497.94</b>      | 1607.76  | 1439.13   |
| 14.   | Input-Output ratio         |                     |          |           |
| a.    | On the basis of cost A1    | 1:4.26              | 1:2.85   | 1:8.03    |
| b.    | On the basis of cost B1    | 1:4.11              | 1:2.72   | 1:7.79    |
| c.    | On the basis of cost B2    | 1:3.08              | 1:2.07   | 1:3.76    |
| d.    | On the basis of cost C1    | 1:3.10              | 1:1.94   | 1:6.08    |
| e.    | On the basis of cost C2    | 1:2.4               | 1:1.58   | 1:3.31    |
| f.    | On the basis of cost C3    | 1:2.26              | 1:1.44   | 1:3.01    |

(Figure in parentheses indicate the percentage to total)

### **Inter crop comparison of costs of cultivation per hectare of different pulses under study area**

Comparative values of different cost per hectare occupied in cultivation of various pulses is presented in table. g. It is revealed that the per hectare total cost was maximum of Pea Rs. 36115.08 followed by Gram Rs. 33431.35 and Pigeonpea Rs. 28794.27. used show that cost of human labour was maximum in pea production followed by Gram and Pigeonpea corresponded to 28.98, 23.34 and 18.04 per cent respectively. Amount paid for per hectare machinery charges and costs of seeds were also found of same trend per hectare cost of fertilizer was highest on Arhar followed by pea and gram which account for 10.84, 7.50 and 7.26 per cent of total cost respectively.

Ratio of input-output was found highest in respect of pigeonpea (1:3.01) followed by Gram 1:2.26 and pea (1:1.44). It is revealed from the table that per hectare gross income received from Arhar was highest i.e. Rs. 87499.68 followed by Gram (Rs.75843.67) and Pea (Rs. 52098.96) Net returns were also found of same trend (Table. h)

It is concluded from the table that cultivation of pigeonpea was more economic as compared to gram and pea due to comparatively low cost of production and higher level of income per hectare.

The importance of pulses can be judged 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 requirements, thus special efforts on intensification of production and supply of pulses are necessary. Pulse crop provides 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 acquire 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 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. 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.

Output input ratio were found to 1:2.26, 1:1.44 and 1:3.01 in case of gram, pea and arhar respectively. It may be concluded that among three pulses under study arhar was most profitable followed by gram and pea. Finally it is concluded that pulse is an unavailable important ingredient of human

diet with the points of view of food and nutritional security of poor vegetarian population of the country. Along with the time population increases and availability of per capita land is decreases which ultimately created the situation of increasing the cultivated area under food grain and reduction in the area of pulses.

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