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Groundnut Baseline and Early-Adoption Surveys in South Asia

Insights from TL-II (Phase-1) Project

Synthesis Report

KR Karunakaran, CP Gracy, H Lokesha, Cynthia Bantilan, D Kumara Charyulu, P Parthasarathy Rao, GD Nageswara Rao, M Vaithiyalingan, HL Nadaf, P Venkataramana, HD Upadhyaya, P Janila and KPC Rao

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Abstract

The production of groundnut and its cultivated areas in India showed a steady growth till the end of the twentieth century. Groundnut, however, lost its preeminence as the most important oilseed crop in the country during the last 13 years after the liberalization of edible oil imports. More recently the importance of groundnut is increasing for food uses. Despite a growth in productivity even during the last decade, the crop is losing areas in all the important growing states to more profitable crops. India is incurring a heavy import bill for the import of edible oils. India has relaunched a technology mission titled the 'Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize' development program to improve the productivity and production of oilseeds in the country and to reduce dependence on the imports of edible oil. Groundnut is one of the mandate crops of the International Crops Research Institute for the Semi-arid Tropics (ICRISAT), and this premier international institute has been contributing its bit for genetic improvement, crop production and protection practices in India and Africa during the last four decades. The generous support received from the Bill & Melinda Gates Foundation has provided ICRISAT an opportunity to work more intensively with its research and development partners to demonstrate the potential of new technologies to enhance the yields, raise the profitability and revive the interest of the farmers in groundnut crop in India and the strategy chosen is the Farmer Participatory Varietal Selection (FPVS). This report synthesizes the efforts made during the short period of three years (2007–10) in the states of Karnataka and Tamil Nadu for groundnut crop improvement in India. Overall, the FPVS results established that the new varieties out-yielded the respective check varieties in two states. Due to different constraints and lack of institutional support, the adoption of those cultivars was low in the targeted districts. From the past lessons learned, the report refocuses on the further efforts needed during the second phase of the project to achieve greater success and impact.

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Chapter 1: Introduction

1.1 Brief introduction

Groundnut is the fifth-largest oilseed produced in the world after oil palm, soybean, rapeseed and sunflower. In 2011–12, world groundnut production was estimated at 35 m tons. Groundnut production caters largely to domestic consumption, and only 6% of it is traded internationally. China and Argentina are the largest exporters of groundnut, and the European Union is the largest importer (FAOSTAT, 2012). India has a larger area (4.9 m ha) under groundnut than China (4.7 m ha), but the latter is the biggest producer of groundnut (16.8 m tons). India produced only 5.7 m tons of groundnuts in 2012. Both these countries together accounted for more than 50% of the world's groundnut production. About 75% of groundnut production in India is crushed for oil, commonly used for cooking in the southern states of the country.

1.2 Recent trends in India and major states

The area under groundnut in India increased till the turn of the century, but fell at an annual rate of 3.48% during 2000–09, after the liberalization of edible oil imports (see Table 1.1). Despite the productivity of groundnut rising by 2.14% per year, the production registered a decline at the rate of 1.14% per year. The measure of instability (CV) was higher in the case of productivity than in the case of area in all the sub-periods. There was a steady growth in the productivity of groundnut in the country between 1950 and 2010 (see Figure 1.1).

Table 1.1 Area, production and productivity of groundnut in India, 1980–2009.

Statistic	Area ('000 ha)	Production ('000 tons)	Productivity (kg/ha)
Mean			
1980–89	7,400	6,600	876
1990–99	7,800	7,700	990
2000–09	6,200	6,700	1,084
1980–2009	7,100	7,000	983
CV (Raw data)			
1980–89	9	23	15
1990–99	8	14	14
2000–09	13	20	19
1980–2009	13	20	19
CV (De-trended)			
1980–89	12	22	12
1990–99	5	14	13
2000–09	6	24	23
1980–2009	10	20	16

(Source: Computed from the data collected from the Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India)

The linear trend seen suggests that the productivity/ha has been rising by about 7.8 kg/year (see Figure 1.1) from 1950 to 2010. But, specifically, yield was increasing at 25 kg/year during the last one decade (2001–11) (see Figure 1.2). Despite this, the crop lost area in the recent decade because of the import of cheaper oils, which depressed groundnut prices, and other competing crops emerged more profitable. India is only a marginal player in groundnut trade.

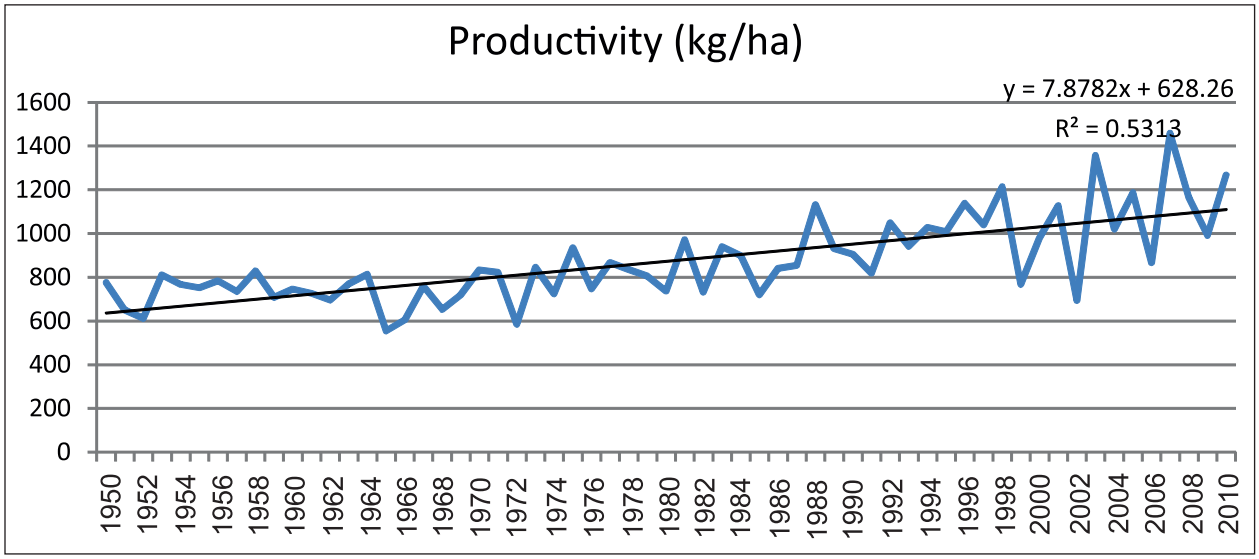

Figure 1.1 Groundnut productivity at an all-India level, 1950–2010 (kg/ha).

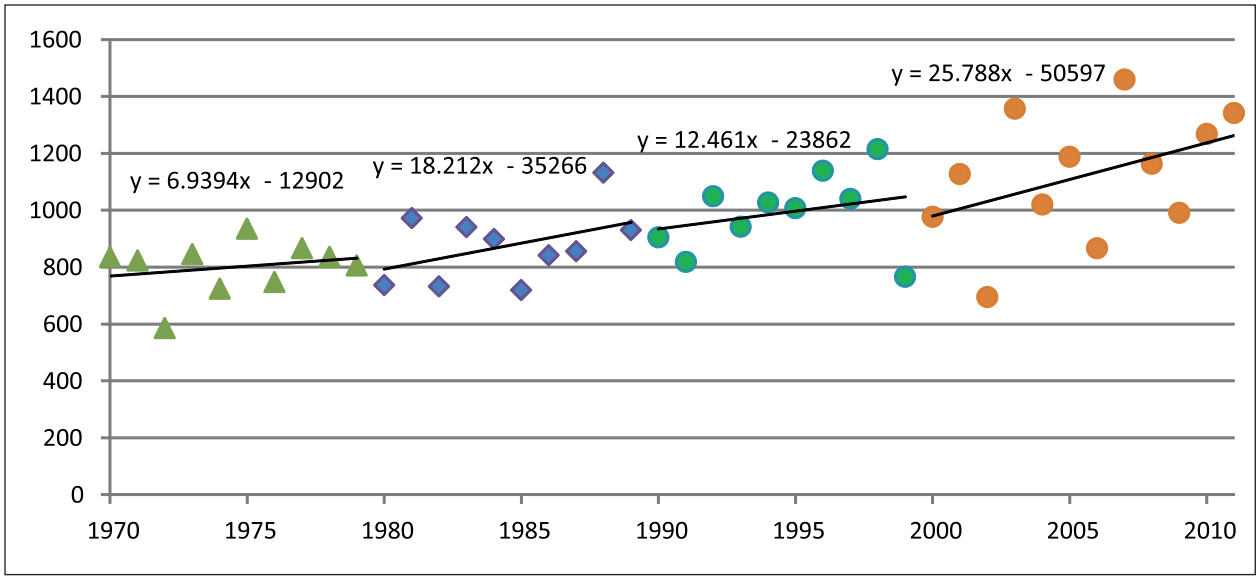

Figure 1.2 Decadal-wise groundnut productivity at an all-India level (kg/ha).

Groundnut is one of the five mandate crops of International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Under the Tropical Legumes-II (TL-II) Project, ICRISAT is spearheading the research and seed-production effort along with many partners to improve the productivity and incomes of groundnut farmers. Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu are the leading producers of groundnut in India, and together account for 75% of groundnut production in the country (see Table 1.2).

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).

	Gujarat		Andhra Pradesh		Karnataka		Tamil Nadu		Maharashtra		Rajasthan	
Statistic	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty
						Mean						
1980–89	1,916	750	1,736	855	951	820	968	1,105	766	889	218	691
1990–99	1,900	920	2,182	892	1,213	835	988	1,529	622	1,101	266	952
2000–09	1,898	1,219	1,645	838	893	680	563	1,830	409	1,072	273	1,329
1980–2009	1,905	963	1,854	862	1,019	778	840	1,488	599	1,021	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
1980–2009	11	52	19	23	19	25	27	24	29	17	19	26
CV (De-trended)												
1980–89	18	40	21	14	22	11	18	8	18	16	12	22
1990–99	5	44	10	22	7	8	10	11	12	13	13	19
2000–09	5	59	13	33	11	19	7	13	7	10	16	15
1980–2009	11	47	19	23	19	24	17	11	13	14	14	31

(Source: Computed from the data collected from the Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India)

Gujarat is the leading producer of groundnut, with a share of nearly 35% in the country (see Table 1.2). The productivity of groundnut increased steadily from an average of 750 kg/ha in 1980–89 to an average of 1,219 kg/ha in 2000–09. Yet, the cultivated area of the crop remained stagnant.

In Andhra Pradesh, the productivity remained stagnant over a three-decade period. The area under the crop increased from an average of 1.74 m ha in 1980–89 to an average of 2.18 m ha in 1990–99, but the figure dropped sharply to an average of 1.65 m ha during the 2000–09 period.

Karnataka also exhibited a similar trend with regard to the total cultivated area of groundnut and falling productivity. Tamil Nadu and Maharashtra also suffered erosion to their groundnut areas after 2000, despite rising productivity. The area under groundnut remained steady, as the productivity increased over the three-decade period, ie., 1980–2009. It was noted that the productivity of groundnut varies widely between the states, and is dependent on factors such as soil fertility, the season it is grown in and the degree of irrigation coverage it receives. The instability indices computed for decadal sub-periods at the state level also suggest that the variability is greater in case of productivity of groundnut than in case of area. This is because the bulk of the area is rain-fed. De-trending of the data reduced the measures of instability only marginally.

The Government of India provides various incentives and financial support to oilseed growers in the country under its Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) development program, in the form of input subsidies and extension services. This program has been merged into the National Food Security Mission (NFSM) since 1 April 2010. In 1986, the Technology Mission on Oilseeds (TMO) was initiated to meet different challenges and complexities in the oilseed sector. All these programs contributed to achieve a fivefold increase in oilseed production between 1950 and 2008. In the same period, the groundnut production trebled in the country. The demand for oilseeds and edible oils increased much faster.

While the population grew at an annual average compound growth rate of 1.9%, the per-capita consumption of oils increased at 4.6% per year. Due to the yawning gap between the demand and supply of edible oils, an increase in the import dependence was seen. Additionally, on account of the relative profitability of the competing crops in both irrigated and rain-fed areas, oilseed crops are losing areas despite productivity growth, and it is perceived impossible to depend exclusively on domestic production of oilseeds and oils. In 2009–10, 58% of the edible oils consumed in the country were imported. With the decline in groundnut area and production, groundnut oil is pushed down to fourth place below palm oil, soybean oil and rapeseed oil. In India, the gross sown area remained constant over the last two decades, and there is now intense competition among the crops for area, with regard to substituting each other. In this scenario, the possibilities for increasing the area under groundnut are limited, and any effort to increase groundnut production should be focused on raising productivity. Hence, the TL-II Project is targeting the popularization of high-yielding varieties and seed delivery. If we succeed in increasing the productivity of groundnut substantially, it might be possible to arrest the trend of falling area under it.

1.3 Scope of the study

This report focuses on how the interventions made under the TL-II Project during 2007–10 through Farmer Participatory Varietal Selection (FPVS) have generated interest among the farmers to grow some of the new varieties (see Figure 1.3). But since the seed requirement is quite high in case of

groundnut, a limited distribution of the pods to the farmers in adopted villages failed to bring about a change in the composition of the groundnut varieties in the study area between the base year in 2007–08 and the year of early-adoption study in 2009–10. The lessons learned from the experience in the first phase have to be used for improving the plans for seed supply during the second phase of the project. During the three years of implementation in the first phase, the TL-II Project had a target of achieving a 5% increase in the productivity of the legumes by achieving 10% coverage of area under the crop in the study area under new- and high-yielding varieties. Globally, the project aimed to accomplish net benefits to the tune of $300 million. The TL-II Project entitled 'Enhancing Grain Legumes' Productivity, Production and Incomes of Poor Farmers in Drought-prone Areas of Sub-Saharan Africa and South Asia' targeted six grain legumes, viz., chickpea, pigeonpea, groundnut, common bean, cowpea and soybean.

In south Asia, the intervention is limited to the first three crops falling under the mandate of ICRISAT. The intervention strategy in the TL-II Project is presented in the form of a diagram in Figure 1.3. The first step in the strategy is to pick areas of promise where the TL-II strategy will be implemented. In the next step, we conduct baseline surveys to document the areas allocated by farmers to groundnut, the varieties grown, and its productivity and profitability. Then, some

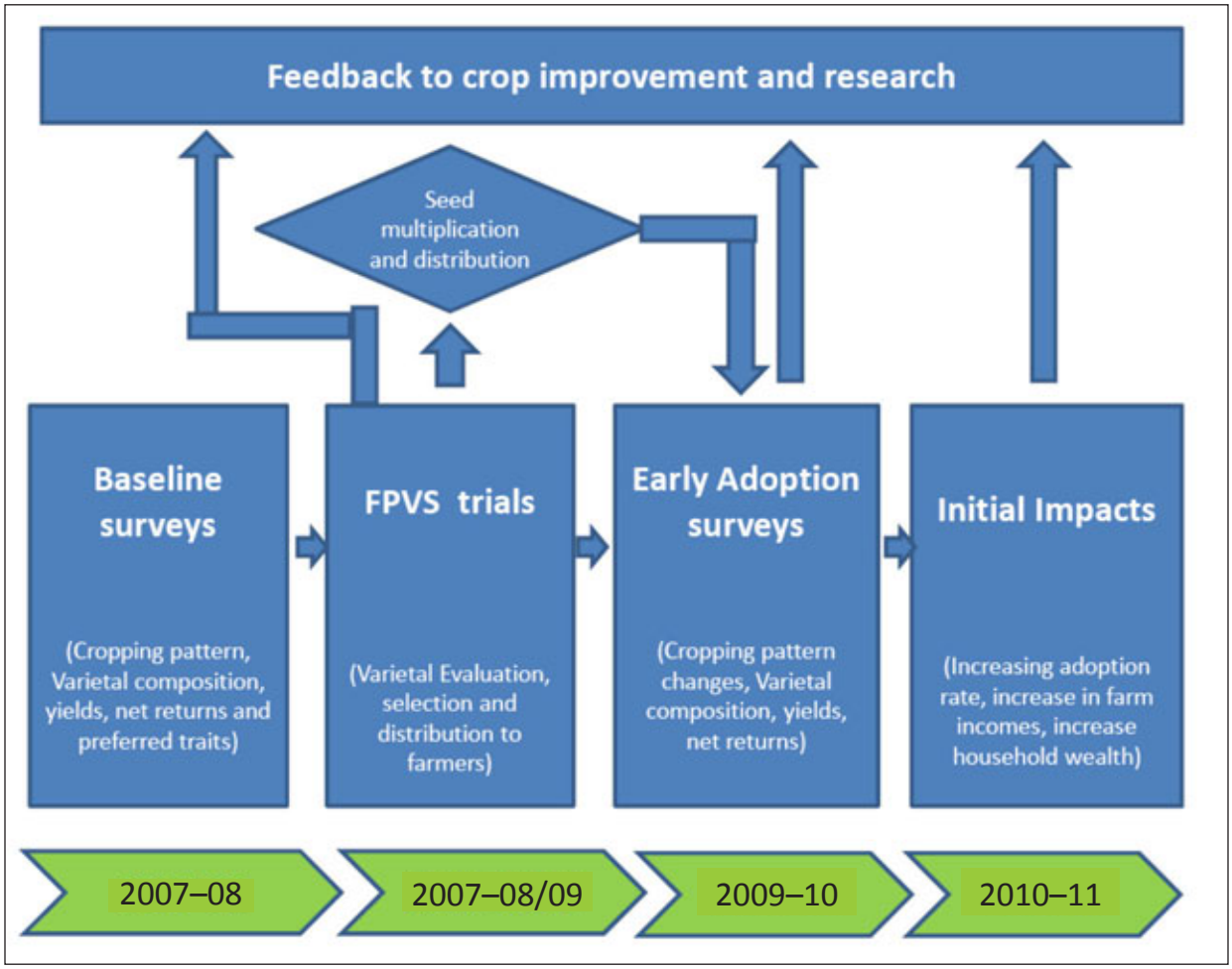

Figure 1.3 TL-II (Phase-1) Project and interventions.

promising high-yielding varieties will be tried on the farmers' fields, and opportunities will be provided to the farmers to select the varieties with which they are most impressed in terms of productivity, pod characteristics and market acceptance. The varieties selected by the farmers are multiplied on selected farmers' fields, and the seed produced is distributed among the farmers with the expectation that the farmers will gradually multiply them on their farms and benefit from the adoption of improved cultivars. It is expected to positively impact the farmers by way of higher yields, reduced unit-cost of production and higher profitability. The project aimed at reducing the time lag between the development of variety and its popularization with the farmers. Karnataka and Tamil Nadu were chosen for implementing the project strategy in case of groundnut. Although Gujarat and Andhra Pradesh are the most important groundnut-producing states, Karnataka and Tamil Nadu were chosen because of the availability of suitable varieties and better cooperation expected from the research and development partners in these states.

1.4 Structure of the report

This first chapter introduced the groundnut crop and its recent performance trends in terms of area, production and productivity in the major states of India and the country as a whole during the last three decades. The causes of shrinkage of groundnut area during the first decade of the twenty-first century were discussed. The increased dependence on the import of edible oils and the substitution of groundnut oil by cheaper oils have eroded the premium position of groundnut. However, the saving grace has been a consistent increase in the productivity of groundnut. Since the possibility of area expansion is limited, the focus should be on increasing the productivity by popularizing the improved varieties. The scope of the study was highlighted by focusing on the strategy of the TL-II Project and how it was implemented in the study area.

Chapter 2 presents the study approach and methodology. The study areas and tools and techniques used are described along with the listing of adopted or intervention villages and control villages in the four districts. Chapter 3 is devoted to the description of the scenario in the baseline study. Its first part described the baseline situation in selected villages in the Raichur and Chitradurga districts of Karnataka, while the second part dealt with the baseline situation in selected villages in the Erode and Thiruvannamalai districts of Tamil Nadu. Chapter 4 details the FPVS trials conducted in selected villages in the Raichur and Chitradurga districts of Karnataka and Erode, and the Thiruvannamalai and Nammakkal districts of Tamil Nadu. The varieties demonstrated in the mother–baby trials and their results are discussed. The process of selection of varieties by the farmers is documented by recording their trait preferences. In many cases, farmers preferred varieties with desirable traits, even though they recorded lesser yields. FPVS trials were conducted on semi-spreading varieties (Virginia Bunch) in the Nammakkal district. The results of these trials are also discussed, although the villages in Nammakkal were not covered in either the baseline or early-adoption surveys. Chapter 5 presents the results of early-adoption surveys conducted in 2009–10. Its first part was devoted to the results from Karnataka and the second part dealt with the results from Tamil Nadu. Finally, the synthesis of the studies in the two states and the lessons learned are summarized in Chapter 6. The appendixes at the end of the report contain the questionnaires used in baseline and early-adoption studies.

Chapter 2: Sample and Methodology

2.1 Sample details and survey methods

Under Phase 1 of the TL-II Project, the Raichur and Chitradurga districts in Karnataka, and the Erode and Thiruvannamalai districts in Tamil Nadu, were chosen for introduction of new varieties and technologies. In each of these four districts, three villages were selected for intervention and were designated as 'adopted' villages. Three other villages were chosen as non-intervention villages or 'control' villages. From each of the adopted villages, a sample of 30 farmers was chosen; this number was 15 in case of the control villages. Thus, in each of the two states, a sample of 180 farmers was drawn from the adopted villages, while 90 farmers were chosen from the control villages. A baseline survey was conducted during 2007–08, immediately after the cropping season, to assess the socioeconomic status of the farmers, adoption and yield levels, and cost-benefit ratios of groundnut vis-à-vis other competing crops. FPVS trials were conducted during the rainy season of 2008–09 in the so-called 'adopted' villages. Some new varieties were tested vis-à-vis the ruling varieties in the region to assess their comparative performance. Farmers were asked to rank the varieties based on the traits preferred by them. The varieties so selected by the farmers were then taken up for seed multiplication. The farmers were supplied with small quantities of seed for them to multiply the seeds and bulk the supply so that a gradual switchover to the preferred varieties may be effected. In 2009–10, an early-adoption survey was commissioned to assess the dent the new varieties are making and to ascertain whether this adoption has caused any improvement in their yields and incomes.

All four selected districts have considerable areas under groundnut and are well served by research stations located close to them. The trends in area, production and productivity of groundnut in the four study districts were analyzed and furnished in Table 2.1. It was observed that the area under groundnut increased in Raichur up until 1988, but that it declined steadily throughout the study period (1988–2009). In fact, in the triennium ending 2009, the area was less than half of what it was in 1983. The productivity of groundnut also peaked in 1988, but declined gradually until 1998, although it recovered to some extent in the next decade. In Chitradurga also the area under groundnut initially increased, but decreased from 1988 onwards. The productivity of groundnut too showed an upward trend until 1988, but thereafter it declined until 2009. Further, the productivity levels in 2009 were only half of the 1988 levels. District-level data on groundnut was not available till 1988 for the two selected districts in Tamil Nadu. Between 1993 and 2009, the area under groundnut showed a declining trend in both the study districts of Erode and Thiruvannamalai. Productivity, on the other hand, was steady in Erode district except for a dip in 2003, while it actually increased in Thiruvannamalai during the study period. The decline in area under groundnut suggests that more profitable crops are replacing groundnut despite its consistent productivity. The measure of instability indicated that the variability in groundnut yield is more than that in area – the de-trending of data reduced the coefficient of variation only marginally.

Table 2.1 Area ('000 ha), production ('000 tons), productivity (kg/ha) and instability indices of groundnut in sample districts of Karnataka and Tamil Nadu.

Triennium ending	Raichur			Chitradurga			Erode			Thiruvannamalai		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
1983	107	55	507	20	20	1,032	NA	NA	NA	NA	NA	NA
1988	142	107	757	103	86	1,054	NA	NA	NA	NA	NA	NA
1993	122	88	723	183	175	953	87	154	1,768	155	185	1,192
1998	107	63	581	169	166	954	58	103	1,833	125	178	1,422
2003	85	59	699	172	108	628	34	47	1,388	98	131	1,310
2009	52	39	750	146	77	519	25	46	1,814	87	159	1,820
Instability measure (CV)												
Raw data									-			
1980–2009	27	41	20	45	54	38	37*	45*	14*	24*	22*	21*
1980–89	17	43	31	73	71	29	NA	NA	NA	NA	NA	NA
1990–99	11	23	15	13	32	23	20	22	9	20	19	11
2000–09	29	35	13	16	52	43	24	35	18	11	22	24
De-trended Data												
1980–2009	19	36	20	31	52	30	17*	24*	14*	16*	21*	17*
1980–89	27	57	30	30	49	38	NA	NA	NA	NA	NA	NA
1990–99	8	19	15	13	31	26	18	26	9	19	20	6
2000–09	17	22	13	32	68	28	16	24	18	13	22	26

*For the period 1990–2009 only

The ICRISAT groundnut breeders, in close consultation with research and development partners, selected the treatment villages for conducting FPVS trials after first testing them in the research stations. The same villages were chosen to conduct the baseline surveys. We selected villages closer to the treatment villages as control villages to provide the counter-factual.

Raichur belongs to the Hyderabad–Karnataka region. A part of the district receives irrigation facilities from the Tungabhadra Dam at Hospet. Raichur has the fifth-largest area under groundnut among the districts of Karnataka. Groundnut is grown in both rainy and post-rainy seasons, but it is relatively more important during the post-rainy season. It is grown as an irrigated dry-crop with the help of irrigation received from the Tungabhadra canals, and is grown as a rain-fed crop in the rainy season. The Chitradurga district belongs to the Old Karnataka region and is essentially a rain-fed district. It has the highest area under groundnut among all the districts of Karnataka and also leads in its production. Groundnut is grown as a rain-fed crop during the rainy season. These two districts differ in groundnut cultivation, with Chitradurga representing rain-fed crops in the rainy season, and Raichur representing a largely irrigated situation in the post-rainy situation.

Table 2.2 Sample villages for baseline survey under the TL-II Project in Karnataka.

Districts	Treatment/Adopted village	No. of farmers	Control village	No. of farmers	Total
	Maragantanala	30	Adavibhavi	15	
Raichur	Bhoomanagunda	30	Singeridoddi	15	135
	Chandrabanda	30	Naganadoddi	15	
	Gulya	30	Chikkanahalli	15	
Chitradurga	Hosahalli	30	Kondlahalli	15	135
	Kaparahalli	30	Mogalalalile	15	
Grand Total		180		90	270

Table 2.2 lists the names of villages where interventions were attempted directly with technology, and with the villages where no such direct interventions were envisaged. In Raichur district, Maragantanala, Bhoomanagunda and Chandrabanda were the villages chosen for intervention, while Adavibhavi, Singeridoddi and Naganadoddi were the control villages. Thirty farmers from each of the adopted villages and 15 farmers from each of the control villages were chosen from the groundnut growers to serve as the sample for the baseline study. In Chitradurga district, the villages chosen for intervention were Gulya, Hosarahalli and Kaparahalli, while Chikkanahalli, Kondlahalli and Mogalalalile were selected as the control villages. As in the case of Raichur, 30 farmers from each of the adopted villages and 15 farmers from each of the control villages were picked up as the sample to conduct the baseline survey. Thus, in all, 180 farmers from the adopted villages and 90 farmers from the control villages constituted the sample for the study in Karnataka.

Table 2.3 Distribution of Karnataka sample farmers among different categories, 2007–08.

	Raichur sample		Chitradurga sample		Pooled sample	
Category	Adopted	Control	Adopted	Control	Adopted	Control
Marginal	9 (10)	6 (13)	7 (8)	5 (11)	16 (9)	11 (12)
Small	30 (33)	13 (29)	28 (31)	14 (31)	58 (32)	27 (30)
Medium	29 (32)	14 (31)	31 (34)	13 (29)	60 (33)	27 (30)
Large	22 (24)	12 (27)	24 (27)	13 (29)	46 (26)	25 (28)
Total	90 (100)	45 (100)	90 (100)	45 (100)	180 (100)	90 (100)

(Figures in brackets represent percentages to the total)

Table 2.3 gives the distribution of the Karnataka sample among the different size-groups of farmers. In both the districts, most of the sample farmers were drawn from the small and medium groups. Large farmers had a considerable share in the sample, while marginal farmers had a relatively smaller share. The bias towards medium and large farmers was a little higher in the Chitradurga sample, in comparison with the Raichur sample. In the pooled sample of adopted villages, 8.9% belonged to the marginal category, and 32.2% were drawn from the small-farmers' category. One third of the sample came from the medium-farmers' group, while the remaining 25.6% of the sample was represented by the large-farmers' group. In case of the control villages, marginal farmers had a slightly higher share of 12.2%. Small and medium categories had shares of 30% each. Large farmers also had a higher share of 27.8%. Thus, farmers belonging to marginal and larger categories were better represented in the control villages, while the small and medium groups had a higher concentration in the sample of adopted villages.

Thiruvannamalai has the largest area under groundnut among all the districts of Tamil Nadu. As most of the area in the district has irrigation facilities, groundnut is grown as an irrigated dry-crop with supportive irrigation. It forms part of the northern districts of the state. Erode district belongs to the western part of the state. This district has relatively fewer irrigation facilities than Thiruvannamalai, which is why groundnut is mainly grown as a rain-fed crop – though it also receives protective irrigation wherever the facilities exist for it.

Table 2.4 gives the details of villages chosen as intervention and control villages in the two selected districts of Tamil Nadu. Ulagadam, Bramadesam and Gettisaviyur were the villages chosen for the introduction of new varieties and technologies in Erode district. Odapalayam, Vambathi and Polavapalayam were picked up as the control villages for the purpose of comparison. As is the standard practice, 30 farmers were chosen from each of the adopted villages, and 15 farmers were included in the sample from each of the control villages. Thus, 90 farmers from adopted villages and 45 farmers from control villages were included in the sample for Erode district. In the same way, Melchettipattu, Sirunathur and Kilsirupakkam villages were identified for the introduction of new technologies in Thiruvannamalai, while Nachinandal, Narimangalam and Radapuram were picked up as a comparison for control villages. Thirty farmers from each of the adopted villages and 15 farmers from each of the control villages were picked up from the groundnut growers to constitute the sample for the baseline study. A total of 180 farmers from the six adopted villages and 90 farmers from the six control villages were identified to form the sample for groundnut study in Tamil Nadu.

Table 2.4 Sample villages for baseline survey under TL-II Project in Tamil Nadu.

Districts	Treatment/ Adopted village	No. of farmers	Control village	No. of farmers	Total
	Ulagadam	30	Odapalayam	15	
Erode	Bramadesam	30	Vambathi	15	135
	Gettisaviur	30	Polavapalayam	15	
	Melchettipattu	30	Nachinandal	15	
Thiruvannamalai	Sirunathur	30	Narimangalam	15	135
	Kilsirupakkam	30	Radapuram	15	
Grand Total		180		90	270

Table 2.5 Distribution of Tamil Nadu sample farmers among different categories, 2007–08.

	Erode sample		Thiruvannamalai sample		Pooled sample	
Category	Adopted	Control	Adopted	Control	Adopted	Control
Marginal	7 (8)	16 (36)	36 (40)	14 (31)	43 (24)	30 (33)
Small	26 (29)	16 (36)	38 (42)	23 (51)	64 (36)	39 (43)
Medium	45 (50)	10 (22)	13 (14)	7 (16)	58 (32)	17 (19)
Large	12 (13)	3 (7)	3 (3)	1 (2)	15 (8)	4 (4)
Total	90 (100)	45 (100)	90 (100)	45 (100)	180 (100)	90 (100)

(Figures in parentheses represent percentages to the total).

There was a considerable difference in the distribution of sample farmers among the different size-groups in the two districts. In Erode district, the sample was biased more in favor of small and medium categories of farmers (see Table 2.5). In fact, there was considerable difference between the adopted and control villages of Erode district in terms of size-group composition. In the case of control villages, the marginal and small farmers were well represented, with each having a share of 35.6% each in the sample. The medium-farmers' category had a share of 22.2%, with the remainder of 6.6% belonging to the large-farmers' category. But in case of adopted villages, 50% of the sample came from the medium-farmers' category alone. The next big share of 26.9% belonged to the small-farmers' group. Large farmers had a share of 13.3% in the sample, and the remaining share of 7.8% belonged to the marginal farmers. Thus, the sample of adopted villages was relatively dominated by the medium and small farmers, while the bulk of it belonged to marginal and small categories in the control villages. The sample of both adopted and control villages in Thiruvannamalai was dominated by marginal and small farmers. They together had a share of 82.2% in these samples. The medium-farmers group had shares ranging from 14 to 16%, while the shares of large farmers were restricted to only 2 to 3% in these samples. Thus, the samples of Thiruvannamalai district were biased in favor of marginal and small categories.

Initially, trials with promising varieties were conducted at the research stations of Raichur and Chintamani in Karnataka, and at Erode and Thiruvannamalai in Tamil Nadu. The best-performing varieties were tested in mother–baby trials conducted in the treatment villages. The seeds of the top varieties selected by the farmers were multiplied on the farmers' fields, and the same were distributed to farmers in the villages in small quantities. After one year we conducted another survey with the same sample of farmers, who were tested in the baseline survey to assess the trends of early adoption and impact.

2.2 Analytical techniques

2.2.1 Tabular analysis

Tabular analysis was adopted to compile the general characteristics of the sample farmers, the resource structure, cost structure, returns, profits and the 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.

2.2.2 Growth-rate analysis

For assessing the trends in area, production and productivity of groundnut in different states and the study districts of Tamil Nadu and Karnataka states, the following growth-rate formula was employed:

$y^t = ab^t u^t$..... (1)

Where:

y^t = area/production/productivity in the year 't'

a = intercept indicating Y in the base period (t = 0)

b = Regression coefficient

^{t} = Time period in years

u^t = Disturbance term for the year 't'.

Equation (1) was converted into logarithmic form to facilitate the use of linear regression. By taking logarithm on both sides of the equation (1), we get equation (2).

Ln Y = ln a + t ln b + ln ut ..... (2)

This is in the linear form.

Yt = A + Bt + et ..... (3)

Where:

Yt = lnYt

A = ln a

B = ln b

et = ln ut

The linear regression of the above form (3) was fitted separately for area, production and productivity of groundnut. The values of 'A' and 'B' were estimated by using the Ordinary Least-Squares technique.

Later, the original 'a' and 'b' parameters in equation (1) were obtained by taking anti-logarithms of 'A' and 'B' values as:

a = Anti log A

b = Anti log B

The average annual compound rate was calculated as:

b = 1 + g

g = b – 1

To obtain the percentage compound growth rate, the value of 'g' was multiplied by 100.

2.2.3 Garrett's ranking technique

The reasons for preferences were prioritized by using Garrett's ranking technique in the following manner. The preferences considered important by the majority of respondents were first listed. Each of the 135 respondents selected from each district were asked to rank the preferences based on their priorities using ranks 1 to 10. In this analysis, rank 1 signifies the most important problem, and rank 10 the least important. In the next stage the rank assigned to each preference by each individual was converted into per cent position using the following formula:

Per cent position = 100 (Rij – 0.5) / Nj

Where:

Rij stands for rank given for the ith factor (i= 1, 2….5) by the jth individual

(j = 1, 2…….,n)

Nj stands for number of factors ranked by jth individual.

Once the percent positions were found, scores were determined for each percent position by referring to Garrett's table. Then the scores for each problem were summed up over the number of respondents who ranked that factor. In this way, total scores were arrived at for each of the factors, and mean scores were calculated by dividing the total score by the number of respondents who gave ranks. The final overall-ranking of the factors was done by assigning ranks in the descending order of the mean scores.

2.2.4 Coefficient of variation (CV)

Coefficient of variation explains the deviation in the observation around its mean value over a period.

CV (percent) = (Standard deviation/mean)*100

Chapter 3: Insights from Baseline Surveys

The baseline survey was conducted in 2007–08 with the sample described in Chapter 2. The survey was conducted immediately after the cropping season of 2007–08 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 vis-à-vis other competing crops, sources of information about technology, trait preferences and gender issues.

3.1 Karnataka

The details of the baseline survey pertaining to the Karnataka sample are discussed first in this section.

3.1.1 Socioeconomic profile of Karnataka sample

Table 3.1 Socioeconomic profile of sample farmers in Karnataka, 2007–08.

	Raichur		Chitradurga		Pooled	
Socioeconomic Issue	A	C	A	C	A	C
Male-headed Households (%)	100	100	99	99	99	99
Household Size (No)	8	7	6	6	7	7
Male Workers(No)	3	2	2	2	2.50	2
Female Workers (No)	2	2	1.2	1.2	1.6	1.6
Dependency Ratio*	0.6	0.75	0.88	0.88	0.71	0.94
Age of Household-head (Years)	42	36	48	46	45	41
Education Level of Household-head (No. of years)	9	4	7	7	8	6
Participation in Local Bodies (%)	11	7	11	11	11	9
Proportion Belonging to Forward Castes (%)	6	0	8	10	7	5
Proportion Belonging to Religious Minorities (%)	14	2	2	2	8	2
Proportion with Agriculture as the Main Occupation (%)	96	93	94	93	95	93
Proportion with Business/Service as Main/ Secondary Occupation (%)	23	11	15	15	19	13
Ownership of Two-wheelers/Bicycles (%)	45	22	37	44	41	33
Ownership of Television Sets (%)	34	6	60	54	47	30
Ownership of Radio/Tape Recorders (%)	31	14	5	2	18	8

* Dependency Ratio= (Size of Family–Number of Workers)/Number of Workers

A: Adopted (Treatment) Village C: Control (Non-Treatment) Village

All the sample households in the district of Raichur are patriarchal (see Table 3.1). The situation is almost the same in Chitradurga whereby a mere 1% of the households are matriarchal. The average size of households was larger in Raichur, with the adopted villages reporting eight family-members, and the control villages having an average family-size of seven. The household size was smaller in Chitradurga in that it averaged six members in both adopted and control villages. The number of workers in the adopted villages of Raichur was also higher at five, comprising three male and two female workers, while there were four workers, two male and two female in control villages. Hence, the dependency ratio was low at 0.6 in adopted villages and 0.75 in control villages. In Chitradurga, on the other hand, there were two male workers and 1.2 female workers in both the adopted and control villages, and the dependency ratio worked out to 0.88 in the district. The average age of the head of the household was lower in Raichur. In adopted villages, it was 42, and much lower at 36 in the sample from the control villages. Contrarily, the average age of a household head was much higher in Chitradurga at 48 years in adopted villages and 46 years in control villages. The household head in the adopted villages of Raichur was more educated, with nine years of schooling. The household head in control villages received only four years of schooling. The head of the household in both the adopted and control villages of Chitradurga had the same level of education with seven years of schooling. About 11% of the household heads participated in local bodies in the adopted villages of both Raichur and Chitradurga districts and in the control villages of Chitradurga. But only 7% of them from the control villages of Raichur had participation in local bodies. Less than 10% of the sample households belonged to forward communities in all the four groups of villages from the two districts. Religious minorities were well represented at 14% in the sample from the adopted villages of Raichur. In the other three groups of villages, their representation was much lower at 2%.

Almost 94% of the households in the adopted villages of both the districts depended on farming as the main source of income. In the control villages of both districts on the other hand, this dependence on farming was slightly lower at 93%. However, as many as 23% of the households in the adopted villages of Raichur depended on the business or service sector as their main or secondary source of income. This proportion was lower at 11% in the case of the sample households of control villages in the same district. In the case of Chitradurga, 15% of sample households from both the adopted and control villages derived some income from business or service. The contrast between the adopted and control villages of Raichur district was stark, as seen in the ownership of two-wheelers/cycles, television sets and radio/tape recorders. Those from the control villages of Raichur lagged far behind their counterparts from the adopted villages. However, the ownership of these consumer durables was more uniform between the adopted and control villages of Chitradurga. Thus, it can be concluded there was greater uniformity between sample households from the adopted and control villages of Chitradurga, but there was sharp contrast between these two groups of villages in Raichur district with respect to education, income sources and with regard to the possession of consumer durables. The sample households from the control villages of Raichur lagged far behind those from adopted villages in the aforementioned respects.

3.1.2 Assets and liabilities

The sample farmers from both adopted and control villages owned the same quantity of land in Raichur (see Table 3.2). But the farmers from the adopted villages cultivated all the land and had a higher proportion of irrigated land. Due to these reasons, the average value of land owned by them was higher at Rs 546,000. But in the case of control villages, 0.81 ha land was kept fallow and a smaller fraction of the total land was irrigated. So the average value of land owned by sample

farmers in control villages was only Rs 463,000 in comparison. In the case of Chitradurga, sample farmers from the control villages owned more land and also had a higher fraction of irrigated land. The value of land owned by sample farmers in the adopted villages of Chitradurga district was lower by Rs 50,000 when compared with the same in the control villages. Unlike in Raichur, where fallow land was valued at a price slightly lower than that of rain-fed land, the fallow land in Chitradurga district was valued at zero price.

Table 3.2 Value of land owned by sample farmers in Karnataka, 2007–08.

	Raichur				Chitradurga			
	Adopted		Control		Adopted		Control	
Type of Land	Area (ha)	Value (Rs 000)	Area (ha)	Value (Rs 000)	Area (ha)	Value (Rs 000)	Area (ha)	Value (Rs 000)
Irrigated Land	2.02	424	1.62	340	0.49	54	0.82	66
Rain-fed Land	1.62	122	1.21	91	2.97	242	3.33	280
Fallow Land	0	0	0.81	32	0.15	0	0.32	0
Total Land	3.64	546	3.64	463	3.61	296	4.74	346

Table 3.3 Value of livestock owned by sample farmers in Karnataka, 2007–08 (Rs/HH).

	Raichur				Chitradurga			
	Adopted		Control		Adopted		Control	
Type of Livestock	Number	Value	Number	Value	Number	Value	Number	Value
Draft Animals	0.86	10,650	1.28	14,750	0.98	12,956	1.18	14,889
Cows	1.06	9,950	1.14	11,025	0.99	8,827	1.02	10,422
Buffaloes	0.52	4,106	0.58	6,240	0.72	3,806	1.16	5,644
Others	3.86	6,838	2.40	4,120	4.55	10,060	9.62	38,738
Total Livestock	6.30	31,544	5.40	36,135	7.24	35,647	12.98	69,693

The details of livestock owned by sample farmers in the four groups of villages and their values are furnished in Table 3.3. The sample farmers own very few draft- and milk-yielding animals, but possess other animals like sheep and goats. In Raichur the sample farms of the adopted villages own more livestock, but the value of animals possessed by sample farms in the control villages was higher. In Chitradurga, the sample farms of the control villages had more animals as well as a higher value of livestock when compared with those from the adopted villages. In particular, the sample farms of the control villages had a higher number of small ruminants.

Table 3.4 Value of farm implements owned by sample farmers in Karnataka, 2007–08 (Rs/HH).

Type of Implement	Raichur				Chitradurga			
	Adopted		Control		Adopted		Control	
	Number	Value	Number	Value	Number	Value	Number	Value
Tractor and Accessories	0.05	16,670	0.09	36,670	0.06	22,222	0.07	20,222
Electrical Pump-sets	0.12	4,972	0.17	5,840	0.42	25,167	0.51	24,578
Bullock-drawn Tools	0.14	1,290	0.11	1,120	0.31	5,322	0.38	7,089
Other Tools	0.74	10,340	0.86	11,880	0.36	8,880	0.27	4,978
Total Farm-implements	1.05	33,272	1.23	55,570	1.15	61,591	1.23	56,867

In the ownership of farm machinery and implements, the control villages of Raichur were better placed with respect to both the number and value (see Table 3.4). But, in Chitradurga, sample farms of the adopted villages owned farm implements valued higher than those of the control villages, although the latter had a larger number of farm implements.

Table 3.5 Value of consumer durables owned by sample farmers in Karnataka, 2007–08.

Type of Consumer Durables	Raichur (Rs/HH)				Chitradurga (Rs/HH)			
	Adopted		Control		Adopted		Control	
	No.	Value	No.	Value	No.	Value	No.	Value
Residential house	0.92	90,285	0.86	44,982	0.96	120,222	0.94	103,289
Cattle Shed	0.52	8,658	0.15	997	0.47	8,522	0.51	8,467
Cycle/Two-wheelers	0.14	3,379	0.12	3,285	0.37	11,910	0.44	11,307
Others	0.70	2,255	0.45	984	1.31	5,633	1.71	8,196
Total Consumer Durables	2.28	104,577	1.58	50,248	3.11	146,287	3.60	131,258

The sample farms of the adopted villages in Raichur had more durable assets than their counterparts in the control villages (see Table 3.5). The value of their residential house and other durable assets was more than twice that of the assets owned by farmers in the control villages. In the case of Chitradurga, adopted villages had a higher value of durable assets than the control villages, while the latter owned a larger number of durable assets.

Table 3.6 Financial liabilities and assets of sample farmers in Karnataka, 2007–08.

Financial Liabilities and Assets	Raichur (Rs/HH)		Chitradurga (Rs/HH)	
	Adopted	Control	Adopted	Control
Borrowings (-)	149,556	203,386	42,576	58,811
Lendings (+)	40,000	70,000	3,723	4,378
Savings (+)	25,000	35,000	3,876	5,284
Net Liabilities	84,556	98,386	34,977	49,149

In both Raichur and Chitradurga, it was observed that the adopted villages had lower rates of borrowing as compared to the control villages. In general, the extent of borrowing was much higher in Raichur than in Chitradurga. The sample farms from both the adopted and control villages of Raichur also reported much higher figures for lendings and savings when compared to those from Chitradurga. Yet, the net liabilities in case of Raichur were about twice as much as in Chitradurga.

Table 3.7: Net worth of sample farmers in Karnataka, 2007–08 (Rs '000/HH).

Assets and Liabilities	Raichur		Chitradurga	
	Adopted	Control	Adopted	Control
Value of Land	546	463	296	346
Value of Livestock	32	36	36	70
Value of Farm Implements	33	56	62	57
Value of Consumer durables	105	50	146	131
Total Assets	716	605	540	604
Net Liabilities	85	98	35	49
Net worth	631	507	505	555

Table 3.7 tabulates the value of the assets and liabilities of sample farmers that were detailed in Tables 3.2 through 3.6. The total assets were highest in the case of sample farms of the adopted villages of Raichur. They were higher than those of the control villages in Raichur as well as higher than the total assets of the adopted villages in Chitradurga. In Chitradurga, the assets of farmers from the control villages were higher than those of the farmers in the adopted villages, mainly on account of the higher values of land and livestock. The assets of sample farms in the control villages of both the districts were about the same, but the net worth of farms was higher in case of the control villages of Chitradurga, due to higher net-liabilities in the Raichur sample. The sample farms of the adopted villages in Raichur possessed the highest net worth, followed by the control villages of Chitradurga, the control villages of Raichur and the adopted villages of Chitradurga, in that order.

3.1.3 Income and expenditure of sample farmers

Table 3.8 Net household-income of sample farmers in Karnataka, 2007–08 (Rs/Year).

	Raichur		Chitradurga	
Source of income	Adopted	Control	Adopted	Control
Income from Crops	32,742	23,358	25,911	33,489
Farm Work (Labor Earnings)	9,055	7,201	1,681	2,222
Non-farm Work (Labor Earnings)	1,152	1,000	228	300
Regular Farm Servant (RFS)	600	0	300	0
Livestock (Milk and Milk-products Selling)	5,171	6,998	8,621	5,393
Income from Hiring Bullocks	500	166	1,631	1,656
Income from Selling Sheep, Goat, Chicken, Meat, Eggs etc	6,551	3,981	4,405	3,027
Selling of Water for Agriculture Purpose	333	0	0	222
Selling CPR (Firewood, Fruits, Stones and mats etc)	0	0	0	0
Selling Handicrafts (Specify)	0	0	0	0
Rental Income (Tractor, Auto, Sprayer, Truck etc)	167	667	3,633	2,844
Rent from Land, Building and Machinery etc	433	0	422	0
Caste Occupations (Specify)	600	0	609	67
Business (Specify)	833	1,000	2,522	2,333
Regular Salaried jobs (Govt./Private)	500	0	9,256	10,244
Out-migration	4,222	1,833	0	0
Remittances	0	1,000	533	0
Interest on Savings and from Moneylending	2,217	2,000	554	611
Gifts in Cash and Kind, Including Dowry Received	667	0	0	0
Pension from Employer	200	4,000	53	0
Government Welfare/Development Programs	800	400	0	0
Others 1	500	0	167	0
Others 2	500	0	0	0
Grand Total	67,743	53,604	60,526	62,408

The net household-income of sample farms from the adopted villages of Raichur was the highest (see Table 3.8) among the four villages. There was a substantial difference of 26.4% in their net

household-income in comparison with that of the control villages in Raichur, which reported the lowest income of Rs 53,604 per year. The net household-incomes of the sample farms from the control villages of Chitradurga were marginally higher by 3.1%. Earnings from crops were the single-most important source of income in case of all the four village-groups. Income from livestock, labor hiring, hiring out of capital assets, business, service and benefits from government welfare-programs also contributed significantly to the total household-income.

Table 3.9 Consumption expenditure of sample farmers in Karnataka, 2007–08 (Rs/Year).

	Raichur		Chitradurga	
Food Item	Adopted	Control	Adopted	Control
Cereals	7,000	8,000	6,000	6,000
Pulses	3,000	4,000	2,500	2,000
Milk and Milk Products	8,000	5,000	2,500	3,700
Edible Oils	4,000	3,000	2,700	3,400
Non-Veg. Foods	1,000	1,000	1,800	2,800
Fruits and Vegetables	3,000	3,000	2,300	3,900
Others	5,000	4,000	2,300	3,000
Total Food Expenditure	31,000	28,000	20,100	24,800
Health	4,000	6,000	3,000	3,000
Education	4,000	5,000	4,000	5,000
Entertainment and Travel	1,000	1,000	1,000	2,000
Clothing and Shoes	5,000	5,000	4,000	5,000
Ceremonies	3,000	4,000	1,000	1,000
Alcohol and Cigarettes	2,000	2,000	500	1,300
Cosmetics	1,000	1,000	1,400	1,400
Others	3,000	1,500	9,100	8,300
Total Non-food	23,000	25,500	24,000	27,000
Total Expenditure	54,000	53,500	44,100	51,800

The annual consumption-expenditure of sample households was also the highest in case of the adopted villages of Raichur (see Table 3.9). However, the consumption expenditure in the control villages was almost equal to the level in the adopted villages, unlike in the case of income where the difference between them was substantial. The expenditure on food was higher than the expenditure on non-food items in both the adopted and control villages of Raichur. The consumption expenditure was minimal in the adopted villages of Chitradurga. It is 17.5% lower than that in control villages of the same district. In both the adopted and control villages of Chitradurga, expenditure was incurred more on non-food items, as compared to food.

3.1.4 Cropping pattern and groundnut varieties

Table 3.10 Relative importance of groundnut in cropped area of Karnataka sample, 2007–08.

	Raichur Sample		Chitradurga Sample		Pooled Sample	
Cropped Area	A	C	A	C	A	C
Rainy-season Cropped Area (ha)	146	75	149	73	295	148
Post-rainy-season Cropped Area (ha)	121	58	62	27	183	85
Area under Rainy-season Groundnut (ha)	23	15	109	54	132	69
Groundnut Area under Post-rainy-season (ha)	77	41	0	0	77	41
Proportion of Groundnut Area to Total Cropped Area (%)	38	42	58	54	44	47

A: Adopted (treatment) Village
C: Control (non-treatment) Village

The relative importance of groundnut in the cropping pattern of the Karnataka sample-farms is presented in Table 3.10. In Raichur, crops are grown in both rainy and post-rainy seasons. Groundnut is also grown in both seasons, but it is predominantly a post-rainy season crop. The area under groundnut accounts for 38% of the total cropped-area in the adopted villages of Raichur. Its share in the control villages is even higher at 42%. Groundnut has a more prominent place in the cropping pattern of Chitradurga. It is grown only during the rainy season, mainly under a rain-fed situation. The area under groundnut area constituted 58% of the total cropped-area in the adopted villages, and 54% of the total cropped-area in the control villages of Chitradurga.

Table 3.11 Composition of groundnut varieties in Karnataka sample, 2007–08 (ha).

	Raichur Sample		Chitradurga Sample		Pooled Sample	
Variety	Adopted	Control	Adopted	Control	Adopted	Control
TMV-2	100	56	109	54	209	110
ICGV91114	0	0	0	0	0	0
R2001-2	0	0	0	0	0	0
ICGV00350	0	0	0	0	0	0
Total	100	56	109	54	209	110

The groundnut cropped-area in the study districts of Raichur and Chitradurga in Karnataka was wholly under a single variety, namely, TMV-2 during 2007–08 (see Table 3.11). This was the case for both the adopted and control villages of the two study districts. R2001-2, which was released a few years ago, failed to make any dent despite its high-yield potential. The lack of preference of this variety in the market is due to its undesirable pod characteristics. Additionally, it is not backed up by the seed-production and distribution system in Karnataka. Similarly, ICGV91114 has not made any

headway, despite desired characteristics like short duration, tolerance to drought, moderate levels of resistance to rust and leaf-spots, and good pod and kernel traits, as well as due to lack of support from the seed production and distribution chain.

Table 3.12 Productivity levels of groundnut (kg/ha) perceived by Karnataka sample, 2007–08.

Perceived Yield	Raichur Sample		Chitradurga Sample		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Rain-fed						
Good	1,023	615	852	830	938	723
Bad	608	435	515	548	562	492
Best	1,195	818	975	1,025	1,135	922
Irrigated						
Good	1,635	1,084	1,370	1,276	1,503	1,180
Bad	1,099	714	1,020	985	1,058	850
Best	2,066	1,307	1,750	1,560	1,908	1,434

The perceived yield of groundnut under different weather scenarios by the sample farmers in 2007–08 is presented in Table 3.12. The yield level is relatively higher in Raichur than in Chitradurga for any comparable weather situation. The yield levels perceived by the groundnut farmers in the adopted villages of Raichur were much higher than those perceived by farmers in the control villages. But the yield perceived by farmers in the adopted and control villages of Chitradurga was around the same. Under good weather conditions, the perceived groundnut-yield ranged between 615–1023 kg/ha. This yield could go down to anything between 435–608 kg/ha if the weather conditions are unfavorable. The best possible yield would be between 818–1195 kg/ha. Under irrigated situations, a good yield can range between 1084–1635 kg/ha. Even under bad weather conditions, the yields would stay within the range of 714–1099 kg/ha. The best yet most feasible yield is perceived to range between 1307–2066 kg/ha. Since the yield level in any season is prone to be influenced by the prevailing weather situation, the perceived yield under alternate weather situations provides the entire range of possible yield in different weather situations. They reflect the considerable experience of the farmers with the crop.

3.1.5 The economics of groundnut and other crops

The perceived gross-returns from the normally grown crops in the sample villages are furnished in Table 3.13. In the adopted villages of Raichur, irrigated groundnut was perceived to be the most-profitable crop, followed by paddy and cotton. Groundnut, as a rain-fed crop, was perceived to give higher gross-returns than all the other rain-fed crops like sunflower, pigeonpea and sorghum. In the control villages of Raichur, irrigated groundnut was perceived to give lower returns than paddy, but more returns than cotton. Groundnut under rain-fed conditions was perceived to give better gross-returns than sunflower, pigeonpea and sorghum. In both the adopted and control villages of Chitradurga, groundnut under rain-fed conditions was perceived to give higher gross-returns than paddy. Similarly, groundnut grown under rain-fed conditions is believed to give better returns than

both sunflower and pigeonpea. These perceived returns indicate that the sample farms in both districts feel that groundnut is the crop believed to be yielding the highest gross-returns when compared with alternative crops. However, since the cost of seed and other cultivation expenses are also higher in case of groundnut, we cannot infer anything about its net profitability.

Table 3.13 Gross returns from different crops grown by sample farmers in Karnataka, 2007–08 (Rs '000/ha).

Gross Income from Crop	Raichur Sample		Chitradurga Sample		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Paddy	28	26	24	22	26	24
Groundnut (Rain-fed)	18	15	18	17	18	16
Sorghum	10	10	-	-	10	10
Groundnut(Irrigated)	30	23	28	27	29	25
Sunflower	14	12	16	14	15	13
Pigeonpea	12	10	14	14	13	12
Cotton	24	22	-	-	24	22

Table 3.14 Economics of rain-fed and irrigated groundnut in the sample farms of Karnataka, 2007–08.

Cost / Returns	Raichur (Rs/ha)		Chitradurga (Rs/ha)	
	Adopted	Control	Adopted	Control
Rain-fed (TMV-2)				
Yield (kg/ha)	1,114	1,031	792	762
COC(Rs/ha)	24,137	22,902	14,747	14,166
Gross Returns(Rs/ha)	29,991	27,757	19,716	18,754
Net returns (Rs/ha)	5,854	4,855	4,969	4,588
BCR	1.24	1.21	1.34	1.32
Irrigated (TMV-2)				
Yield (kg/ha)	1,322	1,258	NA	NA
COC (Rs/ha)	26,153	24,812	NA	NA
Gross returns (Rs/ha)	35,591	33,867	NA	NA
Net returns (Rs/ha)	9,438	9,055	NA	NA
BCR	1.36	1.37	NA	NA

The economics of groundnut cultivation in the sample villages of the two districts are given in Table 3.14. The costs of cultivation, groundnut-yield levels as well as the net returns were higher in Raichur than in Chitradurga. The benefit/cost ratios were higher in Chitradurga because of lower cost of cultivation. Under a rain-fed situation, the net returns as well as the benefit/cost ratio were higher in the adopted villages of Raichur than in the control villages. The yield levels as well as the costs of cultivation were higher when groundnut was grown with irrigation support. Despite it, the net returns as well as the benefit/cost ratios were higher for irrigated groundnut in Raichur as compared to rain-fed groundnut.

3.1.6 Sources of information

Table 3.15 Sources of information on technology to sample farmers in Karnataka, 2007–08 (% farmers getting information from the source).

Sources of Information	Raichur		Chitradurga	
	Adopted	Control	Adopted	Control
TV	36 (5)	37(5)	36 (4)	34 (4)
Radio	20 (6)	18 (6)	12 (6)	10 (6)
Newspaper	8 (8)	9 (8)	8 (7)	8 (7)
Agriculture Magazine/ Agricultural Extension Staff	56 (2)	58 (2)	57 (2)	53 (2)
Other Farmers	40 (4)	39 (4)	29 (5)	30 (5)
Friends/Relatives	60(1)	60 (1)	64 (1)	62(1)
Input Supplier	50 (3)	45 (3)	45 (3)	46 (3)
Research Institute	11 (7)	13 (7)	4 (8)	5 (8)

(Figures in parentheses indicate rank of importance as source of information)

Friends/relatives emerged as the most important sources of information on technology in both the adopted and control villages of Raichur and Chitradurga (see Table 3.15). Agricultural magazines/ agricultural extension staff was the next most-important source of information across all the sample villages. Input suppliers occupied the third place. Other farmers, along with television, also provided information on technology to a considerable number of farmers. Research institutes and other mass-media sources, like radio and newspapers, also gave information on technology to some farmers in the sample.

3.1.7 Preferred traits of groundnut and price premiums

The most desired agronomic or production trait in groundnut, as indicated by the preferences of the sample farmers, was high yield (see Table 3.16). It was observed as the most-preferred trait by the sample farmers from the adopted villages in Raichur and the control villages of both Raichur and Chitradurga. The sample farmers from the adopted villages of Chitradurga, however, assigned the top rank to drought resistance out of all the traits. Pest and disease resistance as well as high oil-content were the other desired traits as rated by most of the sample farmers, indicated by the

Garrett scores. Short duration, high recovery and the ability to fit into the cropping system are the other traits desired by the sample farmers.

Table 3.16 Farmer-preferred traits of groundnut in Karnataka, 2007–08 (Garrett scores).

	Raichur		Chitradurga	
Traits	Adopted	Control	Adopted	Control
High Yield	72 (1)	70 (1)	39 (2)	68 (1)
Short Duration	8 (7)	9 (7)	4 (8)	12 (6)
Disease Resistance	45 (3)	51 (3)	32 (3)	49 (3)
Pest Resistance	51 (2)	59 (2)	27 (4)	50 (2)
Drought Resistance	13 (6)	11 (6)	42 (1)	11 (7)
High Recovery	34 (5)	37 (5)	22 (6)	31 (5)
High Oil-content	36 (4)	39 (4)	17 (7)	35 (4)
Fits into Cropping System	6 (8)	7 (8)	4 (8)	6 (8)

(Figures in parentheses represent ranks in descending order of importance)

Table 3.17 Market traits preferred by groundnut sample-farmers in Karnataka, 2007–08 (Garrett scores).

	Raichur		Chitradurga	
Market Preferred	Adopted	Control	Adopted	Control
High demand (preference by traders for commercial purpose)	54 (2)	51 (2)	48 (2)	46 (2)
Fetches High Price	28 (3)	35 (3)	30 (3)	39 (3)
Less Price-Fluctuations	12 (4)	13 (4)	16 (4)	18 (4)
Bigger Kernel-Size	57 (1)	57 (1)	60 (1)	56 (1)

(Figures in parentheses represent ranks in descending order of importance)

Among all the market traits in consideration, bigger kernel-size was the most preferred one by the sample farmers from all the four groups of villages (see Table 3.17). The next most-preferred trait was that of the high-demand varieties in the market. Those varieties which fetch a good market-price and those that face fewer price-fluctuations were also preferred by the sample farmers.

As indicated by the table on preferred agronomic and market traits, sample farmers indicated their willingness to pay the most for those varieties which incorporate both the desired traits of high yield and bigger kernel-size (see Table 3.18). Farmers across all the village groups expressed their willingness to pay between 13 and 18% more than the existing market-price for the combination of these traits in a single variety. Farmers also indicated their readiness to pay 10 to 11% more for the

seeds incorporating each of the desired traits of high recovery and high oil-content. Farmers were ready to pay about 10% more for the seeds that incorporated pest and disease resistance. It was also reported that farmers were ready to pay about 5% more for each of the other desired traits like drought resistance, better quality and better taste.

Table 3.18 Price premium which farmers are willing to pay for groundnut-seed traits in Karnataka, 2007–08 (Percentage over the prevalent seed price).

	Raichur		Chitradurga	
Traits	Adopted	Control	Adopted	Control
Better Quality	8	9	7	5
Better Taste	5	4	6	7
Better Yield	13	15	14	16
Bigger Kernel-Size	13	15	16	18
Disease and Pest Resistance	8	10	12	10
Drought Resistance	5	3	6	8
High Recovery	12	6	14	11
High Oil-Content	10	8	12	9

3.1.8 Gender analysis

Asset ownership was predominantly the mandate of the male members of the sample households (see Table 3.19). Almost all of the irrigated land and most of the rain-fed land were owned by the male members of the sample households. Women owned land in only 5% of the sample households. However, in case of livestock, about a third of the animals were owned by the female members of the households. But, like land, almost all the farm machinery was owned by the male members.

Table 3.19 Ownership of assets by gender, Karnataka sample, 2007–08.

		Raichur		Chitradurga	
Resource	Gender	Adopted	Control	Adopted	Control
Irrigated Land	Female (No.)	1	0	1	0
	Male (No.)	89	45	89	45
Rain-fed Land	Female (No.)	7	2	4	0
	Male (No.)	83	43	86	45
Livestock	Female (No.)	21	16	44	11
	Male (No.)	69	29	46	34
Machinery	Female (No.)	0	0	1	1
	Male (No.)	90	45	89	44

Since the ownership of assets was heavily skewed in favor of the male members of the sample households, these male members were normally the decision-makers with respect to the use of assets as well as regarding agricultural operations (see Table 3.20). It must be noted, however, in case of social aspects like household maintenance, education of children as well as the marriages of children, the decisions were taken jointly by both male and female members. In case of the adopted villages of Chitradurga, male members are content with the delegation of responsibility of household maintenance to the female members. The same was the case with the control villages of Chitradurga also, to a certain extent. Thus, it may be concluded that women had a greater say in running the affairs of the house in Chitradurga than in Raichur.

Table 3.20 Decision-making by gender, Karnataka sample, 2007–08.

		Raichur		Chitradurga	
Resource	Gender	Adopted	Control	Adopted	Control
	Female (No.)	1	0	1	0
Irrigated Land	Male (No.)	73	4	8	3
	Both (No.)	16	41	81	42
	Female (No.)	1	0	1	0
Rain-fed Land	Male (No.)	73	36	86	42
	Both (No.)	16	9	3	3
	Female (No.)	14	13	65	14
Livestock	Male (No.)	73	28	14	18
	Both (No.)	3	4	11	13
	Female (No.)	2	1	2	4
Machinery	Male (No.)	60	29	52	28
	Both (No.)	28	15	36	13
	Female (No.)	11	5	10	8
Labor Use	Male (No.)	71	38	66	32
	Both (No.)	8	2	14	5
	Female (No.)	1	0	2	1
Children's Marriage	Male (No.)	13	7	1	11
	Both (No.)	76	38	87	33
	Female (No.)	4	0	2	1
Education of Children	Male (No.)	31	15	23	18
	Both (No.)	55	30	65	26
	Female (No.)	9	5	76	19
Household Maintenance	Male (No.)	16	9	7	7
	Both (No.)	65	31	7	19

Field-cleaning and hand-weeding operations were carried out mainly by the female members of the sample households in all the four groups of villages (see Table 3.21). They also contributed a major share of labor in pod-separation and harvesting the main crop as compared to the male members across all four groups of villages. However, other operations like field-preparation, sowing of the seeds, fertilizer-application and plant-protection, are largely carried out by men, with the assistance of women in some cases. Thus, women do contribute substantially to operations in the field in the case of groundnut in all the study villages. Notwithstanding male domination in the ownership of assets and decision-making regarding their use, women do still contribute a significant share of labor, and both men and women take decisions jointly with respect to household maintenance and their children's future. A study by Padmaja et al. (2006) revealed that women's employment opportunities significantly improved with the introduction of improved technology. No perceptible differences were noticed between men and women in the selection of groundnut varieties.

Table 3.21 Performance of operations by gender, Karnataka sample, 2007–08.

		Raichur		Chitradurga	
Operation	Gender	Adopted	Control	Adopted	Control
Field-cleaning	By Female (%)	53	56	65	65
	By Male (%)	2	2	7	7
	Jointly (%)	45	42	28	28
Land-preparation	By Female (%)	0	0	8	8
	By Male (%)	78	80	66	70
	Jointly (%)	22	20	26	22
Sowing Seed	By Female (%)	0	0	3	3
	By Male (%)	79	67	29	30
	Jointly (%)	21	33	68	67
Hand-weeding	By Female (%)	73	80	97	93
	By Male (%)	2	4	1	3
	Jointly (%)	25	16	2	4
Fertilizer-application	By Female (%)	1	0	66	62
	By Male (%)	76	91	15	17
	Jointly (%)	23	9	19	11
Plant-protection Measures	By Female (%)	0	0	2	2
	By Male (%)	89	96	87	85
	Jointly (%)	11	4	11	13
Harvesting Main Crop	By Female (%)	11	4	9	7
	By Male (%)	10	13	3	4
	Jointly (%)	79	83	88	89
Pod-separation	By Female (%)	51	64	73	73
	By Male (%)	0	4	1	1
	Jointly (%)	49	32	26	26

3.2 Tamil Nadu

3.2.1 Socioeconomic profile of the Tamil Nadu sample

Almost all the sample households were patriarchal in the adopted villages of Erode, and in the adopted and control villages of Thiruvannamalai (see Table 3.22). But, in case of the control villages of Erode, 11% of the households were headed by females. The family size was larger in the Thiruvannamalai sample at an average of 5.7 members as against the Erode sample, which averaged 4.7 members. There were also more workers and fewer dependents in Thiruvannamalai than in Erode. As a result, the dependency ratio in Thiruvannamalai was about half of that of Erode. The sample farmers of the adopted villages of Erode were more aged by 4–5 years as compared to the other three groups of villages.

Table 3.22 Socioeconomic profile of sample farmers in Tamil Nadu, 2007–08.

Socioeconomic Issue	Erode Sample		Thiruvannamalai Sample		Pooled Sample	
	A	C	A	C	A	C
Male-headed households (%)	100	89	99	100	100	95
Household Size (No)	4.9	4.3	5.6	5.8	5.3	5.1
Male Workers	1.6	1.5	2.6	2.8	2.1	2.2
Female Workers	1.2	1.2	1.8	1.5	1.5	1.4
Dependency Ratio*	0.75	0.59	0.27	0.35	0.47	0.42
Age of Household-head (Years)	51	46	47	46	49	46
Education Level of Household-head (No. of years)	6.4	7.0	5.3	6.2	5.9	6.6
Participation in Local Bodies (%)	3	2	4	2	4	2
Proportion Belonging to Forward Castes (%)	0	0	0	0	0	0
Proportion Belonging to Religious Minorities (%)	0	0	0	4	0	2
Proportion with Agriculture as the Main Occupation (%)	97	89	100	100	99	95
Proportion with Business/Service As Main/Secondary Occupation	9	33	18	16	14	25
Ownership of Two-wheelers/Bicycles (%)	100	88	94	86	97	87
Ownership of Television Sets (%)	100	88	44	79	72	84
Ownership of Radio/Tape Recorder	57	94	6	43	32	69

*Dependency Ratio = (Household Size–Number of Workers)/Number of Workers

A: Adopted Village; C: Control Village

The education level of the sample households in Erode was a shade better than the corresponding level in the Thiruvannamalai sample. Hardly 2 to 4% of the sample farmers in both the districts participated in local bodies, and none of the sample households in either of the two districts belonged to the forward communities. Virtually all the sample farmers from both the districts were Hindus, except for 4% from the control villages of Thiruvannamalai, who belonged to a minority community.

Almost all the sample households relied on farming as their primary source of income. But, in the control villages of Erode, about 11% of the sample households earned primarily from sources other than farming. In these villages, as many as one-third of the sample households depended on business/service as their main or secondary source of income. In Thiruvannamalai, 18% of the sample households from the adopted villages and 16% of those from the control villages depended on business/service as their main/secondary source of income. The proportion of households that depended on business/service as their main/secondary source of income was only 9% in the adopted villages of Erode. Virtually all the households of the sample possessed two-wheelers/ bicycles. But the sample farmers of Erode had near-universal access to television sets/radios, while those from Thiruvannamalai had comparatively limited access to them. Those sample households from control villages had better access to television sets/radios than those from the adopted villages.

3.2.2 Assets and Liabilities

Table 3.23 Value of land owned by sample farmers in Tamil Nadu, 2007–08.

	Erode				Thiruvannamalai			
	Adopted		Control		Adopted		Control	
Type of Land	Area (ha)	Value (Rs 000)	Area (ha)	Value (Rs 000)	Area (ha)	Value (Rs 000)	Area (ha)	Value (Rs 000)
Irrigated Land	1.32	765	0.61	287	1.11	775	1.34	636
Rain-fed Land	0.31	50	0.40	202	0.20	39	0.05	26
Fallow Land	-	-	-	-	-	-	-	-
Total Land	1.63	815	1.01	489	1.31	814	1.39	662

In Erode, the average size of holding as well as the value of land was much higher in the case of the sample households from the adopted villages than those from the control villages (see Table 3.23). In the case of Thiruvannamalai, the sample households from the control villages possessed marginally larger holdings, but the value of land was much higher in the case of the adopted villages.

Table 3.24 Value of livestock owned by sample farmers in Tamil Nadu, 2007–08.

	Erode (Rs/HH)				Thiruvannamalai (Rs/HH)			
	Adopted		Control		Adopted		Control	
Type of Livestock	Number	Value (Rs)	Number	Value (Rs)	Number	Value (Rs)	Number	Value (Rs)
Draft Animals	0.29	2,049	0.07	511	0.06	4,917	0.91	7,733
Cows	1.88	21,047	1.69	16,822	1.62	10,328	1.62	12,222
Buffaloes	0.41	4,094	0.18	2,022	0.06	400	0.31	522
Others	8.48	25,153	6.64	9,489	2.11	2,251	3.07	2,656
Total Livestock	11.06	52,343	8.58	28,844	3.85	17,896	5.91	23,133

The sample households from the adopted villages of Erode owned more livestock than those from the control villages of the district (see Table 3.24). The value of livestock was also much higher in case of the sample households from the control villages. Comparatively, the sample households from Thiruvannamalai lagged behind those from Erode, both in the number as well as in the value of livestock owned. Among the sample farmers from Thiruvannamalai, those from control villages had a higher number as well as higher value of livestock than those from the adopted villages.

Table 3.25 Value of farm implements owned by sample farmers in Tamil Nadu, 2007–08.

	Erode (Rs/HH)				Thiruvannamalai (Rs/HH)			
	Adopted		Control		Adopted		Control	
Type of Implement	Number	Value (Rs)	Number	Value (Rs)	Number	Value (Rs)	Number	Value (Rs)
Tractor and Accessories	0	0	0	0	0	0	0	0
Electrical Pump-sets	1.37	30,556	0.44	13,400	0.9	27,467	1.04	18,133
Bullock-drawn Tools	0.04	400	0	0	0	0	0.09	933
Other Tools	2	2,595	0.58	1,064	2.17	738	2.07	652
Total farm implements	3.41	33,551	1.02	14,464	3.07	28,205	3.2	19,718

In both the districts, the sample households from the adopted villages owned a larger number of implements, and the value of these farm implements was also higher than their counterparts from the control villages (see Table 3.25). The sample households from the adopted villages of Erode

owned farm implements of more than twice the value of farm implements from the control villages. In the case of Thiruvannamalai also, sample farmers from the adopted villages possessed farm implements of a higher value than those from the control villages, but the difference in value was only marginal.

Table 3.26 Value of consumer durables owned by sample farmers in Tamil Nadu, 2007–08.

Type of Consumer Durables	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
	Value (Rs)	Value (Rs)	Value (Rs)	Value (Rs)
Residential House	225,356	142,533	78,967	91,000
Cattle Shed	444	0	0	0
Cycle/Two-wheelers	25,944	13,980	3,546	9,993
Others	12,264	6,639	6,094	7,334
Total Consumer Durables	264,008	163,152	88,607	108,328

The sample households from Erode possessed a larger number of consumer durables than their counterparts from Thiruvannamalai (see Table 3.26). This contrast is more visible in the value of their residential houses. Observing the Erode sample, the households from the adopted villages possessed durable assets more valuable than those owned by households from the control villages. But in Thiruvannamalai, households from the control villages owned higher-valued consumer durables than those from the adopted villages.

Table 3.27 Financial liabilities and assets of sample farmers in Tamil Nadu, 2007–08 (in Rs).

Financial Liabilities and Assets	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Borrowings (-)	14,013	4,444	18,049	24,321
Lendings (+)	4,009	1,388	2,188	4,488
Savings (+)	6,021	2,578	0	0
Net Liabilities	3,983	478	15,861	19,833

When compared with the sample households from Erode, those from Thiruvannamalai had higher borrowings (see Table 3.27). The households from the adopted villages of Erode lent more money and had more savings than those from the other three village-groups. The net liabilities were the lowest in the case of households from the control villages of Erode, followed by those from the adopted villages of the same district. The net liabilities were much higher in case of the households from Thiruvannamalai as compared to Erode, with the households from the control villages having higher net-liabilities than the adopted villages.

Table 3.28 Net worth of sample farmers in Tamil Nadu, 2007–08 (Rs '000/HH).

Assets and Liabilities	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Value of Land	815	489	814	662
Value of Livestock	52	29	18	23
Value of Farm Implements	37	16	31	27
Value of Consumer Durables	264	163	89	108
Total Assets	1,168	497	952	820
Net Liabilities	4	1	16	20
Net Worth	1,164	696	936	800

All the information on assets and liabilities from Tables 3.23 through 3.27 is presented in a consolidated format in Table 3.28. The sample households from the adopted villages of Erode had the highest net-worth among the four groups of villages. Their net worth was 67% higher than the net worth of the control villages, and 24% higher than the net worth of households from the adopted villages of Thiruvannamalai. In turn, the net worth of households from the adopted villages of Thiruvannamalai was 17% higher than that of households from the control villages. Of the four village groups, the households from the control villages of Erode had the lowest net-worth, registering 15% lower than the net worth of households from the control villages of Thiruvannamalai.

3.2.3 Income and consumption expenditure

The average annual net household-income of sample households from Erode was the highest among the four village groups (see Table 3.29). In general, the income levels were much higher in Erode than in Thiruvannamalai. The net crop-income of the households from the adopted villages of Erode was more than twice that of households from the other three groups of villages. Contributions from labor hiring, livestock sources and salaried jobs/businesses were also substantial in case of the adopted villages of Erode district; while in Erode, the contributions from livestock sources and sale of handicrafts were substantial. Net household-incomes were about the same for the households from the adopted and control villages of Thiruvannamalai. In the adopted villages, net crop-income was higher, but income from livestock sources was higher in case of the control villages with incomes from salaried jobs being substantial in both the groups of villages.

Table 3.29 Annual average net household-income of samples in Tamil Nadu, 2007–08.

Sources of Income (Rs/Year)	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Income from Crops	62,467	30,485	28,178	23,778
Farm Work (Labor Earnings)	1,344	111	2,722	2,000
Non-farm Work (Labor Earnings)	7,900	1,333	769	0
Regular Farm Servant (RFS)	989	0	0	178
Livestock (Milk and Milk-products Selling)	11,646	10,381	4,851	7,340
Income from Hiring-out Bullocks	528	1,022	411	800
Selling of Sheep and Goats	5,290	9,627	100	178
Selling of Water for Agriculture Purposes	144	0	0	0
Selling CPR (Firewood, Fruits, Stones, Mats etc)	667	178	0	0
Selling Handicrafts (Specify)	89	7,222	0	0
Rental Income (Tractor, Auto, Sprayer, Truck etc)	1,578	22	433	400
Rent from Land, Building and Machinery etc	0	0	0	489
Caste Occupations (Specify)	0	0	0	1,000
Business (Specify)	1,222	1,111	0	0
Regular Salaried Jobs (Govt./Private)	6,000	1,333	6,389	6,444
Out-migration	0	0	0	133
Interest on Savings and from Moneylending	1,539	222	0	0
Pension from Employer	22	0	800	0
Others 1	0	0	2,700	4,667
Others 2	0	0	189	0
Grand Total	101,424	63,048	47,542	47,407

The consumption expenditures were also substantially higher in Erode than in Thiruvannamalai, just as in the case of net household-incomes (see Table 3.30). While there was a substantial difference between the net household-incomes of the adopted and control villages of Erode, there was only a marginal difference in the consumption expenditure between the two sets of villages. In Erode, non-food expenditures were higher than the food expenditures in both the adopted and control villages. The expenditure on food in the adopted villages was marginally lower than in the control villages. However, the expenditure on non-food items was much higher in the adopted villages than in the control villages. In the case of Thiruvannamalai, expenditure on food items was higher than that on non-food items in both the adopted and control villages. In general, the sample households from

Thiruvannamalai spent more on cereals than their counterparts in Erode, but their expenditure on all other quality food-items was much lower than those in Erode. Thus, we can conclude that Erode households had a much higher standard-of-living that is reflected in the expenditure on quality foods and non-food items like health, education, clothing, entertainment, ceremonies etc, when compared with the expenditure on the same items in Thiruvannamalai.

Table 3.30 Consumption expenditure of sample farmers in Tamil Nadu, 2007–08 (Rs/year).

Item of Consumption	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Cereals	7,894	8,438	9,809	8,330
Pulses	2,695	2,537	1,386	1,708
Oils and Oilseeds	2,097	1,486	2,551	2,608
Non-veg. Foods	4,221	3,687	1,440	1,933
Milk and Milk Products	1,922	1,517	1,157	2,015
Fruits and Vegetables	6,974	5,231	3,408	3,424
Other Food Items	1,256	4,865	717	800
Total Food Expenditure	27,059	27,761	20,468	20,818
Health	4,859	3,642	2,121	3,371
Education	12,570	11,560	4,703	3,740
Clothing/Shoes	4,000	3,630	3,317	3,422
Toddy and Alcohol, Bidi and Cigarettes	407	363	582	293
Entertainment and Travel	6,807	5,956	978	1,130
Other Non-food Items Including Ceremonies	6,561	6,968	2,690	3,679
Total Non-food Expenditure	35,204	32,119	14,391	15,635
Total Expenditure	62,263	59,880	34,859	36,453

3.2.4 Cropping pattern and groundnut yield

The relative importance of groundnut in the cropping pattern of the sample farmers from the adopted and control villages of the two districts, Erode and Thiruvannamalai, is presented in Table 3.31. In the adopted villages of Erode, groundnut (as both sole and inter-crop) had a share of 80.6%. Maize and millets were the other crops that have a considerable area share of 6.7%. The share of groundnut was slightly lower at 79.5% in the cropped area of the control villages of Erode. The control villages of Thiruvannamalai had the highest proportion of groundnut with 92.1% in the gross cropped-area. This share was a little lower at 86.86% in the adopted villages of the same district. In all the four groups of villages, groundnut was the dominant crop with more than four-fifths of the cropped area.

Table 3.31 Relative importance of groundnut in cropped areas, Tamil Nadu sample, 2007–08.

Crop area in ha	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Paddy	-	-	9	2
Maize	15	5	2	-
Other Millets	12	4	-	1
Groundnut (Sole)	104	44	81	49
Groundnut (Intercropped)	46	18	38	21
Sesame	3	4	4	2
Other Pulses	2	1	1	1
Sugarcane	1	-	-	-
Other Commercial Crops	3	2	2	-
Gross Cropped-Area (ha)	186	78	137	76
Proportion of Groundnut Area to Gross Cropped-Area (%)	80.6	79.5	86.86	92.1

Table 3.32 Composition of groundnut varieties, Tamil Nadu sample, 2007–08 (ha).

Variety	Erode				Thiruvannamalai			
	Adopted (ha)	Adopted (% area)	Control (ha)	Control (% area)	Adopted (ha)	Adopted (% area)	Control (ha)	Control (% area)
CO-2	78	52	30	48	0	0	0	0
JL-24	4	3	2	3	1	1	1	1
TMV-1	1	1	0	0	0	0	0	0
TMV-2	14	9	8	13	0	0	0	0
TMV-7	3	2	1	2	52	44	28	40
VRI-2	50	33	21	34	0	0	0	0
POL-2	0	0	0	0	66	55	41	59
TMV-13	0	0	0	0	0	0	0	0
Grand Total	150	100	62	100	119	100	70	100

The composition of different groundnut varieties on the sample farms of Tamil Nadu is summarized in Table 3.32. In the Erode sample, CO-2 is the most-popular variety in both the adopted and control villages – it occupied 52% of the total groundnut area in the adopted villages, while its share was slightly lower in the control villages at 48%. VRI-2 was the second most-popular variety in Erode, occupying 33% area in the adopted villages and 34% in the control villages. TMV-2 covered 9% of

the area in the adopted villages and 13% in the control villages. JL-24 had 3% share of the area in both the villages, while TMV-7 came next with 2% share in both the villages. TMV-1 was responsible for a 1% share on the sample farms of adopted villages in Erode. In Thiruvannamalai, POL-2 was the most-popular variety in the adopted villages, with a share of 55% in the total groundnut area. TMV-7 was also popular, occupying 44%. The remainder of the 1% area was under the JL-24 variety. The ranking order of varieties was similar in the control villages of the same district. POL-2 was the dominant variety in control villages, with a share of 59% in the groundnut area. TMV-7 had the next-largest share of 40%, and JL-24 contributed 1% of the total groundnut area.

3.2.5 Economics of groundnut and other crops

Tamil Nadu is known for its high groundnut-yield . One of the reasons is because of the irrigation support it receives in many parts of the state. The perceived yield of groundnut is generally higher in Thiruvannamalai as compared to Erode (see Table 3.33).

Table 3.33 Perceived-yield levels of groundnut, Tamil Nadu sample, 2007–08 (kg/ha).

Season	Rain-fed/ Irrigated	Good/Bad Year	Erode		Thiruvannamalai		Pooled	
			A	C	A	C	A	C
Kharif	Rain-fed	Good	1,065	852	951	1,363	1,008	1,107
		Bad	687	520	679	690	683	605
		Best Yield	1,282	1,084	1,667	1,986	1,475	1,535
	Irrigated	Good	1,450	1,067	1,638	1,729	1,544	1,398
		Bad	946	574	720	718	833	646
		Best Yield	1,798	1,396	2,203	2,232	2,001	1,814
Rabi/Summer	Rain-fed	Good	852	683	1,447	1,263	1,150	973
		Bad	484	426	1,020	795	752	611
		Best Yield	1,010	872	1,895	1,497	1,453	1,185
	Irrigated	Good	1,124	837	1,675	1,712	1,400	1,275
		Bad	650	467	877	904	764	686
		Best Yield	1,257	1,057	2,253	2,305	1,755	1,681

The perceived yield of groundnut is much higher in the adopted villages than in the control villages of Erode, with the opposite being true in case of Thiruvannamalai. The yield of groundnut perceived in the control villages was generally higher than that perceived by the adopted villages of Thiruvannamalai. In the rainy season, the perceived yield of groundnut was around 1000–1100 kg/ha under rain-fed conditions. But, under unfavorable conditions, the yield can go down to 600–700 kg/ha. The best yield recorded was around 1500 kg/ha under rain-fed conditions. Under irrigated conditions, the normal yield is perceived to go up to about 1400–1600 kg/ha. However, under unfavorable seasonal conditions, the perceived yield of groundnut under irrigated conditions is only a shade better

than the yield under rain-fed conditions. The best yields perceived from irrigated crops are around 1800–2000 kg/ha.

In the post-rainy/summer season, the perceived normal-yield of rain-fed groundnut is around 1000–1100 kg/ha. In other states, it is impossible to grow groundnut under rain-fed conditions during the post-rainy season; but, in Tamil Nadu, rainfall is distributed between the southwest and northeast monsoons which makes it possible to grow groundnut in the post-rainy season, ie, from October to January. However, when weather conditions are unfavorable, the yield can dip to 600–750 kg/ha. The best yield perceived for post-rainy season under rain-fed conditions range between 1200–1450 kg/ha. Under irrigated conditions, a good yield is perceived to be between 1275–1400 kg/ha. The perceived yield is quite low, being around 700 kg/ha under bad weather conditions, even with the support of irrigation. The best-possible yield perceived under irrigation support is around 1700 kg/ha.

Table 3.34 Economics of groundnut on Tamil Nadu sample farms, 2007–08.

Cost/ Returns	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Varieties	Co-2	Co-2	POL-2	POL-2
Yield (kg/ha)	1,382	1,000	883	1,493
Variable Cost (Rs/ha)	12,726	11,577	12,495	11,718
Fixed Cost (Rs/ha)	2,500	2,269	2,249	2,700
Total Cost (Rs/ha)	15,226	13,846	14,744	14,418
Gross Returns (Rs/ha)	40,280	29,579	25,863	42,505
Net Returns (Rs/ha)	25,054	15,733	11,119	28,087
Benefit/Cost Ratio	2.65	2.14	1.75	2.95

Just as in the case of perceived yield, the average yield of groundnut reported was higher in case of the adopted villages than in the control villages of Erode (see Table 3.34). In Thiruvannamalai, the yield was much higher in the control villages than in the adopted villages. In both the districts, however, the cost of cultivation was slightly higher on the sample farms of the adopted villages than the control villages. The highest net-returns along with the highest benefit/cost ratios were reported from the control villages of Thiruvannamalai. In Erode, the benefit/cost ratio was higher in case of the adopted villages. In Thiruvannamalai, the lower yield obtained resulted in the lower benefit/cost ratio for the adopted villages than the control villages.

3.2.6 Sources of information about technology

The main sources through which sample farmers receive information about technology are presented in Table 3.35. In all the four groups of villages, input dealers turned out to be the most important source of information, with about 50% of the farmers obtaining information from them. Neighbors, friends and relatives were the next important source of information for the sample farmers. The media provided information on technology to the sample farmers from the adopted

villages of both the districts when compared to those from the control villages. To summarize, more sample farmers from both sets of villages of Thiruvannamalai obtained information about technology as compared to farmers from Erode.

Table 3.35 Sources of information about technology, Tamil Nadu sample, 2007–08 (% of farmers getting information from the source).

Sources of Information	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Input-dealers	51.11	66.67	44.44	53.33
Research Station	3.33	1.00	6.67	8.89
Extension Staff	4.44	2.22	10.00	6.67
Media	23.33	8.89	18.89	6.67
Neighbors, Friends and Relatives	18.89	20.00	28.89	35.56

3.2.7 Production and marketing traits preferred by farmers

Table 3.36 Farmer-preferred traits of groundnut, Tamil Nadu, 2007–08 (Garrett scores).

Traits	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
High Yield	60(1)	45(2)	34(2)	49(1)
Short Duration	54(4)	41(5)	26(3)	12(5)
Disease Resistance	50(6)	35(6)	12(7)	9(7)
Pest Resistance	56(2)	48(1)	23(5)	11(6)
Drought Resistance	55(3)	42(4)	38(1)	43(3)
High Recovery	45(7)	33(7)	25(4)	47(2)
High Oil-Content	51(5)	44(3)	18(6)	21(4)

(Figures in parentheses represent ranks in descending order of importance)

Among the agronomic traits of the varieties, farmers from the adopted villages of Erode and the control villages of Thiruvannamalai gave top billing to the high-yielding nature of the varieties (see Table 3.36). However, sample farmers from the control villages of Erode ranked pest resistance as the most-preferred agronomic trait over high-yielding nature. In the same way, sample farmers from the adopted villages of Thiruvannamalai rated drought resistance higher than high-yielding nature. In general, high yield, pest resistance and drought resistance were the top production-traits rated by the farmers. High recovery and short duration were also highly rated by one or two groups of farmers along with high oil-content and disease resistance.

Table 3.37 Market traits preferred by groundnut sample-farmers, Tamil Nadu, 2007–08 (Garrett scores).

	Erode		Thiruvannamalai	
Market-Preferred	Adopted	Control	Adopted	Control
High Demand	59(1)	53(1)	26(3)	33(1)
Fetches High Price	48(2)	52(2)	36(1)	24(3)
Less Price Fluctuations	47(3)	51(3)	16(4)	30(2)
Big Kernel-Size	45(4)	41(4)	27(2)	12(4)

(Figures in parentheses represent ranks in descending order of importance)

Among the market-preferred traits, the variety with a high market-demand was preferred by the sample farmers of both the adopted and control villages in Erode (see Table 3.37). In Thiruvannamalai, sample farmers preferred those varieties which would fetch a higher price. Other varieties preferred by the farmers were those with low fluctuations in market price and big kernel-size.

Table 3.38 Price premium which farmers are willing to pay for groundnut traits, 2007–08.

	Erode (%)		Thiruvannamalai (%)	
Traits	Adopted	Control	Adopted	Control
Better Taste	26	30	9	8
Better Yield	24	17	11	12
Big Kernel-Size	26	12	10	9
Disease and Pest Resistance	23	22	10	8
Drought Resistance	24	27	12	10
High Recovery	19	17	10	8
High Oil-Content	24	21	11	12

When asked to indicate the price premium they would pay for the varieties incorporating the desired traits, sample farmers from the adopted villages of Erode most expressed a willingness to pay higher price premiums than those from other groups of villages (see Table 3.38). In general, respondents from Erode showed their readiness to pay a higher price-premium of 26% over the ruling seed prices in the market for varieties with the desired traits of better taste or bigger kernel-size. They also indicated their willingness to pay 24% more for the varieties incorporating either a high yield, drought resistance or high oil-content. Seeds with pest and disease resistance were perceived to fetch 23% more over the ruling seed-price, while those with high recovery would even demand a price premium of 19%. Sample farmers from control villages of Erode indicated that they would pay 30% more for the varieties with better taste, 27% more for the varieties with drought resistance, 22% more for the varieties with pest and disease resistance, 21% more for

the varieties with high oil-content, 17% more each for the varieties with better yield and high recovery; and 12% more for the varieties with big kernel-size. The sample farmers from the adopted villages of Thiruvannamalai displayed their readiness to pay 12% more for the varieties having drought-resistance traits and 11% more for the traits of better yield and high oil-content. Varieties incorporating each of the traits of big kernel-size, pest and disease resistance and high recovery would be bought at a price premium of 10%, while the price premium they were prepared to dish out for the trait of better taste was only 9%. The sample farmers from the control villages of Thiruvannamalai were prepared to pay a 12% price premium for each of the traits of high yield and high oil-content. They were also willing to pay 10% more for drought resistance and a 9% premium for the trait of big kernel-size. The other three desired traits of better taste, pest and disease resistance, and high recovery were perceived to fetch a price premium of 8% each.

3.2.8 Gender analysis

Table 3.39 Ownership of assets by gender, Tamil Nadu sample, 2007–08.

		Erode		Thiruvannamalai	
Resource	Gender	Adopted	Control	Adopted	Control
Irrigated Land	Female (No.)	0	0	3	0
	Male (No.)	90	45	87	45
Rain-fed Land	Female (No.)	0	0	3	0
	Male (No.)	90	45	87	45
Livestock	Female (No.)	12	7	23	19
	Male (No.)	78	38	22	26
Machinery	Female (No.)	3	12	20	8
	Male (No.)	87	33	70	37

The pattern of asset ownership between males and females of the sample farms is summarized in Table 3.39. The sample land in question was owned totally in case of the adopted villages of Erode and the control villages of both the study districts. In case of the adopted villages of Thiruvannamalai, land was held in the name of female household members. However, some of the livestock was also owned by the female members. Due to the role played by women in livestock rearing, some of the livestock is owned by the female members. In the same way, some of the farm machinery and implements were also owned by the female members. So, unlike in the case of land, which was predominantly owned by the men, some of the livestock and farm machinery is owned by the women in case of the sample farms of Tamil Nadu.

Table 3.40 Decision-making by gender, Tamil Nadu sample, 2007–08.

		Erode		Thiruvannamalai	
Resource	Gender	Adopted	Control	Adopted	Control
	Female (No.)	3	0	4	0
Irrigated Land	Male (No.)	87	45	86	45
	Both (No.)	0	0	0	0
	Female (No.)	3	0	4	0
Rain-fed Land	Male (No.)	75	38	73	39
	Both (No.)	12	7	13	6
	Female (No.)	10	5	20	4
Livestock	Male (No.)	30	35	50	35
	Both (No.)	50	5	20	6
	Female (No.)	0	3	5	2
Machinery	Male (No.)	60	30	70	32
	Both (No.)	30	12	15	10
	Female (No.)	6	12	15	3
Labor Use	Male (No.)	50	30	60	26
	Both (No.)	34	3	15	16
	Female (No.)	5	3	6	2
Children's Marriage	Male (No.)	27	0	70	40
	Both (No.)	58	42	14	3
	Female (No.)	2	1	0	0
Education of Children	Male (No.)	38	20	84	83
	Both (No.)	50	24	6	7
	Female (No.)	5	7	3	2
Household Maintenance	Male (No.)	13	2	83	84
	Both (No.)	72	36	4	4

Most of the decisions relating to the use of land and farm machinery are observed as being taken by the male members of the households (see Table 3.40). However, women also have some agency in the decisions regarding livestock in some of the households in the group of four villages. They also influence the decisions relating to labor use and hiring. With respect to social decisions like the education and marriage of children and household maintenance, the decisions are jointly taken

by both males and females in Erode, but it is hard to ignore the domination of males even in these social aspects, as is evident in the case of the adopted and control villages of Thiruvannamalai.

Table 3.41: Performance of operations by gender, Tamil Nadu sample, 2007–08.

		Erode		Thiruvannamalai	
Operation	Gender	Adopted	Control	Adopted	Control
	By Female (%)	44	10	20	10
Field-Cleaning	By Male (%)	22	33	10	7
	Jointly (%)	44	57	70	83
	By Female (%)	1	0	0	0
Land-Preparation	By Male (%)	84	44	74	33
	Jointly (%)	15	56	26	67
	By Female (%)	10	5	20	10
Sowing Seed	By Male (%)	26	20	2	2
	Jointly (%)	64	75	78	88
	By Female (%)	50	60	55	54
Hand-Weeding	By Male (%)	5	7	6	2
	Jointly (%)	45	33	39	44
	By Female (%)	10	12	8	15
Fertilizer-Application	By Male (%)	60	45	55	60
	Jointly (%)	30	43	37	25
	By Female (%)	0	0	1	0
Plant-protection Measures	By Male (%)	60	70	65	75
	Jointly (%)	40	30	35	25
	By Female (%)	40	30	45	35
Harvesting Main Crop	By Male (%)	27	20	0	2
	Jointly (%)	33	50	55	63
	By Female (%)	30	32	26	34
Pod-Separation	By Male (%)	56	42	6	4
	Jointly (%)	14	26	68	62

Although women neither own many assets nor play a dominant role in the decisions regarding farm management, they are responsible for contributing labor for the farm operations in a significant way (see Table 41). They participate majorly in farm operations like hand-weeding, field-cleaning,

harvesting the main crop and pod-separation, along with helping in other operations like sowing and fertilizer-application. They are not as participative in field preparation and plant-protection measures.

A research study conducted in ICRISAT by Feldstien (1998) showed that the adoption of new varieties and technologies not only resulted in increased groundnut production and household incomes, but also resulted in a greater workload for women in shelling the pods of the increased production. Since the family is a basic economic unit, both men and women share the tasks in a way that maximize the benefits to the family. However, the lack of ownership of assets and influence of women in decision-making is implicitly an indication of their subordinate status and exploitation.

Chapter 4: FPVS Trials

The baseline report revealed that groundnut is the dominant crop in the four study districts of the two states and that is a profitable crop as indicated by the high benefit/cost ratios. However, its yield and profitability need to be further enhanced to retain its edge with respect to other competing crops. The FPVS trials aim to try new varieties on the farmers' fields so that the varieties with the most-preferred traits may be selected. It was observed earlier that some of the high-yielding varieties did not become popular with the farmers because of undesirable market traits. If left up to the farmers, they are more likely to choose varieties with desirable market traits along with production traits like high yield and disease resistance.

A mother trial tests all the promising varieties at the same location, and when conducted on several farmers' fields in a village, these locations serve as replications. By observing the relative performance of the varieties in all the trials, farmers in the village as well as visitors will be able to assess the average performance of these varieties. They can also assess pod characteristics like size, shape, color and shelling percentage. Since plant breeders and social scientists jointly record the preferences of the farmers for different varieties with respect to production and market traits, they will be able to score the varieties by trait. Baby trials test only two or three varieties with a particular farmer. While all the varieties figure in baby trials with some farmers, it is possible that the fertility status and management ability of the farmers may influence the performance of the varieties. For this reason, to avoid the mistakes that occur in baby trials, the analysis is restricted to only mother trials so that the results are not impacted by uncontrollable factors like soil fertility and farmers' management ability.

4.1 Karnataka

Mother–baby trials were conducted at both locations in Raichur and Chitradurga. In Raichur, these trials were conducted in all the adopted villages from the three taluks of Raichur, Deodurg and Lingsugur. In the case of Chitradurga, the FPVS trials were conducted in nine different villages. For appropriate comparison, only the results of mother trials were analyzed.

4.1.1 Results of FPVS trials in Karnataka

The results from mother trials conducted in Raichur during 2009 are presented in Table 4.1. The performance of six new varieties was assessed against that of local check, TMV-2. Four of the new varieties, ICGV00350, R2001-2, R2001-3 and ICGV91114, reported significantly higher yields than TMV-2 but, two of the new varieties, GPBD-4 and Dh-4-3, fared worse than TMV-2. While the yield of GPBD-4 was not significantly different from TMV-2, the yield of Dh-4-3 was significantly lower. Of all the varieties tested in the mother trial, ICGV 00350 gave the best yield of 1382 kg, which was 55% higher than TMV-2. This variety is yet to be released in Karnataka so that it can enter the seed chain. The two varieties, R-2001-2 and R2001-3, were released a few years ago, but are yet to be accepted by the farmers because of the undesirable pod characteristics of these varieties, despite their higher yield potential. R-2001-2 gave 37% higher yield than TMV-2, while the margin of advantage with R-2001-2 was 32% higher when compared with the local check. ICGV91114 produced a yield that was 11% higher than TMV-2. ICGV91114 is also shorter in crop duration than TMV-2 and, hence, can escape terminal drought better. Although this variety was also released in Karnataka, it has not yet entered the seed chain of the government of Karnataka.

Table 4.1 Yield obtained from mother trials conducted in Raichur, 2009–10.

Sl. No.	Entry	Yield in Kg/ha				% Increase in Yield Over Check Variety (TMV-2)
		Raichur	Deodurga	Lingasugur	Mean	
1	ICGV00350	1,478	1,378	1,289	1,382	54.98
2	R-2001-2	1,361	1,433	1,245	1,235	37.14
3	R-2001-3	1,300	1,183	1,097	1,193	32.04
4	ICGV91114	1,046	1,027	994	1,022	11.29
5	Local check (TMV-2)	944	1,000	844	929	-
6	GPBD-4	966	933	811	903	-3.45
7	Dh-4-3	866	822	783	824	-12.74
CV (%)			4.03			
CD at 5%			77.98			

The range of varieties tried in the mother trials in Chitradurga was much wider. As many as 10 new varieties were tested in Chitradurga. The results from the mother trials are presented in Table 4.2. As many as 4 out of 10 new entries, TMV (Gn)-13, Chintamani-1, K-6 and GPBD-4 , failed to yield as much as the check variety. The best performance was exhibited by R2001-2, closely followed by Chintamani-2 and ICGV04096. R2001-3 was also a significantly high performer. While ICGV00350 also reported higher yield, it was not significantly higher than the local check. ICGV91114, on the other hand, gave a lower yield than the local-check variety by a few kilograms, but this difference was not statistically significant.

Table 4.2 Average pod yields of different varieties in mother trials conducted in Chitradurga, 2008.

Varieties	Gulya	GulyaGollarahatti	Yalagondanahalli	Kaparahalli	Hulikunte	Jadekunte	Nerlahalli	Hirehalli	Konasagar	Average Pod yield (q/ha)
Chintamani-1	11.86	10.88	10.78	9.02	7.06	8.82	11.86	10.98	2.20	9.46
Chintamani-2	20.97	17.74	18.23	14.31	13.33	14.31	17.35	15.48	3.10	15.27
R-2001-2	19.5	16.38	19.89	14.41	13.13	14.8	21.74	14.7	2.94	15.32
R-2001-3	17.15	16.46	17.15	13.33	13.82	13.13	17.54	12.74	2.55	14.09
GPBD-4	10.88	12.94	11.86	9.31	9.21	8.92	11.56	10.09	2.05	9.87
K-6	10.29	11.07	9.51	9.41	9.6	11.96	11.86	10.19	2.02	9.84
ICGV00350	14.8	13.03	12.64	9.51	8.43	11.56	12.64	12.26	2.50	11.09
ICGV04096	19.89	20.78	19.01	13.62	10.88	13.92	17.44	15.19	3.04	15.22
ICGV91114	11.96	13.92	13.23	11.07	8.72	10.98	13.62	9.6	1.92	10.73
TMV(Gn)-13	11.37	11.66	11.96	8.82	8.04	9.11	10.19	10.39	2.08	9.45
TMV-2	12.84	10.39	13.82	10.39	9.41	11.96	14.01	10	2.00	10.76
SEM+					0.68					
CD @ 5%					1.142					

Farmers in Karnataka have still not accepted R2001-02 and R2001-03 because of their undesirable pod characteristics, though they were released a few years ago. Farmers now have other options available like ICGV 00350, ICGV 91114 and Chintamani-2, which have been accepted by the farmers in the FPVS trials. The Karnataka government has to look beyond TMV-2, take up seed production of the other varieties majorly and make it available to the farmers. It would be possible to increase the average yield of groundnut in Raichur and Chitradurga by introducing these varieties along with better agronomic and crop-protection packages and provision of lifesaving irrigation wherever feasible.

4.2 Tamil Nadu

In Tamil Nadu, FPVS trials were conducted for Spanish-bunch types of groundnut varieties in Erode and Thiruvannamalai, because these districts grow only bunch varieties of groundnut. Besides these, FPVS trials were also conducted in the district of Namakkal for semi-spreading types (runners) of groundnut varieties (Virginia Bunch). This was done because spreading varieties are predominantly grown in Namakkal. In 2008, the FPVS trials were conducted with a large number of entries, but in 2009, the FPVS trials were conducted with a smaller number of varieties. In 2010, only two varieties

were retained, and paired comparisons were conducted with a large number of replications. In the case of Namakkal, FPVS trials were conducted with eight varieties in 2008. During the next two years, only paired comparisons were carried out. Thus, large-scale comparisons were attempted through paired comparisons.

4.2.1 FPVS trials in Erode

Table 4.3 Yield performance of Spanish-bunch genotypes in FPVS trials conducted in Erode district.

	2008 Rainy Season (n=26+80=106), 9 Villages				2009 Rainy Season (n=27+60=87),9 Villages				2010 Rainy Season (n=103) 8 Villages			
Genotypes	n	Yield	CV	% inc	n	Yield	CV	% inc	n	Yield	CV	% inc
ICGV 00351					57	1220	35	36	103	2197	25	30
VG0104	50	758	20	31	57	1034	34	16				
R2001-03	47	724	70	26								
R2001-02	46	703	19	22	57	1184	36	32				
ICGV91114	47	690	53	20								
TVG 0004	50	661	21	15	57	1039	36	16				
TMVGn-13	45	642	20	11	87	894	33	0				
VRIGn-6	45	639	18	11								
CHINTAMANI	46	599	20	4								
TMV-7	107	577	20	0								
VRI2									103	1684	30	0

Note: Yield kg of dry pod/ha; Coefficient of variation (CV) (%); % inc=% of yield increase over check

The results of FPVS trials in Erode are presented in Table 4.3. In 2008, eight new varieties were tested in the FPVS, with TMV-7 as the check variety. VG0104 gave the best performance and recorded 31% higher yield than TMV-7. R2001-03 and R2001-02 followed with 26% and 22% higher yield over the check variety. ICGV91114 yielded 20% higher than the local check, TMV-7; while TVG0004 gave 15% higher yield. Both TMV Gn13 and VRIGn-6 produced a yield 11% higher than the check variety. Chintamani also yielded 4% more than the check variety. Since the FPVS trials were conducted on a large number of plots, the average yield computed for different varieties is the most reliable mode of assessment. Many changes were made in the 2009 FPVS trials. For instance, a new promising variety ICGV00351 was added, and four of the varieties, R2001-03, ICGV91114, VRIGn-6 and Chintamani, were dropped. The check variety, TMV-7, was also dropped, with TMVGn-13 being designated as the check variety. The ICGV00351 variety performed the best, with a 36% yield increase over the check variety, TMV GN-13. R2001-02 came second, with a 32% higher yield. Both VG0104 and TVG 0004 gave a 16% higher yield each.

The strategy for the FPVS trials was changed again in 2010. The best-performing variety in the 2009 trials, ICGV 00351, alone was retained as the improved variety. The check variety was changed to VRI-2 from TMV Gn13, and a paired comparison was conducted between these varieties in 103 sites. The ICGV 00351 variety gave a 30% higher yield over VRI-2. Due to the enhanced seasonal conditions, the yield levels of groundnut varieties showed an upward trend from 2008 to 2009, and again to 2010. The best-performing variety in 2008 gave a yield of 758 kg/ha, and it increased to 1220 kg/ha the following year. The same variety, ICGV 00351, reported a higher yield of 2197 kg/ha in 2010, compared to the 1220 kg/ha yield in the previous season.

4.2.2 FPVS trials in Thiruvannamalai

The results of FPVS trials in Thiruvannamalai conducted from 2008 through 2010 are summarized in Table 4.4. In the 2008 season, FPVS trials were conducted with seven new varieties, and TMV-7 as the check variety. All seven varieties gave a significantly higher yield than TMV-7. R2001-02 was the best performer with yield that was 76% higher than the local check. It was followed by ICGV00351, with a 64% yield advantage over the local. R2001-03 and TVG 004 also recorded impressive performances, with 56 and 52% higher yields, respectively, over the local check. Chintamani, ICGV 91114 and TMV Gn13 also recorded yield increases of 46, 27 and 17% over TMV-7, respectively. Just as in the case of Erode, the strategy for FPVS was changed in the 2009 season. The local check was changed from TMV-7 to TMVGn-13, which yielded a 17% higher yield in 2008 over TMV-7. VG0104 was added to the trial, while R2001-03, ICGV91114 and Chintamani were dropped from the 2009 trial. R2001-02 performed the best in 2009 also, with a 26% higher yield over TMVGn-13. ICGV00351 came close behind, recording a yield 25% higher than the check variety. However, TVG0004 was able to produce only a 10% advantage over the local check, and VG0104 was just at par with the check variety, with a mere 10% advantage. These conclusions are only indicative as they are based on absolute differences and not critical differences. Since the critical differences were not estimated, we are unable to draw definitive conclusions regarding the superiority of the varieties, which is further hindered by the fact that because the values for coefficient of variation are quite high for most of the varieties.

In 2010 also TMV Gn13 was retained as the check variety, and ICGV 00351 and TVG 0004 were picked up as the high-yielding varieties for FPVS trials. Although R2001-02 and R2001-03 varieties produced a higher yield in both 2008 and 2009, they were excluded from the trials due to their undesirable pod characteristics. ICGV 00351 and TVG 0004 were chosen because they were highly favored by the farmers. In the 2010 season, the TVG 0004 variety produced a yield 19% higher than the local check, but ICGV 00351 was just at par with it. Just as in the case of Erode, the seasonal conditions improved in the period 2008 to 2010. The three varieties, ICGV 00351, TVG 0004 and TMV Gn13, which were present in all the three seasons, produced higher yields in 2010 as compared to the earlier two seasons.

Table 4.4 Performance of Spanish-bunch genotypes in FPVS trials conducted in Thiruvannamalai.

	2008 Rainy Season (n=27+72=99), 9 Villages				2009 Rainy Season (n=27+54=81) 9 Villages				2010 Rainy Season (n=90) 18 Villages			
Genotypes	n	Yield	CV	% inc	n	Yield	CV	% inc	n	Yield	CV	% inc
R2001-02	45	1535	45	76	54	1615	44	26				
ICGV 00351	45	1429	56	64	54	1609	47	25	90	1893	15	0
R2001-03	45	1354	49	56								
TVG 0004	44	1321	42	52	54	1408	39	10	90	2243	17	19
CHINTAMANI	45	1266	43	46								
ICGV91114	45	1102	47	27								
TMV7	100	870	54	0								
VG0104					54	1303	48	1				
TMVGn13	45	1014	53	17	81	1285	52	0	90	1892	18	0

Note: Yield kg of dry pod/ha; - Coefficient of variation (CV) (%)

Table 4.5 Preferred traits in Spanish-bunch genotypes as ranked by the farmers in Erode and Thiruvannamalai [Mean score (10 points)].

Genotypes	Overall Growth Attribute	Drought Resistance	Fodder Quality	Post-harvest Characters	Marketability	Overall Rank
ICGV00351	8	9	8	8	8	9
TVG0004	8	5	7	8	8	8
R2001-02	7	5	7	7	7	8
TMVGn13	7	5	7	7	8	8
VG0104	7	6	7	7	7	7
R2001-03	7	5	7	7	7	7
ICGV91114	7	7	7	7	7	7
VRIGn6	7	4	6	7	8	7
CHINTAMANI	6	5	7	7	6	7
TMV7	6	4	6	7	6	7

Note: Yield kg of dry pod/ha; Coefficient of variation (CV) (%); % inc=% of yield increase over check

The ranking of Spanish-bunch varieties by the farmers of Erode and Thiruvannamalai, based on the desired traits, is presented in Table 4.5. ICGV 00351 was ranked the highest, possessing all five desired traits, and it was ranked an overall 9 out of a maximum of 10. TVG 0004 got a consistently

higher rank than R2001-02 and TMVGn-13, with respect to all the attributes other than drought resistance. But, in the overall ranking, all these three varieties were bracketed together and were ranked 8 out of 10. The other six varieties were assigned the overall rank of 7 out of 10 by the farmers participating in FPVS. Thus, the farmers' ranking of varieties narrowed down on ICGV 00351 as the most-preferred variety. It is a requirement to get this variety released by the Tamil Nadu government and take up the production and distribution of seed to the groundnut farmers in Erode and Thiruvannamalai.

4.1.3 FPVS trials in the district of Namakkal

Semi-spreading varieties of groundnut (Virginia Bunch) still ruled the roost in Namakkal district (see Table 4.6). Seven new varieties were compared with the check variety, TMV1, in the 2008 FPVS trials, and ICGV87846 gave an outstanding result by recording a yield 85% higher than the local check. ICGV98369 turned out to be the next best-performer with a 54% increase over the local check. The other five varieties, ICGV 97115, VRI 7, ICGV 98370, ICGV 86325 and ICGV 96217, also performed well, yielding 44 to 29% higher yields. In the next two seasons, all the new varieties other than ICGV 87846 were dropped from the trial, and paired comparisons were conducted between ICGV 87846 and TMV-1. In 2009, ICGV 87846 was seen to produce 58% higher yield over the local check. In 2010, the margin of advantage that ICGV 97846 possessed dropped to 32%. Additionally, in comparison to 2008, both ICGV 87846 and TMV-1 recorded lower yields in the 2009 season, but reported the highest yields of all three seasons in 2010. Since ICGV 87846 gave a consistently superior performance over TMV-1 in all the three seasons, the solution for a preferred high-yielding variety was easily found. Due to the fact that farmers had no reservation about this variety, the task cut out before the extension system was to multiply its seed and make it available to the farmers growing semi-spreading types of groundnut. It is sure to create a positive impact on the yields and incomes of groundnut farmers in Namakkal.

Table 4.6 Yield performance of Virginia Bunch genotypes in Namakkal.

	2008 Rainy Season (n=27+63=90) 9 Villages				2009 Rainy Season (n=237) 8 Villages				2010 Rainy Season (n=196), 12 Villages			
Genotypes	n	Yield	CV	% inc	n	Yield	CV	% inc	n	Yield	CV	% inc
ICGV87846	38	1604	32.8	84.8	237	1011	20.3	57.8	196	2009	17.6	31.6
ICGV 98369	37	1334	29.9	53.7								
ICGV 97115	35	1253	22.6	44.4								
VRI7	38	1197	22.1	37.9								
ICGV 98370	36	1160	31.0	33.5								
ICGV 86325	37	1144	28.2	31.8								
ICGV 96217	37	1120	19.2	29.1								
TMV 1	89	868	15.1		237	641	14.6	0.0	196	1526	18.3	0.0

(Yield in kg of dry pod/ha; Coefficient of variation (CV) in %;% inc- % increase yield over check variety)

Chapter 5: Early-Adoption Surveys

Early-adoption surveys were carried out in 2009–10 to assess whether the new varieties identified through FPVS and other components of groundnut production technology – like the balanced use of fertilizers, optimum plant population and weed- and pest-control practices – had been picked up by the farmers. It was also assessed whether the adoption of improved cultivars, if any, had created any impact on the groundnut yield and incomes of the sample farmers. The same sample of farmers chosen for baseline surveys in 2007–08 was retained for the early-adoption surveys of 2009–10 as well. In one way, it is too premature to assess this impact because the process of FPVS continued from 2008 through 2010. Even where some varieties were identified, they were not yet released by the concerned state governments due to which a final conclusion has not been reached in many cases. An important limitation of this study is that unless the varieties are released, they cannot enter the seed chain. Since it was decided to conduct the adoption survey in 2009–10, irrespective of whether the varieties were released by the government or whether they entered the seed chain or not, the only way of reaching the farmers was through the seed supply made by the researchers conducting FPVS trials. Anxious to reach a large number of farmers, the researchers distributed only 2 kg of pods of the promising varieties in the first year. However, given the high seed-requirement of groundnut, it can be expected to have only a limited impact or none at all on the farmers. Since the first phase of the TL-II Project has come to an end, the early-adoption surveys were commissioned to learn lessons for better planning of Phase 2.

5.1 Karnataka

5.1.1 Changes in the cropping pattern and groundnut area

The cropping patterns of the sample farmers in Raichur, Karnataka during the baseline year (2007–08) and the early-adoption survey year (2009–10) are presented in Table 5.1. In the adopted villages, its share remained constant at 15.8% in the rainy season. The area under paddy, pigeonpea and sunflower increased at the expense of other crops in the adopted villages during the rainy season. Additionally, in the post-rainy season, the share of groundnut and the area under sorghum increased slightly from 63.6 to 63.8%. In the control villages, the cropped area during the rainy season decreased slightly due to unfavorable seasonal conditions. The area under groundnut dropped slightly, resulting in a marginal drop in its share of cropped area from 20 to 19.7%. On the contrary, the area under pigeonpea, vegetables and cotton increased at the expense of other crops. The cropped area increased, while the area under groundnut remained the same during the post-rainy season in the control villages of Raichur, leading to a marginal decline in the share of groundnut. Despite some changes in the cropped areas and in the cropping pattern, the relative position of groundnut remained largely intact in the study villages.

Table 5.1 Changes in cropping pattern on sample farms of Raichur district (ha).

	Baseline (2007–08)		Early Adoption (2009–10)	
Season and Crops	Adopted	Control	Adopted	Control
Rainy Season				
Pearl millet	33	14	29	15
Paddy	0	9	6	8
Pigeonpea	20	5	25	13
Vegetables	21	3	21	0
Cotton	11	6	11	8
Sunflower	27	16	33	3
Groundnut	23	15	24	14
Others	14	2	8	1
Total	146	75	152	71
Post-rainy Season				
Groundnut	77	41	74	41
Sorghum	0	0	9	4
Others	44	17	33	17
Total	121	58	116	62

Table 5.2 Changes in cropping pattern on sample farms of Chitradurga district (ha).

	Baseline (2007–08)		Early Adoption (2009–10)	
Season and Crops	Adopted	Control	Adopted	Control
Rainy Season				
Paddy	10	5	8	6
Groundnut	109	54	108	55
Onion	17	8	15	4
Sunflower	4	4	3	4
Others	9	2	13	6
Total	149	73	147	75
Post-rainy Season				
Sunflower	43	21	38	23
Others	19	6	23	5
Total	62	27	61	28

The cropping patterns on the sample farms of the adopted and control villages of Chitradurga during 2007–08 and 2009–10 are presented in Table 5.2. Due to drought conditions, the cropped area in the adopted villages decreased marginally in both the seasons, but the cropped areas in the control villages of Chitradurga were not affected in either season. The relative position of groundnut in the cropped areas during the rainy season remained intact in both the adopted and control villages of Chitradurga. In the adopted villages, the cropped areas under paddy, onion, sunflower and groundnut marginally declined in the rainy season, while the area under other crops increased slightly. During the post-rainy season, the area under sunflower declined, while the area under other crops increased. In the control villages, the areas under paddy, groundnut and sunflower increased marginally during the rainy season. During the post-rainy season, the area under sunflower saw a slight increase at the expense of other crops. Despite these minor changes, groundnut maintained its preeminent position in the rainy season.

5.1.2 Trends in early adoption

Table 5.3 Variety-wise cultivation of groundnut, Raichur sample, early-adoption survey, 2009–10.

			Adopted		Control		Both	
Crop Name	Season	Variety	Cropped Area (ha)	Number of Farmers	Cropped Area (ha)	Number of Farmers	Cropped Area (ha)	Number of Farmers
Groundnut	Rainy/ Post-rainy	TMV-2	93	65	53	31	146	96
Groundnut	Rainy/ Post-rainy	R2001-2	4	5	1	2	5	7
Groundnut	Rainy/ Post-rainy	ICGV 00350	1	1	1	1	2	2
Total			98	71	55	34	153	105

The composition of groundnut varieties in Raichur during the rainy season of 2009–10 is detailed in Table 5.3. Just as in case of the baseline-survey year, the dominance of TMV-2 remained intact in 2009–10 also. In the adopted villages, 65 farmers continued to grow TMV-2 in an area admeasuring 93 ha. The new varieties made a small dent in about 5% of the area. Five farmers planted the R2001-02 variety in 4 ha area, while a lone farmer grew the new variety ICGV00350 in 1 ha area. Thus, it was observed that only 6 out of 71 farmers adopted the improved varieties in a mere 5 ha, out of a total of 98 ha under groundnut. In the control villages also, 31 farmers remained with TMV-2 and grew it in 53 ha area. And only two farmers cultivated R2001-02 in a total area of 1 ha. There was also the case of another farmer trying ICGV00350 in 1 ha area. In the total sample, 96 farmers grew TMV-2 in 146 ha area, while nine farmers adopted the new varieties of R2001-02 and ICGV00350 in 7 ha area. Thus, only 4.6% groundnut area was under the new varieties introduced through FPVS, and 8.6% of the farmers in the sample adopted them. This low adoption was possibly due to the inability of the farmers to access the information about new cultivars and in believing them to be superior.

Table 5.4 Variety-wise cultivation of groundnut in Chitradurga, 2009–10.

			Adopted		Control		Both	
Crop Name	Season	Variety	Cropped Area (ha)	Number of Farmers	Cropped Area (ha)	Number of Farmers	Cropped Area (ha)	Number of Farmers
Groundnut	Rainy	TMV-2	97	80	51	34	148	114
Groundnut	Rainy	ICGV 91114	9	5	3	2	12	7
Groundnut	Rainy	R2001-2	2	2	1	1	3	3
Total			108	87	55	37	163	124

The early-adoption trends of the new groundnut varieties of the sample farms of Chitradurga are encapsulated in Table 5.4. The stronghold of TMV-2 was evident in Chitradurga also. In the adopted villages, 80 out of 87 farmers persisted with TMV-2 in 2009–10 as well, despite the FPVS trials demonstrating the superiority of new varieties. The TMV-2 variety covered 97 out of 108 ha area under groundnut in the adopted villages. Only five farmers grew ICGV91114 in 9 ha area, with just two farmers adopting R2001-02 in 2 ha area. In the control villages, 34 out of 37 farmers continued with TMV-2, and grew it in 51 out of 55 ha area. Two farmers tried ICGV91114 in a total of 3 ha area, and a lone farmer cultivated R2001-02 in 1 ha area. The coverage of groundnut area with new varieties in 2009–10 was only 10.2% in the adopted villages, and 7.3% in the control villages. In the pooled sample of Chitradurga, only 8.1% of the sample farmers adopted the new varieties in 9.2% of the area.

Table 5.5 Changes in yield levels of groundnut in Karnataka sample (Kg/ha).

	Baseline		Early Adoption	
Variety	Raichur	Chitradurga	Raichur	Chitradurga
TMV-2	1,240	782	1,297	846
ICGV91114	-	-	-	1,350
R2001-2	-	-	1,473	1,250
ICGV00350	-	-	1,401	-

Table 5.5 presents a comparative picture of groundnut by variety in the baseline and early-adoption survey years. In the baseline survey year (2007–08), only TMV-2 was grown. Its weighted average yield was considerably higher at 1240 kg/ha in Raichur, compared to Chitradurga, which was at 846 kg. This was because groundnut was largely a post-rainy season crop grown under irrigation in Raichur, while it was purely a rain-fed crop grown in rainy season in Chitradurga. The weighted average yield of TMV-2 variety of groundnut improved to 1,297 kg/ha in Raichur, registering an increase of 4.6% between 2007–08 and 2009–10. The yield improvement of TMV-2 was better in the case of Chitradurga, where the yield increased by 8.2% to reach 846 kg/ha in the same period. The high-yielding variety, R2001-02, yielded an impressive 1,473 kg in Raichur, and 1,250 kg/ha in

Chitradurga. Another new variety ICGV 00351 yielded 1,401 kg/ha in Raichur, while the improved variety, ICGV 91114 recorded a yield of 1,350 kg/ha in Chitradurga.

5.1.3 Unit-cost reduction due to the impact of technology

The economics of TMV-2 during 2009–10 in the two study districts of Karnataka are presented in Table 5.6. The cost of cultivation as well as the weighted average yield of cultivation was much higher in Raichur than in Chitradurga. While the net return was higher in Raichur, the benefit/cost ratio was higher in Chitradurga because of the lower cost of cultivation. Additionally, the unit cost of production was also much lower in Chitradurga.

Table 5.6 Economics of TMV-2 variety of groundnut, 2009–10 (Rs/ha).

Costs and Returns	Raichur Sample	Chitradurga Sample	Pooled Sample
Cost of Cultivation (Rs/ha)	27,571	15,628	21,600
Grain Yield of Groundnut (kg/ha)	1,297	846	1,072
Gross Returns (Rs/ha)	38,348	25,014	31,681
Net returns (Rs/ha)	10,777	9,386	10,081
Benefit/Cost Ratio	1.39	1.60	1.47
COP (Rs/100 kg)	2,126	1,847	2,015

Table 5.7 Economics of improved varieties of groundnut, 2009–10.

Costs and Returns	Raichur Sample (R2001-2)	Chitradurga Sample (ICGV 91114)	Pooled Sample
Cost of Cultivation (Rs/ha)	30,390	23,850	27,120
Grain Yield of groundnut (kg/ha)	1,452	1,330	1,391
Gross Returns (Rs/ha)	42,843	41,769	42,306
Net Returns (Rs/ha)	12,453	17,919	15,186
Benefit/Cost Ratio	1.41	1.91	1.66
COP (Rs/100 kg)	2,093	1,793	1,950

The economics of the improved varieties of groundnut during 2009–10 are furnished in Table 5.7. The cost of cultivation as well as the weighted average yield of improved varieties was higher in Raichur than in Chitradurga. Due to a lower cost of cultivation in Chitradurga, the net returns as well as the benefit/cost ratio of the improved varieties were much higher there. As a consequence, the unit cost of production of improved varieties was also much lower in Chitradurga, just like with TMV-2.

Table 5.8 Unit-cost reduction in groundnut, Karnataka sample.

Item	Raichur Sample	Chitradurga Sample	Pooled Sample
Cost of Production in Baseline (2006–07) Rs/100 kg	2,429	1,861	2,145
Cost of Production in Early Adoption (2009–10) Rs/100 kg	2,124	1,842	1,983
Reduction in Cost of Production	305	19	162
% Reduction in Unit Cost of Production	12.6	1.0	7.6

The reduction in the unit cost of production of groundnut on the sample farms of the two study districts in Karnataka is illustrated in Table 5.8. The yield of TMV-2 in both the study districts improved over the two-year period. The improved varieties which made a small dent on the sample farms reported better yields than TMV-2. However, because their adoption was limited to only about 5% of the area in the Raichur sample and about 10% area in the Chitradurga sample, the weighted average unit-cost of production reduced marginally. In Raichur, it fell by 12.6%, while the drop was quite marginal in Chitradurga, registering a 1% reduction. For the pooled sample, the drop in the unit cost of production was by 7.6%.

5.1.4 Impact of technology on farmers' income

The impact of groundnut-production technology on the income of the sample farmers in Raichur and Chitradurga was assessed and presented in Table 5.9. In 2007–08, all the groundnut area in the two districts was under TMV-2. The weighted average net return from TMV-2 in Raichur was Rs 8,631/ha. For the total area of 1.13 ha under groundnut, the total net return was Rs 9,753 per farm. In 2009–10, the area under groundnut per farm remained the same at 1.13 ha. The area under TMV-2 variety slightly decreased to 1.08 ha. The net return from 1 ha of TMV-2 increased to Rs 10,777 in 2009–10, and the total net return from TMV-2 was Rs 11,639. The return from 1 ha of groundnut under improved varieties was higher at Rs 12,453. Since only 0.05 ha was under improved varieties on a sample farm, the net income from this part was only Rs 623. The total return from groundnut crop was Rs 12,262 per farm. The increased income from groundnut was Rs 2,509 per farm, when compared with the baseline return of Rs 9,753. It worked out to an increase of 25.7% in the two-year period. This increase was due to an increase in yield by 5.2%, and an increase in price by 9.8%. The increased income from groundnut represented a 5% increase over the net crop-income of a sample farm in Raichur in 2007–08.

Table 5.9 Impact of groundnut technology on farmers' income, Karnataka sample.

	Raichur		Chitradurga	
Item	Baseline	Early Adoption	Baseline	Early Adoption
Area under Groundnut (ha/farm)	1.13	1.13	1.21	1.21
Area under TMV-2	1.13	1.08	1.21	1.11
Net Returns from TMV-2 (Rs/ha)	8,631	10,777	4842	9,386
Net Returns from TMV-2 (Rs/farm)	9,753	11,639	5859	10,418
Area under Improved Varieties	0	0.05	0	0.1
Net Returns from Improved Varieties (Rs/ha)	0	12,453	0	17,919
Net Returns from Improved Varieties (Rs/farm)	0	623	0	1,792
Total Net Return from Groundnut (Rs/farm)	9,753	12,262	5859	12,210
Increased Net Return	-	2,509	-	6,351
% Increase over Baseline Net Returns	-	25.7	-	108
Yield Increase (%)	-	5.2	-	14.4
Price (%)	-	9.8	-	18.8
Increased Income as a Share Net Crop Income in Baseline	-	5	-	17

In Chitradurga, 1.21 ha area was under groundnut in both 2007–08 and 2009–10. All the area was under TMV-2 in 2007–08. The net return from 1 ha of TMV-2 was Rs 4,842/ha. The total net return from groundnut in 2007–08 was Rs 5,859/sample farm. In 2009–10, the net return from 1 ha under TMV-2 increased to Rs 9,386. The area under TMV-2 in 2009–10 dropped to 1.11 ha. Thus, the income from TMV-2 component worked out to Rs 10,418 per farm. The area under improved varieties of groundnut was a mere 0.1 ha. Since the net returns from the improved varieties of groundnut was Rs 17,919/ha, the net return contribution of improved varieties worked out to Rs 1,792 per farm. Hence, the total net return from groundnut totaled Rs 12,210 per farm, representing an increase of Rs 6,351 per farm. It worked out to a 108% increase over the baseline income from groundnut per farm. Such a big increase was possible because of a 14.4% increase in yield and an 18.8% increase in price over the period of two years. This substantial increase in net return worked out to a 17% increase over the net crop-income of a sample household in 2007–08. The use of TMV-2 registered an increase in yields though it could be because of better agronomy or better seasonal conditions in 2009–10. The cost of production was not deflated and neither was the groundnut price to factor in inflation. Since both increased by about the same proportion, the analysis remained at nominal-prices level.

5.1.5 Factors influencing adoption of technology

The single-most important factor that influences the adoption of technology is its profitability vis-à-vis other competing crops or technologies. This margin of advantage determines the speed at which the technology is adopted by the farmers. Clearly, if the margin of advantage is very high, the farmers lose no time in adopting it. They will be encouraged to procure the seeds or other inputs required, and adopt it to harness the innovators' premium. However, if the margin of advantage is low or uncertain, it becomes the duty of the extension officials to convince the farmers to adopt the technology by demonstrating its use through several seasons, as one-time demonstrations will be inadequate when the margin of advantage is low or uncertain. Since groundnut is largely a rain-fed crop, an element of uncertainty is always present in the performance of technology. The quantum and distribution of rainfall influences the productivity of not just all rain-fed crops, but specifically groundnut, as it is grown predominantly under rain-fed conditions. Sustained demonstrations are required so that the farmers get enough experience with it and develop an idea about the average returns from the new varieties or other production technologies.

A study conducted in 1998 on the adoption of GPT technology resulted in producing 38% higher yield that rose from 1.6 to 2.2 t/ha, generating 38% more net income (adopters – Rs 21,470/ha, and non-adopters – Rs 15,580/ha), and reducing the unit cost by 16% from Rs 4.58/kg to Rs 3.86/kg (Joshi and Bantilan, 1998). The technology was also vital in improving the natural-resource base along with easing certain women-specific agricultural operations (Bantilan et al., 2005). Another study (Bantilan et al., 1999), found that major factors influencing the adoption of improved groundnut varieties enhanced the yield-potential of pod and fodder, timely availability of seed, duration of the crop, irrigation, awareness about the cultivar, high oil and shelling percentages etc. Besides field demonstrations, support services for production and the distribution of new varieties of seeds are required to facilitate the spread of technology. Since farmers are looking for seed supply from the markets, persistent efforts are required to organize seed production and distribution.

5.1.6 Constraints in the adoption of technologies

Farmers often face many constraints in the adoption of technologies. FPVS trials were conducted in only one season and they were accessible to only a small number of farmers. In Tamil Nadu, paired comparison trials were organized with the ruling variety and the most-promising variety. However, in Karnataka, FPVS trials were conducted for only one season. If demonstrations are conducted with the most-promising variety for more than one season, they will encourage the farmers to try and take advantage of the new varieties. Repeated demonstrations help the farmers to believe in the superiority of the variety in different seasons. Campaigns through mass media, farmer field schools and the distribution of seed in mini-kits also help in popularizing the varieties.

The varieties R2001-02 and R2001-03 released a few years ago, but were not accepted by the farmers because of their undesirable pod characteristics. These varieties were again tested in the FPVS trials and, despite their enhanced performance, remained unpopular among the farmers. Farmers are reluctant to stop using TMV-2 because of its desirable pod characteristics. Farmers want varieties which yield better, but which retain the good pod-characteristics of TMV-2. It is yet to be seen if the new variety ICGV 00350 would be preferred for its high yield and marketability, although it would require some more demonstrations to convince the farmers. Thus, this variety has to be released before it can enter the seed chain sponsored by the state government, otherwise farmers

who throng to Krishi Samparka Kendras for seed will not get it at a subsidized price. If the seed supply is not ensured, the new varieties will vanish from the scene without getting a fair trial by the farmers.

The results clearly establish that seed availability is the abiding constraint in popularizing the varieties that have done well in the FPVS trials. Farmers have to be encouraged to undertake the production and multiplication of the seeds of these varieties majorly. There is also a need to augment seed storage-facilities at the community level, particularly when groundnut is grown in only one season of the year. In the absence of proper storage-facilities, the viability of the seed may be adversely affected. In such a situation, farmers have a tendency to dispose of the produce of improved varieties in the market and try to look for seed during the next season. Adequate storage facilities in the villages will incentivize retention of the produce of improved varieties because the viability will be ensured till the next sowing season.

Bantilan et al. (1999) concluded that the area under ICRISAT groundnut varieties was low (1–5%) in both states (Andhra Pradesh and Maharashtra) due to non-availability of seed, lack of awareness and the long duration of cultivars. Promotion and extension through NARS and ensuring a timely seed supply will definitely enhance the adoption of ICRISAT varieties in the future.

5.2 Tamil Nadu

5.2.1 Changes in cropping pattern and groundnut areas

The changes in the cropping patterns of the sample farms of Erode and Thiruvannamalai between 2007–08 and 2009–10 are documented in Table 5.10. In both districts, 2009–10 turned out to be a drought year. The cropped area in Erode fell from 264 to 216 ha, which represents a decline of 18.2%. The area under sole crop of groundnut decreased from 148 to 67 ha – a sharp drop of 54.7%. In the same way, the area under groundnut inter-crops fell from 64 to 40 ha, marking a reduction by 37.5%. The area under sesame and other crops like maize etc, increased. The share of groundnut in the cropped area dropped from 80.3% in 2007–08 to 49.5% in 2009–10, partly due to weather aberrations and a shift to more profitable crops.

Table 5.10 Changes in cropping pattern, Tamil Nadu sample.

	Erode		Thiruvannamalai	
Season and Crop	Baseline (2007–08)	Early Adoption (2009–10)	Baseline (2007–08)	Early Adoption (2009–10)
Groundnut Sole (ha)	148	67	130	44
Groundnut Intercrop (ha)	64	40	59	94
Paddy (ha)	-	-	13	20
Sesame (ha)	7	32	4	3
Others (ha)	45	77	7	26
Total Area (ha)	264	216	213	187

The cropped area in Thiruvannamalai also declined from 213 to 187 ha, a fall of 12.2%, due to unfavorable seasonal conditions between 2007–08 and 2009–10 (see Table 5.10). The area under sole crop of groundnut decreased from 130 ha in 2007–08 to 44 ha in 2009–10. However, it is important to note that the area under intercropping of groundnut increased from 59 to 94 ha in the same period. The total area under a groundnut-based cropping system decreased from 189 ha to 138 ha. The share of groundnut in the cropped area dropped from 88.7% in 2007–08 to 73.8%. Weather factors as well as market factors caused this reduction in groundnut area by 27%. Area under paddy and other crops increased in the same period. To judge whether this is a mere seasonal aberration or a reversal trend can be understood only by looking at the groundnut area and total cropped area in the subsequent years.

5.2.2 Trends in early adoption

The composition of groundnut varieties in the baseline survey year (2007–08) and early-adoption survey year (2009–10) is presented for the sample farms of Erode and Thiruvannamalai in Table 5.11. In 2007–08, CO-2 occupied 48.1% area in Erode, followed by VRI-2 (33.5%) and TMV-2 (10.4%). JL-24, TMV-7 and TMV-1 occupied only minor areas. In 2009–10, VRI-2 covered 62.5% area, followed by CO-2 (32.7%) and TMV-7 (1.9%). There was a token presence of new varieties in less than 1% of the area. In the Thiruvannamalai sample, POL-2 and TMV-7 were the most popular varieties of 2007–08, occupying 56.6% and 42.3% areas respectively. The remaining 1.1% area was under JL-24. In 2009–10 as well, the same varieties held sway over the groundnut farmers in the sample. POL-2 covered 64.5% of the area, and TMV-7 had a 21% share, with CO-2 accounting for 13.8% of the area. New varieties had a token adoption in the form of 0.7% of the area. Thus, new varieties failed to make a dent in the groundnut areas of sample farmers, even though there was a churning between the old varieties. Cropped areas and groundnut areas decreased, and farmers were observed to be shifting to more profitable crops in the absence of sustained efforts in popularizing high-yielding new varieties.

Table 5.11 Change in composition of groundnut varieties, Tamil Nadu sample (ha).

	Erode		Thiruvannamalai	
Variety	Baseline (2007–08)	Early Adoption (2009–10)	Baseline (2007–08)	Early Adoption (2009–10)
CO-2	108	35	0	19
JL-24	6	0	2	0
TMV-1	1	0	0	0
TMV-2	22	0	0	0
TMV-7	4	4	80	29
VRI 2	70	67	0	0
POL-2	0	0	107	89
New Varieties	0	1	0	1
Total	212	107	189	138

However, signs of hope were visible as seen in the promising yield of new varieties. The details of yield by groundnut in the baseline and early-adoption survey years are furnished in Table 5.12. In Erode, CO-2 yielded 1,382 kg/ha in the adopted villages of Erode during 2007–08. In the control villages, this variety recorded an average yield of 1,000 kg/ha, while the same variety yielded an average of 1,286 kg/ha in 2009–10. Impressively, in the same year, the new variety, TVG 0004, yielded almost twice that amount. However, it's important to keep in mind that it was tried in only 1 ha of land. However, the results indicated good potential, and merits further testing in a larger area in the subsequent years. In Thiruvannamalai, yields are reported for POL-2 for the baseline and early-adoption survey years. In the adopted villages, POL-2 recorded a yield of 883 kg/ha in 2007–08. In the control villages, the yield of POL-2 was as high as 1,493 kg/ha. In 2009–10, the yield figures were reversed, with the adopted villages recording a yield of 1,527 kg/ha for POL-2, indicating an increase of 73% over the baseline year reports. However, in the control villages, it fell to 1,152 kg/ha – a drop of 22.8%. The weighted average yield of POL-2 was 1,086 kg/ha in 2007–08, and 1,402 kg/ha in 2009–10. The new variety, ICGV 00351, was tried in small areas only, and it yielded 1,522 kg/ha in the adopted villages, and 1,864 kg/ha in the control villages. Thus, its average yield was 1,693 kg/ha in 2009–10. It represents an increased yield of 20.8% over the weighted average of POL-2. Thus, it indicated good potential for achieving higher yields and conclusively merits more widespread testing by bulking the seed.

Table 5.12 Groundnut yields by variety, Tamil Nadu sample (kg/ha).

	Erode		Thiruvannamalai	
Variety	Baseline (2007–08)	Early Adoption (2009–10)	Baseline (2007–08)	Early Adoption (2009–10)
CO-2				
Adopted	1,382	1,286	-	-
Control	1,000	-	-	-
POL-2				
Adopted	-	-	883	1,527
Control	-	-	1,493	1,152
TVG 0004				
Adopted	-	2,482	-	-
Control	-	-	-	-
ICGV00351				
Adopted	-	-	-	1,522
Control	-	-	-	1,864

5.2.3 Potential for cost-reduction with new varieties

The profitability of traditional varieties of groundnut in the two study districts was analyzed for 2007–08 and 2009–10, and summarized in Table 5.13. In Erode, the cost of cultivation of CO-2

increased by 18.2%. The average yield increased by 2.5%. The price of groundnut also went up by 13.6% over the two-year period. As a result, the gross returns went up by 16.4%. The net returns per ha increased by Rs 3,342/ha, but the benefit/cost ratio dropped from 2.49 in 2007–08 to 2.45 in 2009–10. Similar results were reported in case of POL-2 variety in Thiruvannamalai. The net returns per ha showed up from Rs 16,775 in 2007–08 to Rs 26,657 in 2009–10. The benefit/cost ratio surged from 2.15 in 2007–08 to 2.59 in 2009–10.

Table 5.13 Change in profitability of groundnut, Tamil Nadu sample (Rs/ha).

	Erode (CO-2)		Thiruvannamalai (POL-2)	
Costs and Returns	Baseline (2007–08)	Early Adoption (2009–10)	Baseline (2007–08)	Early Adoption (2009–10)
Fixed Cost	2,423	2,600	2,399	2,550
Variable Cost	12,343	14,860	12,236	14,240
Total Cost	14,766	17,460	14,635	16,790
Yield (kg/ha)	1,255	1,286	1,086	1,402
Gross Return	36,713	42,749	31,410	43,447
Net Return	21,947	25,289	16,775	26,657
Benefit/Cost Ratio	2.49	2.45	2.15	2.59

Table 5.14 Economics of improved varieties, Tamil Nadu sample, 2009–10.

Item	Erode (TVG0004)	Thiruvannamalai (ICGV00351)
Variable Cost (Rs/ha)	17,847	16,777
Fixed Cost (Rs/ha)	2,750	2,618
Total Cost (Rs/ha)	20,597	19,395
Yield (kg/ha)	2,482	1,693
Gross Returns (Rs/ha)	54,481	48,423
Net Returns (Rs/ha)	33,884	29,028
BCR	2.65	2.50

The improved varieties were grown in small areas only due to the limited seed availability. However, they showed promising returns, which are presented in Table 5.14. In Erode, TVG0004 recorded a very high yield of 2,482 kg/ha. Despite the high cost of cultivation, the net returns were quite impressive at Rs 33,884/ha. It also reported a high benefit/cost ratio of 2.65. Compared to this, the new variety suitable to Thiruvannamalai ICGV00351 recorded a lower yield of 1,693 kg/ha. Its net return of Rs 29,028/ha was higher than that for POL-2 in the same district during 2009–10. However, the benefit/cost ratio of ICGV00351 was only marginally higher at 2.50, when compared with the benefit/cost ratio of 2.59 reported for POL-2 in 2009–10.

Table 5.15 Change in unit cost of production, Tamil Nadu sample.

Yield and Cost of Production	Erode		Thiruvannamalai	
	Baseline (2007–08)	Early Adoption (2009–10)	Baseline (2007–08)	Early Adoption (2009–10)
CO-2 in Erode and POL-2 in Thiruvannamalai Total Cost (Rs/ha)	14,766	17,460	14635	16,790
Yield of Groundnut (kg/ha)	1,255	1,286	1086	1,402
Cost of Groundnut Production (Rs/100 kg)	1,177	1,358	1232	1,198
TVG0004 in Erode and ICGV00351 in Thiruvannamalai Total Cost (Rs/ha)	-	20,597	-	19,395
Yield of Groundnut (kg/ha)	-	2,482	-	1,693
Cost of Groundnut Production (Rs/100 kg)	-	830	-	1,146

The unit costs of production for different varieties of groundnut were worked out and presented in Table 5.15. For the CO-2 variety in Erode, the unit-cost of production increased from Rs 1,177 per 100 kg in 2007–08 to Rs 1,358 in 2009–10. In Thiruvannamalai, the unit cost of production of POL-2 marginally decreased from Rs 1,232 per 100 kg in 2007–08 to Rs 1,198 in 2009–10. Although the cost increased in case of Erode in nominal terms, an actual decline might be recorded if the rate of inflation is factored in. However, the new varieties offer a prospect for drastic reduction in unit cost of cultivation even in nominal terms because of their yield potential. In Erode, the cultivation of TVG0004 can bring down the unit cost by 39%. In case of ICGV00351 in Thiruvannamalai, the reduction in unit cost of production would be more modest by 4.3%, when compared to POL-2.

5.2.4 Impact of groundnut technology on farmers' income

In the earlier section, the potential for unit-cost reduction was discussed. A way of implementing this is by growing new varieties, and for increasing the net returns of the farmers, but for a host of reasons, the arrangements for seed production, bulking and distribution of the same to the sample farmers did not materialize. As a result, there was hardly any uptake of the new varieties by the sample farmers. The 2009–10 seasons were afflicted by drought conditions due to which the cropped area decreased. The area under groundnut in particular fell drastically either because of weather factors or because of more profitable alternatives being available to the farmers. Due to a reduction in the area of groundnut per sample farm, the net return earned from groundnut registered an obvious decline. This decline was much sharper in Erode than in Thiruvannamalai (see Table 5.16).

In Erode, the area under groundnut per sample-farm fell by half between 2007–08 and 2009–10. In 2007–08, the area under groundnut per sample-farm was 1.57 ha/farm, and the net-return per ha

from the traditional varieties was Rs 21,947. Hence, the income from groundnut per farm was Rs 34,457. In 2009–10, the area under groundnut per sample-farm dropped to 0.79 ha. The net-return per ha from the traditional varieties, increased to Rs 25,289 in 2009–10. Out of 0.79 ha, 0.78 ha was under traditional varieties, and 0.01 ha was under improved varieties. The net return from traditional varieties worked out to Rs 19,725 and Rs 339 from improved varieties. Thus, the total income from 0.79 ha under groundnut added up to Rs 20,064. The income from groundnut decreased by Rs 14,393, representing a shortfall by 41.8%. While the area under groundnut fell by 50%, there was a parallel reduction in the income as it fell by 41.8%. During the two-year period, the yield of groundnut on the sample farms increased by 3.4% and the price increased by 13.6%.

In case of Thiruvannamalai, the area under groundnut decreased from 1.4 ha/farm in 2007–08 to 1.02 ha in 2009–10. In 2007–08, the net return from 1 ha under traditional varieties was Rs 16,775, while the income from groundnut per farm was Rs 23,485 in the same year. The following year, the income per ha from traditional varieties increased to Rs 26,657. Out of the total 1.02 ha area under groundnut, 1.01 ha area was under traditional varieties. The income from the traditional varieties of groundnut worked out to Rs 26,924, while from the 0.1 ha area under improved varieties, a net income of Rs 290 was obtained. Thus, the total income earned from groundnut per farm added up to Rs 27,214. The income from groundnut increased by 15.9% over the two-year period, despite the decline in the area under groundnut by 27.1%. This was due to a 29.4% increase in yield and a 7.2% increase in the price of groundnut.

Table 5.16 Impact of groundnut technology on farmers' incomes, Tamil Nadu sample.

	Erode		Thiruvannamalai	
Impact Indicator	Baseline	Early Adoption	Baseline	Early Adoption
Area under Groundnut (ha/farm)	1.57	0.79	1.4	1.02
Area under Traditional Varieties (ha/farm)	1. 57	0.78	1.4	1.01
Net Income from Traditional Varieties (Rs/ha)	21,947	25,289	16,775	26,657
Net Income from Traditional Varieties (Rs/farm)	34,457	19,725	23,485	26,924
Area under Improved Varieties (ha/farm)	0	0.01	0	0.01
Net Income from Improved Varieties (Rs/ha)	-	33,884	-	29,028
Net Income from Improved Varieties (Rs/farm)	0	339	0	290
Total Net Income from Groundnut (Rs/farm)	34,457	20,064	23,485	27,214
Increase in Net Income (%)	-	-41.8	-	15.9
Increase in Yield (%)	-	3.4	-	29.4
Increase in Price (%)	-	13.6	-	7.2

Note: The analysis is left at nominal level because both the cost of production as well as the groundnut price increased by about the same percentage.

5.2.5 Factors influencing adoption of technologies

Enhanced profitability is the best way for any variety to gain popularity with the farmers. The higher the margin of profit, the faster will be the uptake of technology. In Tamil Nadu, the process of FPVS continued over three seasons lasting from 2007–08 to 2009–10. While it took three years to reach a conclusion on the performance of technology, the early-adoption survey was enacted before that period elapsed. Sustained testing and the demonstration of technology are required to win the farmers over.

The supply of seed is a factor that can hasten the spread of technology. A new trend can be seen in that farmers are no longer preserving their own seeds because the viability of groundnut seed is short-lived. Due to this reason, farmers are depending on the market for their supply of seed. Unless the new varieties are formally released, they cannot enter the seed chain. Thus, the release of varieties, production and supply of seed are critical supporting factors for the popularization of the technology.

A case study conducted in Tuban, Indonesia by Subba Rao et al. (1993) on the adoption of groundnut-production technology revealed that the economic benefits of new packages gave 120% higher yield, 335% higher net-income, and generated 36% additional employment compared to the existing practices. The reduction in production cost was Rupaiah 188/kg by adopting the improved technology (groundnut medium input package). All the adopted farmers were willing to continue the technology in the presence of subsidies.

5.2.6 Constraints in the adoption of technologies

The results clearly establish that seed availability is the abiding constraint in popularizing the varieties which have done well in the FPVS trials. Farmers have to be encouraged with some incentive to undertake the production and multiplication of the seeds of these varieties in a big way. There is also a need to augment seed storage-facilities at the community level, particularly when groundnut is grown in only one season of the year. In the absence of proper storage facilities, the viability of the seed may be adversely affected. In such a situation, farmers have a tendency to dispose of the produce of the improved varieties in the market and try to buy seed from the market during the next season. Adequate storage facilities in the villages will incentivize the retention of the produce of improved varieties, because the viability will be ensured till the next sowing season. There is also hope that it will improve farmer-to-farmer seed supply as the strategy of TL-II anticipated. The bulky nature of the groundnut seed is another big constraint which limits its adoption and multiplication process. Due to the limited storage facilities available, farmers generally buy the seed from the market just before sowing time. Their main concern at this time is observed to be the timely availability of seed as opposed to the quality of seed being purchased.

Farmers also face several constraints in the adoption of technologies. A proper assessment of technology is severely lacking, and more trials and demonstrations are required to test new varieties and technologies so that the farmers can assess the mean and variability of performance with respect to yield, quality, price etc. In several cases, farmers have no alternative but to buy seed from traders who sell nondescript seed, as the seed supply by public agencies is meager.

Farmers in the study area are also looking for better alternatives to varieties like CO-2, POL-2, VRI-2 etc. However, these attempts remain futile. If new varieties like TVG 0004 and ICGV 00351

can outperform the ruling varieties, farmers would be willing to adopt them if a reasonable return on the additional investment is possible. If these varieties are declared to produce better returns, the research system should get its act together and get them released officially. Their official release itself will not guarantee that they will enter the seed chain immediately, but the seed will be multiplied and distributed to the farmers at a lower cost, or at some subsidy. After conducting FPVS trials, sample farmers in the adopted villages were provided small quantities of pods (2 kg per farmer). In order to involve a large number of farmers, each one was given only 2 kg of pods. The seed requirement is very high in case of groundnut, which is why such small quantities of seed do not motivate farmers to bulk the seed through repeated multiplication and cultivate the new varieties. These constraints will be removed only if the new varieties are released and their seed production is taken up in a big way. Unless the new varieties enter the seed chain in a big way, they cannot be expected to spread fast on their own.

Chapter 6: Synthesis and Lessons Learned

6.1 Synthesis of results

Under the first phase of the TL-II Project, the Raichur and Chitradurga districts in Karnataka, and the Erode and Thiruvannamalai districts in Tamil Nadu, were chosen for the introduction of new varieties and technologies. In each of these four 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 designated 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 each of the two states, a sample of 180 farmers was drawn from the adopted villages, while 90 farmers were chosen from the control villages. A baseline survey was conducted during 2007–08, immediately after the cropping season, to assess the socioeconomic status of the farmers, adoption and yield levels and benefit/cost ratios of groundnut vis-à-vis other competing crops. FPVS trials were conducted during the rainy season of 2008–09 in the so-called adopted villages. Some new varieties were tested vis-à-vis the ruling varieties in the region to assess the comparative performances of groundnut. Farmers were asked to rank the varieties based on the traits preferred by them, and the varieties so selected were taken up for seed multiplication. The farmers were supplied with small quantities of seed so that they may multiply the seeds and bulk the supply, enabling them to gradually switch over to the preferred varieties. In 2009–10, an early-adoption survey was commissioned to assess the dent the new varieties were making and whether this adoption has caused any improvement in their yields and incomes.

The baseline study found that the groundnut crop had a dominant presence in the cropping pattern and contributed significantly to the crop incomes of the farmers. However, it was found that the farmers are still cultivating age-old varieties like TMV-2 in Karnataka, and CO-2, POL-2, VRI-2 and TMV-7 varieties in Tamil Nadu. FPVS trials were conducted with several new varieties and with the ruling variety as the local-check variety. The results of these established that the new varieties outshone the check varieties, but farmers did not always select the varieties with the highest-yield potential. For instance, farmers in Raichur were not in favor of R2001-02 and R2001-03, despite their high-yield potential, because of their poor pod characteristics and low market acceptance. In Chitradurga, ICGV 91114 performed as well as TMV-2 in the FPVS trials. Despite this, it was preferred by the farmers over R2001-02 because of the positive attributes of short duration, drought tolerance and good pod characteristics. ICGV00351 in Erode and TVG0004 in Thiruvannamalai performed well, resulting in them being preferred by the farmers. The FPVS trials were conducted for one season in Karnataka, but were carried on for three seasons in Tamil Nadu to reach a logical conclusion. After the initial screening process, the varieties tested in the trials were pruned in the second season, and paired comparisons were tested in the third season. This elaborate process identified that ICGV00351 has the potential to replace the old varieties and increase the yields in Erode. The same goes for TVG0004 in Thiruvannamalai and ICGV 87846 in Namakkal, as both hold great promise in achieving substantial yield impact. These varieties did well not only in FPVS but also in the farmers' fields. By 2009–10, however, they had still failed to reach many farmers at the time the early-adoption surveys were conducted. These varieties had not been released by the respective State Variety Release Committees, and it is only after their official release that they can enter the seed production and distribution chain of the state agencies supporting agriculture.

In Karnataka, despite the seasonal conditions in 2009–10 being sub-normal, the area under groundnut remained the same. Due to better production practices, a slightly higher yield was obtained with the traditional varieties as well. The new varieties were grown in small areas, but they reported better yield and higher net-returns when compared to the traditional varieties. With increases in groundnut yield and prices, the net return/ha increased in comparison to the baseline survey year. Despite increases in the cost of cultivation, the net return was higher in 2009–10, considering both traditional and new varieties. However, the impact on yield and income both was limited due to the slow spread of the new varieties. The total net returns from groundnut per sample-farm increased to some extent and the unit cost of production fell slightly to conclude that the impact of technology was positive, but limited.

In Tamil Nadu, the seasonal conditions in 2009–10 were unfavorable due to which the cropped area declined, which then led to a reduction of the area under groundnut, either because of weather abnormalities or other competing crops. In Thiruvannamalai, the area under groundnut fell by a quarter. Yet, due to higher yields reported by the traditional and new varieties in very small areas and the higher prices of groundnut, the total net returns from groundnut increased per sample-farm. There was a marked departure in Erode, where the groundnut area fell by half, and the total net return from groundnut dropped by about 42%. This was despite small increases in yield as well as in prices. The economics of improved varieties pointed to good potential, but it was wasted due to lack of adequate support in seed production and distribution. The official release of new varieties and their subsequent entry into the seed chain can go a long way in strengthening the chances of a positive impact. The provision of small quantities of groundnut seed to the farmers by the project staff did not yield the expected benefit, and it is speculated that the small quantities were inadequate in the attempt to encourage the farmers to grow and bulk the seed.

6.2 Lessons learned from Phase 1 of TL-II Project

An important lesson learned was not to hasten the conduct of early-adoption study even before the FPVS trials were completed. Certainly, the results of the early-adoption study were less than heartening for the TL-II staff, although such results are expected in the absence of the ability to influence the state government to release the varieties and put them in the seed chain. After the first year of the FPVS trials was completed in 2008–09, there was only one season before the early-adoption study was conducted. Just one season was not enough for the bulking of seed and growing it in appreciable areas. Extensive paired demonstration of FPVS with the locals will pave the way for increased adoption in targeted regions. The quantity of seed samples (2 kg) should be increased in case of groundnut for attracting and encouraging the farmers to take up new cultivars.

Another important lesson is to get the new promising varieties released by the concerned State Variety Release Committees rather quickly. Normally, perhaps, testing of the varieties for two to three seasons may be required for the committee to release the varieties. However, on the basis of the FPVS results and field performance, the process of variety release may be shortened. In case the variety release process cannot be shortened, alternate arrangements have to be made for increasing the seed production and distribution of promising new varieties. Even if a private seed company is involved in increasing the production and distribution of seeds, focus should be on reaching more farmers quickly. A community seed systems approach may also be tried to hasten the process of diffusion of the varieties selected by the farmers in the FPVS trials.

Additionally, government departments should be approached to extend the benefit of subsidy for the new varieties, instead of extending the same repeatedly to the same old and ruling varieties. Many a new technology has spread initially on the crutches of subsidy for one to two seasons. Farmers are used to the culture of subsidies and may be discouraged in using the new varieties by its non-subsidized price .

If all these elements of development strategy are combined with research efforts, the impact of technology can be demonstrated much quicker to the farmers, in comparison to the experience of the first phase of the TL-II Project.

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Appendices

Baseline Survey for Targeting Legumes Breeding and Seed Delivery Efforts to Enhance Impact on the Livelihoods of the Poor in South Asia, Tropical Legumes-II, (Phase-1), 2007

PART-1

Module 1. Basic information:

1.1. Date of interview	----------
1.2. Name of the investigator	----------
1.3. Name of the main crop referred for the survey	----------
1.4. Country	India
1.5. State	----------
1.6. District/division	----------
1.7. Block/taluka/mandal/township	----------
1.8. Village	----------
1.9. Adopted/control village	----------
1.10. Farm size (marginal, small, medium and large)*	----------
1.11. Household number	----------
1.10. Head (who takes major decisions) in the household	----------
1.12. Son/daughter/wife of	----------
1.13. Gender	----------
1.14. Age (completed years)	----------
1.15. Education (completed years of schooling)	----------
1.16. Member of any elected/nominated body	Yes/No
1.17. If yes, name of the body/organization	----------
1.18. Caste and Category (BC, SC, ST and FC)	----------
1.19. Religion	----------
1.20. Main occupation (major proportion of income)	----------
1.21. Secondary occupation (secondary source of income)	----------

1.22. Total family members: ---------- Male: ---------- Female: ---------- Children (<12 years) ----------

1.23. No. Of literates: ---------- No. of persons working on own farm: ----------

Module 2. Land holding as on July 2007.				
Particulars	Dry (acres)	Irrigated (acres)	Permanent fallow (acres)	Total (acres)
Own land	-	-	-	-
Leased/shared in land	-	-	-	-
Leased/shared out land	-	-	-	-
Operated land (own land+leased/shared in – leased/shared out land)	-	-	-	-

* Households operating < 2.5 acres of land (marginal), 2.51 to 5 acres (small), 5.01 to 10 acres (medium) and more than 10 acres (large).

Module 3. Resource endowments as on July 2007.		
Type	Quantity	Present total value in rupees
1. Land:	**-**	**-**
1.1. Dryland including fallow (acres)	-	-
1.2. Irrigable land (acres)	-	-
2. Livestock:	**-**	**-**
2.1. Draft animal	-	-
2.2. Local cows	-	-
2.3. Improved/jersey cows	-	-
2.4. Local/improved she buffaloes	-	-
2.5. Young stock	-	-
2.6. Goat and sheep	-	-
2.7. Poultry	-	-
2.8. Others	-	-
3. Farm implements:	**-**	**-**
3.1. Tractor with implements	-	-
3.2. Harvesters/threshers/groundnut sheller	-	-
3.3. Sprinkler sets/drip irrigation	-	-
3.4. Trucks/autos/4 wheelers	-	-
3.5. Cane crusher/agro-processing equipment	-	-
3.6. Rice/flour mills	-	-
3.7. Electric pumpsets a (1) (2)	-	-
3.8. Diesel pumpsets	-	-
3. 9. Broad bed and furrow (BBF marker)	-	-
3.10. Bullock cart	-	-
3.11. Manual/power sprayers	**-**	**-**

Continued

Continued

Module 3. Resource endowments as on July 2007.		
Type	Quantity	Present total value in rupees
3.12. Others (specify)	-	-
4. Residential house and consumer durables:	-	-
4.1. Residential house and plots	-	-
4.2. Farm house (cattle-shed)	-	-
4.3. Two wheelers/bicycles	-	-
4.4. Television sets	-	-
4.5. Fridge	-	-
4.6. Washing machine	-	-
4.7. Radio/tape recorder	-	-
4.8. Air coolers/fans	-	-

a Write share and value if farmer owns a share in the pumpsets and farm implements

Module 4. Financial assets and liabilities as on July 2007.			
Sources	Outstanding amount (Rs)	Purpose	Interest rate (%)
1. Loans			
1.1. Co-operatives	-	-	-
1.2. Nationalized banks	-	-	-
1.3. Self Help Groups	-	-	-
1.4. Friends & relatives	-	-	-
1.5. Finance companies	-	-	-
1.6. Moneylenders	-	-	-
1.7. Others	-	-	-
2. lending	-	-	-
2.1. Villagers	-	-	-
2.2. Friends/relatives	-	-	-
2.3. Others	-	-	-
3. Savings	-	-	-
3.1. Banks	-	-	-
3.2. LIC/PLI policies	-	-	-
3.3. Share market	-	-	-
3.4. Co-operatives	-	-	-
3.5. Chit funds	-	-	-
3.6. Self Help Groups	-	-	-
3.7. Mahila mandal	-	-	-
3.8. Post office	-	-	-
3.9. Others	-	-	-

Module 5. Major sources of household net income during the year.	
Sources of income	Net income (Rs)
1. Income from crops	-
2. Farm work (labor earnings)	-
3. Non-farm work (labor earnings)	-
4. Regular Farm Servant (RFS)	-
5. Livestock (milk and milk products selling)	-
6. Income from hiring out bullocks	-
7. Income from selling sheep, goat, chicken, meat, eggs etc.	-
8. Selling of water for agriculture purpose	-
9. Selling CPR (firewood, fruits, stones, and mats etc)	-
10. Selling handicrafts (specify)	-
11. Rental income (tractor, auto, sprayer, & truck etc.)	-
12. Rent from land, building and machinery etc.	-
13. Caste occupations (specify)	-
14. Business (specify)	-
15. Regular salaried jobs (Govt./private)	-
16. Out migration	-
17. Remittances	-
18. Interest on savings and from money lending	-
19. Cash and kind gifts including dowry received	-
20. Pension from employer	-
21. Government welfare/development Programs	-
22. Others 1	-
23. Others 2	-

Module 6. Cropping pattern for Chickpea July 2006 to June 2007 (Groundnut and pigeonpea July 2007 to June 2008).

Plot name	Owner ship*	Area (acres)	Soil Type**	Season ***	Name of the crop	Row arrange- ment/ proportion	Name of the variety	Cropped area (acres)	Irrigated yes/no	Source of irrigation	Main production (Kgs)	Harvest price/ kg	By-product (Qt)****	Harvest price/qt

* Use the codes. Own land (OW), leased-in (LI), leased-out (LO), shared-in (SI), and shared-out (SO).

** Deep black-1, Medium black-2, Medium to shallow black-3, Deep red-4, shallow red-5, Gravelly-6, Saline and alkaline-7 and others (specify) ---------- 8

*** Season codes: K-kharif (rainy), R-rabi (post rainy), S-summer, and P-perennial.

**** If farmer reported by-product in bundles or cart loads/truck loads covert and record in quintals by asking the approximate weight of each bundle

Module 7. Consumption expenditure for July to June (one year).

Total members of the household consumed the food (adults) ---------- (children >12 years)

Item	Code ** D/W/M/Y	Average quantity consumed Kg/liter	Average unit price (Rs)	Total value (Rs)
1. Food expenditure:	-	-	-	-
PDS rice *	-	-	-	-
Rice	-	-	-	-
PDS wheat *	-	-	-	-
Wheat	-	-	-	-
Sorghum	-	-	-	-
Pearl millet	-	-	-	-
Finger millet	-	-	-	-
Other cereals	-	-	-	-
Pigeon pea	-	-	-	-
Chick pea	-	-	-	-
Green gram	-	-	-	-
Black gram	-	-	-	-
Others pulses	-	-	-	-
Milk	-	-	-	-
Other milk products	-	-	-	-
Cooking oil	-	-	-	-
Groundnut kernels	-	-	-	-
Non-veg	-	-	-	-
Fruits	-	-	-	-
Vegetables	-	-	-	-
Tea, coffee, sugar & gur	-	-	-	-
All spices	-	-	-	-
Processed food items & hotel expenses	-	-	-	-
Other food items	-	-	-	-
2. Non-food expenditure:	-	-	-	-
Health expenditure	-	-	-	-
Entertainment/travel/vehicle	-	-	-	-
Education/stationery	-	-	-	-
Clothing/shoes	-	-	-	-
Ceremonies	-	-	-	-
Toddy & alcohol	-	-	-	-
Cosmetics (hair oil, soaps etc)	-	-	-	-
Taxes/maintenance/phone bill	-	-	-	-
Pan, beedi, cigarettes etc.	-	-	-	-

* Received on subsidy from public distribution system (PDS) for BPL families

** D-day, W- week, M- month, and Y- year

PART II CROP SPECIFIC MODULES

Module 8. History of the crop

Name of the main crop referred for the survey (groundnut, chickpea, pigeonpea):----------

(Note: all following questions refer to the selected crop)

1. Which year did you starts growing this crop? ----------

2. Reasons for growing this crop.

Purpose	Rank (order of importance)
1. Food/home consumption	-
2. Fodder/animal consumption	-
3. Higher Income	-
4. Restore soil fertility	-
5. Fitted well into the present cropping system	-
6. Best suited to my land	-
7. Fits well into a rotation	-
8. Others (specify)	-

3. Once in how many years do you grow this crop on same land (crop rotation)?

(a) Every season (b) every year (c) once in two years (d) once in three years (e) once in four years ( )

4. What are the crops planted by you before and after this crop in your field?

Before		After	
Season	Crop	Season	Crop
-	-	-	-
-	-	-	-

5. Area under this crop increasing/decreasing/constant in the last five years?----------

6. What are the crops replaced by this crop, if the area is increasing?

(a) ---------- (b) ---------- (c) ----------

7. What are the crops replacing this crop, if the area is decreasing?

(a) ---------- (b) ---------- (c) ----------

8. Is this crop grown as sole/inter crop? ---------- If inter crop, what are the crop

(a) ---------- (b) ---------- (c) ----------

9. In which year the area under this crop is maximum? Year ---------- Area (Ac) ----------

10. Average yield harvest by this household (kgs/acre).

	Rainy season (*kharif*)		Post rainy season (*rabi*)	
Year	Irrigated	Rainfed (dry)	Irrigated	Rainfed (dry)
Good year	-	-	-	-
Bad year	-	-	-	-
Best yield recorded so far	-	-	-	-

11.What varieties (cultivars) did you grow in the last three years?.

(Please show seed sample boxes to identify the varieties grown by the household)

		2006-07		2005-06		2004-05	
Crop varieties	Season (kharif/rabi)	Source of seed	Area (acres)	Source of seed	Area (acres)	Source of seed	Area (acres)
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-

12. When did you start growing these cultivars/varieties?.

	First year of Adoption					Peak adoption	
Cultivars	Year	Area sown (acres)	Source of information	Source of seed	Decision maker to adopt *	Year	Area sown (acres)
1. Local	-	-	-	-	-	-	-
2.	-	-	-	-	-	-	-
3.	-	-	-	-	-	-	-
4.	-	-	-	-	-	-	-
5.	-	-	-	-	-	-	-

* Husband-1, wife-2, both wife and husband-3, son-4 and other family members-5

13. Steps followed by the household in selecting seeds from his own crop?

(1) ----------

(2) ----------

(3) ----------

(4) ----------

14. Precautions followed by the household in storage of own seed?

(1) ----------

(2) ----------

(3) ----------

(4) ----------

15. What factors do you or household members consider when purchasing seed?	
(1) Brand name	Yes/no
(2) Price (rs/kg)	Yes/no
(3) Certification	Yes/no
(4) Good packing	Yes/no
(5) Others ----------	Yes/no

16. What are the major constraints in purchasing seed (rank)?	Rank
(a). Lack of information about recommended variety	---------
(b). Non-availability of required variety	---------
(c). Seed is not of good quality (up to expectation level)	---------
(d). High seed price	---------
(e). Need to travel long distances	---------
(f). Credit facility not available	---------
(f). Others (specify) ----------	---------

17.What are the major pests and diseases affecting this crop on your field?	
Major pests	Major diseases
1.	1.
2.	2.
3.	3.

18. Frequency of occurrence and yield loss estimated by the household in the last 5 years?			
Year	Type of pest /disease	% area affected	% Yield loss
	-	-	-
	-	-	-
	-	-	-
	-	-	-

19. Are the pest and disease problems increasing? Yes/No----------

20. If yes, what is causing increased incidence of pest and diseases?	**Rank**
(a) Growing it every year without rotation	----------
(b) Growing other crops, which are alternative hosts	----------
(c) Weather related reasons	----------
(d) Growing susceptible varieties	----------
(e) Not adopting IPM/IDM technologies	----------
(f) Others (Specify)	----------

21. How do you control pest?	**Rank**
(a) Relying only on chemical pesticides	----------
(b) Adopting IPM/IDM technologies	----------
(c) Traditional control (farmers practices) measures (specify)	----------
(d) Altering sowing time	----------
(e) Others (specify)	----------

22. How do you control diseases?	**Rank**
(a) Relying only on chemical pesticides	----------
(b) Adopting IPM/IDM technologies	----------
(c) Traditional control (farmers practices) measures (specify)	----------
(d) Altering sowing time	----------
(e) Others (specify)	----------

23. Source of information about pest control measures (Rank in order of importance).

Decision	T.V	Radio	News papers	Agrl. Magazine Diary/news letter	Farmers	Friends/ relatives	Input supplier	Research Institute	NGO
When to apply	-	-	-	-	-	-	-	-	-
Type of pesticide	-	-	-	-	-	-	-	-	-
Quantity to use	-	-	-	-	-	-	-	-	-
Mixing chemical	-	-	-	-	-	-	-	-	-

24. Constraints and characteristics in the cultivars grown by the household (Rank with in each group).

	Variety 1	Variety 2	Variety 3	Variety 4	Variety 5
Characteristics	Local	-	-	-	-
1. Constraints	**-**	**-**	**-**	**-**	**-**
Low yield	-	-	-	-	-
High pest incidence	-	-	-	-	-
High disease incidence	-	-	-	-	-
Long duration	-	-	-	-	-
Small grain size	-	-	-	-	-
Poor color	-	-	-	-	-
Poor taste	-	-	-	-	-
Low recovery/shelling %	-	-	-	-	-
Low market price	-	-	-	-	-
Not fit into cropping system	-	-	-	-	-
Poor fodder quality	-	-	-	-	-
Susceptible to storage pest	-	-	-	-	-
2. Prefered traits	-	-	-	-	-
2.1. Production:	-	-	-	-	-
High yield	-	-	-	-	-
Short duration	-	-	-	-	-
Drought resistance	-	-	-	-	-
Pest resistance	-	-	-	-	-
Disease resistance	-	-	-	-	-
Fit into existing cropping system	-	-	-	-	-
Improve soil fertility	-	-	-	-	-
More recovery/shelling %	-	-	-	-	-
More oil content	-	-	-	-	-
2. 2. Consumption:	-	-	-	-	-
Better taste	-	-	-	-	-
Less cooking time	-	-	-	-	-
High keeping quality	-	-	-	-	-
2.3. Fodder:	-	-	-	-	-
More fodder quantity with leafy	-	-	-	-	-
Palatability (quality/taste)	-	-	-	-	-
More durability of fodder	-	-	-	-	-
2.4. Marketing:	-	-	-	-	-
High demand	-	-	-	-	-
Fetches higher price	-	-	-	-	-
Low price fluctuations	-	-	-	-	-
Bigger grain size	-	-	-	-	-

25. List four major characteristics are you/household members looking for in a new variety/ cultivar?

	Existing Market Price Rs/kg willing to pay	New premium price Rs/kg at present
a). ----------	----------	----------
b). ----------	----------	----------
c). ----------	----------	----------
d). ----------	----------	----------

Module 9. Pattern of utilization of output.

1. Utilization of production for Chickpea 2006-07 (Groundnut and pigeonpea 2007-08).

Variety	Grain output (kgs)	Consu- med (kgs)	Other uses* (kgs)	Own seed (kgs)	Sold as seed (kgs)	Seed sale price Rs/kg	Sold (kgs)	Prod. of byproduct (qts)	Own Use (qts)	Sold (qts)	Sale price Rs/qt
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

* Includes kind wages, gifts and fed to cattle etc.

2. Marketing of crop production (Chickpea 2006-07, groundnut and pigeonpea 2007-08).

Total sale during the year: ---------- kgs

Name of market	Place	Dista- nce	Marketing cost (rs/qt) Bag- ing	Trans- port	Commi- ssion agent	Market fee	Hamali (labor)	Quantity sold (kgs)	Sale price (Rs/kg)
Village	-	-	-	-	-	-	-	-	-
Weekly	-	-	-	-	-	-	-	-	-
Regulated	-	-	-	-	-	-	-	-	-

3. Did you sell crop output immediately after harvest? Yes/No.

If yes, what are reasons? (tick)	If no, what are the reasons? (tick)
Lack of money in hand	1. Expecting higher price
Repayment of loan	2. No urgent requirement of money
For household functions	3. To meet the future needs
To invest in business	4. Others (specify)
No storage facility	-
Others (specify)	

4. How do you store (storage structures) crop produce?

(a). Gunny bags ----------

(b). Cane made bins ----------

(c). Mud pots ----------

(d). Under ground storage ----------

(e). Storage rooms ----------

(f). Others (specify) ----------

5. How long do you store the crop production after harvest?

(a) Days ----------

(b) Months ----------

6. What precautions do you generally take while storing grain against pest and diseases problems?

(a) ----------

(b) ----------

(c) ----------

7. Do you obtain information on market prices prior to the sale?		Yes/ No
If yes, list important sources of information (rank)?		
Sl. No.	Source of information	Rank
1.	Relatives, friends and neighbors	-
2.	Community bulletin board	-
3.	Local news papers	-
4.	National news papers	-
5.	Radio/Television	-
6.	Group or association (specify)	-
7.	Community leaders	-
8.	Government agent	-
9.	NGO	-
10.	Internet	-
11.	Input dealer	-
12.	Farmer’s service centers	-
13.	Commission agent/trader	-
14.	Others (specify)	-

8. Does this information influence your decision on when, where and whom to sell? Yes/ No.

a. Village ---------- b) Market ----------

9. What are the advantages and disadvantages if the household sells the production to middlemen/ broker in the village?.

Advantages	Disadvantages
-	-
-	-
-	-

10. What are the advantages and disadvantages if the household sells the production in markets?

Advantages	Disadvantages
-	-
-	-
-	-

Module 10. Role of gender (Collect the following information from woman only).

1. Role of gender in groundnut/chickpea/pigeonpea crop cultivation (Tick the crop):

	Who does		
Activity	Primarily done by men	Primarily done by women	Joint activity (men & women)
1. Selection of crop	-	-	-
2. Selection of variety	-	-	-
3. Field cleaning	-	-	-
4. Land preparation	-	-	-
5. Transport of manure and application	-	-	-
6. Seed treatment	-	-	-
7. Sowing seed	-	-	-
8. Chemical fertilizer application	-	-	-
9. Hand weeding	-	-	-
10. Interculture/mechanical weeding	-	-	-
11. Plant protection measures	-	-	-
12. Irrigation	-	-	-
13. Watching	-	-	-
14. Harvesting main crop	-	-	-
15. Threshing	-	-	-
16. Transport of grain	-	-	-
17. Storage of produce	-	-	-
18. Fodder harvesting	-	-	-
19. Transport and stacking fodder	-	-	-
20. Seed selection and storage	-	-	-

2. Resource analysis:

Resources	Ownership Male/female/ both	Decision making Male/ female/both	Who influences the utilization
1. Assets	-	-	-
Land	-	-	-
Livestock	-	-	-
Credit	-	-	-
Implements	-	-	-
Machinery	-	-	-
Investment	-	-	-
2. Inputs	-	-	-
Seeds	-	-	-
Fertilizers	-	-	-
Pesticides	-	-	-
Own labor	-	-	-
Hired labor	-	-	-
3. Outputs	-	-	-
Crop production	-	-	-
Sale quantity	-	-	-
Fodder	-	-	-
4. Others	-	-	-
Household maintenance	-	-	-
Education of children	-	-	-
Children marriage	-	-	-
Migration	-	-	-

3. What are the most important sources of information about government programs (agricultural extension, welfare and new cultivars)?

Sl. No.	Source of information	Rank
1.	Relatives, friends and neighbors	-
2.	Community bulletin board	-
3.	Community or local news papers	-
4.	National news papers	-
5.	Radio	-
6.	Television	-
7.	Group or association (specify)	-
8.	Community leaders	-
9.	Government agent	-
10.	NGO	-
11.	Internet	-
12.	Field days	-
13.	Training melas	-
14.	Krishi (farmers) mela	-

4. Constraints and characteristics in the cultivars grown by the household (Rank with in each group)

(Please show seed sample boxes to identify the varieties grown by the household)

	Variety 1	Variety 2	Variety 3	Variety 4	Variety 5
Characteristics	Local	-	-	-	-
1. Constraints	-	-	-	-	-
Low yield	-	-	-	-	-
High pest incidence	-	-	-	-	-
High disease incidence	-	-	-	-	-
Long duration	-	-	-	-	-
Small grain size	-	-	-	-	-
Poor color	-	-	-	-	-
Poor taste	-	-	-	-	-
Low recovery/shelling %	-	-	-	-	-
Low market price	-	-	-	-	-
Not fit into present cropping system	-	-	-	-	-
Susceptible to storage pest	-	-	-	-	-
Poor fodder quality	-	-	-	-	-
2. Prefered traits	-	-	-	-	-
2.1. Production:	-	-	-	-	-
High yield	-	-	-	-	-
Short duration	-	-	-	-	-
Drought resistance	-	-	-	-	-
Pest resistance	-	-	-	-	-
Disease resistance	-	-	-	-	-
Fit into existing cropping system	-	-	-	-	-
Improve soil fertility	-	-	-	-	-
More recovery/shelling %	-	-	-	-	-
More oil content	-	-	-	-	-
2. 2. Consumption:	-	-	-	-	-
Better taste	-	-	-	-	-
Less cooking time	-	-	-	-	-
High keeping quality	-	-	-	-	-
2.3. Fodder:	-	-	-	-	-
More fodder quantity and leafy	-	-	-	-	-

Continued

Continued

4. Constraints and characteristics in the cultivars grown by the household (Rank with in each group).

(Please show seed sample boxes to identify the varieties grown by the household)

	Variety 1	Variety 2	Variety 3	Variety 4	Variety 5
Characteristics	Local	-	-	-	-
Palatability (quality/taste)	-	-	-	-	-
More durability of fodder (free from pest and diseases)	-	-	-	-	-
2.4. Marketing:	-	-	-	-	-
High demand	-	-	-	-	-
Fetches higher price	-	-	-	-	-
Low price fluctuations	-	-	-	-	-
Bigger grain size	-	-	-	-	-

5. List four major characteristics are you/household members looking for in a new variety/ cultivar?

	Existing Market Price Rs/kg at present	New premium price Rs/kg willing to pay
a). ----------	----------	----------
b). ----------	----------	----------
c). ----------	----------	----------
d). ----------	----------	----------

PART III. Input-output information module:

Village: ---------- Block/mandal/taluka/township: ----------District/division: ----------

State: ---------- Country ----------Farmer's name:---------- Plot name:----------

Crop/crop mixtures: ---------- Variety:---------- Year: ----------

Season:---------- Crop area (acres): ---------- Proportion: ----------

Operations			Labor use1		Input/Output		
		Unit	Quantity	Wage rate	Quantity	Unit price	Remarks
1A. Land preparation (Ploughing primary and secondary tillage)	M	D					
	F	D					
	B	D					
	T	HR					
1B. Seedbed preparation (BBF/NBF/FLAT)	M	D					
	F	D					
	B	D					
	T	HR					
2. FYM/C Compost/Sheep penning/ Tank silt application	M	D					
	F	D					
	B	D					
	T	HR					
FYM/Compost/poultry		QT					
Animal penning		NO					
Date of sowing							
3. Planting/Sowing	M	D					
	F	D					
	B	D					
4A. Seed: Crop1		KG					
Crop2		KG					
Crop3		KG					
4B. Seed treatment	M	D					
	F	D					
		GM					
		GM					
5A. Fertilizer application	M	D					
	F	D					

Continued

Continued

Operations		Labor use1			Input/Output		
		Unit	Quantity	Wage rate	Quantity	Unit price	Remarks
		KG					
		KG					
		KG					
		KG					
5B. Micronutrient application	M	D					
	F	D					
		KG					
		KG					
6. Interculture	M	D					
	F	D					
	B	D					
7. Weeding/Weedicide application	M	D					
	F	D					
Type (sprayer/duster/other)	SP	HR					
		LT					
		LT					
8.PlantprotectionSpraying/Dusting/ Shaking /Hand picking pest)	M	D					
	F	D					
	B	D					
Type (sprayer/duster/other)	SP	HR					
	DU	HR					
9. Irrigation	M	D					
	F	D					
Source of Irrigation							
10. Watching (Birds, Pigs etc.,)	M	D					
	F	D					
Date of harvesting main crop							
11. Harvesting2 : Crop1 Date of Harvesting: Crop2 Crop3	M	D					
	F	D					
Crop 2	M	D					
	F	D					
Crop 3	M	D					
	F	D					

Continued

Continued

Operations			Labor use1		Input/Output		
		Unit	Quantity	Wage rate	Quantity	Unit price	Remarks
12. Threshing Crop 1	M	D					
	F	D					
	B	D					
	TH	HR					
Crop 2	M	D					
	F	D					
	B	D					
	TH	HR					
Crop 3	M	D					
	F	D					
	B	D					
	TH	HR					
13. Marketing (including transport, and storage)	M	D					
	F	D					
	B	D					
	T	HR					
14. Fixed Cost: Land Rent (Ac) Cash		RS					
Kind		KG					
Land tax (Acre)		RS					
15. Grain Yield: Crop1		KG					
Crop 2		KG					
Crop 3		KG					
16. Fodder yield: Crop1		QT					
Crop 2		QT					
Crop 3		QT					
		QT					
		QT					
17. Stalk: Crop 1		QT					
Crop 2		QT					

1. Labor input includes total labor days of family and hired labor for each operation. Specify male and female labor as well as bullock labor separately wherever necessary.

2. Estimate the labor requirement if you had given to contractor for harvesting.

3. Specify clearly the units (eg. 5 kgs, FYM - 2 qts etc).

M = Male labor, F = Female labor, B = Bullock pair labor,

T = Tractor/Truck, TH = Thresher, SP = Sprayer, DU = Duster.

Note : Irrigation (Open dugwell, borewell, Submersible pump, tank, canal, and others(specify)---------

Note : Cost of hiring tractors\bullocks pair includes cost of operator.

Note : Ask\calculate land rent (Rs/acre) for that particular crop.

Monitoring and Evaluation Survey in South Asia Tropical Legumes - II, 2009.

PART-1

Module 1. Basic information:

1.1. Date of interview ----------

1.2. Name of the investigator ----------

1.3. Name of the main crop referred for the survey ----------

1.4. Country ----------

1.5. State ----------

1.6. District/division ----------

1.7. Block/taluka/mandal/township ----------

1.8. Village ----------

1.9. Adopted/control village ----------

1.10. If adopted, is this household selected for experimental trial Yes/No

1.11. If Yes, Type of trail: Mother/Baby trail

1.12. Farm size (marginal, small, medium and large)* ----------

1.13. Household number ----------

1.14. Head (who takes major decisions) in the household ----------

1.15. Son/daughter/wife (Write member ID) ----------

Module 2. Family composition as on July 2009.

Sr no	Name of the member	Relation To head[a]	Member ID	Gen-der M/F	Age years	Marital status	Completed years of education[c]	Main occupa-tion	Secondary occupa-tion	Working on own farm Yes/No
1		Head	01							
2			02							
3			03							
4			04							
5			05							
6			06							
7			07							
8			08							
9			09							
10			10							

a First write the name of the head of the household and then other members who are staying with this household and their relationship with the head

b Married, unmarried, widow, and divorced etc.

c Write zero if the person is illiterate

2. A. Resource analysis.

Resources	Ownership (Member ID)	Decision making (Member ID)	Who influences the utilization (Member ID)
Irrigated land			
Rainfed Land			
Livestock			
Machinery			
Investment			
Seeds			
Fertilizers and pesticides			
Own labor			
Others (specify)			

Module 3. Sources of credit and information (Chickpea, pigeon pea and groundnut 2008-09).

1. Are there times you have critical shortage of available funds for agricultural activities?

[1] Yes [2] No (If no go to question 2)

If yes, provide information on the cash and input credit you received during 2008-09

Item	Amount (Rs)	Source1	Interest rate (%)	Form of repayment2	Was credit received on time? Yes = 1 No=2
Production cash credit	-	-	-	-	-
Consumption cash credit	-	-	-	-	-
Input credit – Write selected crop name					-
1. Seed	-	-	-	-	-
2. Fertilizers	-	-	-	-	-
3. Pesticides	-	-	-	-	-
4. Others (Specify)	-	-	-	-	-

[1]Source of credit:	0= N/A	4= Relative	[2]Repayment: 1= Cash
	1= Financial institution	5= Government program	2= Crop output
	2= Money lender	6= Self help groups (SHG)	3= Cash & output
	3= Neighbor	7= Others	4= Others

2. During 2008-09, did you attend field days/demonstrations organized by the following organizations?

Organization	No. of field days attended 0=None	No. of field demonstrations attended 0=None	Number of times you discussed about crop 0=None
ICRISAT	-	-	-
Agricultural Extension Services	-	-	-
Agricultural Research Institute	-	-	-
NGO (specify)	-	-	-
Seed Company	-	-	-
Others (Specify)	-	-	-

3. What are your frequent sources of extension messages?

[1] Agric extension staff [2] Extension bulletins [3] News paper [4] Radio [5] Television [6] Other (specify):

4. How many times did you interact with Agri.extension agencies on crop production in 2008-09?

Module 4. Cropping pattern (Chickpea, pigeonpea and groundnut, July 2008 to June 2009).

Plot name	Owner ship*	Area of the plot (acres)	Member ID Who owns this land	Soil Type**	Season ***	NAME OF THE CROPS				Area under this cropping system	Member ID Who decides to grow this crop	Row arrange-ment	Irrigated Area (Ac)	Source of irrigation	CROP VARIETIES			
						Crop 1	Crop 2	Crop 3	Crop 4						Crop 1	Crop 2	Crop 3	Crop 4

Plot Name	Crop 1				Crop 2				Crop 3				Crop 4			
	Main production (kg)	Harvest price (Rs/kg)	By-product (Qt)	Harvest price (Rs/qt)	Main production (kg)	Harvest price (Rs/kg)	By-product (Qt)	Harvest price (Rs/qt)	Main production (kg)	Harvest price (Rs/kg)	By-product (Qt)	Harvest price (Rs/qt)	Main production (kg)	Harvest price (Rs/kg)	By-product (Qt)	Harvest price (Rs/qt)

* Use the codes. Own land (OW), leased-in (LI), leased-out (LO), shared-in (SI), and shared-out (SO).

** Deep black-1, Medium black-2, Medium to shallow black-3, Deep red-4, shallow red-5, Gravelly-6, Saline and alkaline-7 and others (specify) ---------- 8

*** Season codes: K-kharif (rainy), R-rabi (post rainy), S-summer, and P-perennial.

**** If farmer reported by-product in bundles or cart loads/truck loads covert and record in quintals by asking the approximate weight of each bundle

PART - II

Crop Specific Modules

Module 5. Name of the main crop referred for the survey (groundnut, chickpea, pigeonpea).

(Note: all following questions refers to the selected crop only)

1. What varieties (cultivars) did you grow during this year?

(Please show seed sample boxes to identify the varieties grown by the household)

Crop varieties	Local/Improved/ Hybrid	Season (Kharif/ Rabi/Summer)*	Source of information	Source of seed	Decision maker to adopt (Member ID)
-	-	-	-	-	-
-	-	-	-	-	-

* Collect by season if farmer is growing this crop in different seasons
Note: If any crop varieties purchased/borrowed, then answer the following, if not go to question 4

2. What factors did you considered while purchasing/borrowing seed during this year? (Rank).

List the varieties grown	Crop varieties			
	-	-	-	-
(1) Brand name	-	-	-	-
(2) Price (Rs/kg)	-	-	-	-
(3) Good quality seed	-	-	-	-
(4) Certification	-	-	-	-
(5) Good packing	-	-	-	-

3. What are the major constraints did the household faced in purchasing/borrowing seed during this year?

List the varieties grown	Crop varieties			
	-	-	-	-
Non-availability of required variety	-	-	-	-
Seed is not of good quality	-	-	-	-
High seed price	-	-	-	-
Need to travel long distances	-	-	-	-
Credit facility not available				

4. What are the major pests and diseases affecting crop production on your field during this year?

Varieties grown	Major pest	Control measure[1]	% yield loss	Major diseases	Control measure[1]	% yield loss
-	-	-	-	-	-	-
-	-	-	-	-	-	-

1 Control measures: 0= No control measures, 1= Relying only on chemical pesticides, 2= Adopting IPM/IDM technologies, 3= Traditional control (farmers practices) (specify) ---------- 4= Others (specify) ----------

5. Constraints and preferred traits in the cultivars grown by the household (Rank with in each group).

	Perceptions of head (Male)				Perceptions of Female 1			
	Variety 1	Variety 2	Variety 3	Variety 4	Variety 1	Variety 2	Variety 3	Variety 4
Characteristics	Local				Local			
1. Constraints								
Low yield (%----------)								
High pest incidence								
High disease incidence								
Long duration (days-------)								
Small grain size								
Poor color (----------)								
Poor taste								
Low recovery/shelling ---%								
Low market price (Rs------)								
Poor fodder quality								
Susceptible to storage pest								
2. Preferred traits								
2.1. Production:								
High yield (%----------)								
Short duration (Days-------)								
Drought resistance								
Pest resistance								
Disease resistance								
Improve soil fertility								
More recovery/shelling --%								
More oil content (-------%)								
2. 2. Consumption:								
Better taste								
Less cooking time (min----)								
High keeping quality								
2.3. Fodder:								
More fodder quantity (---%)								
Palatability (quality/taste)								
More durability of fodder								
2.4. Marketing:								
High demand								
Fetches higher price (-----%)								
Bigger grain size								

1 Information needs to record preferably by women field investigator from women (spouse or any women dealing with crop activity)

6. Utilization of production for Chickpea, pigeonpea and groundnut 2008-09.

Variety	Grain output (kgs)	Consumed (kgs)	Other uses* (kgs)	Own seed (kgs)	Sold as seed (kg)	Grain sold in market	Sale price Rs/kg	Type of market**	Unsold stock	Prod. byproduct (qts)	Own Use (qts)	If sold (qts)	Sale price Rs/qt
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Includes kind wages, gifts and fed to cattle etc.

** Village-1, Weekly market-2, Regulated market-3), Others (Specify)----------4

7. Tracking of seed sale:

Crop variety	Selling to whom1	Sale quantity (kg)	Price (Rs/kg)	Distance (Kms)
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

1 Seed company-1, Village farmers-2, Farmers belongs to neighboring villages-3, Farmers belongs to faraway villages –4, Others (Specify) ------5

Module 7. Adopting to and mitigating effects of dry-spell and drought.

1. What is the most important source of vulnerability?

(a). Drought (b). Pests/Diseases (c). Heavy/Untimely rains (d) Others (Specify)----------

2. How do you consider the climatic conditions (rainfall) during 2008-09 cropping year?

   (a) Good (b) Very good (c) Normal (d) Bad (e) Very bad

3. How often does drought occur? Once in ---------- years

4. What are your perceptions about rainfall pattern at present compared to 10 years ago?	Is this drought problem 1= Increasing 2= decreasing 3= No change	Effects on harvest? 1= reduced seed size 2= change in seed color 3= poor quality seed 4= reduced the yield 5= Others (specify
1. Arrival of monsoons		
2. Distribution of rainfall		
3. Number of rainy days		
4. Mid season drought		
5. Quantum of rainfall		
6. Availability of water		
7. Heavy rains		
8. Temperature		

5. Did you experience any severe drought that affected crop production (selected crop) in the last 5 years?Yes/No.

If Yes, Frequency of occurrence and yield loss estimated by the household in the last 5 years?

Year	Type of drought1	% area affected due to drought	% Yield loss due to drought	Any other Remarks
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

1 Late rains –1, Rains ending early-2 Mid season rainfall gaps –3, and Low amount of rain overall -4

6. Did you adopt any coping mechanisms when crops failed because of severe drought? Yes/No.

If yes, What are they?	Rank
(a) _____	_____
(b) _____	_____
(c) _____	_____
(d) _____	_____
(e) _____	_____

About ICRISAT

International Crops Research Institute for the Semi-Arid Tropics

ICRISAT is a member of the CGIAR Consortium

The **International Crops Research Institute for the Semi-Arid Tropics** (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, of whom 644 million are the poorest of the poor. ICRISAT innovations help the dryland poor move from poverty to prosperity by harnessing markets while managing risks – a strategy called Inclusive Market-Oriented Development (IMOD).

ICRISAT is headquartered in Patancheru near Hyderabad, Andhra Pradesh, India, with two regional hubs and five country offices in sub-Saharan Africa. It is a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future.

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