*Original Research Article*

**A study on level of input and economics of production of groundnut in Gujarat**



**Abstract**

Groundnut, popularly known as peanut, which is one of the important *kharif* oilseed crop and its botanical name is *Arachis hypogea*. It ranks second next to China in terms of production. During 2019-20, groundnut was cultivated under 31.57 million hectares producing 53.64 million tonnes groundnuts in the world. India ranked first in term of area, with 15.30 per cent share to the world acreage followed by China (14.57 %) and Nigeria (12.89 %). Keeping all these things in view, the researcher has decided to conduct a study entitled to study level of input and economics of production of groundnut in Gujarat and objective of the study was to study level of input and economics of production for groundnut. A multistage sampling was adopted as appropriate sampling procedure for the study. In the first stage, out of thirty-three districts, seven districts were selected purposively according to the highest command area of groundnut cultivation. In the second stage, two talukas from each selected district were chosen purposively. In the third stage, two villages from each selected taluka were selected randomly. In the fourth stage, twelve respondents were selected from each selected village. Thus, a total of 336 respondents were selected for the study. As regards analytical tools, following techniques were used to analyse the stipulated objectives, *i.e.* calculation of cost and returns, Cobb-Douglas production function and MVP/MC ratio. All type of farm size group used more groundnut seeds than the recommended seed rate except marginal farmers. Nitrogen and Phosphorus usage were higher than the recommended doses by all type of farm size group. Manure usage were half of the recommended doses by selected farmers. Medium, semi medium and large farmers return per ha over cost A and cost B was higher than small and marginal farmers. Input-output ratio was observed highest in case of large farmers (1.69) over cost $C_2$, followed by medium farmers (1.68). Farmers over utilize of inputs for groundnut production like seed, fertilizer, bullock labour and irrigation, Whereas, farmers underutilize of inputs for groundnut production like farm equipment, PPC, human labour and manure.

Key word: Production function, Cost of cultivation, Efficiency

**Introduction**

Groundnut, popularly known as peanut, which is one of the important *kharif* oilseed crop and the botanical name is *Arachis hypogea*. The word "groundnut" is derived from two Greek words, '*Arachis*' meaning a legume and '*hypogea*,' meaning below ground, referring to the pods in the soil and occupied a significant position in the agricultural economy of the country. Groundnut is thought to have originated in Brazil and is later grown in Peru,

Argentina, and Ghana. It was introduced into India during the first half of 16th century (John *et al.,* 1955). South Arcot district (Madras) was the first place in India where it was originally grown on a significant scale at about 4,000 acres during 1850-51. Thereafter, groundnut gained recognition as popular oil seed in the nation and spread from meager 0.36 million hectares during the decade ending 1909-10 (Seshadri, 1962) to current 4.83 million hectares in 2019-20, with a maximum of 8.71 million hectares during 1992-93. Likewise, its production increased from 0.39 to 9.95 million tonnes in respective periods, with a maximum of 9.95 million tonnes during 2019-20 (http://www.fao.org/faostat/en). In India, Gujarat is the leading groundnut producing state with 4645.50 thousand tonnes (2019-20) accounting for 46.68 percent of total production. Rajasthan ranked second with production of 1619.30 thousand tonnes, followed by Tamil Nadu (1033.00 thousand tonnes) and Andhra Pradesh (848.80 thousand tonnes). Area under groundnut is highest in the state of Gujarat (1688.70 thousand hectare), followed by Rajasthan (739.00 thousand hectare), Andhra Pradesh (661.00 thousand hectare) and Karnataka (504.00 thousand hectare) (https://eands.dacnet.nic.in/). Little work done on the economics aspects of cultivation of groundnut. There is a greater variation in the cost of cultivations from one region to another. Farmers cannot calculate proper cost of cultivations for that they have less information regarding the profit from the cultivation.

**Braj and Singh (2016)** stated that size group 2 ha and above highest cost of groundnut production ₹ 80010.00/ha, followed by 1-2 ha ₹ 71586.22/ha, and 0-1 ha ₹ 62143.81/ha. Causes for these variations include manures and fertilizers, irrigation facilities, intercultural practices, and good farm management differences. Size group 2 ha and above highest net return ₹ 42840/ha, followed by 1-2 ha was ₹ 36213.78/ha, and 0-1 ha was ₹ 26006.19. The per hectare average input output 1:1.49 and highest input output ratio was 2 ha and above 1:1.53 followed by 1-2 ha 1:1.50 and 0-1 ha 1:1.42 and per farm net return 2 ha and above highest ₹114382.80 followed by 1-2 ha ₹ 52872.11 and 0-1 ha ₹ 15733.74, input output ratio was 1:1.42, 1:1.50 and 1:1.53, respectively which are so the increasing trend with the increasing size of holdings.

**Naidu *et al.* (2019)** calculated the cost of production per hectare, gross revenue, net income from farm investments, cost of production and input to output ratio of groundnut were calculated overall farm level. The findings showed that small, medium, and large farmers paid, ₹ 63537.0/ha, ₹ 61115.0/ha and ₹ 59455.0/ha, respectively in costs. Small, medium, and large farmers each received a gross return of ₹ 83130/ha, ₹ 85575/ha and ₹ 89487/ha, respectively. Small (1:1.37), medium (1:1.46), and large (1:1.56) were the input-output ratios per hectare, respectively. The farmer profit estimates were ₹ 86064 per hectare.

**Patel (2021)** analysed the costs and returns associated with using resources, their productivity, and how efficiently resources were used. The study found that the average cost per hectare for *kharif* groundnut was ₹ 49562.36. The average per-hectare costs A and B were calculated to be ₹ 30340.84 and ₹ 43457.36, respectively. The rental value of the land, manure, hired labour, and seed were the major components of the cost of agriculture. At the aggregate level, the marginal value product to factor cost ratio (MVP/MC) for human labour ($X_1$), bullock labour ($X_2$), seed ($X_4$), manures ($X_5$), and plant protection ($X_{10}$) were found to be greater than unity, suggesting that these input resources should be increased for better response in terms of yield.

**Rawal (2021)** studied an economic analysis of resource use efficiency of groundnut in Chhattisgarh plains. The cost of cultivation of groundnut was found to be ₹ 35560.37 per hectare. The overall yield of groundnut in the study area was 11.10 quintal per hectare. The input – output ratio was 1:1.56. The allocative resource use efficiency for groundnut

production under the category of overall farmers MVP to FC ratio was less than unity for land (0.0011) followed by human labour (0.1069), manure and fertilizer (0.0981), irrigation (0.0027), and plant protection chemicals (0.0003) indicated over utilization of these resources, where s more than unity for Seed (1.0540) indicated underutilization of resource.

## Materials and methods

Total production costs comprise of fixed and operational costs. Although the cash expenses such as buying of inputs like seeds, fertilizers, plant protection material, etc., were directly observed, but utilization of his fixed assets (like land, machinery, implements, etc.) and owned inputs like family labour (FL) in production are also accounted to give a realistic picture of the total costs incurred. In addition to fixed and operational costs, the cost concepts (Costs A, B, C) used by Commission for Agricultural Costs and Prices (CACP) is presented in this section. The different cost items that are included under each cost concept are detailed below with their imputation procedures. Here, Cost A is also referring as operating cost or paid out cost. Cost A can also be divided into two parts *viz.*, Cost $A_1$ and Cost $A_2$, if tenant farmers are there in the study. The farm management cost concept approach is widely used in India for evaluating crop profitability in production. The cost concepts in brief, are Cost A, Cost B, Cost $C_1$ and Cost $C_2$.

### Functional Analysis

The Cobb-Douglas type of production function was used to study the effect of various inputs on groundnut output. It being a homogenous function provided a scale factor enabling to measure the returns to scale. The estimated regression coefficients represented the production elasticities. The form of Cobb-Douglas production function used in the present study was as follows.

$$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}X_7^{b7}e^u$$

Where,

Y = Gross returns (₹/ha)
a = Intercept (efficiency) term
$X_1$ = Expenditure on seeds (₹/ha)
$X_2$ = Expenditure on FYM (₹/ha)
$X_3$ = Human labour expenditure (₹/ha)
$X_4$ = Bullock labour expenditure (₹/ha)
$X_5$ = Charges for machineries (₹/ha)
$X_6$ = Expenditure on Fertilizer (₹/ha)
X7= Expenditure on PPC (₹/ha)
e = Error term
$b_i$'s = Output elasticities of respective inputs, i = 1, 2....7

The Cobb-Douglas production function was converted into log linear form and parameters (coefficients) were estimated by employing Ordinary Least Square Technique (OLS).

The logarithmic form of equation was given below.

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + u$$

The regression coefficients (bi's) were tested using 't' test at chosen level of significance.

Marginal physical productivity of inputs from the most appropriate groundnut production function *i.e.* Cobb-Douglas in the present case was worked out by the following formula,

(i) Marginal physical product (MPP)

$$MPP = bi(\frac{\bar{Y}}{\bar{X}})$$

Where,

$\bar{Y}_i$= Arithmetic mean of output Y

$\bar{X}_i$= Arithmetic mean of $i^{th}$ input

$b_i$= Regression coefficient of $i^{th}$ input

(ii) Marginal cost (MC)

MC= Price per unit of input

After estimating the MVP, the resource use efficiency of different resources was evaluated with the help of MVP to factor price (Px) ratio as under

MVP/MC= 1 Optimum use of resource

MVP/MC< 1 Excess utilization of resource

MVP/MC> 1 Underutilization of resource

Henry Garrett's ranking technique was used to evaluate the problems faced by the respondents. The orders of merit given by the respondents were converted in to rank by suing the formula. To find out the most significant factor which influences the respondent, Garrett's ranking technique was used. The factors having highest mean value is considered to be the most important factor.

**Result and Discussion**

**Level of Input Used for Groundnut Production**

Input management assumes critical importance in groundnut production and makes use of critical inputs which was essential for the optimum production of groundnut. The quantitative figure of inputs used by selected groundnut farmers, directly affect the cost of cultivation and therefore, the use of various inputs viz; human labour, bullock power, charges for machineries, seeds, manures, fertilizers, irrigations, micronutrients and plant protection measures studied and presented in the Table 1.

It is shown from the Table 1 that, overall farm level per hectare utilization of groundnut seeds were 126.99 kg. Among the different category of farmers, it was the highest in the case of large farmers (133.33 kg) followed by semi medium farmers (129.24 kg), small farmers (127.52 kg), medium farmers (125.88 kg) and marginal farmers (116.79 kg). The human labour per hectare used by small farmers were 59.64 man-days, followed by Marginal farmers (56.80 man-days), semi medium farmers (53.51 man-days), medium farmers (52.45 man-days) and large farmers (50.86 man-days). The overall farmers per hectare human labour use was 48.23 man-days. From the total human labour, family labour man-days was decreased with increase land holding of farmer and hired labour man days was increased with increase land holding. The use of bullock labour in pair days was for the medium farmers was 3.19 days, followed by large farmers (2.98 days), small farmers (2.79 days), marginal farmer (2.62 days) and semi medium farmer (2.57 days). It was observed that medium and large

farmers were used bullock labour more than small, marginal and semi medium farmers. 2.83 pair days bullock labour was used by overall category farmers. The charges for machineries incurred by small farmers were observed highest with 10284.48 ₹ followed by semi medium farmers (₹ 9617.54), small farmers (₹ 9560.26), medium farmers (₹ 9528.66) and large farmers (₹ 9332.81). The charges for machineries incurred by overall category farmers were ₹ 9740.36. In general, for obtaining high yield of groundnut application of well decomposed farmyard manure @ 10 tonnes/ha at least 21 days before sowing. The manure used by semi medium farmers was 5.16 tonnes/ha followed by medium farmers (4.15 tonnes/ha), marginal farmers (3.52 tonnes/ha), large farmers (3.01 tonnes/ha) and small farmers (2.98 tonnes/ha) which was lesser than the half of the recommended manure (10.00 tonnes/ha) resulted in decrease the productivity of groundnut. Groundnut, beings a leguminous crop, is capable of fixing atmospheric nitrogen by the root nodule bacteria. Application of nitrogenous fertilizers is not required but lower doses of nitrogen would be sufficient to raise a good crop. For an irrigated crop, nitrogen may be applied in two equal splits at sowing and 30 days after sowing. Nitrogen used by semi medium farmers was 59.39 kg per ha, followed by large farmers (57.59 kg/ha), medium farmers (55.27 kg/ha), small farmers (53.02 kg/ha) and marginal farmers (48.35 kg/ha) and it was 55.60 kg/ha for overall category farmers. Nitrogen usage was higher than the recommended doses (25-37.5 kg/ha) by all type of farm size group, which indicates that the overutilization of nitrogen and due to this reason increases in the cost of cultivation. Phosphorus fertilizer used by the large farmers was 65.77 kg/ha followed by small farmers (65.57 kg/ha), marginal farmers (64.25 kg/ha), semi medium farmers (63.48 kg/ha) and medium farmers (61.83 Kg/ha) over the recommended dose of 50-60 kg per ha, which indicate that consumption of phosphorus fertilizer was higher than the recommended doses. Potash fertilizer used by the medium farmers was 24.28 kg per ha followed by semi medium farmers (23.50 kg/ha), marginal farmers (22.04 kg/ha) small farmers (20.88 kg/ha) and large farmers (14.43 kg/ha). The use of potash fertilizer was at par with the recommended level (0-30 kg/ha). However, if the fertilizer usage pattern of selected groundnut farmers compared with recommended levels of major nutrients indicates the excess use of phosphorus and nitrogen by sample growers, while manure usage by selected farmers was lower than the recommended level due to higher cost of manure and not timely available of manure. Lower usage of manure and excess usage of N and P resulted in less production per ha of groundnut and reduces the soil fertility of groundnut farmers. Patel (2021) found that the use of fertilizer was more than the recommended dose of N and P. The farmers from large size group had used more fertilizers than small and medium size groups.

As observed from the Table 1, per ha irrigation expenses was ₹ 1822.91 by large farmers followed by marginal farmers (₹ 1737.54), semi medium farmers (₹ 1718.75), small farmers (₹ 1715.60) and medium farmers (₹ 1710.73). Patel (2021) conducted study on production and marketing of groundnut and indicated that the charges for irrigation was ₹ 230.14, ₹ 210.00 and ₹ 197.20 for large, medium and small farmers, respectively.

Plant protection charges of medium farmers was ₹ 3227.90, followed by large farmers (₹ 3162.51), marginal farmers (₹ 3049.77), semi medium farmers (₹ 2863.54) and small farmers (₹ 2854.19). Kaur (2019) conducted study on production and marketing of groundnut and indicated that the number of sprays of plant protection chemicals performed on large, medium and small farms was 2.57, 2.08 and 1.57 sprays respectively with an average of 1.92 sprays. Also, found that cost of the plant protection chemicals was ₹ 1334.79, ₹ 1105.61 and ₹ 979.96 per acre for large, medium and small farmers, respectively.

It is shown from the Table 1 that at the overall level, per ha total human labour required for groundnut was 48.23 man-days. The use of bullock power, charges for machinery, seeds,

irrigation charges and manures for groundnut was 2.83 pair days, ₹ 9740.36/ha , 126.99 kg/ha, ₹ 1722.00/ha and 4.52 tonnes/ha, respectively. Among different fertilizers used, the use of nitrogen (55.60 Kg/ha) and phosphorus (63.69 kg/ha) were more than recommended level. The selected sample farmers used potash fertilizer at par. However, if the fertilizer uses pattern of groundnut compared with recommended levels of major nutrients indicates the excess use of nitrogen and phosphorus by sample farmers. Kaur (2019) conducted study on production and marketing of groundnut and indicated that The use of human labour, seeds, irrigation application, and fertilizers for groundnut was 79.95 hours/acre, 42.35 kg/acre, 1.13 No./acre and 107.83 kg/acre, respectively.

**Table 1: Level of input used for groundnut production**

| Sr. No. | Particulars (per ha) | Recommended doses (per ha) | Farm size group | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Marginal | Small | Semi medium | Medium | Large | Over all |
| 1 | Total human labour (Man-days) | | 56.80 | 58.58 | 53.51 | 52.45 | 50.86 | 48.23 |
| | (i) Family labour | | 32.00 | 27.76 | 22.93 | 20.94 | 13.66 | 18.75 |
| | (ii) Hired labour | | 24.80 | 30.82 | 30.57 | 31.50 | 37.19 | 29.47 |
| 2 | Bullock (Pair-days) | | 2.62 | 2.79 | 2.57 | 3.19 | 2.97 | 2.83 |
| 3 | Charges for machineries (₹) | | 10284.48 | 9560.26 | 9617.54 | 9528.66 | 9332.81 | 9740.35 |
| 4 | Manure (tonnes) | 10 tonnes | 3.51 | 4.78 | 5.15 | 4.14 | 3.00 | 4.52 |
| 5 | Seed (kg) | 100-120 kg | 116.78 | 127.52 | 129.24 | 125.87 | 133.33 | 126.98 |
| 6 | Fertilizer (kg) | | | | | | | |
| | N (kg) | 25-37.50 kg | 48.35 | 53.02 | 59.39 | 55.27 | 57.58 | 55.60 |
| | P (kg) | 50-60 kg | 64.25 | 65.56 | 63.47 | 61.82 | 65.77 | 63.69 |
| | K (kg) | 0-30 kg | 22.04 | 20.88 | 23.50 | 24.27 | 14.43 | 22.50 |
| 7 | Irrigation charges (₹) | | 1737.54 | 1715.60 | 1718.75 | 1710.73 | 1822.91 | 1722.00 |
| 8 | Plant protection charges (₹) | | 3049.77 | 2854.19 | 2863.54 | 3227.89 | 3162.51 | 2948.83 |



**Cost and Returns of Groundnut Production of Selected Farmers in Gujarat**

Table 2 showed that cost of cultivation per hectare of selected overall groundnut farmers i.e., working cost, cost A, cost B, cost $C_1$ and cost $C_2$ was worked out to ₹ 42819.05, ₹ 50707.47, ₹ 68448.27, ₹ 75082.20 and ₹ 82590.42 respectively. Working cost, cost A, cost B and cost $C_1$ were 51.85, 61.40, 82.88 and 90.91 per cent of the cost $C_2$, respectively.

From the different items of cost, seed was the major item of expenditure in cost A which accounted for ₹ 11872.45 (14.38 %) followed by charges for machinery ₹ 9740.36 (11.79 %), depreciation on farm building and implements ₹ 5376.71 (6.51 %), hired human labour ₹ 7368.80 (8.92 %), value of manure ₹ 3731.25 (4.52 %), value of pesticides and insecticides ₹ 2948.84 (3.57 %) and interest on working cost ₹ 2511.70 (3.04 %). The cost of fertilizer, value of bullock labour, irrigation charges and seed treatment cost were ₹ 2245.08 (2.72 %), ₹ 2232.97 (2.70 %), ₹ 1722.01 (2.08 %) and ₹ 118.65 (0.14 %), respectively.

The contribution of rental value of owned land and interest on fixed capital assets in cost B were ₹ 15639.21 (18.94 %) and ₹ 2101.59 (2.54 %) respectively. The cost of family labour was ₹ 6633.93 (8.03 %) and managerial charges for farm was ₹ 7508.22 (9.09 %).

Yield of main produce was 25.25 quintal per hectare and by produce was 18.76 quintal per hectare. The return from main produce and by produce were ₹ 128557.12 and ₹ 7502.38 respectively. The total gross return from one hectare of groundnut farm was ₹ 136059.50. These findings were in consonance with Raut (2013) and Kaur (2019).

**Table 2: Cost and returns of groundnut production of selected farmers in Gujarat**

| Sr. No. | Particulars | Small | Marginal | Semi medium | Medium | Large | Overall |
|---|---|---|---|---|---|---|---|
| | | ₹ (%) | ₹ (%) | ₹ (%) | ₹ (%) | ₹ (%) | ₹ (%) |
| 1 | Value of hired human labour | 6200.12 (7.74) | 7705.20 (9.17) | 7644.12 (9.24) | 7875.63 (9.54) | 9299.04 (10.99) | 7368.80 (8.92) |
| 2 | Value of bullock labour | 2215.19 (2.76) | 2240.78 (2.67) | 2092.60 (2.53) | 2559.63 (3.10) | 2389.50 (2.82) | 2232.97 (2.70) |
| 3 | Value of seeds (kg) | 11154.48 (13.92) | 12109.68 (14.42) | 11968.50 (14.46) | 12309.87 (14.91) | 12373.92 (14.62) | 11872.45 (14.38) |
| 4 | Seed treatment (gm) | 75.11 (0.09) | 103.53 (0.12) | 138.15 (0.17) | 123.09 (0.15) | 113.10 (0.13) | 118.65 (0.14) |
| 5 | Value of manure (tonne) | 3262.26 (4.07) | 3872.50 (4.61) | 4163.76 (5.03) | 3326.03 (4.03) | 2391.21 (2.83) | 3731.25 (4.52) |
| 6 | Value of fertilizer | 2248.42 (2.81) | 2243.15 (2.67) | 2265.90 (2.74) | 2203.05 (2.67) | 2151.84 (2.54) | 2245.08 (2.72) |
| | N (kg) | 302.94 (0.38) | 325.59 (0.39) | 355.93 (0.43) | 329.51 (0.40) | 341.17 (0.40) | 329.08 (0.40) |
| | P (kg) | 1570.16 (1.96) | 1578.42 (1.88) | 1527.04 (1.85) | 1484.48 (1.80) | 1579.41 (1.87) | 1551.67 (1.88) |
| | K (kg) | 375.32 (0.47) | 339.14 (0.40) | 382.92 (0.46) | 389.06 (0.47) | 231.26 (0.27) | 364.34 (0.44) |
| 7 | Value of pesticides and insecticides | 3049.77 (3.81) | 2854.19 (3.40) | 2863.54 (3.46) | 3227.90 (3.91) | 3162.51 (3.74) | 2948.84 (3.57) |
| 8 | Irrigation charges | 1737.54 (2.17) | 1715.60 (2.04) | 1718.75 (2.08) | 1710.74 (2.07) | 1822.92 (2.15) | 1722.01 2.08) |
| 9 | Charges for machineries | 10284.48 (12.84) | 9560.26 (11.38) | 9617.54 (11.62) | 9528.66 (11.54) | 9332.81 (11.03) | 9740.36 (11.79) |
| 10 | Other paid out expenses if any | 1020.00 (1.27) | 785.00 (0.93) | 820.00 (0.99) | 760.00 (0.92) | 920.00 (1.09) | 838.66 (1.02) |
| **Working capital (Rs.)** | | **41247.37 (51.48)** | **43189.89 (51.42)** | **43292.86 (52.31)** | **43624.59 (52.83)** | **43956.84 (51.94)** | **42819.05 (51.85)** |
| 11 | Depreciation on farm building and implements | 3631.01 (4.53) | 5932.18 (7.06) | 5780.38 (6.98) | 5869.23 (7.11) | 9740.00 (11.51) | 5376.71 (6.51) |
| 12 | Interest on working capital | 2409.14 (3.01) | 2538.08 (3.02) | 2540.08 (3.07) | 2564.49 (3.11) | 2575.42 (3.04) | 2511.70 (3.04) |
| **Cost A** | | **47287.52 (59.02)** | **51660.15 (61.51)** | **51613.33 (62.36)** | **52058.31 (63.04)** | **56272.26 (66.49)** | **50707.47 (61.40)** |
| 13 | Rental value of owned land | 15625.00 (19.50) | 15599.80 (18.57) | 15739.29 (19.02) | 15625.00 (18.92) | 14791.67 (17.48) | 15639.21 (18.94) |
| 14 | Interest on fixed capital | 1925.60 | 2153.20 | 2151.97 | 2149.42 | 2453.17 | 2101.59 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | assets | (2.40) | (2.56) | (2.60) | (2.60) | (2.90) | (2.54) |
| **Cost B** | | **64838.12 (80.92)** | **69413.15 (82.64)** | **69504.58 (83.98)** | **69832.73 (84.57)** | **73517.10 (86.87)** | **68448.27 (82.88)** |
| 15 | Imputed value of family labour | 8000.00 (9.98) | 6941.53 (8.26) | 5733.52 (6.93) | 5237.18 (6.34) | 3416.67 (4.04) | 6633.93 (8.03) |
| **Cost C1** | | 72838.12 (90.91) | 76354.68 (90.91) | 75238.09 (90.91) | 75069.91 (90.91) | 76933.76 (90.91) | **75082.20 (90.91)** |
| 16 | Managerial charge | 7283.91 (9.09) | 7635.62 (9.09) | 7523.79 (9.09) | 7506.95 (9.09) | 7693.33 (9.09) | 7508.22 (9.09) |
| **Cost C2** | | **80122.03 (100.00)** | **83990.30 (100.00)** | **82761.89 (100.00)** | **82576.87 (100.00)** | **84627.10 (100.00)** | **82590.42 (100.00)** |

**Input-Output Ratio of Selected Farmers of Groundnut**

Table 3 showed that highest gross return per hectare was ₹143341.2 by the large farmers followed by medium farmers (₹ 138822.2), small farmers (₹ 137437.5), semi medium farmers (₹ 137225.6) and marginal farmers (₹ 130913). It has been observed that Medium, semi medium and large farmers return per ha over cost A and cost B was higher than small and marginal farmers. Similar observations expressed by Chandraskehar (1993). Return per ha over cost $C_1$ and $C_2$ were increased with increase the land holding of farmers. The variation in different cost and return was high on all type of farmers which has been resulted into vast difference in cost of cultivation and return over different cost of kharif groundnut in all types of farmers under study area and similar result was found by Patel (2021).

Input-output ratio was observed highest in case of large farmer (3.17) over working cost followed by medium, small, semi medium and marginal farmers. Highest input-output ratio over cost A and cost B was found in case of marginal and small farmers and lowest ratio was observed in case of large farmers. This result showed that depreciation on farm implements and buildings and interest on working cost was higher in case of large farmers and lower value with decreasing farm size which showed that large farmer had more farm implements and buildings than the small farmers. Input-output ratio was observed highest in case of large farmers (1.69) over cost $C_2$ followed by medium farmers (1.68), semi-medium farmers (1.66), small farmers (1.64) and marginal farmers (1.63). It is worth noting that because large farmers have readily available cash, they use resources more efficiently, resulting in higher crop productivity than other farmers, according to Choudhary *et al.* (2017).

**Table 3: Input-output ratio of selected farmers of groundnut**

| | **Marginal** | **Small** | **Semi medium** | **Medium** | **Large** | **Over all** |
|---|---|---|---|---|---|---|
| Gross return per ha (₹) | 130913.01 | 137437.50 | 137225.57 | 138822.17 | 143341.18 | 136059.50 |
| **Cost per ha** | | | | | | |
| Working cost (₹) | 41247.37 | 43189.89 | 43292.86 | 43624.59 | 43956.84 | 42819.05 |
| Cost A (₹) | 47287.52 | 51660.15 | 51613.33 | 52058.31 | 56272.26 | 50707.47 |
| Cost B (₹) | 64838.12 | 69413.15 | 69504.58 | 69504.58 | 73517.1 | 68448.27 |
| Cost $C_1$ (₹) | 72838.12 | 76354.68 | 75238.09 | 75238.09 | 76933.76 | 75082.2 |
| Cost $C_2$ (₹) | 80122.03 | 83990.30 | 82761.89 | 82761.89 | 84627.1 | 82590.42 |
| **Return per ha over** | | | | | | |
| Working cost (₹) | 89665.64 | 94247.60 | 96213.08 | 96392.14 | 99384.34 | 93996.71 |
| Cost A (₹) | 83625.49 | 85777.34 | 87892.62 | 87958.42 | 87068.92 | 86108.29 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Cost B (₹) | 66074.89 | 68024.35 | 70001.36 | 70512.15 | 69824.08 | 68367.49 |
| Cost $C_1$ (₹) | 58074.89 | 61082.82 | 64267.85 | 64778.63 | 66407.42 | 61733.56 |
| Cost $C_2$ (₹) | 50790.98 | 53447.20 | 56744.05 | 57254.84 | 58714.09 | 54225.34 |
| **Input-output ratio over** | | | | | | |
| Working cost | 3.17 | 3.18 | 3.17 | 3.18 | 3.26 | 3.18 |
| Cost A | 2.77 | 2.66 | 2.66 | 2.67 | 2.55 | 2.68 |
| Cost B | 2.02 | 1.98 | 1.97 | 1.99 | 1.95 | 1.99 |
| Cost $C_1$ | 1.80 | 1.80 | 1.82 | 1.85 | 1.86 | 1.81 |
| Cost $C_2$ | 1.63 | 1.64 | 1.66 | 1.68 | 1.69 | 1.65 |

The result indicated that at overall farm level cost A, cost B, cost $C_1$ and cost $C_2$ were ₹ 50707.47, ₹ 68448.27, ₹ 75082.2 and ₹ 82590.42 respectively. Per ha returns over cost A, cost B, cost $C_1$ and cost $C_2$ were realized at ₹ 85352.04, ₹ 67611.23, ₹ 60977.3 and ₹ 53469.08 respectively. Input-output ratio over cost A, cost B, cost $C_1$ and cost $C_2$ were 2.68, 1.99, 1.81 and 1.65 respectively. Similar pattern of cost and return was noticed by Lakhana (2003).

**Resource Use Efficiency in Groundnut Production of Selected Farmers**

The production function analysis was carried out to examine the resource use efficiency in groundnut production using Cobb-Douglas production function with the help of coefficients of elasticity of major resources along with value of $R^2$ and F ratio in Table 4.

The result revealed that the co-efficient of multiple determination ($R^2$) was 0.60 it indicates that about 60 per cent for overall farm level. It was indicted that variable inputs have functional relationship contributed as 60 per cent for overall selected farm size of groundnut cultivation. Which indicated that the relationship between farm profit and the included variables had good relationship. The total number of selected farmers were 336 and degree of freedom was 327 in study area. The estimated coefficient for variables $X_1$, $X_2$….$X_8$ i.e., seed, manure, fertilizer, human labour, bullock labour, machine cost, irrigation and PPC (Insecticides and pesticides), respectively are significantly different from zero.

**Table 4: Resource Use Efficiency in Groundnut Production of Farmers**

| Sr. No. | Variables | Regression coefficient of variable | MVP/MC |
|---|---|---|---|
| 1 | Intercept | 0.3614* (0.1840) | - |
| 2 | Seed ($X_1$) | 0.0892** (0.0153) | 0.9660 |
| 3 | Manure ($X_2$) | 0.0326** (0.0065) | 1.1192 |
| 4 | Fertilizer ($X_3$) | 0.0104 (0.0210) | 0.5859 |
| 5 | Human labour ($X_4$) | 0.2000** (0.0344) | 1.8349 |
| 6 | Bullock labour ($X_5$) | 0.0044 (0.0125) | 0.2445 |
| 7 | Charges for machineries ($X_6$) | 0.4170** (0.0338) | 5.4773 |
| 8 | Irrigation ($X_7$) | 0.0012 (0.0102) | 0.0919 |

| | | | |
|---|---|---|---|
| 9 | PPC ($X_8$) | 0.0486* (0.0242) | 2.1402 |
| 10 | $R^2$ | 0.6019 | - |

*Note* : '*' and '**' indicates significant at 5 per cent and 1 per cent, respectively and figures in parenthesis indicated standard error

The inputs *i.e.* seed, human labour, charges for machineries, PPC and manure contributed positive significantly to the productivity of groundnut at overall selected farmers and found to be 0.0892, 0.2000, 0.4170, 0.0486 and 0.0326, respectively. However, the contribution of the other remaining variables fertilizer (0.0104), bullock labour (0.0044) and irrigation (0.0012) were noticed non-significant but positively influencing the profit. Similar findings were observed by Rawal (2021).

Thus, findings of functional relationship between variable inputs and productivity of groundnut indicates that farmers of the selected area were ignoring recommended package of practices and new technologies by following traditional method for cultivation of groundnut. This needs immediate policy interventions to aware about recommended package of practices and new technologies to the groundnut farmers by involving the extension activities and extension personnel through arranging farmers meetings, field level demonstrations, meeting with progressive farmers *etc.*

**Allocative Resource Use Efficiency for Groundnut Production of Selected Farmers**

The resource use efficiency of groundnut crop cultivation was calculated and results presented in Table 4. It was observed from the results that in the cultivation of groundnut under category of overall farmers MVP to MC ratio was less than one for seed (0.9660), fertilizer usage (0.5859), Bullock labour used in pair days (0.2445) and Irrigation application (0.0733), this indicates that the over utilization of resources. This indicates that optimum efficiency of resource usage was not achieved in case of these variables so there was need to decrease the usage of these excess inputs to reach at optimum production of selected farmers. The forgoing analysis indicated that MVP to MC ratio of these resources was more than one for charges for machineries (5.4773), PPC (2.1402), human labour (1.8349) and manure (1.1192) indicated underutilization of resources. The profitability of groundnut cultivation at overall level farmers could be maximized by increasing the use of manure, human labour, charges for machineries and PPC. Similar findings in line with Choudhary *et al.*(2017). Hence, apart from the groundnut, The groundnut farmers could increase their gross return by using all their excess resources to the cultivation of other crop and other farm activities. The groundnut farmers also reduce excess usage of over utilized inputs by adopting recommended package of practices for groundnut cultivation resulted in decrease the cost of cultivation of the groundnut crop.

**Conclusion**

Input management assumes critical importance in groundnut production which was essential for the optimum production of groundnut. The quantitative figure of inputs used by selected groundnut farmers, directly affect the cost of cultivation. All type of farm size group used more groundnut seeds than the recommended seed rate except marginal farmers. Nitrogen and Phosphorus usage were higher than the recommended doses by all type of farm size group, which indicates that the overutilization of Nitrogen and Phosphorus. Manure usage were half of the recommended doses by selected farmers. Medium, semi medium and large farmers return per ha over cost A and cost B was higher than small and marginal farmers. Input-output ratio was observed highest in case of large farmers (1.69) over cost $C_2$, followed

by medium farmers (1.68), semi-medium farmers (1.66), small farmers (1.64) and marginal farmers (1.63). Farmers over utilize of inputs for groundnut production like seed, fertilizer, bullock labour and irrigation, Whereas, farmers underutilize of inputs for groundnut production like farm equipment, PPC, human labour and manure.

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