Impact assessment of Technology Mission on Oilseeds (TMO) on farm economy in Karnataka -Special reference to groundnut crop

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Abstract

The present study was conducted to examine the growth and economic impact of TMO on farm economy of major oilseeds growing districts of Karnataka and the state as a whole. The study period was divided into Period-I (Pre TMO) from 1972-73 to 1985-86, Period –II (Post TMO) from 1986-87 to 2009-10 and Overall period from 1972-73 to 2009-10. Primary data survey was done for groundnut crop in Tumkur district, Karnataka. The results of the CGR analysis revealed that, the growth in area, production and yield of total oilseeds found to be positive during Period-I except area growth in Belgaum and Dharwad districts and yield growth in Bijapur and Gulbarga districts. During Period-II in most of the study districts, area showed declining growth except in Belgaum and Dharwad and Bijapur and Gulbarga for yield growth. The quantities of inputs and labour utilized and per hectare output realized were more in beneficiaries.

Key words: Technology Mission on Oilseeds (TMO), Groundnut, Compound Growth Rate (CGR), Tabular analysis and Budgeting technique.

1. Introduction

Oilseeds are one of the commercially grown crops in India along with cereals, pulses and spices. India is one of the largest producers of oilseeds in the world and this sector occupies an important position in the agricultural economy. Indian vegetable oil economy is the fourth largest in the world next only to USA, China and Brazil accounting for about 14 per cent of world's oilseeds area and 8.5 per cent of world's oilseeds production. India ranks first in castor and safflower production in the world, second in groundnut and sesame, third in linseed and rapeseed, fifth and sixth in soybean and sunflower respectively. In terms of area, out of eight oilseed crops, India ranks first in five crops (Groundnut, Sesame, Safflower, Linseed and Castor) second in rapeseed next only to China and fourth in sunflower and soybean. Among the nine oilseeds grown in India, soybean is the single largest crop produced in India with a share of 43 per cent followed by mustard with 29 per cent contribution to total oilseeds production. The top four oilseed producing states in the country are Madhya Pradesh, Rajasthan, Gujarat and Maharashtra. Madhya Pradesh alone accounts for 31 per cent of the total oilseed production in India, with the other three states contributing 10 to 15 per cent each. Andhra Pradesh, Karnataka, Tamil Nadu, Haryana, Uttar Pradesh, West Bengal, Orissa and Assam are the other important oilseed producers in India. Groundnut holds the third position accounting for 20 per cent of total

oilseeds production. It is mainly grown in the states of Gujarat, Andhra Pradesh, Tamil Nadu and Karnataka. The three largest states producing mustard are Tamil Nadu, Rajasthan and UP. Sunflower is mainly grown in Karnataka, AP and Maharashtra (*Directorate of oilseeds Research, (ICAR), Hyderabad).*

The Technology Mission on Oilseeds was launched during 1986 by the Central Government to increase the production of oilseeds, to reduce import and to achieve self-sufficiency in edible oils. Subsequently, pulses, oil palm and maize were also brought within the purview of the Mission during 1990-91, 1992 and 1995-96 respectively. The other schemes implemented under Technology Mission are Oilseeds Production Programme (OPP), National Pulses Development Project (NPDP), Accelerated Maize Development Programme (AMDP) and Oil Palm Development Programme (OPDP) and have been merged into one Centrally Sponsored Integrated Scheme of Oilseeds, Pulses, Oil palm and Maize (ISOPOM) being implemented since April 2004. Under this Scheme, financial assistance is provided for purchase of breeder seeds, production of foundation seeds, production and distribution of certified seeds, seed minikits, plant protection chemicals and equipments, weedicides, etc. to encourage farmers to grow oilseeds and pulses.

After the introduction of Technology Mission on Oilseeds in the state, the total area under oilseeds has increased. It is, therefore, of great importance to study the performance of oilseeds in major producing districts of the state and assess the impact of TMO. Hence, the present study attempts to analyse the growth performance of the oilseeds of Karnataka both at disaggregate and aggregate levels with the objectives to study the growth in area, production and yield of oilseeds in Karnataka during pre and post Technology Mission on Oilseeds periods and to analyze the impact of Technology Mission on Oilseeds on farm economy of the state. The results of the present study may help the Technology Mission to carry out its programme still in a better way and reach its goal of making Karnataka in particular and India in general self sufficient in oilseeds production.

2. Methodology

Karnataka state was selected purposively as it is one of the major oilseeds growing states in the country and also the Technology Mission on Oilseeds scheme has been implemented in the state. Karnataka stands 6th position with respect to area under oilseeds. The study is based on the district wise and state level secondary data on area, production and yield of groundnut and total oilseeds as well as primary survey. The data required for the study were collected from the Directorate of Economics and Statistics, Bangalore for the period from 1972-73 to 2009-10. To assess the impact of TMO, the study period has been divided into Period–I (1972-73 to 1985-86), Period –II (1986-87 to 2009-10) and Period-III (1972-73 to 2009-10). Period-I represents the Pre-

TMO and Period-II represents the Post TMO period and Period –III represents the Overall study period. For the convenience of analysis the districts are considered as undivided districts as the data used for analysis is from 1980.

Primary data for the present study on crop yield, cropping pattern, input usage and cost of cultivation of beneficiaries and non-beneficiaries were obtained for the year 2011-12 from the selected sample famers through personal interview method with the help of pre–tested and well structured schedule.

2.1. Selection of Sample Farmers

Multistage sampling technique was adopted for the selection of district, taluk and villages. One major oilseed crop, groundnut was selected as it is one of the major oilseed crop in Karnataka. In the state for groundnut crop one major oilseed growing district was selected. Hence, the primary data was collected from Tumkur district for groundnut crop as this district has highest area under groundnut crop in the state and covered under Technology Mission on Oilseeds. In the next stage, one taluk having maximum area was chosen. At the final stage, from the selected taluk, three villages having maximum area under groundnut were selected and in each village ten beneficiaries and ten non-beneficiaries were selected randomly which makes a total sample size of 60 sample farmers. Out of ten farmers, five small farmers and five large farmers were selected both in case of beneficiaries and non- beneficiaries.

2.2. Statistical Tools

2.2.1. Compound Growth Rate Analysis

Compound growth rates in area, production and yield of groundnut and total oilseeds in eight selected districts and for the state as a whole were estimated by using the exponential function of the form (*Angels, 2001*).

$$Y_t = a\, b^t\, e^{Ut} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

Y_t = Area/production/ yield of groundnut and total oilseeds in year ‘t’.

a = Intercept

b = Regression coefficient

t = Year which takes values 1, 2 … n.

U_t = Disturbance term in year‘t’.

The equation (1) was transformed into log-linear form and written as

$$\log Y_t = \log a + t \log b + U_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Parameters in Equation (2) are estimated by using Ordinary Least Square (OLS) technique.

The compound growth rate (g) was then estimated by the identity given in equation (3)

$$\hat{g} = (\hat{b}-1) \times 100 \quad \ldots\ldots\ldots\ldots\ldots \quad (3)$$

Where,

g = Estimated compound growth rate in percentage per annum.

b = Antilog of regression coefficient

2.2.2. Tabular analysis

Tabular analysis was carried out to analyze the impact of Technology Mission on oilseeds on farm economy. Primary data from farmers were used to obtain meaningful results on the impact of Technology Mission on their crop yield, change in cropping pattern and difference in input usage of beneficiaries and non-beneficiaries.

2.2.3. Budgeting technique

Cost and returns of beneficiaries and non-beneficiaries were analysed using budgeting technique.

Indian rupee was converted to USD by considering ₹60 is equal to $1.

3. Results and Discussion

The results of the Compound Growth Rate analysis of area, production and yield of groundnut and total oilseeds in the selected districts as well as for the state as a whole are presented in Table 1 and Table 2 respectively.

3.1. Groundnut

It could be seen from the Table 1 that, the growth in area under groundnut during both entire period and Period-I was marginal (0.16% and 0.38% respectively) whereas; during Period-II it showed decelerating growth of 1.76 per cent per annum. Similar results were observed in most of the districts. In the Overall period, the districts of Bellary, Chitradurga, Dharwad and Tumkur registered positive growth rates, while Belgaum, Bijapur, Gulbarga and Raichur districts showed just the opposite. During the Period-I, most of the districts experienced positive growth except Belgaum, Bellary, Bijapur and Gulbarga. However, during the Period-II, area under groundnut in all districts showed negative growth.

Groundnut production growth trend was almost similar to that of the area. At the aggregate level, production increased at the rate of 0.17 per cent per annum during the Overall period as against 2.24 per cent per annum during the Period-I, however during Period-II the production decelerated at the rate of 3.63 per cent per annum. The districts of Bijapur, Chitradurga, Dharwad, Gulbarga and Tumkur recorded a positive growth in the Overall period, whereas in remaining districts it was found opposite. During Period-I, the production of groundnut was positive in most of the districts except in the case of Bijapur. However, during Period-II, all the districts experienced negative growth in the production of groundnut.

With respect to the yield levels of groundnut the state recorded negative growth of 0.04 per cent and 1.84 per cent during Overall period and Period-II respectively. Whereas during Period-I it was Positive growth rate. The district-wise analysis confirmed that most of the growth rates in Period-I were positive except Tumkur. The positive growth rates observed in most of the districts were transformed to negative growth rates in Period-II barring Bijapur and Gulbarga. During the Overall period, majority of the districts witnessed stagnation in yield levels.

3.2. Total Oilseeds

Perusal of the Table 2 revealed that, total oilseeds area and production comprised of area and production of nine oilseeds grown in the state. During the Period-I, all the study districts and state as a whole experienced a positive growth in area except in the case of Belgaum and Dharwad districts. The state as a whole showed positive significant growth of 2.44 per cent. The highest positive growth (22.34%) was registered in Chitradurga district followed by Bijapur (12.27 %), Gulbarga (10.25%) and Bellary (5.02%) districts. In the case of production of total oilseeds all the districts and state as a whole recorded positive growth rate. The growth in yield of total oilseeds during the Period-I was 4.51 per cent per annum in state as a whole. The highest positive growth was registered in Chitradurga district (14.93 %) followed by Bellary (12.24%), Tumkur (8.83 %), Belgaum (6.99%) and Raichur (5.26%) districts.

During the Period-II, the annual rate of increase in total oilseeds area was declining significantly in Bellary (-0.83 %), Bijapur (-0.57 %), Gulbarga (-3.20 %) and Tumkur (-0.64 %). Further the results revealed that with the exception of improvements are seen in Dharwad and Belgaum districts which showed positive significant growth. Similar trend was seen in state as a whole as like most of the districts showed negative growth of -0.74 per cent per annum. The production performance of total oilseeds was much lower during Period-II than Period-I. Positive growth rates were registered only in the districts of Belgaum and Bijapur districts whereas, in remaining districts as well as state as a whole (-1.65%) recorded negative growth. At the state level, total oilseeds yield was found to be declining substantially at the rate of 0.91 per cent per annum. All the districts showed negative growth except Bijapur and Gulbarga. The truncated analysis revealed that the yield of total oilseeds was not encouraging during the Period-II in all the districts and state as a whole. The results were in line with the findings of Sonnad (2008).

It can be observed from the table that during the Overall period, the growth in area was 1.79 per cent and was found significant at one per cent level of significance. Similarly in most of the districts area growth was positive and statistically significant. The highest positive growth was registered in Chitradurga district (7.71 %) followed by Bijapur (3.59 %), Tumkur (3.52%) and Bellary (3.01%). The growth rate in production of total oilseeds during the Overall period was encouraging (1.82 %) in the state. At the state level, total oilseeds yield was found to be declining substantially at the rate of 0.037 per cent per annum over the years. The yield growth rates across the districts were not different from that of the state. During the entire period, the positive growth rates were observed only in Belgaum, Bijapur, Chitradurga, Dharwad and Gulbarga but it was very negligible.

The overall results revealed that oilseeds have been gaining importance in the recent years. The growth in production of oilseeds was achieved mainly due to expansion in acreage and additional irrigated area rather than due to improvement in yield levels. In other words, the technologies developed for major oilseed crops have not made a significant dent in increasing oilseeds production. Also about 80-85 per cent of oilseeds cultivation takes place under rainfed condition predisposes the farmer to a risk factor for adoption of recommended technologies. The findings of overall period are on par with the findings of Sonnad (2008). Girish *et al*., (2012) reported that the positive trend during the 1980's could be due to government initiatives in the form of TMO as well as price and marketing support for oilseeds growers. The reverse trend during the 1990's was mainly due to decrease in oil prices relative to other crops and liberalization of edible oil imports in 1996-97. The government price support mechanism has

continuously favoured wheat and rice crops but not the oilseed crops, which led to lowered oilseeds cultivation.

3.3. Impact of Technology Mission on Oilseeds on Farm Economy

3.3.1. General Characteristics of Growers of Groundnut in the Study Area

General features of sample respondents (Table 3) revealed that the average age of beneficiaries was 46.4 years and that of non-beneficiaries was 47.8 years. It was observed that majority of the sample farmers both beneficiaries (80.0%) and non-beneficiaries (63.3%) were literate and in both the cases the main occupation was agriculture. It is noted fact that higher the education level more will be the knowledge and better will be the understanding capacity of the new technologies. The average size of the family of both beneficiaries and non- beneficiaries was about five members. The average size of the land holding was 2.97 ha and 2.5 ha in the case of beneficiaries and non-beneficiaries respectively. Average area under groundnut cultivation in the case of beneficiaries and non- beneficiaries was 1.53 ha and 1.12 ha respectively. All beneficiaries used hybrid seeds for cultivation of groundnut whereas more than 70 per cent of non-beneficiaries used local seeds. Hence, there exists yield difference between them.

3.3.2. Cropping Pattern of Groundnut Growers in the Study Area

The result in Tables 4 clearly distinguished the cropping pattern followed by both beneficiaries and non-beneficiaries. In *Kharif* season, groundnut occupied 44.4 per cent and 38.6 per cent of the gross cropped area of beneficiary and non-beneficiary farms respectively. Cereals occupied major share in area among non-beneficiaries (21.7%) whereas the total area covered under pulses was more in the case of beneficiaries farms (27.0%) as against non- beneficiaries (25.1%). Similarly, the area covered under oilseeds was more with 44.4 per cent on beneficiaries farms as against only 38.6 per cent in the case of non- beneficiaries. The area covered under horticultural and plantation crops were also relatively more and accounted 11.0 per cent and 14.2 per cent of the gross cropped area in the case of beneficiaries and non- beneficiaries respectively. These results showed the relevance and importance of inputs availability under TMO in determining area allocation under different crops. Eventually, the beneficiaries chose to have more area under oilseed crops when compared to non- beneficiaries.

Similarly, the cropping intensity was also found to be relatively high on beneficiary farms (147.5%) compared to non-beneficiary farms (146.0%). Similar findings of favourable effect of credit on cropping pattern were reported in the study conducted by Deorukhakar *et al.* (2007).

3.3.3. Labour Use Pattern in Groundnut Cultivation

Per hectare quantity of labour used in different operations of groundnut production is presented in the Tables 5.

Perusal of the table revealed that, the total quantity of human, bullock and machine labour utilized were more in case of beneficiaries in all the major operations like ploughing, harrowing, loading, transportation and spreading of FYM, sowing, fertilizer application, weeding, intercultivation, PPC application and harvesting. This was mainly because of the timely operations and use of more quantity of inputs by beneficiaries than non-beneficiaries.

3.3.4. Input Use Pattern and Output Obtained in Groundnut Cultivation

Per hectare utilization of different inputs and output realized by the sample farmers in the district is depicted in Table 6. The different inputs utilized were seeds, human labour, bullock labour, machine labour, Farm Yard Manure (FYM), fertilizers and plant protection chemicals.

The quantities of inputs utilized were more in case of beneficiaries in all the major inputs like seeds, labour, organic manure, chemical fertilizers and PPC in case of groundnut crop. This revealed more quantity of input utilization among the beneficiaries as against non-beneficiaries. This was mainly because of availability of adequate and timely availability of inputs through TMO scheme which helped them to use more quantity of inputs. These findings were in line with the findings of Shalini (2011) wherein, she reported borrowers used more inputs than non borrowers because of availability of adequate institutional credit in time. As a result the output obtained by beneficiaries (27.2 quintals) per hectare of groundnut cultivation was more than that of non-beneficiaries (21.8 quintals).

3.3.5. Costs and Returns in Cultivation of Groundnut

A comparison of cost and returns structure of groundnut production between beneficiaries and non-beneficiaries farms is presented in Table 7. The total variable costs incurred on the cultivation of groundnut were more on the beneficiary farms ($683/ha) compared to those on the non- beneficiary farms ($596/ha). This revealed better input utilization and their timely application as opined by beneficiaries during the survey. This was mainly because of availability of inputs in time whenever they required.

The gross return among beneficiary farms per hectare for groundnut ($1649) was significantly more than that of non-beneficiary farms ($1306). It can be seen from the table that, there is an increase in the total cost of cultivation on beneficiary farms by $87 over non-beneficiary farms. The reasons identified for this were increased cost of seeds, FYM and recommended amount of fertilizer with gypsum. All together the beneficiaries were obtained additional net returns of about $256 over non-beneficiaries and also the profit per rupee of cost

was enhanced on beneficiary farms (1.9) when compared to non-beneficiary farms (1.7). It was mainly due to the timely availability of these inputs at the right time by the beneficiaries and the knowledge they gained through training and demonstration conducted under TMO scheme. The results are on par with Deorukhakar *et al.* (2007) where they indicated that gross income on beneficiary farm was approximately three times higher than non-beneficiary farms.

4. Conclusion

Although the implementation of TMO has overcome varietal constraints and agronomic constraints in groundnut production still there exist environmental constraints which hinder the groundnut growth as it is grown mostly in rainfed regions. Erratic rainfall which is one of the major limiting factor for declining growth, majority of years sufficient rain is available in June and July for sowing and establishment of the crops whereas August and September are commonly drier with less rainy days, this situation adversely affects the groundnut production. Groundnut crop also suffers heavily from infestation of leaf minor and sucking pests like aphids, jassids and thrips and major diseases like bud necrosis, rust and leaf spot. Thus there is need for development of region specific, drought resistant and pest resistant varieties and measures should be taken to increase the area under irrigation which would go a long was in avoiding problem of stagnated level of production. Another reason for less productivity in groundnut is that it is cultivated on marginal and sub-marginal lands with soils of poor fertility thus the government should think on promoting the cultivation of this crop in large farms with the help of extension activities. Inputs utilized and gross return obtained with higher net income and profit per rupee of cost on beneficiary farms was more than the non-beneficiary farms which was due to the intervention of TMO in beneficiary farms. Hence the measures should be taken by TMO to cover all oilseed growers.

5. References

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Table 1: District wise compound growth rate of area, production and yield of groundnut in Karnataka

(Per cent per annum)

Districts	Period I			Period II			Overall period		
	A	**P**	**Y**	**A**	**P**	**Y**	**A**	**P**	**Y**
Belgaum	-1.69	2.30	4.24*	-2.72**	-4.06**	-0.88	-2.21**	-1.64**	0.38
Bellary	-1.85	2.93	5.40**	-0.243	-4.27**	-4.04**	1.08**	-0.38	-1.37**
Bijapur	-0.90	-0.77	0.28	-2.18**	-0.69	1.93*	-1.01**	0.62	1.97**
Chitradurga	10.26**	4.43	0.37	-0.99	-1.77	-1.74*	5.13**	4.55**	-1.72**
Dharwad	5.38	4.22	2.19	-1.32**	-3.12*	-1.27	0.36	1.09	0.48
Gulbarga	-1.05	4.14	2.06	-4.31**	-3.43**	0.91	-1.35**	0.19	1.08*
Raichur	1.31**	4.05*	2.66	-2.84**	-3.16**	-0.34	-1.22**	-1.02*	0.24
Tumkur	7.33**	4.56	-2.43	-0.94**	-4.51**	-3.60**	3.21**	1.89*	-1.26*
Karnataka	**0.38**	**2.24**	**2.22**	**-1.76****	**-3.63****	**-1.84****	**0.16**	**0.17**	**-0.04**

** and * indicates significance at 1 and 5 per cent level respectively

Table 2: District wise compound growth rate of area, production and yield of total oilseeds in Karnataka

(Per cent per annum)

Districts	Period I			Period II			Overall period		
	A	**P**	**Y**	**A**	**P**	**Y**	**A**	**P**	**Y**
Belgaum	-0.74*	2.87	6.99*	0.82**	0.56	-0.25	0.88**	0.33**	0.69
Bellary	5.02*	7.18*	12.24**	-0.83	-3.19**	-2.37**	3.01**	1.53*	-0.72
Bijapur	12.27**	13.08*	-3.02	-0.57	0.01	1.19	3.59**	4.02**	0.33
Chitradurga	22.34**	23.38**	14.93*	0.44	-1.38	-1.08	7.71**	1.15**	0.026
Dharwad	-0.15	4.91	1.78	1.73	-0.63	-0.28	1.43**	2.05**	0.33
Gulbarga	10.25	9.30	-0.08	-3.20**	-2.30**	0.921	1.30	1.66*	0.56
Raichur	3.53**	6.18**	5.26*	0.41	-1.06	-3.03**	2.66**	1.80**	-1.88**
Tumkur	0.72	4.23	8.83*	-0.64	-3.55**	-2.91*	3.52**	2.29*	-0.07
Karnataka	**2.44****	**4.52**	**4.51***	**-0.74**	**-1.65****	**-0.91***	**1.79****	**1.82****	**-0.037**

** and * indicates significance at 1 and 5 per cent level respectively

Table 3: General characteristics of groundnut growers in the study area

(n=60)

Sl. No.	Particulars	Unit	Beneficiary	Non-beneficiary
1	Age	Years	46.4	47.8
2	Education			
	Illiterate	No.	6 (20.0)	11 (36.6)
	Primary	No.	11 (36.6)	9 (30.0)
	High school	No.	6 (20.0)	4 (13.3)
	College	No.	7 (23.3)	6 (20.0)
3	Occupation			
	Agriculture as main occupation	No.	28 (93.3)	27 (90.0)
	Agriculture as subsidiary occupation	No.	2 (6.6)	3 (1.0)
4	Family size	No.	4.7	4.6
5	Land holdings			
	Irrigated	Ha	0.76 (25.6)	0.6 (24.0)
	Rainfed	Ha	2.21 (74.4)	1.9 (76.0)
	Total	Ha	2.97 (100.0)	2.5 (100.0)
6	Average area under groundnut	Ha	1.53 (51.5)	1.12 (45.0)
7	Varieties used			
a.	Jl-24	No	13 (43.3)	8 (26.6)
b.	Ajay	No	7 (23.3)	0
c.	TMV-2	No	10 (33.3)	0
d.	Local	No	0	22 (73.3)

Figures in parentheses indicates percentage to total samples

Table 4: Cropping pattern of groundnut growers in the study area

(ha), (n=60)

Sl. No.	Crops	Beneficiary	Non-beneficiary
I	*Kharif*		
1	Pigeon pea	0.50 (14.5)	0.44(15.2)
2	Groundnut	1.53 (44.4)	1.12 (38.6)
3	Green gram	0.12 (3.5)	0.08 (2.8)
4	Paddy	0.13 (3.8)	0.19 (6.6)
5	Ragi	0.31 (9.0)	0.25 (8.6)
	Total *Kharif*	2.59 (75.2)	2.08 (71.7)
II	*Rabi*		
1	Jowar	0.16 (4.7)	0.19 (6.6)
2	Chickpea	0.31 (9.0)	0.21 (7.2)
3	Total *Rabi*	0.47 (13.6)	0.40 (13.8)
III	Perennial crops		
1	Coconut	0.21 (6.1)	0.22(7.6)
2	Arecanut	0.17 (4.9)	0.20 (6.9)
3	Sub total	0.38 (11.0)	0.42 (14.2)
	Gross cropped area	3.44	2.9
	Net cropped area	2.97	2.5
	Cropping intensity (%)	147.4	146.0

Figures in parentheses indicate percentage to the total gross cropped area

Table 5: Labour use pattern in groundnut cultivation

(Per ha), (n=60)

Particulars	Beneficiary			Non-beneficiary		
	Human labour (man days)	Bullock labour (pair days)	Machine labour (hrs)	Human labour (man days)	Bullock labour (pair days)	Machine labour (hrs)
Ploughing	1.6	-	8.5	1.5	-	7.8
Harrowing	2.7	5.9	-	2.6	5.4	-
Loading, transportation and spreading of FYM	10.4	-	5.3	7.7	-	2.9
Sowing	8.2	3.85	-	8.0	4.0	-
Fertilizer application	4.7	-	-	3.7	-	-
Weeding	27.1	-	-	27.7	-	-
Inter cultivation	2.2	4.7	-	2.1	4.3	-
PPC application	2.6	-	-	2.8	-	-
Harvesting	22.6	-	-	22.5	-	-
Total	82.0	14.5	13.7	79.3	13.7	10.8

Table 6: Input use pattern and output obtained in groundnut cultivation

(Per ha), (n=60)

Sl. No.	Particulars	Units	Beneficiary	Non-beneficiary
1	Seeds	Kgs	125.7	115.8
2	Human labour	Man days	82.0	79.3
3	Bullock labour	Pair days	14.5	13.8
4	Tractor labour	Hours	13.7	10.8
5	Farm yard manure (FYM)	Tonnes	7.8	5.1
6	Fertilizers			
a.	N	Kgs	38.9	32.3
b.	P	Kgs	69.1	60.2
c.	K	Kgs	39.4	35.6
d.	Gypsum	Kgs	126.6	101.9
7	PPC	$	12.0	11.0
8	Output	Qtls.	27.2	21.8

Table 7: Costs and returns in cultivation of groundnut

($/ha), (n=60)

Sl. No.	Particulars	Beneficiary	Percent	Non-beneficiary	Percent
I. Variable cost					
1	Human labour	157	18.6	154	20.4
2	Bullock labour	85	10.0	80	10.6
3	Machine labour	91	10.8	72	9.5
4	Seeds	115	13.6	99	13.0
5	Farm yard manure	98	11.5	64	8.4
6	Fertilizers	80	9.5	75	9.9
7	PPC	12	1.4	12	1.5
8	Interest on working capital @ 7%	45	5.3	39	5.1
	Subtotal (I)	683	81.0	596	78.8
II. Fixed cost					
1	Rental value of land	127	15.0	127	16.7
2	Land revenue	1	0.1	1	0.1
3	Depreciation	16	1.9	17	2.1
4	Interest on fixed capital @11%	16	1.8	16	2.1
Subtotal (II)		160	18.9	160	21.1
Total cost of cultivation (I)+ (II)		843	100.0	756	100.0
Gross returns		1649		1306	
Net returns		806		550	
B:C		1.9		1.7	
Increase in cost in beneficiary farms over non-beneficiary farms			87		
Increase in returns in beneficiary farms over non-beneficiary farms			343		
Net additional returns			256		