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Targeting and introduction of Groundnut improved cultivars in Odisha state of India

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1. Introduction

Groundnut is the major oilseed crop in India grown in an area of 4.93 m ha during 2010 (FAOSTAT, 2012). It contributes about 30% to the edible oil basket of the country. The South Asia has more than 7 million ha (31% of world total) under groundnut, roughly 83% of this is in India. The country has lost 4.62 m ha of groundnut area to other competing crops like soybean, maize and Bt. cotton during the last decade at an annual rate of 3.48% mainly because of cheaper imports of other edible oils, which depressed groundnut prices. Though productivity of groundnut was increased by 2.14% during the period, production declined at the rate of 1.14% annually. About 85% of the total groundnut area in the country is sown in the rainy season. Being a rainfed crop, the yield variability across both, growing regions and years is high. The instability measure (CV) was higher in the case of productivity than in the case of area in all the sub-periods (Table-1.1).

Table 1.1 Area, Production and productivity of groundnut in India, 1981-2010

Statistics	Area ('000 ha)	Production ('000 tons)	Productivity (kg/ha)
Mean			
1981-1990	7585	6815	898
1991-2000	7605	7578	996
2001-2010	6096	6894	1131
1981-2010	7095	7095	1000
CV (Raw data)			
1981-1990	8.96	20.54	13.24
1991-2000	8.75	14.83	13.44
2001-2010	6.63	23.64	21.54
1981-2010	12.97	19.66	19.48

Source : Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India

1.1 Status of groundnut in major producing states

Andhra Pradesh, Karnataka and Maharashtra states produce more than 75 % of the total groundnut output in the country. Gujarat ranks first as far as area under groundnut is concerned in the country. Though productivity of groundnut in Gujarat increased from 750 kg/ha during 1980-89 to 1219 kg/ha in 2000-09, the area remained stagnant (Table 1.2). In Andhra Pradesh, groundnut area fluctuated during the different decades. However, productivity remained almost stagnant over the three decade period. Karnataka also exhibited a similar trend with regard to the total cultivated area of groundnut and declining productivity. Tamil Nadu and Maharashtra also suffered erosion of area under groundnut during the last decade, despite increasing productivity. It is observed that the productivity varies widely among the states and is dependent on factors like soil fertility, coverage

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of irrigation under the crop and the season when it is grown. The instability indices computed for decadal sub-periods at the state level implied that the variability is greater in case of productivity than in case of the area and is mainly because of majority of the area under groundnut being rainfed.

Table 1.2 Area, production and productivity of groundnut in major states (1980-2009) and instability measures (Area in '000 ha and productivity in kg/ha).

Year	Gujarat		AP		Karnataka		Tamil Nadu		Maharashtra		Rajasthan	
	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty
1980-89	1916	750	1736	855	951	820	968	1105	766	889	218	691
1990-99	1900	920	2182	892	1213	835	988	1529	622	1101	266	952
2000-09	1898	1219	1645	838	893	680	563	1830	409	1072	273	1329
1980-09	1905	963	1854	862	1019	778	840	1488	599	1021	252	991
CV (Raw data)												
1980-89	18	53	20	14	21	12	10	12	12	19	16	36
1990-99	5	45	11	22	7	16	13	16	19	14	15	30
2000-09	5	48	14	33	11	22	16	13	14	9	17	15
1980-09	11	52	19	23	19	25	27	24	29	17	19	26

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India

1.2 Groundnut in the state of Odisha

Groundnut constituted 33% of the total oilseed acreage in the state of Odisha contributing more than 65% of the total oilseeds produced in the state during the triennium ending 2011-12. In Odisha, groundnut is grown both in rainy as well as post rainy seasons. Area under rainy season groundnut comprises 34 % as compared to 66% post rainy season and is mostly rainfed.

Table 1.3 Area, Production and Productivity of groundnut in Odisha, 1980 to 2012

Statistic	Area ('000 ha)	Production ('000 tons)	Productivity (kg/ha)
Mean			
1980-1990	302.2	398.3	1318
1990-2000	312.3	412.0	1319
2000-2012	236.1	368.7	1562
1980-2012	279.2	390.8	1400
CV (Raw data)			
1980-1990	15.1	15.7	7.9
1990-2000	9.3	22.0	14.8
2000-2012	9.1	21.5	14.2
1980-2012	12.7	19.3	14.8

Source: Odisha Agricultural Statistics

Area under groundnut during the period 1980-90 was 302.23 thousand ha which declined by almost 22% to 236.11 thousand ha during 2000-12 (Table 1.3). Production however, declines only by 7% from 398.31 thousand tons to 368.75 thousand tons during the period mainly because of increase in yield from 1318 kg/ha to 1562 kg/ha. Decline in area is mainly attributed to climatic aberrations and early cessation of rainfall and non availability of groundnut seeds immediately after harvest of autumn rice. Nineties and the last decade experience slight higher yield variability mainly because

of higher frequency of drought during the post rainy season. The groundnut productivity in Orissa is quite high as compared to national average but there is scope for further increase. The climate of Orissa is conducive for groundnut. The availability of seed in Rabi (post rainy season) is the major hindrance for the farmers.

Majority of the groundnut varieties being grown in the country are quite old and are susceptible to both biotic and abiotic stresses. The TL-II program is targeting the popularization of newly released stress tolerant varieties and efficient seed delivery mechanism so as to enable the groundnut farmers to raise the yield at a higher front. ICRISAT initiated TL-II project in Odisha during 2012-13 to take concrete steps in releasing some promising groundnut varieties conducive to growing conditions in the state. A baseline survey was undertaken in this project with the following objectives: 1. To study the current status of groundnut crop in the state of Odisha; 2. To examine the socio-economic profile of the groundnut farmers in the studied area; 3. To find out the importance of groundnut in the area allocation by farmers; and 4. To investigate the level of adoption of modern varieties, productivity level, profitability, preferred traits of groundnut crop etc.

2. Methodology

2.1 Sample framework

In Odisha, two districts were selected by the breeders to implement the TL-II project. One was based on highest area during post-rainy season (Jajpur) and another having substantial area both under rainy as well as post-rainy season i.e., Dhenkanal. There are hardly any competing crops in Jajpur for groundnut during post-rainy season. In Dhenkanal, similar observation is also made. Area under groundnut in Jajpur is hovering around 32 thousand ha (Table 2.1). Production increase was observed mainly because of yield increase. In contrast to Jajpur, area under groundnut in Dhenkanal district declined sharply from 20.55 thousand ha during the triennium ending 1998 to 11.63 thousand ha during the last triennium though production remains same around 20 thousand tons because of increased productivity from 974 to 1725 kg/ha.

Table 2.1: Area, production and productivity and instability indices of Groundnut in sample districts of Jajpur and Dhenkanal

Triennium ending	Jajpur			Dhenkanal		
	Area (‘000 Ha)	Production (‘000 tons)	Yield (kg/ha)	Area (‘000 Ha)	Production (‘000 tons)	Yield (kg/ha)
1998	31.18	33.62	1078	20.55	20.02	974
2003	33.21	46.62	1404	16.06	17.58	1095
2009	31.92	59.58	1867	12.07	18.42	1525
2012	32.04	56.33	1758	11.63	20.06	1725
CV(Raw data)						
1995-2000	8.72	46.38	43.56	2.18	24.60	25.16
2000-2012	2.58	19.28	19.57	16.66	15.75	21.71
1995-2012	4.98	29.70	28.80	24.14	19.16	25.74

High groundnut yield variability was observed in case of Jajpur during the period 1995-2000 because of severe drought in 1996 and also due to super cyclone in 1999. In Dhenkanal, area variability was substantially high during the period 2000-12 (Table 2.1)

Table 2.2 lists the sampling design which depicts the villages where TL-II program was implemented. In each of these two districts, three villages were selected for intervention and were designated as ‘adopted’ villages and three control villages where no such intervention was made. All together 180 groundnut farmers were selected randomly from among the groundnut growers in the treated villages at the rate of 30 respondents per village. Similarly 90 farmers were selected from among the control villages @ 15 farmers per village.

Table-2.2: Sample villages for baseline survey under TL-II Project in Odisha

Districts	Treatment/ Adopted village	No. of farmers	Control village	No. of farmers	Total
Jajpur	Nosta	30	Swainsahi	15	135
	Udaynagar	30	Bhagwanpur	15	
	Radhadeipur	30	Saboo	15	
Dhenkanal	Nuagaon	30	Kotpala	15	135
	Mandapal	30	Sananagana	15	
	Thakurpala	30	Kaluriapatna	15	
Grand Total		180		90	270

In Jajpur district, among the respondent farmers, 90% belongs to marginal and small in the adopted villages whereas, in Dhenkanal district, these categories constituted 71%. In case of control villages, 84% of the farmers are from the marginal and small categories in Jajpur whereas, these categories together represented 87% in Dhenkanal district (Table 2.3).

Table 2.3: Distribution of groundnut sample farmers among different categories, 2011-12

Category	Jajpur		Dhenkanal		Pooled sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Marginal	42 (46.67)	20(44)	23(25.56)	12(27)	65(36.12)	32(36)
Small	39(43.33)	18(40)	41(45.56)	27(60)	80(44.44)	45(50)
Large	9(10)	7(16)	26(28.88)	6(13)	35(19.44)	13(14)
Total	90(100)	45(100)	90(100)	45(100)	180(100)	90(100)

(Figures in the parentheses represent percentages to the column total)

2.2 Analytical techniques: In this study, tabular analysis was adopted to compile the general characteristics of the sample farmers, the resource structure, cost structure, returns, profits and opinions of farmers regarding the problems in production and marketing. Simple statistics like averages and percentages were used to compare, contrast and interpret results in an appropriate way. To analyze and study the traits preferred in chickpea cultivars by the farmers, weighted average ranking method was used.

3. Results and discussions

3.1 Socio-economic profile of sample farmers

The survey was conducted immediately after the cropping season of 2011-12 to minimize recall bias. The baseline survey dealt with several findings: the socioeconomic profile, assets and liabilities, sources of income and details of consumption expenditure, cropping pattern, varietal composition, yield levels and economics of groundnut cultivation, sources of information about technology, trait preferences and gender issues.

Table 3.1: Socio-economic profile of sample farmers in groundnut, 2011-12

Socio-economic Issue	Jajpur		Dhenkanal		Pooled	
	A	C	A	C	A	C
Male headed households (%)	100	100	100	100	100	100
Household size (No)	6.06	8.82	6.07	6.18	6.06	7.5
Male workers(no)	2.2	4.7	2.5	3.4	2.4	2.7
Female workers (no)	0.3	0.3	0.1	0.4	0.2	0.2
Dependency ratio*	1.38	1.66	1.33	1.46	1.36	1.58
Age of household head (years)	52	57	52	48	52	53
Education Level of household head (no. of years)	6	7	6	5	6	6
Participation in local bodies (%)	1.11	6.67	5.56	4.44	3.33	5.56
Proportion belonging to forward castes (%)	56	40	4	Nil	30	20
Proportion belonging to religious minorities (%)	Nil	Nil	Nil	Nil	Nil	Nil
Proportion with agriculture as the main occupation (%)	35.6	42	48	78	41.8	60
Proportion with business/service as secondary occupation (%)	6.7	11.1	12.2	20.0	9.5	15.5
Ownership of two wheelers/bicycles (%)	91	96	96	93	93	94
Ownership of television sets (%)	61	73	44	60	53	67
Ownership of mobilephones(%)	87	91	84	98	86	94
* Dependency ratio= (Size of family-Number of workers)/Number of workers A: Adopted village; C: Control village						

All the sample households are patriarchal, irrespective of adopted or control villages in both the districts. Average household size was 6 in case of adopted villages whereas it stood at 7.5 in case of control villages. Farming activities are highly dominated by male workers in both the districts. Dependency ratio in case of adopted villages was estimated at 1.36 whereas, for control villages it was found to be 1.58. Average age of the household head was about 52 to 53 years in the studied villages and the education level was up to the 6th level. Among the respondent farmers, poor participation in the local bodies was observed. About 42 and 60 % of the farmers had farming as their main profession in adopted and control villages respectively. Majority of the groundnut farmers in the adopted and control villages owned two wheelers/bicycles and mobile sets.

3.1.1 Land holding size

Average land holding was found to be higher among Dhenkanal farmers than that of Jajpur district (Table 3.2). In Jajpur, marginal, small and large farmers had operated lands of 0.67, 1.38 and 2.86 ha respectively whereas, for Dhenkanal, the land holding sizes were found to be 0.71, 1.41 and 2.53 ha respectively for marginal, small and large farmers.

Table 3.2 Average land holding size across different farm categories (ha)

District	Particulars	Irrig/dry	Marginal	Small	Large	Pooled
Jajpur	Own land	Irrigated	0.10	0.20	0.40	0.17
		Dry	0.41	0.80	1.86	0.75
		Fallow	0.00	0.00	0.03	0.01
		Total	0.51	1.00	2.29	0.93
	Leased-in land	Irrigated	0.00	0.02	0.09	0.02
		Dry	0.18	0.37	0.51	0.30
		Fallow	0.00	0.00	0.00	0.00
		Total	0.19	0.39	0.59	0.32
	Leased-out land	Irrigated	0.01	0.00	0.00	0.00
		Dry	0.01	0.00	0.00	0.01
		Fallow	0.00	0.00	0.00	0.00
		Total	0.02	0.00	0.00	0.01
	Operated land	Irrigated	0.09	0.21	0.49	0.19

		Dry	0.58	1.17	2.37	1.04
		Fallow	0.00	0.00	0.00	0.00
		Total	0.67	1.38	2.86	1.23
Dhenkanal	Own land	Irrigated	0.15	0.24	0.43	0.26
		Dry	0.52	0.82	1.53	0.91
		Fallow	0.02	0.06	0.03	0.04
		Total	0.69	1.13	2.05	1.23
	Leased-in land	Irrigated	0.02	0.05	0.16	0.07
		Dry	0.10	0.30	0.56	0.31
		Fallow	0.00	0.00	0.08	0.02
		Total	0.12	0.36	0.72	0.38
	Leased-out land	Irrigated	0.00	0.00	0.03	0.01
		Dry	0.08	0.00	0.12	0.05
		Fallow	0.00	0.01	0.03	0.00
		Total	0.08	0.00	0.17	0.06
	Operated land	Irrigated	0.17	0.29	0.56	0.32
		Dry	0.54	1.12	1.97	1.17
		Fallow	0.00	0.00	0.00	0.00
		Total	0.71	1.41	2.53	1.49

3.1.2 Assets and liabilities

Land owned by the respondent farmers in Jajpur was comparatively lower than that of Dhenkanal district (Table 3.3). Higher land value in case of adopted villages in Dhenkanal district compared to that of Jajpur was mainly because of irrigated land discriminating between the two districts. Same is true for control villages, where land value of Jajpur district exceeds that of Dhenkanal district.

Table 3.3: Value of land owned by sample farmers, 2011-12 (‘000 Rs/Hh)

Type of land	Jajpur				Dhenkanal			
	Adopted		Control		Adopted		Control	
	Area (ha)	Value	Area (ha)	Value	Area (ha)	Value	Area (ha)	Value
Irrigated land	0.09	57.61	0.34	258.11	0.31	326.78	0.15	121.89
Rainfed land	0.77	313.77	0.70	459.33	0.91	496.03	1.09	579.00
Others	0.01	1.83	0.01	1.56	0.01	2.50	0.00	0.00
Total land	0.86	373.22	1.05	719.00	1.22	825.31	1.24	700.90

Overall value of livestock owned by respondent farmers were found to be Rs 23900 and Rs 30100 per Hh respectively for adopted villages of Jajpur and Dhenkanal and were Rs 26200 and Rs 27900 respectively for the control villages of these districts as depicted in Table 3.4.

Table 3.4: Value of Livestock owned by sample farmers, 2011-12 (‘000Rs/Hh)

Type of Livestock	Jajpur				Dhenkanal			
	Adopted		Control		Adopted		Control	
	No.	Value	No.	Value	No.	Value	No.	Value
Draft animals	0.8	12.9	1	12.9	1.9	23.3	1.51	18.0
Cows	1.02	7.8	1.22	9.5	0.84	4.6	1.07	6.0
Buffaloes	0	0	0	0	0.02	0.4	0.00	0.00
Young stock	0.87	2.9	1.09	3.4	0.98	1.8	1.11	2.1
Sheep/goat	0.37	0.4	0.13	0.4	0.04	0.1	0.89	1.7
Others	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total livestock	3.16	23.9	3.4	26.2	3.89	30.1	4.58	27.9

Value of farm implements were Rs 26820 and Rs 31170 per Hh respectively for the farmers belonging to adopted villages of Jajpur and Dhenkanal while for the control villages, the values were Rs 25860 and Rs 26180 per Hh respectively for the two types of villages (Table 3.5). Ownership of mechanized implements was found to be low among the respondent groundnut farmers irrespective of the districts.

Table 3.5: Value of farm implements owned by sample farmers, 2011-12 ('000 Rs/Hh)

Type of Implement	Jajpur				Dhenkanal			
	Adopted		Control		Adopted		Control	
	No.	Value	No.	Value	No.	Value	No.	Value
Tractor, harvesters, threshers and accessories	0.04	10.5	0.14	16.56	0.05	17.77	0.04	15.56
Electrical/diesel pump sets	0.12	1.38	0.35	2.55	0.23	3.37	0.09	1.44
Bullock drawn tools	3.68	3.81	4.24	3.82	4.31	9.92	3.73	9.18
Trucks & others	0.01	11.11	0.02	2.67	0	0	0	0
Others tools	0.03	0.024	0.38	0.24	0.12	0.099	0	0
Total farm implements	3.88	26.82	5.13	25.86	4.71	31.17	3.86	26.18

Value of consumer durables owned by respondent farmers was found to be higher in case of Dhenkanal than that of Jajpur irrespective of adopted and control villages as observed in Table 3.6.

Table 3.6: Value of Consumer durables owned by sample farmers, 2011-12 ('000 Rs/Hh)

Type of Consumer durables	Jajpur				Dhenkanal			
	Adopted		Control		Adopted		Control	
	No.	Value	No.	Value	No.	Value	No.	Value
Residential house	-	184.47	-	263.00	-	270.56	-	277.89
Cattle shed	-	7.40	-	6.68	-	7.15	-	5.12
Cycle/two-wheelers	1	9.86	1.13	18.84	1.15	12.54	1.07	9.27
Others	2	6.88	2.4	8.73	1.81	6.08	2.35	9.05
Total consumer durables	3	208.60	3.53	297.26	2.96	296.32	3.42	301.33

3.1.3 Source of finance among the respondent farmers of sample districts

Multiple sources of finance are available to the farmers in both the districts and farmers avail finance from these sources which and when becomes more conducive. In case of Jajpur district, input traders were found to be major source of financing farming with high interest rate of 34.5% and about 73% of the farmers availed this opportunity followed by cooperative banks and nationalized banks, both of which are available at low interest ranging from 5 to 12% as seen in Table 3.7. In case of Dhenkanal, cooperatives loan are availed mostly by the groundnut farmers constituting about 74% of the farmers followed by moneylenders, from whom, around 64% of the farmers borrowed at exorbitant interest rate of 36%. Also about 31% of the farmers in Dhenkanal took loan from nationalized banks.

Table 3.7 Source of finance across sample districts (% Hh availed)

Source of loans	Jajpur	Interest rate (%)	Dhenkanal	Interest rate (%)
Co-operatives	35.0	5	74.1	5
Nationalized banks	15.00	12	31.1	12.3
Private banks			0.74	15
NGOs/SHGs	1.5	30	5.1	24
Friends/relatives	4.4	10	4	12
Input Traders	72.6	34.5	4	36
Moneylenders	8.1	35.54	64	36

3.1.4 Financial liabilities and assets of sample farmers

Overall it is observed in Table 3.8 that net liabilities were higher in case of Dhenkanal than that of Jajpur district. It was found to be Rs 26000 and Rs 43540 respectively for adopted villages of Jajpur and Dhenkanal districts whereas, for control villages the values were Rs 34000 and Rs 41000 respectively for the two districts. Though savings was found to be much more in case of farmers of the adopted villages of Dhenkanal district, the borrowings was higher at Rs 54000 per Hh.

Table 3.8: Financial liabilities and assets of sample farmers, 2011-12(Rs ‘000 per Hh)

Financial Liabilities and Assets	Jajpur		Dhenkanal	
	Adopted	Control	Adopted	Control
Borrowings (-)	29.009	38.133	54.072	46.822
Lending's (+)	0	0	0	0
Savings (+)	2.9956	4.111	10.532	5.709
Net Liabilities	26.03	34.022	43.54	41.179

3.1.5 Net worth of sample groundnut farmers

Net worth of sample farmers of adopted villages of Jajpur district was found to be low at Rs 606.54 thousand per Hh as compared to its control villages mainly due to lower land area i.e., 0.86 ha which these farmers possess and consequently low value of land and thus low net worth(Table 3.9).

Table 3.9: Net worth of sample farmers, 2011-12 (Rs ‘000 per Hh)

Assets and Liabilities	Jajpur		Dhenkanal	
	Adopted	Control	Adopted	Control
Value of Land	373.22	719.00	825.31	700.9
Value of Livestock	23.93	26.19	30.14	27.91
Value of Farm Implements	26.82	25.86	31.17	26.18
Value of Consumer durables	208.6	297.26	296.32	301.33
Total Assets	632.57	1068.31	1182.94	1056.32
Net Liabilities	26.03	34.02	43.54	41.18
Net worth	606.54	1034.29	1139.4	1015.14

3.1.6 Income and expenditure of sample farmers

3.1.6.1 Net household income

In case of adopted villages of Jajpur district, bulk of the income came from farming which stood at Rs. 48580 per Hh (Table 3.10) followed by salaried job (Rs. 28160), non-farm labour income(Rs.10220), remittances (Rs. 10000), business(Rs. 8400) and farm labour income(Rs.6010) . However, in case of adopted villages of Dhenkanal, though still farming contributed the major chunk of the income which stood at Rs. 44320, nonfarm farm labour income was the second most important source of income at Rs. 20600 followed by salaried job (Rs.13270), business(Rs.7940) and farm labour income(Rs.5340). Among all the categories of respondent farmers, highest net household income of Rs 166160 was observed to be with the farmers of control villages in Jajpur district.

Table 3.10: Net household income of sample farmers, 2011-12 (Rs '000 per Hh)

Source of income	Jajpur		Dhenkanal	
	Adopted	Control	Adopted	Control
Income from crops	48.58	65.07	44.32	48.66
Farm work (labor earnings)	6.01	4.60	5.34	5.34
Non-farm work (labor earnings)	10.22	4.64	20.60	17.51
Regular Farm Servant (RFS)	0.00	0.00	0.00	0.00
Livestock (milk and milk products selling)	2.03	3.27	1.19	0.67
Income from hiring out bullocks	0.00	0.00	0.00	0.40
Income from selling sheep, goat, chicken, meat, eggs etc.	0.06	0.00	2.23	1.42
Selling of water for agriculture purpose	0.00	0.00	0.08	0.00
Selling CPR (firewood, fruits, stones, mats etc)	0.00	0.00	0.00	0.04
Selling handicrafts	0.00	0.00	0.00	0.00
Rental income (tractor, auto, sprayer, truck etc.)	0.00	0.00	1.50	2.67
Rent from land, building and machinery etc.	0.00	0.00	0.00	0.00
Caste occupations	0.00	0.00	0.00	0.00
Business	8.40	13.93	7.94	4.07
Regular salaried jobs (Govt./private)	28.16	54.53	13.27	17.04
Out migration	0.67	0.00	1.33	0.00
Remittances	10.00	10.09	1.92	8.44
Interest on savings and from money lending	0.00	0.00	0.00	0.00
Cash and kind gifts including dowry received	0.00	0.00	0.00	0.00
Pension from employer	2.19	7.56	0.67	0.08
Government welfare/development Programs	1.97	2.07	1.34	1.42
Others 1	1.03	0.40	2.56	1.40
Grand Total	119.31	166.16	104.30	109.17

3.1.6.2 Consumption expenditure of respondent groundnut farmers

Expenditure on food items was lower among the groundnut farmers in the adopted villages of Jajpur district than that of Dhenkanal district though both had the same household size as observed in Table 3.11. However, in case of control villages of Jajpur, food item expenses surpassed that of Dhenkanal because of higher household size. As incase of food item expenses, non food item expenditure was also in higher side in the adopted villages of Dhenkanal than that of Jajpur. Overall, the total consumption expenditure for adopted villages was Rs. 71583 and Rs. 85910 respectively for Jajpur and Dhenkanal and Rs. 100240 and Rs. 92345 respectively for the control villages of the two districts.

Table 3.11: Consumption expenditure of sample farmers, 2011-12 (Rs/Hh/Year)

Food item	Jajpur		Dhenkanal	
	Adopted	Control	Adopted	Control
Cereals	14107	21505	17120	17810
Pulses	2537	3786	3519	3708
Milk and Milk products	4286	5752	4016	3167
Edible oils	1731	2187	1875	1966
Non-Veg. foods	3223	4904	4288	4476
Fruits and vegetables	5876	6474	6728	6322
Others	5685	6789	7338	6646
Total food expenditure	37445	51398	44883	44095
Health	4778	6956	6000	10100
Education	4528	10644	7939	11144
Entertainment and travel	5080	8016	4211	4644
Clothing and shoes	5500	7100	5239	5678
Ceremonies	7544	8222	10128	9711

Alcohol and Cigarettes	267	0	200	67
Cosmetics	2429	2311	1723	1700
Others	4013	5593	5588	5206
Total Non-food	34138	48842	41027	48250
Total expenditure	71583	100240	85910	92345

3.2 Cropping pattern and importance of groundnut

The relative importance of groundnut in the cropping pattern among the sample farms is presented in Tables 3.12.

3.2.1 Kharif area allocation

Kharif season is dominated by rice crop in both the districts. The rice area per household among the farmers in the adopted villages varied between 1.15 ha for Jajpur district to 1.26 ha for Dhenkanal, whereas, for control groups, it was 1.18 and 1.02 ha respectively for Jajpur and Dhenkanal. However, a very little area allocation was observed for kharif groundnut in Dhenkanal district which varied between 0.08 ha in case of adopted villages to 0.05 ha in case of control villages.

3.2.2 Rabi area allocation

During rabi, area allocation under groundnut was higher in Jajpur both in case of adopted as well as control villages which stood roughly at 0.9 ha per Hh. Apart from mung bean, all other crops like black gram, horse gram, vegetables were minor crops in Jajpur. In Dhenkanal, though groundnut is the main crop among the groundnut farmers, area allocation is low at around 0.6 ha per Hh as compared to Jajpur. Mung bean was the second most important crop during the Rabi season. However, it is not a competing crop with groundnut as it requires heavier soil than that of groundnut.

Table 3.12 Average cropping patterns across study districts (ha per Hh)

Crops	Jajpur		Dhenkanal	
	Adopted	Control	Adopted	Control
Kharif (Rainy) season area allocation				
Rice	1.15	1.18	1.26	1.02
Jute	0.01	0.07	0	0
Groundnut	0	0	0.08	0.05
Pigeon pea	0	0	0.02	0.00
Vegetables	0.001	0.071	0.01	0
Rabi(post-rainy) season area allocation				
Groundnut	0.90	0.91	0.61	0.59
Mung	0.08	0.31	0.28	0.06
Blackgram	0.14	0.02	0.03	0.09
Horsegram	0.02	0.04	0.01	0.04
Gram	0	0	0	0.0007
Vegetables	0.003	0.04	0.0004	0.0007
Rice	-	-	0.0007	-
Summer season area allocation				
Mung	0.02	-	-	-
Vegetables	0.0009	0.004	-	-
Annual crops				
Sugarcane	0.01	0	0.02	0.16
Banana	-	0.0001	-	-

Apart from kharif and Rabi area allocation, few farmers in adopted villages of Jajpur had mung bean and vegetables during summer. Also farmers in Dhenkanal district had grown sugarcane both in adopted as well as in control villages. Sugarcane area allocation was highest at 0.16 ha per Hh in case of control villages of Dhenkanal district.

3.1.8 Importance of groundnut in sample farmers

Groundnut is grown in both kharif and rabi season in Dhenkanal district irrespective of adopted and control villages. However, during kharif season, groundnut is planted in the uplands and is highly infested with weeds and has very low yield. In Jajpur, groundnut is solely grown in post rainy season with available moisture in the soil. It is mostly planted after the harvest of autumn paddy during 4th week of October to 1st week of December in Jajpur whereas, in Dhenkanal, post-rainy season groundnut is planted during 1st week of December to the last week of December. In Jajpur, 38.5% of the total cropped area was under groundnut crop in the adopted villages while, it was 29.69% in case of Dhenkanal. In the control villages, groundnut cropped area were 34.34 % and 31.45 % respectively for Jajpur and Dhenkanal districts. Overall, groundnut cropped area were 34.11% and 33.09% respectively for adopted and control villages under study (Table 3.13).

Table 3.13: Relative importance of groundnut crop in the cropped area, 2011-12

Cropped area	Jajpur		Dhenkanal		Pooled Sample	
	A	C	A	C	A	C
Rainy season cropped area (ha)	104	59.25	123.07	48.09	227.07	107.34
Post rainy season cropped area (ha)	102.87	59.57	84.05	35.97	186.91	95.54
Annual and Summer crops	3.08	0.251	1.92	7.13	5.00	7.38
Area under rainy season groundnut (ha)	0	0	6.93	2.07	6.93	2.07
Area under post- rainy season groundnut area post rainy area (ha)	80.84	40.89	55.08	26.50	135.92	67.39
Proportion of groundnut area to total cropped area (%)	38.50	34.34	29.69	31.45	34.11	33.09

3.3 Productivity levels of major crops

Among the crops grown in the studied villages, sugarcane yield was 91884 kg/ha in the adopted villages of Jajpur district whereas, its yield ranged between 73889 kg/ha in case of control villages in Dhenkanal district to 87284 kg/ha in case of adopted villages. Rice is the most important crop in the kharif season in both the district. However, the crop is subjected to frequent flooding during the crop growth stage. During kharif, 2011, massive flood washed away the rice crop in Jajpur district irrespective of adopted and control villages. So the yield was too low at 262 kg/ha and 576 kg/ha respectively for adopted and control villages. However, for Dhenkanal district, yield of rice varied from 2673 kg/ha in case of control villages to 2895 kg/ha for adopted villages. During kharif, groundnut is grown only in the Dhenkanal district and its yield varied between 873 kg/ha for adopted villages to 941 kg/ha in case of control villages. Pigeon pea is grown in uplands in Dhenkanal district both in the adopted villages as well as in control villages. However, pigeon pea yield varied widely from only 325 kg/ha in case of adopted villages to 926 kg/ha for control villages.

In case of Rabi rice, yield was found to be 4250 kg/ha in the adopted village of Dhenkanal district. Groundnut yield found to be 2516 kg/ha and 2186 kg/ha respectively for the adopted villages of Jajpur and Dhenkanal district, whereas for control villages, yield remained 2417 kg/ha and 1985 kg/ha respectively for the Jajpur and Dhenkanal district (Table 3.14). Jajpur district yield

outweighed the state and district average yield among the studied villages. So also was the case with Dhenkanal district. Other major pulses grown in the studied villages were horsegram, mung bean, black gram and gram. These crops are not competing crops with groundnut and also yield was also found to be too low excepting in case of horse gram in control villages of Jajpur where, it was observed to be 942 kg/ha. Rabi season vegetables yield was comparatively higher than that of kharif season.

Table 3.14 Average productivity levels across major crops (Kgs per ha)

Crops	Season (K/R/S)	Jajpur		Dhenkanal	
		Adopted	Control	Adopted	Control
Sugarcane	Annual	91884	-	87284	73889
Banana	Annual	-	30875	-	-
Rice	Kharif	261	576	2894.75	2673.33
Groundnut	Kharif	-	-	872.87	940.72
Jute	Kharif	1290	1970	-	-
Pigeon pea	Kharif	-	-	324.69	926.25
Vegetables	Kharif	8645	14722.80	11527	-
Rice	Rabi	-	-	4250	-
Groundnut	Rabi	2516	2417	2186	1985
Horsegram	Rabi	265	942	420	525
Mung	Rabi	405	464	365	322
Black gram	Rabi	428	299	387	399
Gram	Rabi	-	-	-	463
Vegetables	Rabi	14786	17989	14820	12350
Mung	Summer	263	-	-	-

3.4 Area allocation to different ground varieties during the last three post-rainy seasons

In Jajpur district, majority of the farmers use purchased seeds from seed dealers who in turn brought it from major groundnut growing states during kharif season like Gujarat, Karnataka, Andhra Pradesh, Maharashtra and even from the Baragarh district of Odisha where groundnut has the highest area during kharif season in the state. However, farmers have scant idea about the varieties being grown by them and typically groundnut varieties are named as per the states from where the seed is procured by the agents from the respective state mandis. So typical groundnut varieties were found to be Gujarati, Amravati, Padmapuri etc. as is seen in Table 3.15. During 2009-10, in the adopted villages of Jajpur district, area under Amravati variety was 48.38% which reduced to 38.05% during 2011-12 whereas, Gujarati variety increased from 41.46% to 60.80% during the same period because of bold grain and higher shelling percentage and also yield is relatively better. Padmapuri variety declined from 8.38% to 1.15% during the period. Smruti variety was found to be also very popular in the control villages of Jajpur district and it constituted 47% of the total groundnut area over all these years. In control villages, Amravati and TMV 2 hardly occupied any major area.

In Dhenkanal district, the old AK 12-24 variety still occupies more than 50% of the groundnut area in the adopted villages. Area under Gujarati slightly increased from 33.21% to 35.72% during the period. Other varieties like Amravati, TMV-2, Smruti were found to be of little significance. In control villages of Dhenkanal district, AK 12-24 was found to be most dominant which occupied more than 90% of the area allocated to groundnut. Gujarati and TMV-2 were the two least important varieties in the control villages of Dhenkanal district.

Overall it is seen that Gujarati variety is gaining importance among the groundnut farmers at the expense of Amravati and AK 12-24 in the adopted villages and in case of control villages, though percentage area under Gujarati variety is increasing, but the change is slow at the expense of AK 12-24. Percentage area under Smruti remained stagnant at around 29% in the control villages during the period under study.

Table 3.15 Allocation of area under different cultivars/varieties in the last three seasons (%)

Year	Variety	Jajpur		Dhenkanal	
		Adopted	Control	Adopted	Control
2009-10	AK 12-24	0.00	0	60.72	100.00
	Gujarati	41.46	48.31	33.21	0.00
	Amravati	48.38	1.75	1.24	0.00
	TMV-2	0.76	0.00	1.79	0.00
	Padmapuri	8.38	2.21	0.00	0.00
	Smruti	0.00	47.74	3.04	0.00
	NSC seeds	1.01	0.00	0.00	0.00
2010-11	AK 12-24	0.00	0.00	59.44	99.23
	Gujarati	53.70	48.24	34.56	0.77
	Amravati	44.57	3.79	1.29	0.00
	TMV-2	0.00	0.00	1.07	0.00
	Padmapuri	1.48	0.30	0.00	0.00
	Smruti	0.00	47.67	3.64	0.00
	Karnataki	0.25	0.00	0.00	0.00
2011-12	AK12-24	0.00	0.00	57.15	91.46
	Gujarati	60.80	46.74	35.72	4.57
	Amravati	38.05	1.39	2.52	0.00
	TMV-2	0.00	3.65	1.71	3.96
	Padmapuri	1.15	0.00	0.00	0.00
	Smruti	0.00	47.23	2.90	0.00
	Rajasthani	0.00	0.99	0.00	0.00

Table 3.16: Composition of groundnut varieties in the sample, 2011-12 (ha)

Variety	Jajpur		Dhenkanal		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
AK 12.24	0.00	0.00	38.05	27.91	38.05	27.91
Gujarati	49.13	19.08	19.63	1.21	68.76	20.29
Amravati	30.74	0.57	1.38		32.12	0.57
TMV-2		1.49	1.10	1.05	1.10	2.54
Padmapuri	0.93				0.93	0.00
Smruti			1.60		1.60	0.00
Baragarhi		19.28			0.00	19.28
Rajasthani		0.40			0.00	0.40
Total	80.8	40.82	23.71	30.17	104.51	70.99

Among the groundnut varieties, Gujarati occupied highest area of 68.76 ha in the adopted villages followed by AK 12-24 (38.05 ha), Amravati (32.12 ha) and other varieties of least significance were TMV-2 (1.10 ha), Padmapuri (0.93 ha), Smruti (1.60 ha) during 2011-12 as depicted in Table 3.16. In case of control villages, AK-12-24 is still found to be ruling variety and it had an area of 27.91 ha followed by Gujarati (20.29 ha) and Smruti (19.28 ha). Other varieties of minor importance were TMV-2(2.54 ha), Amravati (0.57 ha) and Rajasthani (0.4 ha).

3.5 Perception on productivity of groundnut among the respondent farmers

Among the sample farmers, groundnut yield is found to be high even better than the national average in the bad years. As perceived by the farmers, yield of groundnut in the worst years stood at 12.47 qt/ha and 12.40 qt/ha respectively for adopted and control villages of Jajpur districts (Table 3.17). While, the yield was 12.51 qt/ha and 13.28 qt/ha during the bad years respectively for adopted and control villages of Dhenkanal district. In the good years, yield was found to be quite high at 22.66 qt/ha and 19.95 qt/ha for adopted and control villages of Jajpur district respectively. Best yield was observed to be 26.27 qt/ha among the adopted farmers of Jajpur district. Overall, groundnut yield was found to be 21.09 qt/ha, 12.49 qt/ha and 24.87 qt/ha respectively for the good, bad and best years among the adopted villages and 19.64 qt/ha, 12.84 qt/ha and 23.57 qt/ha respectively for the good, bad and best years among the control villages.

Table 3.17: Productivity levels of groundnut (Qtls/ha) perceived by the sample, 2011-12

Perceived Yield	Jajpur		Dhenkanal		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Rain fed						
Good	22.66	19.95	19.51	19.32	21.09	19.64
Bad	12.47	12.40	12.51	13.28	12.49	12.84
Best	26.27	24.62	23.47	22.53	24.87	23.57

3.5.1 Productivity of groundnut by major varieties

Productivity level of groundnut by variety is presented in Table 3.18. It is evinced that among all the major groundnut varieties being cultivated by the farmers, Gujarati variety performed better and its yield recorded was 2482 kg/ha and 2597 kg/ha among the adopted and control villages respectively. Few isolated varieties like Rajasthani also outperformed other varieties and its yield was observed to be 2717 kg/ha in the control villages. Padmapuri also did pretty well at 2580 kg/ha among the adopted villages. The yield of Amravati variety recorded at 2355 kg/ha and 1894 kg/ha respectively for adopted and control villages.

Table 3.18: Productivity of groundnut by varieties in groundnut sample, 2011-12 (kgs per ha)

Variety	Jajpur		Dhenkanal		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
AK 12-24	-	-	1772	1815	1772	1814
Amravati	2357	1894	2290	-	2355	1894
Gujarati	2594	2640	2190	2038	2482	2597
Padmapuri	2580	-	-	-	2580	-
Rajasthani	-	2717	-	-	-	2717
Smruti	-	2184	2399	-	2399	2184
TMV2	-	1896	2449	2228	2449	2054

The oldest variety i.e., AK 12-24 which is still widely grown in Dhenkanal district, recorded 1772 and 1814 kg/ha for the adopted and control villages respectively. The other older variety TMV 2 recorded yield of more than two tons per ha irrespective of adopted (2449 kg/ha) or control villages (2054 kg/ha). One of the newest varieties released by OUAT, i.e., Smruti also performed better with about 2400 kg/ha and 2184 kg/ha respectively for adopted and control villages. During the course of survey, it was found that the post rainy season groundnut crop was exceptionally good for the 2011-12 and was best among the last 10-15 preceding years. During kharif season, majority

of the groundnut area was flooded in Jajpur and to certain extent in Dhenkanal which might have caused silt deposition and retaining moisture for better crop growth that might have resulted in exceptional yield achieved by the groundnut farmers in the studied area. The genetic potential of AK 12-24 has declined significantly. Also it has become susceptible to pest and diseases and that may be reason for lower yield than rest of the varieties.

3.6 Economics of groundnut and other competing crops

The gross returns from the crops normally grown in the sample villages are furnished in Table 3.19. In Jajpur district, though rice is the main kharif season crop, the return was abysmally low because of flooding. Majority of the respondent farmers in Jajpur district opined that they do not rely on kharif season rice crop as these areas are frequently subjugated to flood and over the years, groundnut has emerged as the most lucrative crop enterprise and as such they are putting sand to heavier clay and clay loam soil to make them enable to raise groundnut. The gross return per ha in Jajpur was found to be Rs 101083 and Rs 96357 respectively for adopted and control villages, whereas, for Dhenkanal it was observed to be quite lower at Rs 76211 and Rs 74636 respectively. Lower return was observed in Dhenkanal mainly because of low yield of the old and degenerated seeds used by the farmers. However, the farmers face lower cost of production in terms of low seed and fertilizer cost and labour expenses. In Jajpur, seed is purchased at exorbitant rate from the seed trader on the condition that the output will be delivered to the seed trader. Here the seed traders act both as seed as well as output merchant. Higher seed price though compensate in terms of higher yield observed and better farm gate price realized. In Dhenkanal, majority of the seeds are procured locally either from the farmers who raise groundnut during kharif or traders who procures the locally produced seeds.

Table 3.19: Gross returns from different crops grown by sample farmers, 2011-12(Rs/ha)

Gross Income from Crop	Jajpur		Dhenkanal		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Groundnut	101083	96357	76211	74636	91547	86068
Rice	2463	4028	27966	26305	15391	14606
Black gram	16687	11927	13803	18262	15779	17312
Pigeon pea	-	-	17811	27788	17811	27788
Mung	16210	22544	15024	15542	15300	20310
Horsegram	5459	29057	8898	11490	7866	17037
Sugarcane	165931	-	152792	148410	156077	148410

The gross return from mung bean was found to be Rs 15300 and Rs 20310 per ha respectively for adopted and control villages while in case of black gram, it was Rs 15779 and Rs 14606 per ha respectively for adopted and control villages. Another important pulse crop, horse gram, recorded gross return of Rs 7866 and RS 17037 per ha for adopted and control villages. Pigeon pea is mainly grown in the uplands during kharif season in Dhenkanal district and the gross return was Rs 17811 and Rs 28888 per ha respectively for adopted and control villages. Sugarcane was found to be grown mainly in Dhenkanal district with lift irrigation facility and the gross return was Rs 156077 and Rs 148410 per ha respectively for adopted and control villages.

3.6.1 Cost of cultivation of groundnut by variety among the sample farmers (Rabi season)

Costs of cultivation of groundnut for different varieties have been placed in Table 3.20(a) and Table 3.20(b) respectively for Jajpur and Dhenkanal districts. In the adopted villages of Jajpur district,

total cost of production of groundnut varied between Rs 50979/ha for Amravati to Rs 55499/ha for Gujarati variety. Bulk of the costs ranging from 25 to 27% was meant for rental value of land followed by seed cost constituting 21 to 26% of the total cost as entire seed is purchased and harvesting and threshing cost (20 to 21% of the total cost). Fertilizer cost ranged from Rs 3291 in case of Amravati to Rs 4457 in case of Padmapuri variety. The yield of different varieties for which cost of cultivation was recorded stood at 2339, 2597 and 2561 kg/ha respectively for Amravati, Gujarati and Padmapuri for adopted villages of Jajpur district.

Table 3.20(a): Economics of Rabi season groundnut by variety, 2011-12 (Rs per ha)

Operation	Jajpur						
	Adopted			Control			
	Amravati	Gujarati	Padmapuri	Amravati	Gujarati	Smruti	TMV2
No of plots	71	68	3	3	15	15	12
Land preparation	3939(7.7)	3770(6.8)	3973(7.2)	3881(9.3)	3691(6.0)	2930(4.8)	3255(9.7)
FYM/Compost	0	0	0	0	0	0	0.0
Seed costs	12047(23.6)	14327(25.8)	11813(21.3)	6616(15.8)	14726(23.7)	12319(20.4)	0.00
Sowing costs	2584(5.0)	2556(4.6)	2470(4.5)	2646(6.3)	3055(4.9)	3746(6.2)	2749(8.2)
Fertilizer costs	3291(6.5)	3767(6.8)	4457(8.0)	2867(6.8)	3691(6.0)	2936(4.9)	1920(5.7)
Micro-nutrient costs	15	26	0	0	315(0.5)	1261(2.0)	0.00
Inter-culture costs	5025(9.9)	4918(8.9)	4994(9.0)	4764(11.4)	6295(10.1)	6737(11.1)	3222(9.6)
Weeding costs	0	0	0	0	0	0	0.00
Plant protection costs	610(1.2)	709(1.3)	644(1.2)	706(1.7)	358(0.6)	1663(2.7)	644(1.9)
Irrigation costs	0	20	0	618(1.5)	123(0.2)	0	906(2.7)
Watching expenses	0	0	0	0	0	0	0.00
Harvesting costs	5570(10.9)	5975(10.8)	5960(10.8)	4499(10.7)	5795(9.3)	4568(7.6)	5202(15.4)
Threshing costs	4873(9.6)	5321(9.6)	6014(10.9)	2911(7.0)	4222(6.8)	4568(7.6)	3524(10.5)
Marketing costs	0	0	0	0	0	0	0.00
Rental value per season	13025(25.5)	14110(25.4)	15088(27.2)	12350(29.5)	19760(31.9)	19765(32.7)	12283(36.4)
Others costs if any	0	0	0	0	0	0	0
Total cost	50979	55499	55413	41858	62031	60493	33705
Grain yield (kgs)	2339	2597	2561	1888	2609	2350	1755
Grain price/kg	40	40.3	40.3	40	42	40.8	40.00
Fodder yield (kgs)	786	874	865	635	862	786	594
Fodder price/kg	1	1	1	1	1	1	1

Note: Figures in the parentheses indicate percentages to the total cost of production

For control villages of Jajpur district, the total cost of cultivation of different varieties varied between Rs 33705/ha in case of TMV 2 to Rs 62031/ha in case of Gujarati. Lower cost of production in case of TMV 2 was attributed mainly to the fact that the seed variety was demonstrated for the first time with the support extended through government agricultural department. Seed cost of Gujarati variety was found to be Rs 14726 per ha followed by Rs 12319 in case of Smruti. Sowing cost was found to be higher in case of control villages than that of adopted villages. However, fertilizer cost was comparatively less than the adopted villages. Harvesting and threshing cost ranged between 15 % in case of Smruti to 26 % in case of TMV 2 of the total cost.

Groundnut being cultivated as a commercial crop, exorbitant rental value of land has been observed. The yield of different varieties for which cost of cultivation information was estimated, varied from 1755 kg per ha in case of TMV 2 to 2609 kg/ha for Gujarati. Among the varieties grown in the control villages, Gujarati fetched the highest price of Rs 42/kg followed by Smruti (Rs 40.8/kg).

Table 3.20 (b): Economics of rabi season groundnut by variety, 2011-12 (Rs per ha)

Operation	Dhenkanal							
	Adopted					Control		
	AK12-24	Amravati	Gujarati	Smruti	TMV2	AK12-24	Gujarati	TMV2
No of plots	57	4	27	1	1	41	4	2
Land preparation	3670(7.4)	3720(6.9)	3404(7.4)	4234(8.4)	2555(4.1)	3018(7.2)	3129(6.8)	2724(6.5)
FYM/Compost	0.00	0	2334(5.1)	1411(2.8)	0.00	599(1.4)	906(1.9)	0
Seed costs	8405(16.9)	11346(21)	13346(29.2)	12844(25.6)	11179(18)	8514(20.2)	13420(29.2)	10715(25.6)
Sowing costs	2615(5.3)	2902(5.4)	2228(4.9)	1694(3.4)	3194(5.2)	2422(5.7)	2223(4.8)	2543(6.1)
Fertilizer costs	2744(5.5)	2827(5.2)	2229(4.9)	3529(7.0)	5323(8.6)	1908(4.5)	1515(3.3)	2179(5.2)
Micro-nutrient costs	9.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inter-culture costs	4677(9.4)	4464(8.3)	3892(8.5)	4940(10)	5323(8.6)	3537(8.4)	2305(5.0)	4795(11.5)
Weeding costs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant protection costs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation costs	67.00	372 (0.7)	149 (0.3)	0.0	3194 (5.2)	32.00	0.0	0.0
Watching expenses	0.00	0	15	0.0	0.00	0.00	0.0	0.0
Harvesting costs	3533(7.1)	4055(7.5)	2081(4.6)	3529(7)	4791(7.7)	2497(5.9)	2388(5.2)	2543(6.1)
Threshing costs	5571(11.2)	5803(10.7)	4006(8.8)	5646(11.3)	7985(12.9)	5424(12.9)	7739(16.8)	3996(9.6)
Marketing costs	0.00	0	0	0	0.00	0.00	0	0
Rental value per season	18347(37)	18525(34.3)	12063(26.4)	12350(24.6)	18525(29.9)	14273(33.8)	12350(26.9)	12350(29.5)
Others costs if any	0	0	0	0	0	0	0	0
Total cost	49638	54014	45747	50177	62069	42224	45975	41845
Grain yield (kgs)	2185.0	2477	2152	2258	2449.0	2014.0	2017	2216
Grain price/kg	39.00	38	38.8	42	39.00	40.00	39.5	40
Fodder yield (kgs)	736.00	830	720	776	820.00	681.00	687	726
Fodder price/kg	1	1	1	1	1	1	1	1

Note: Figures in the parentheses indicate percentages to the total cost of production

Cost of cultivation of groundnut in adopted as well as control villages in Dhenkanal district was found to be comparatively lower than that of Jajpur district. Total cost per hectare varied between Rs 45747 in case Gujarati to Rs 54017 in case of Amravati for adopted villages, whereas, for control villages, it ranged between Rs 41845 in case of TMV 2 to Rs 45975 for Gujarati. Seed cost of Gujarati variety accounted for 29% of the total cost of production in both adopted and control villages. AK 12-24 being locally procured, costed much less than the other varieties and it varied between Rs 8405 for adopted villages to Rs 8514/ha for control villages. Smruti variety having attractive peel colour is costlier also and the seed cost was Rs 12844 per ha in adopted village. Fertilizer costs accounted for 5 to 8.5% of the total cost in case of adopted villages whereas, for control villages, its share was 3 to 5%. Harvesting and threshing cost together accounted for 13 to 20% of the total costs for adopted villages and for control villages, the two components shared 16 to 22%. In case of TMV 2, since it was irrigated, yield was comparatively higher at 2449 kg per hectare. The average yield per hectare of other groundnut varieties in the adopted villages varied from 2152 kg to 2258 kg and for control villages, it ranged between 2014 kg to 2216 kg.

3.6.2 Economics of groundnut cultivation

Average yield of groundnut per hectare in Jajpur districts was 2484 kg and 2402 kg respectively for adopted and control villages whereas, it was comparatively low in Dhenkanal and estimated at 2155 kg and 2017 kg respectively for adopted and control villages. Cost of cultivation per hectare was quite high at Rs 53541 and Rs 58410 respectively for adopted and control villages in Jajpur as compared to Rs 46226 and Rs 42486 respectively for adopted and control villages of Dhenkanal district. Though gross return was quite higher in case of Jajpur district, it has got low BC ratio, because of higher cost of cultivation pertaining mainly to seed and fertilizer. BC Ratio was 1.13 and 1.43 respectively for adopted and control villages in Jajpur district while it was much higher at 1.83 and 1.89 respectively for adopted and control villages in Dhenkanal district. BC Ratio for irrigated

groundnut in adopted village of Dhenkanal district was found to be lower at 1.72 than that of rainfed crop (Table 3.21).

Table 3.21 Cost and returns in groundnut farming among the sample farmers, 2011-12

Cost /returns	Jajpur (Rs per ha)		Dhenkanal (Rs per ha)	
	Adopted	Control	Adopted	Control
Rain fed				
Yield (kg/ha)	2484	2402	2155	2017
COC(Rs/ha)	53541	58410	46226	42486
Gross returns(Rs/ha)	100739	99134	84600	80483
Net returns (Rs/ha)	47197	40724	38373	37996
BCR	1.13	1.43	1.83	1.89
Irrigated				
Yield (kg/ha)			2216	
COC (Rs/ha)			50584	
Gross returns (Rs/ha)			86842	
Net returns (Rs/ha)			36258	
BCR			1.72	

3.7 Crop utilization among the sample farmers

Groundnut utilization pattern in sample villages is placed in Table 3.22. Groundnut output per household was highest in case of adopted villages of Jajpur. Of the total grain output of 2256.58 qts per Hh in the adopted villages of Jajpur, more than 86% is sold whereas, for control villages, about 89.5 % was sold. In Dhenkanal, grain output per Hh was 1407 kgs and 609.33 kgs respectively for adopted and control villages. About 77% of the crop output per Hh was sold in case of adopted villages of Dhenkanal district, whereas, the figure for the control village was estimated at 80%. It is obvious that when the crop output is low a highly commercial crop like groundnut, higher percentage of the output was sold as in case of control villages of both Jajpur and Dhenkanal district. Others uses mainly takes the form of labour payment and recorded 301 kgs and 243.67 among the adopted farmers of Jajpur and Dhenkanal district respectively and for control villages it was 104.33 kg and 89.06 kgs respectively. In Dhenkanal, farmers grow both kharif and Rabi season groundnut. So seed is kept for the next season crop. About 3.75% and 2.72% of the crop output was kept for seed purpose respectively for adopted and control villages of Dhenkanal district. Sale price of groundnut was found to be higher in Jajpur than that of Dhenkanal. It varied from Rs 40.24 to Rs 40.98/kg respectively for adopted and control villages of Jajpur district, whereas, it ranged between Rs 38.87 to Rs 39.62/kg respectively for adopted and control villages of Dhenkanal district.

Table 3.22: Crop utilization (main product) per HH (kgs)

Particulars	Jajpur		Dhenkanal	
	Adopted	Control	Adopted	Control
Grain output (Kg)	2256.58	1098.17	1407	609.33
Consumed (Kg)	10.31(0.46)	10.83(0.99)	31.39(2.23)	14.44(2.37)
Other uses	301.00(13.34)	104.33(9.50)	243.67(17.32)	89.06(14.62)
Kept as own seed (Kg)	0.00	0.00	52.83(3.75)	16.56(2.72)
Sold as seed (Kg)	0.00	0.00	0.00	0.00
Seed sale price (Rs/kg)	0.00	0.00	0.00	0.00
By-product (Kg)	14.94	0.00	0.00	0.00
By-product own use (Kg)	0.00	0.00	0.00	0.00
By-product sold (Kg)	0.00	0.00	0.00	0.00
By-product sale price (Rs/Kg)	0.00	0.00	0.00	0.00
Qty sold in the market (kg)	1945.27(86.20)	983.00(89.51)	1079.11(76.70)	489.28(80.30)

Note: Figures in the parentheses indicate percentages to the total grain output

3.8 Preferred traits of Groundnut and price premiums for traits

Irrespective of the adopted or control villages in both the districts, high yield remains the preferred trait of the varieties (Table 3.23). In adopted villages of Jajpur district, the second most important trait being the determinate type. Since groundnut in post rainy season is purely rainfed, with indeterminate type pegging, the crop is subject to drought and subsequently results in poor yield. Groundnut is priced as per shelling percentage. A shelling percentage above 70 fetches a remunerative price. Since groundnut is a cash crop and high shelling percentage provide better price and hence higher income. Also majority of the groundnut farmers have low resource base. As such they heavily relied on seed traders for seed and other monetized input. Also because of inadequate time for planting groundnut immediately after the harvest of autumn paddy to avail the residual moisture in the soil, there remains huge rush to get quality seeds and since there is limited scope of getting kharif harvested seeds within the state within the fixed period of planting, seed traders resort to bring seeds from major kharif grown states of Gujarat, Maharashtra, Karnataka, Andhra Pradesh etc which automatically raises the cost of seeds to an exorbitant level. Majority of the farmers are unable to procure seeds at that level which is in excess of Rs 60/kg. So low seed cost was given priority in the adopted villages of Jajpur district. Majority of the farmers in the adopted villages of Jajpur district have started cultivating groundnut even in heavier soils by adding river bed sand to make them enable for groundnut cultivation. Still farmers face difficulty in harvesting groundnut at times because of uncertain rain or some other reasons. In heavier soils, farmers also face diseases in the pod as well as in the peg which makes them difficult to harvest the entire produce and so strong peg has become one of the preferred traits. Since seeds are costly, low seed rate has emerged as one of the traits. In control villages of Jajpur district, drought occurrence is common and as such drought resistance and short duration have been the preferred traits. Low seed cost was not found to be the preferred traits in control villages, as Smruti and TMV 2 seeds were locally available from the government seed centres and from the inland producing district of Baragarh.

In adopted villages of Dhenkanal, drought resistance was found to be preferred variety as the soil is mostly sandy besides the river embankment and with poor moisture retaining capacity, crop suffers due to drought. For the same reason, short duration and determinate type of varieties are preferred.

Table 3.23: Production traits preferred by groundnut sample farmers, 2011-12

Production preferred Traits	Jajpur		Dhenkanal	
	Adopted	Control	Adopted	Control
High Yield	7.00	6.67	6.28	6.81
Short Duration	-	2.00	3.19	3.78
Disease Resistance	2.75	-		
Pest Resistance	-	-		
Drought resistance	-	3.00	6.38	2.54
Highest Shelling (%)	5.27	5.27	4.76	5.78
High oil content	-	-	-	-
Fits in to cropping system	-	2.11	3.09	
Determinate	5.35	4.79	4.31	4.16
Strong peg	5.09	5.09		
Low Seed Cost	5.19			
Low Seed rate	4.03	4.00	2.63	

4. Synthesis of results and policy options

During the 2nd phase of the TL-II Project, two districts viz., Jajpur and Dhenkanal of Odisha were chosen for implementation of the program for groundnut crop. In each of these two districts, three villages were selected for intervention and were designated as 'adopted' villages and three more villages were chosen as non-intervention villages, which were termed as 'control' villages. From each of the adopted villages, a sample of 30 farmers was chosen, while this number was 15 in case of the control villages. Thus, in of these two districts, a sample of 90 farmers was drawn from adopted villages and 45 farmers were chosen from control villages. A baseline survey was conducted during 2011-12, immediately after the cropping season, to assess the socioeconomic status of the farmers, adoption and yield levels and benefit/cost ratios of groundnut crop.

The inferences taken from the baseline study suggest that groundnut crop is the dominant crop during the post-rainy season irrespective of the two districts. In Jajpur district, groundnut is the leading crop which sustains the farming community. In both the districts, it contributed significantly to the farm incomes. However, it was found that farmers are hugely constrained in getting quality seeds at the appropriate time. In Jajpur district, farmers entirely depend on seed traders for the seed which is procured mainly from the states of Gujarat, Maharashtra, Karnataka and Andhra Pradesh and farmers hardly have any idea about the varieties being grown by them. Since they are in hurry to plant the crop because of fear of moisture depletion from the soil, whatever seed is being provided to them by the seed traders are sown. Seed traders have also taken it as granted and hardly find any incentive to provide quality seeds of designated varieties. They are also in a hurry to arrange for seeds and are mostly lifted from mandis of respective states and so the varieties are not ensured and farmers and traders designate the varieties as per the source of arrival of seeds. In Dhenkanal district, decades old AK 12-24 is still the dominant variety. Though government is supplying TMV-2, farmers hardly find any difference between the two varieties and still go with AK 12-24 though now it has become susceptible to pests and diseases.

During 2011-12, Jajpur experienced severe flooding during October, and it suited well for groundnut crop during the post rainy season for groundnut crop and also the season during the crop growth period was exceptionally good resulting in very high yield which was not realized for over a decade. Similar was the situation in Dhenkanal also. However, due to traditional varieties being grown in the district and to poor soil quality than that of Jajpur, yield was comparatively low in Dhenkanal district.

B:C ratio for groundnut crop was found to be low in Jajpur as compared to Dhenkanal mainly because of higher cost of cultivation in Jajpur pertaining to seed and labour cost though yield was higher. Fellow farmers are the main source of information for new cultivars and fertilizer management. Input dealers also play role in providing information related to pest and disease controls. Preferred traits for groundnut varieties among the respondent farmers were found to be higher yield, determinate type, drought tolerance, bold grain, high shelling percentage and strong peg.

So releasing of varieties having above desirable traits suitable to the agro-climatic conditions of the state is of outmost importance. Releasing the variety is not enough, efficient seed delivery system has to be developed for making available desired seed at appropriate time with certain incentives in form of subsidies and market invention to encourage farmers to increase the area under the crop thereby enhancing the production. There is need for developing technologies to advance sowing

in Odisha to escape high temperature stress at the later stages of the crop growth and to protect the crop from unseasonal rains. Suitable technology pertaining to use of machineries in groundnut cultivation must be introduced so as to reduce the dependence on human labour as labour cost is becoming exorbitant in the face of vanishing labour force from the rural masses.
