Groundnut Baseline and Early Adoption Surveys in South Asia

Insights from TL-II (Phase-I) project

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Synthesis Report

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ABSTRACT

Area under groundnut in India and its production showed a steady growth till the end of twentieth century. But the crop lost its pre-eminence 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 re-launched a Technology Mission in the name of 'Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize' (ISOPOM) development program to improve the productivity and production of oilseeds in the country and to reduce the 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 the genetic improvement, crop production and protection practices in India and Africa during the last four decades. The generous support received from the Bill and Melinda Gates Foundation (BMGF) 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 learnt, the report re-focuses on the further efforts needed during the second phase of the project to achieve greater success and impact.

Chapter 1

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 million 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 European Union is the largest importer (FAOSTAT, 2012). India has larger area (4.9 m ha) under groundnut than China (4.7 m ha) but later is the biggest producer of groundnut (16.8 m tons). India is currently producing 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, which is the popular cooking oil in the southern states of the country. The area under groundnut in India increased till the turn of the century, but it fell at an annual rate of 3.48% during 2000-09, after liberalization of edible oil imports (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 case of productivity than in 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 (Fig 1.1).

Table 1.1 Area, Production and Productivity of groundnut in India, 1980 to 2009

Statistic	Area ('000 ha)	Production ('000 tons)	Productivity (kg/ha)
Mean			
1980-89	7400	6600	876
1990-99	7800	7700	990
2000-09	6200	6700	1084
1980-2009	7100	7000	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 Directorate of Economics and Statistics, Ministry of Agriculture and cooperation, GOI)

The linear trend suggests that the productivity per ha has been rising by about 7.8 kg per year (see Fig 1.1) from 1950 to 2010. But, specifically yield was increasing at 25 kg per year during the last one decade (2001-2011) (see Fig 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.

Fig 1.1: Groundnut Productivity at all-India level, 1950-2010 (Kg per ha)

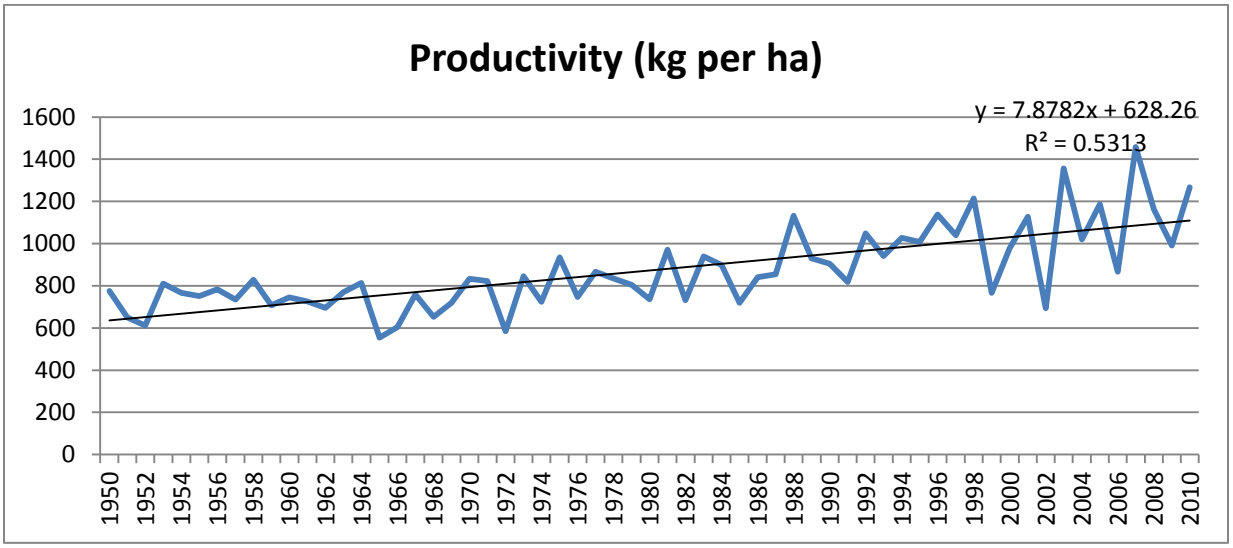
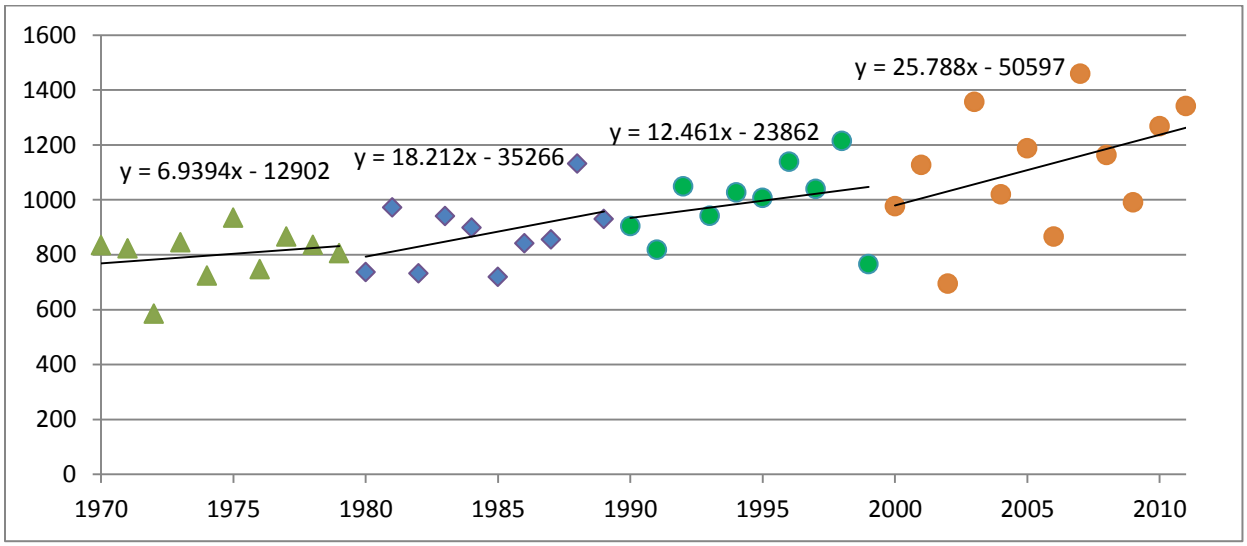


Fig 1.2: Decadal-wise groundnut productivity at all-India level (Kg per ha)



Groundnut is one of the five mandate crops of International Crops research Institute for the Semi-arid Tropics (ICRISAT). Under the Tropical Legumes-II project, ICRISAT is spearheading the research and seed production effort along with many partners to improve the productivity and the incomes of the 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 to 2009 and instability measures *(Area in '000 ha and Productivity in kg/ha)*

Statistic	Gujarat		Andhra Pradesh		Karnataka		Tamil Nadu		Maharashta		Rajasthan	
	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty	Area	Pdty
Mean												
1980-89	1916	750	1736	855	951	820	968	1105	766	889	218	691
1990-99	1900	920	2182	892	1213	835	988	1529	622	1101	266	952
2000-09	1898	1219	1645	838	893	680	563	1830	409	1072	273	1329
1980-2009	1905	963	1854	862	1019	778	840	1488	599	1021	252	991
CV (Raw data)												
1980-89	18	53	20	14	21	12	10	12	12	19	16	36
1990-99	5	45	11	22	7	16	13	16	19	14	15	30
2000-09	5	48	14	33	11	22	16	13	14	9	17	15
1980-2009	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 Directorate of Economics and Statistics, Ministry of Agriculture and cooperation, GOI)

Gujarat is the leading state, with a share of nearly 35% in the country (Table 1.2). The productivity of groundnut increased steadily from 750 kg/ha during 1980-89 (average) to 1219 kg/ha during 2000-09 (average). Yet, the area under the crop remained stagnant. In Andhra Pradesh, the productivity remained stagnant over the three decades period. Area under the crop increased from 1.74 million ha (1980-89 average) to 2.18 million ha (1990-99 average), but dropped sharply to 1.65 million ha during 2000-09 (average). Karnataka also exhibited similar trend in area along with falling productivity. Tamil Nadu and Maharashtra also suffered erosion in area after 2000 A.D., despite rising productivity. The area under groundnut remained steady, as the productivity increased over the three decades period. It was noted that the productivity of groundnut varies widely between the states and it is because of soil fertility, season grown and the degree of irrigation coverage. 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. It 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 the oilseed growers in the country under its Integrated Scheme of Oilseeds, Pulses, Oil palm and Maize development program (ISOPOM) in the form of input subsidies and extension services. This program is merged in to National Food Security Mission (NFSM) since April 1, 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 five-fold 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.

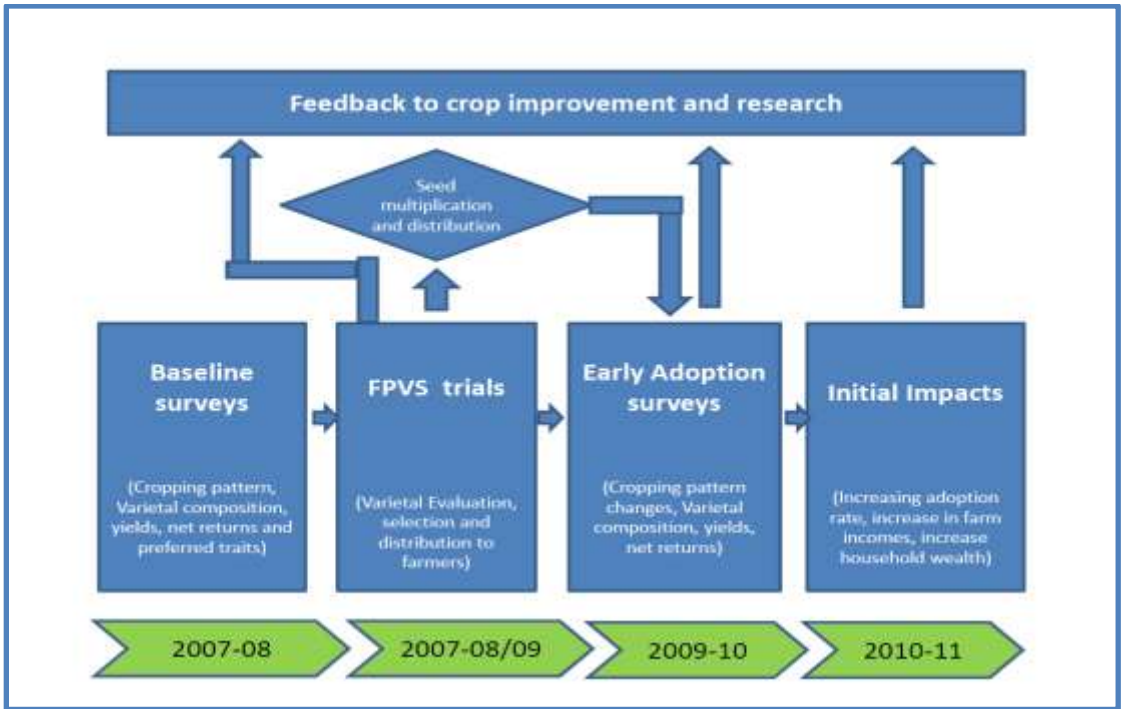
While the population grew at an annual average compound growth rate of 1.9 per cent, the per capita consumption of oils increased at 4.6 per cent per year. Because of the yawning gap between demand and supply of edible oils, the import dependence increased. Because of the relative profitability of the 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 per cent 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 intense competition among the crops for area. 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 Tropical Legumes-II (TL-II) is targeting on 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 Tropical Legumes-II project during 2007-10 through Farmer Participatory Varietal Selection (FPVS) have generated interest among the farmers to grow some of the new varieties (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 learnt 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 Tropical Legumes-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., Chick pea, Pigeon Pea, Groundnut, Common bean, Cow pea and Soy bean.

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



In South Asia, the intervention is limited to the first three crops falling under the mandate of International Crops Research Institute for Semi-arid Tropics (ICRISAT). The intervention strategy in the Tropical Legumes (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, its productivity and profitability. Then some promising high yielding varieties will be tried on the farmers' fields and opportunities are provided to the farmers to select the varieties with which they are impressed in terms of productivity, pod characteristics and market acceptance. The varieties selected by the farmers are multiplied on selected farmers' fields and 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 create an impact on 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 states of India were chosen for implementing the project strategy in case of Groundnut. Although Gujarat and Andhra Pradesh are the most important states for groundnut production in the country, 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 introductory first chapter provided the general introduction about groundnut crop and its recent trends of performance in terms of area, production and productivity in the major states of India and the country as a whole during the last three decades period. The causes of shrinkage of groundnut area during the first decade of the Twenty First century were discussed. The increased dependence on import of edible oils and substitution of groundnut oil by cheaper oils have eroded the premium position of groundnut. But the saving grace has been a consistent increase in 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 Tropical Legumes –II project and how it was implemented in the study area.

Chapter 2 presents the study approach and methodology. Effort is devoted to the description of the study areas and listing of the adopted or intervention villages and control villages in the four districts. The simple tools and techniques used in the study to achieve the objectives of the study are described. Chapter 3 is devoted to the description of the scenario in the baseline study. Its first part described the baseline situation in the selected villages of Raichur and Chiradurga districts of Karnataka, while the second part dealt with the baseline situation in the selected villages of Erode and Thiruvannamalai districts of Tamil Nadu. Chapter 4 details the Farmer Participatory Varietal Trials (FPVS) conducted in the selected villages of Raichur and Chitradurga districts of Karnataka and Erode, 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 the trait preferences of the farmers. In many cases, farmers preferred the varieties with desirable traits, even though they yielded less. FPVS trials were conducted on semi-spreading (Virginia Bunch) varieties in Nammakkal district. The results of these trials are also discussed. But Nammakkal villages were not covered in either baseline or early adoption surveys. Chapter 5 presents 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 learnt are summarized in Chapter 6. The appendices at the end of the report contain the questionnaires used in baseline and early adoption studies.

Chapter 2

Sample and Methodology

Under phase I of TL-2 project, Raichur and Chitradurga districts in Karnataka and 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 and three more villages were chosen as non-intervention villages and 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 base line survey was conducted during 2007-08, immediately after the cropping season to assess the socio-economic status of the farmers, adoption and yield levels and benefit cost ratios of groundnut vis-à-vis other competing crops. Farmer Participatory Varietal Selection (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 taken up for seed multiplication. The farmers were supplied with small quantities of seed so that they will multiply the seeds and bulk the supply so that they can gradually switch over to the preferred varieties. In 2009-10, an early adoption survey was commissioned to assess the dent the new varieties are making and whether this adoption has caused any improvement in their yields and incomes.

All these four selected districts have considerable areas under groundnut and are well served by research stations located closer to them. The trends in area, production and productivity of groundnut in the four study districts were analyzed and furnished in Table 2.1. Area under groundnut increased in Raichur district up to 1988, but it steadily declined throughout the study period (1988-2009). In the triennium ending 2009, the area was less than one half of what it was in 1983. Its productivity also reached a peak in 1988 but it gradually declined till 1998, although it recovered back to some extent in the next decade. In Chitradurga district also, the area under groundnut initially increased but decreased from 1988 onwards. The productivity of groundnut also showed an upward trend till 1988 but, thereafter, it went on declining till 2009. The productivity in 2009 was only one half of what it was in 1988. 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. But the productivity of groundnut was steady in Erode district except for a dip in 2003, while it actually increased in Thiruvannamalai district during the study period. The decline in area of groundnut suggests that more profitable crops are replacing groundnut even

when its productivity is not falling. The measure of instability indicated that the variability in groundnut yield is more than that in area. De-trending of data reduced the coefficient of variation only marginally.

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

Triennium ending	Raichur			Chitradurga			Erode			T.V.Malai		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
1983	107	55	507	20	20	1032	N.A	N.A	N.A	N.A	N.A	N.A
1988	142	107	757	103	86	1054	N.A	N.A	N.A	N.A	N.A	N.A
1993	122	88	723	183	175	953	87	154	1768	155	185	1192
1998	107	63	581	169	166	954	58	103	1833	125	178	1422
2003	85	59	699	172	108	628	34	47	1388	98	131	1310
2009	52	39	750	146	77	519	25	46	1814	87	159	1820
Instability measure (CV)												
Raw data												
1980-2009	27	41	20	45	54	38	37*	45*	14*	24*	22*	21*
1980-1989	17	43	31	73	71	29	N.A	N.A	N.A	N.A	N.A	N.A
1990-1999	11	23	15	13	32	23	20	22	9	20	19	11
2000-2009	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*
1980-1989	27	57	30	30	49	38	N.A	N.A	N.A	N.A	N.A	N.A
1990-1999	8	19	15	13	31	26	18	26	9	19	20	6
2000-2009	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 the research and development partners have selected the treatment villages for conducting Farmers Participatory Varietal Selection (FPVS) trials after first testing them in the research stations. We have chosen the same villages for conducting the baseline surveys. We selected villages closer to the treatment villages as control villages to provide the counter-factual.

Raichur district belongs to 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 four or five irrigations received from the TungaBhadra canals, while it is grown as a rain fed crop in the rainy season. Chitradurga district belongs to 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 stands first in production. Groundnut is grown as a rain fed crop during the rainy season. These two districts offer a contrast in groundnut cultivation with Chitradurga representing rain fed crop in the rainy season and Raichur representing largely irrigated situation in the post-rainy situation.

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

Districts	Treatment/ Adopted village	No. of farmers	Control village	No. of farmers	Total
Raichur	Maragantanala	30	Adavibhavi	15	135
	Bhoomanagunda	30	Singeridoddi	15	
	Chandrabanda	30	Naganadoddi	15	
Chitradurga	Gulya	30	Chikkanahalli	15	135
	Hosahalli	30	Kondlahalli	15	
	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 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. 30 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 baseline study. In Chitradurga district, the villages chosen for intervention were Gulya, Hosarahalli and Kaparahalli, while Chikkanahalli, Kondlahalli and Mogalalalile were picked up as the control villages. Just as in case of Raichur district, 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 adopted villages and 90 farmers from control villages constituted the sample for the study in Karnataka.

Table 2.3: Distribution of Karnataka sample farmers among different categories, 2007-08

Category	Raichur sample		Chitradurga sample		Pooled sample	
	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 the parentheses 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 considerable share in the sample, while marginal farmers had relatively smaller share in the sample. The bias towards medium and large farmers was a little higher in Chitradurga sample, relative to Raichur sample. In the pooled sample of adopted villages, 8.9 per cent belonged to marginal category and 32.2 per cent were drawn from small farmers' category. One third of the sample came from the medium farmers group and the remaining 25.6 per cent 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 per cent. Small and medium categories had shares of 30 per cent each. Large farmers also had a higher share of 27.8 per cent. 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. 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 western part of the state. This district has relatively less irrigation facilities than Thiruvannamalai district. Groundnut is mainly grown as a rain fed crop but it receives protective irrigation wherever 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 introduction of new varieties and technologies in Erode district. Odapalayam, Vambathi and Polavapalayam were picked up as the control villages for comparison purpose. 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, the villages of Melchettipattu, Sirunathur and Kilsirupakkam were

identified for introduction of new technologies in Thiruvannamalai district, while the villages of Nachinandal, Narimangalam and Radapuram were picked up as control villages for the sake of comparison. 30 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 picked up 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
Erode	Ulagadam	30	Odapalayam	15	135
	Bramadesam	30	Vambathi	15	
	Gettisaviur	30	Polavapalayam	15	
T.V.Malai	Melchettipattu	30	Nachinandal	15	135
	Sirunathur	30	Narimangalam	15	
	Kilsirupakkam	30	Radapuram	15	
Grand Total		180		90	270

Table 2.5: Distribution of Tamil Nadu sample farmers among different categories, 2007-08

Category	Erode sample		T.V. Malai sample		Pooled sample	
	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 the parentheses represent percentages to the total)

There was a considerable difference in the distribution of sample farmers among the different size groups between the two districts. In Erode district, the sample was biased more in favor of small and medium categories of farmers (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 case of control villages, the marginal and small farmers were well represented with each of them having a share of 35.6 per cent each in the sample. Medium farmers' category had a share of

22.2 per cent, with the remainder of6.6 per cent belonging to large farmers' category. But, in case of adopted villages, 50 per cent of the sample came from medium farmers' category alone. The next big share of 26.9 per cent belonged to small farmers' group. Large farmers had a share of 13.3 per cent in the sample and the remaining share of only 7.8 per cent belonged to 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 district was dominated by marginal and small farmers. They together had a share of 82.2 per cent in these samples. The medium farmers group had shares ranging between 14 and 16 per cent, while the shares of large farmers were restricted to only 2 to 3 per cent 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 farmer's fields and the same were distributed to the farmers in the villages in small quantities. After one year, we conducted another survey with the same sample of farmers as in case of 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 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.

$$^{yt} = ab^{t}u^{t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

^{yt} = 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 the logarithmic form to facilitate the use of linear regression. By taking logarithm on both sides of the equation (1), we get the equation (2).

Ln Y = ln a + t ln b + ln ut …… (2)
This is of 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 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

Average annual compound rate was calculated as
b = 1 + g
g = b – 1

To obtain 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 majority of respondents were first listed. Each of 135 respondents selected in each district were asked to rank the preferences based on their priorities using ranks from 1 to 10. In this analysis, rank 1 means most important problem and rank 10 means least important problem. In the next stage rank assigned to each reason 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 per cent positions were found, scores were determined for each per cent position by referring Garrett's table. Then, the scores for each problem were summed 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. Final overall ranking of the factors was carried out by assigning rank 1, 2, 3 etc., in the descending order of the mean scores.

2.2.4 Coefficient of variation (CV)

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

CV (per cent) = (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 the recall bias. The baseline survey dealt with the socio-economic 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 sample

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

3.1.1 Socio-economic profile of Karnataka sample

Table 3.1: Socio- economic profile of sample farmers in Karnataka, 2007-08

Socio-economic Issue	Raichur		Chitradurga		Pooled	
	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 Raichur district are male-headed (Table 3.1). Same was the case in Chitradurga district except one per cent of households which are headed by females. The size of household was larger in Raichur district, with the adopted villages reporting a size of 8 and the control villages having an average size of 7. The household size was smaller in Chitradurga district at 6 in both adopted and control villages. The number of workers in adopted villages of Raichur district was also higher at 5, comprising of 3 male workers and 2 female workers, while there were 4 workers divided equally in to male and female workers in control villages. Hence, the dependency ratio was low at 0.6 in adopted villages and 0.75 in control villages. In Chitradurga district, 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 household head was lower in Raichur district. In adopted villages, it was 42, while it was much lower at 36 in the sample from control villages. In contrast to this, the average age of household head was much higher in Chitradurga sample at 48 years in adopted villages and 46 years in control villages. The household head in adopted villages of Raichur district was more educated with 9 years of schooling. The household head in control villages received only four years of schooling. The household head in both adopted and control villages of Chitradurga district had the same level of education with 7 years of schooling. About 11 per cent of household heads participated in local bodies in adopted villages of both Raichur and Chitradurga districts and in control villages of Chitradurga district. But only 7 per cent of them from control villages of Raichur district had participation in local bodies. Less than 10 per cent 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 per cent in the sample from adopted villages of Raichur district. In the other three groups of villages, their representation was much lower at two per cent.

94 per cent of households in the adopted villages of both the districts depended on farming as the main source of income. In the control villages of both the districts, this dependence on farming was slightly lower at 93 per cent. But as many as 23 per cent of households in adopted villages of Raichur district depended on business or service as main or secondary source of income. This proportion was lower at 11 per cent in case of sample households of control villages in the same district. In case of Chitradurga district, 15 per cent of sample households from both the adopted and control villages derived some income from business or service. The contrast between adopted and control villages of Raichur district was quite visible in the ownership of two wheelers/cycles, television sets and radio/tape recorders. Those from control villages of Raichur district lagged far behind their counterparts from adopted villages. The ownership of these consumer durables was more uniform between the adopted and control villages of Chitradurga district. Thus, there was greater homogeneity between the sample households from adopted and control villages of Chitradurga district. But, there was sharp

contrast between these two groups of villages in Raichur district with respect to education, income sources and in the possession of consumer durables. The sample households from control villages of Raichur district lagged far behind those from adopted villages in all these respects.

3.1.2 Assets and liabilities

The sample farmers from both adopted and control villages owned the same quantity of land in Raichur district (Table 3.2). But the farmers from 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 the sample farmers in adopted villages was higher at Rs. 546, 000. But, in 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 case of Chitradurga district, sample farmers from control villages owned more land and also had a higher fraction of irrigated land. The value of land owned by sample farmers in adopted villages of Chitradurga district was lower by Rs. 50, 000 when compared with the same in control villages. Unlike in Raichur district, 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

Type of Land	Raichur				Chitradurga			
	Adopted		Control		Adopted		Control	
	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
Rainfed 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. Per Hh)

Type of Livestock	Raichur				Chitradurga			
	Adopted		Control		Adopted		Control	
	Number	Value	Number	Value	Number	Value	Number	Value
Draft animals	0.86	10650	1.28	14750	0.98	12956	1.18	14889
Cows	1.06	9950	1.14	11025	0.99	8827	1.02	10422
Buffaloes	0.52	4106	0.58	6240	0.72	3806	1.16	5644
Others	3.86	6838	2.40	4120	4.55	10060	9.62	38738
Total livestock	6.30	31544	5.40	36135	7.24	35647	12.98	69693

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 district, the sample farms of adopted villages own more livestock, but the value of animals possessed by sample farms in control villages was higher. In Chitradurga district, sample farms of control villages had more animals as well as higher value of livestock when compared with those from adopted villages. In particular, the sample farms of control villages had higher number of small ruminants.

Table 3.4: Value of Farm Implements owned by sample farmers in Karnataka, 2007-08

(Rs per Hh)

Type of Implement	Raichur				Chitradurga			
	Adopted		Control		Adopted		Control	
	Number	Value	Number	Value	Number	Value	Number	Value
Tractor and accessories	0.05	16670	0.09	36670	0.06	22222	0.07	20222
Electrical pumpsets	0.12	4972	0.17	5840	0.42	25167	0.51	24578
Bullock drawn tools	0.14	1290	0.11	1120	0.31	5322	0.38	7089
Others tools	0.74	10340	0.86	11880	0.36	8880	0.27	4978
Total farm implements	1.05	33272	1.23	55570	1.15	61591	1.23	56867

With respect to ownership of farm machinery and implements, the control villages of Raichur district were better placed with respect to both the number and value (Table 3.4). But, in Chitradurga district, sample farms of adopted villages owned higher value of farm implements than those of 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 per Hh)				Chitradurga (Rs per Hh)			
	Adopted		Control		Adopted		Control	
	No.	Value	No.	Value	No.	Value	No.	Value
Residential house	0.92	90285	0.86	44982	0.96	120222	0.94	103289
Cattle shed	0.52	8658	0.15	997	0.47	8522	0.51	8467
Cycle/two-wheelers	0.14	3379	0.12	3285	0.37	11910	0.44	11307
Others	0.70	2255	0.45	984	1.31	5633	1.71	8196
Total consumer durables	2.28	104577	1.58	50248	3.11	146287	3.60	131258

The sample farms of adopted villages in Raichur district had more durable assets than their counterparts in control villages (Table 3.5). The value of their residential house and other durable assets was more than twice that of the assets owned in control villages. In case of Chitradurga district, adopted villages had a higher value of durable assets than the control villages, while the later owned more 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 (-)	149556	203386	42576	58811
Lending's (+)	40000	70000	3723	4378
Savings (+)	25000	35000	3876	5284
Net Liabilities	84556	98386	34977	49149

The sample farms in adopted villages of Raichur district had lower borrowings than those from control villages (Table 3.6). In case of Chitradurga district also, higher borrowings were reported by the sample farms from control villages. In general, the extent of borrowing was much higher in Raichur district than in Chitradurga district. The sample farms from both adopted and control villages of Raichur district also reported much higher figures for lendings and savings when compared to those from Chitradurga district. Yet, the net liabilities in case of Raichur district were about twice as big as in Chitradurga district.

Table 3.7: Net worth of sample farmers in Karnataka, 2007-08 (Rs '000 per 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 brings together the value of assets and liabilities of sample farmers detailed in Tables 3.2 through 3.6. The total assets were the highest in case of sample farms of adopted villages in Raichur district. They were higher than those of control villages in Raichur district as well as than the assets of adopted villages in Chitradurga district. In Chitradurga district, the assets of farmers

from control villages were higher than those in adopted villages, mainly on account of 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 control villages of Chitradurga, due to higher net liabilities in case of Raichur sample. The sample farms of adopted villages in Raichur district possessed the highest net worth, followed by control villages of Chitradurga district, control villages of Raichur district and adopted villages of Chitradurga district.

3.1.3 Income and expenditure of sample farmers

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

Source of income	Raichur		Chitradurga	
	Adopted	Control	Adopted	Control
Income from crops	32742	23358	25911	33489
Farm work (labor earnings)	9055	7201	1681	2222
Non-farm work (labor earnings)	1152	1000	228	300
Regular Farm Servant (RFS)	600	0	300	0
Livestock (milk and milk products selling)	5171	6998	8621	5393
Income from hiring out bullocks	500	166	1631	1656
Income from selling sheep, goat, chicken, meat, eggs etc.	6551	3981	4405	3027
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	3633	2844
Rent from land, building and machinery etc.	433	0	422	0
Caste occupations (specify)	600	0	609	67
Business (specify)	833	1000	2522	2333
Regular salaried jobs (Govt./private)	500	0	9256	10244
Out migration	4222	1833	0	0
Remittances	0	1000	533	0
Interest on savings and from money lending	2217	2000	554	611
Cash and kind gifts including dowry received	667	0	0	0
Pension from employer	200	4000	53	0
Government welfare/development Programs	800	400	0	0
Others 1	500	0	167	0
Others 2	500	0	0	0
Grand Total	67743	53604	60526	62408

The net household income of sample farms from adopted villages of Raichur district was the highest (Table 3.8) among the four villages. There was a substantial difference of 26.4 per cent in their net household income when compared with that of control villages in Raichur district, which reported the lowest income of Rs.53, 604 per year. The sample farms of control villages of Chitradurga district had a marginally higher net household income by 3.1 per cent than those from adopted villages. Income from crops was 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 significant amounts to the total household income.

Table 3.9: Consumption expenditure of sample farmers, Karnataka 2007-08 (Rs/Year)

Food item	Raichur		Chitradurga	
	Adopted	Control	Adopted	Control
Cereals	7000	8000	6000	6000
Pulses	3000	4000	2500	2000
Milk and Milk products	8000	5000	2500	3700
Edible oils	4000	3000	2700	3400
Non-Veg. foods	1000	1000	1800	2800
Fruits and vegetables	3000	3000	2300	3900
Others	5000	4000	2300	3000
Total food expenditure	**31000**	**28000**	**20100**	**24800**
Health	4000	6000	3000	3000
Education	4000	5000	4000	5000
Entertainment and travel	1000	1000	1000	2000
Clothing and shoes	5000	5000	4000	5000
Ceremonies	3000	4000	1000	1000
Alcohol and Cigarettes	2000	2000	500	1300
Cosmetics	1000	1000	1400	1400
Others	3000	1500	9100	8300
Total Non-food	**23000**	**25500**	**24000**	**27000**
Total expenditure	**54000**	**53500**	**44100**	**51800**

The annual consumption expenditure of sample households was also highest in case of adopted villages of Raichur district (Table 3.9). But the consumption expenditure in control villages was also quite close to the level in adopted villages, unlike in case of income where the difference was substantial between them. The expenditure on food was higher than that on non-food in both the adopted and control villages of Raichur district. The consumption expenditure was quite low in adopted villages of Chitradurga district. It is lower by 17.5 per cent than that in control villages of the same district. In both the adopted and control villages of Chitradurga district, non-food expenditure was higher than that on food.

3.1.4 Cropping pattern and Groundnut varieties

Table 3.10: Relative importance of groundnut in cropped area of Karnataka sample, 2007-08

Cropped area	Raichur Sample		Chitradurga Sample		Pooled Sample	
	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
Area under post- rainy season groundnut area post rainy area (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 Karnataka sample farms is presented in Table 3.10. In Raichur district, crops are grown in both rainy and post-rainy seasons. Groundnut is also grown in both the seasons, but more prominently in post-rainy season. Groundnut area accounts for 38 per cent of the total cropped area in the adopted villages of Raichur district. Its share is even higher at 42 per cent in control villages. Groundnut has a more prominent place in the cropping pattern of Chitradurga district. It is grown only during the rainy season, mainly under rain fed situation. Groundnut area constituted 58 per cent of the total cropped area in adopted villages and 54 per cent of the total cropped area in control villages of Chitradurga district sample.

Table 3.11: Composition of groundnut varieties in Karnataka sample, 2007-08 (ha)

Variety	Raichur Sample		Chitradurga Sample		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
TMV-2	100	56	109	54	209	110
ICGV91114	0	0	0	0	0	0
R 2001-2	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 districts of Karnataka was completely under a single variety, namely, TMV-2 during 2007-08 (Table 3.11). This was the case in both the adopted and control villages of the two study districts. R 2001-2 which was released a few years ago failed to make any dent despite its high yield potential. This variety has undesirable pod characteristics due to which it is not preferred in the market. It is not

also backed up by seed production and distribution system in Karnataka. Similarly, ICGV91114 has not made any head way, despite some desired characteristics like short duration, tolerance to drought, moderate levels of resistance to rust and leaf spots and good pod & kernel traits, mainly 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		Chitrdurga Sample		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Rain fed						
Good	1023	615	852	830	938	723
Bad	608	435	515	548	562	492
Best	1195	818	975	1025	1135	922
Irrigated						
Good	1635	1084	1370	1276	1503	1180
Bad	1099	714	1020	985	1058	850
Best	2066	1307	1750	1560	1908	1434

The perceived yields of groundnut under different weather scenarios by the sample farmers in 2007-08 are presented in Table 3.12. The perceived yield levels of groundnut are relatively higher in Raichur district than in Chitradurga district for any comparable weather situation. The yield levels perceived by the groundnut farmers in adopted villages of Raichur district were much higher than those perceived by farmers in control villages. But the yield levels perceived by farmers in adopted and control villages of Chitradurga district were around the same levels. Under good weather situation, the perceived groundnut yields ranged between 615 and 1023 kg per ha. These yields could go down to 435 to 608 kg per ha if the weather conditions are not good. The best yields could touch between 818 and 1195 kg per ha. Under irrigated situation, the good yields can range between 1084 and 1635 kg per ha. Even under bad weather conditions, the yields could range between 714 and 1099 kg per ha. The best yields which are perceived to be feasible could range between 1307 and 2066 kg per ha. Since the yield levels in any season could be influenced by the prevailing weather situation, the perceived yields under alternate weather situations provide the range of possible yields in different weather situations. They reflect the long experience of the farmers with the crop.

3.1.5 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 district, groundnut (irrigated) was perceived to be the most profitable crop, followed by paddy and cotton. Groundnut (rain fed) was perceived to give higher gross returns than other rain fed crops like sunflower, pigeon pea and sorghum. In the control villages of Raichur district, groundnut (irrigated) was perceived to give lower returns

than paddy but more returns than cotton. Groundnut under rain fed condition was perceived to give better gross returns than sun flower, pigeon pea and sorghum. In both the adopted and control villages of Chitradurga district, groundnut (irrigated) was perceived to give higher gross returns than paddy. Similarly, groundnut grown under rain fed condition is believed to give better returns than sunflower and pigeon pea. These perceived returns indicate that the sample farms in both the districts believe that groundnut is the crop perceived to be yielding highest gross returns when compared with the alternative crops. However, since the cost of seed and other cultivation expenses are also higher in case of groundnut, we cannot infer anything about their 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(Rainfed)	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
Pigeon pea	12	10	14	14	13	12
Cotton	24	22	-	-	24	22

Table 3.14: Economics of rain fed and irrigated groundnut on sample farms of Karnataka, 2007-08

Cost /returns	Raichur (Rs per ha)		Chitradurga (Rs per ha)	
	Adopted	Control	Adopted	Control
Rain fed (TMV-2)				
Yield (kg/ha)	1114	1031	792	762
COC(Rs/ha)	24137	22902	14747	14166
Gross returns(Rs/ha)	29991	27757	19716	18754
Net returns (Rs/ha)	5854	4855	4969	4588
BCR	1.24	1.21	1.34	1.32
Irrigated (TMV-2)				
Yield (kg/ha)	1322	1258	N.A	N.A
COC (Rs/ha)	26153	24812	N.A	N.A
Gross returns (Rs/ha)	35591	33867	N.A	N.A
Net returns (Rs/ha)	9438	9055	N.A	N.A
BCR	1.36	1.37	N.A	N.A

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

3.1.6 Sources of information

Table 3.15: Sources of information on technology to sample farmers in Karnataka, 2007-08
(Percent 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)
News paper	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 the parentheses indicate rank of importance as source of information)

Friends/relatives emerged as the most important source of information on technology in both adopted and control villages of Raichur and Chitradurga districts (Table 3.15). Agricultural magazines/agricultural extension staff was the next important source of information across all the sample villages. Input suppliers occupied the third place among the sources of information. Other farmers and television also provided information on technology to a considerable number of farmers. Research institutes and other media sources, 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 the high yield (Table 3.16). It was the most preferred trait by the sample farmers from the adopted villages in Raichur district and the control villages of both the Raichur and Chitradurga districts. The sample farmers from the adopted villages of Chitradurga district, however, assigned the top rank to drought resistance among all the traits. Pest and

disease resistance as well as high oil content are the other desired traits by most of the sample farmers as indicated by the Garette scores. Short duration, high recovery and ability to fit in to cropping system are the other traits desired by the sample farmers.

Table 3.16 Farmer preferred traits of Groundnut, Karnataka, 2007-08 (Garette scores)

Traits	Raichur		Chitradurga	
	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 in to 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, Karnataka, 2007-08

(Garette scores)

Market Preferred	Raichur		Chitradurga	
	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)
Big kernel size	57(1)	57(1)	60(1)	56(1)

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

Among the market traits considered, big grain size was the most preferred one by the sample farmers from all the four groups of villages (Table 3.17). The varieties which are in high demand in the market were preferred next by the sample farmers. Those varieties which fetch good market price and those which face less price fluctuations are also preferred by the sample farmers of all the categories of farmers.

As indicated by the table on preferred agronomic and market traits, sample farmers indicated their willingness to pay the most to those varieties which incorporate the desired traits of high yield and bigger grain size (Table 3.18). Farmers across all the village groups expressed their willingness to pay 13 to 18 per cent more than the existing market price. Farmers also indicated their preparedness to pay 10 to 11 per cent more for the seeds incorporating each of the desired traits of high recovery and high oil content. For the varieties incorporating pest and disease resistance, farmers were ready to pay about 10 per cent more for the seeds. Farmers indicated

their willingness to pay about 5 per cent 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, Karnataka, 2007-08 (Percentage over the prevalent seed price)

Traits	Raichur		Chitradurga	
	Adopted	Control	Adopted	Control
Better Quality	8	9	7	5
Better Taste	5	4	6	7
Better Yield	13	15	14	16
Big Grain Size	13	15	16	18
Disease & 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 largely a preserve of the male members of the sample households (Table 3.19). Almost all the irrigated land and most of the rain fed land were owned by the male members of the sample households. Women own land in only five per cent of the sample households. But, in case of livestock, about a third of the animals were owned by the female members of the households. But almost all the farm machinery was owned by the male members of the sample households.

Table 3.19: Ownership of assets by gender, Karnataka sample, 2007-08

Resource	Gender	Raichur		Chitradurga	
		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, males were normally the decision makers with respect to the use of assets as well as with the decision making in case of agricultural operations (Table 3.20). But, in case of social aspects like household maintenance, education of children as well as the marriages of children, the decisions are taken jointly by both male and female members. In case of adopted villages of Chitradurga district, male members are content with delegation of the responsibility of household maintenance largely to the female members. The same was the case with the control villages of Chitradurga district also to some extent. It may be concluded that women had a greater say in running the affairs of the house in Chitradurga district than in Raichur district.

Table 3.20: Decision making by Gender, Karnataka sample, 2007-08

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

Field cleaning and hand weeding operations were carried out largely by the female members of the sample households in all the four groups of villages (Table 3.21). They also contribute a major share of labor in pod separation and in harvesting main crop relative to the male members

across all the four groups of villages. But 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 the field operations in case of groundnut in all the study villages. Notwithstanding the fact of male domination in ownership of assets and decision making regarding their use, women do contribute a significant share of labor and both men and women take decisions jointly with respect to household maintenance and about the future of their children**.** 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

Operation	Gender	Raichur		Chitradurga	
		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 Socio-economic profile of Tamil Nadu sample

Almost all the sample households were male headed in adopted villages of Erode district and adopted and control villages of Thiruvannamalai districts (Table 3.22). But, in case of control villages of Erode district, 11 per cent of the households were headed by females. The family size was larger in Thiruvannamalai district sample at 5.7 than in Erode district sample, which was at 4.7. There were also more workers and less number of dependents in Thiruvannamalai district sample than in Erode district sample. As a result, the dependency ratio was about one half in Thiruvannamalai sample households compared to that in Erode district. The sample farmers of adopted villages in Erode district were more aged by 4 to 5 years than those in the other three groups of villages.

Table 3.22: Socio- economic profile of sample farmers in Tamil Nadu, 2007-08

Socio-economic Issue	Erode sample		TV Malai 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 district was a shade better than the corresponding level in Thiruvannamalai sample. Hardly 2 to 4 per cent of the sample farmers in both the districts participated in the local bodies. None of the sample households in the two districts belonged to the forward communities. Virtually all the sample farmers from both the districts belonged to Hindu religion, except for 4 per cent of the households from control villages of Thiruvannamalai district, who belonged to minority community.

Almost all the sample households had farming as their main source of income. But, in the control villages of Erode district, about 11 per cent of the sample households had sources other than farming as their main source of income. In these villages, as many as one-third of the sample households depended on business/service as their main or secondary sources of income. In Thiruvannamalai district, 18 per cent of the sample households from the adopted villages and 16 per cent of those from control villages depended on business/service as their main/secondary source of income. This proportion of households that depended on business/service as their main/secondary source of income was only 9 per cent in the adopted villages of Erode district. Virtually, almost all the households of the sample possessed two wheelers/bicycles. But, the sample farmers of Erode district had nearly universal access to television sets/radios, while those from Thiruvannamalai district had limited access to them. Among the Thiruvannamalai district sample, those 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

Type of Land	Erode				T.V.Malai			
	Adopted		Control		Adopted		Control	
	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
Rainfed 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 district, the average size of holding as well as the value of land was much higher in case of the sample households from adopted villages than those from control villages (Table 3.23). In case of Thiruvannamalai district sample, the sample households from control villages possessed marginally larger holdings, but the value of land was much higher in case of the sample households from adopted villages.

Table 3.24: Value of Livestock owned by sample farmers in Tamil Nadu, 2007-08

Type of Livestock	Erode (Rs per Hh)				T.V.Malai (Rs per Hh)			
	Adopted		Control		Adopted		Control	
	Number	Value (Rs.)	Number	Value (Rs.)	Number	Value (Rs.)	Number	Value (Rs.)
Draft animals	0.29	2049	0.07	511	0.06	4917	0.91	7733
Cows	1.88	21047	1.69	16822	1.62	10328	1.62	12222
Buffaloes	0.41	4094	0.18	2022	0.06	400	0.31	522
Others	8.48	25153	6.64	9489	2.11	2251	3.07	2656
Total livestock	11.06	52343	8.58	28844	3.85	17896	5.91	23133

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

Table 3.25: Value of farm Implements owned by sample farmers in Tamil Nadu, 2007-08

Type of Implement	Erode (Rs. Per Hh)				T.V.Malai (Rs. Per Hh)			
	Adopted		Control		Adopted		Control	
	Number	Value (Rs.)	Number	Value (Rs.)	Number	Value (Rs.)	Number	Value (Rs.)
Tractor and accessories	0	0	0	0	0	0	0	0
Electrical pumpsets	1.37	30556	0.44	13400	0.9	27467	1.04	18133
Bullock drawn tools	0.04	400	0	0	0	0	0.09	933
Others tools	2	2595	0.58	1064	2.17	738	2.07	652
Total farm implements	3.41	33551	1.02	14464	3.07	28205	3.2	19718

In both the districts, the sample households from the adopted villages owned more number of implements as well as higher value of farm implements than their counterparts from the control villages (Table 3.25). The sample households from adopted villages in Erode district owned more than twice the value of farm implements when compared with those from the control villages. In case of Thiruvannamalai sample also, sample farmers from adopted villages possessed higher value of farm implements than those from the control villages, but the gap 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		T.V.Malai	
	Adopted	Control	Adopted	Control
	Value (Rs.)	Value (Rs.)	Value (Rs.)	Value (Rs.)
Residential house	225356	142533	78967	91000
Cattle shed	444	0	0	0
Cycle/two-wheelers	25944	13980	3546	9993
Others	12264	6639	6094	7334
Total consumer durables	264008	163152	88607	108328

The sample households from Erode district possessed more consumer durables than their counterparts from Thiruvannamalai district (Table 3.26). This contrast is seen more in the value of residential house. In Erode sample, the households from the adopted villages possessed more value of durable assets than those from the control villages. But, In Thiruvannamalai district sample, households from control villages were better placed in the value of consumer durables than those from the adopted villages.

Table 3.27: Financial Liabilities and Assets of sample farmers in Tamil Nadu, 2007-08 (Rs)

Financial Liabilities and Assets	Erode		T.V.Malai	
	Adopted	Control	Adopted	Control
Borrowings (-)	14013	4444	18049	24321
Lending's (+)	4009	1388	2188	4488
Savings (+)	6021	2578	0	0
Net Liabilities	3983	478	15861	19833

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

Table 3.28: Net worth of sample farmers in Tamil Nadu, 2007-08 (Rs '000 per Hh)

Assets and Liabilities	Erode		T.V.Malai	
	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	1168	497	952	820
Net Liabilities	4	1	16	20
Net worth	1164	696	936	800

All the information on assets and liabilities from Tables 3.23 to 3.27 is consolidated in Table 3.28. The sample households from adopted villages of Erode district had the highest net worth among the four groups of villages. They had 67 per cent higher net worth than those from the control villages of the same district. Their net worth was higher by 24 per cent than that of households from the adopted villages of Thiruvannamaalai district. In turn, the net worth of households from adopted villages of Thiruvannamalai district was higher by 17 per cent than that of households from control villages of the same district. Of the four village groups, the households from control villages of Erode district had the lowest net worth. Their net worth is lower by 15 per cent than that of the households from control villages of Thiruvannamalai district.

3.2.3 Income and Consumption expenditure

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

Table 3.29: Annual average net household income of sample in Tamil Nadu, 2007-08

Sources of income **(Rs per Year)**	Erode		Thiruvannamalai	
	Adopted	Control	Adopted	Control
Income from crops	62467	30485	28178	23778
Farm work (labor earnings)	1344	111	2722	2000
Non-farm work (labor earnings)	7900	1333	769	0
Regular Farm Servant (RFS)	989	0	0	178
Livestock (milk and milk products selling)	11646	10381	4851	7340
Income from hiring out bullocks	528	1022	411	800
Selling of sheep and goat	5290	9627	100	178
Selling of water for agriculture purpose	144	0	0	0
Selling CPR (firewood, fruits, stones, and mats etc)	667	178	0	0
Selling handicrafts (specify)	89	7222	0	0
Rental income (tractor, auto, sprayer, & truck etc.)	1578	22	433	400
Rent from land, building and machinery etc.	0	0	0	489
Caste occupations (specify)	0	0	0	1000
Business (specify)	1222	1111	0	0
Regular salaried jobs (Govt./private)	6000	1333	6389	6444
Out migration	0	0	0	133
Interest on savings and from money lending	1539	222	0	0
Pension from employer	22	0	800	0
Others 1	0	0	2700	4667
Others 2	0	0	189	0
Grand Total	101424	63048	47542	47407

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

other quality food items were much lower than those in the Erode samples. Thus, Erode sample households had a much higher standard of living as reflected in the expenditures on quality foods and non-food items like health, education, clothing, entertainment, ceremonies etc., when compared with the expenditures on the same items in Thiruvannamalai district.

Table 3.30: Consumption expenditure of sample farmers in Tamil Nadu, 2007-08 (Rs.per year)

Item of Consumption	Erode		T.V.Malai	
	Adopted	Control	Adopted	Control
Cereals	7894	8438	9809	8330
Pulses	2695	2537	1386	1708
Oils and Oil seeds	2097	1486	2551	2608
Non-Veg. foods	4221	3687	1440	1933
Milk and Milk products	1922	1517	1157	2015
Fruits and vegetables	6974	5231	3408	3424
Other food items	1256	4865	717	800
Total Food expenditure	**27059**	**27761**	**20468**	**20818**
Health	4859	3642	2121	3371
Education	12570	11560	4703	3740
Clothing/shoes	4000	3630	3317	3422
Toddy & alcohol, Bid and Cigarettes	407	363	582	293
Entertainment and Travel	6807	5956	978	1130
Other non-food items including Ceremonies	6561	6968	2690	3679
Total non-food expenditure	**35204**	**32119**	**14391**	**15635**
Total expenditure	**62263**	**59880**	**34859**	**36453**

3.2.4 Cropping pattern and Groundnut yields

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 district, groundnut (sole and inter crop) had a share of 80.6 per cent. Maize and millets were the other crops that have a considerable area share of 6.7 per cent each. The share of groundnut was slightly lower at 79.5 per cent in the cropped area of control villages of Erode district. The sample farms of control villages of Thiruvannamalai district had the highest proportion of 92.1 per cent in the gross cropped area. This share was a little lower at 86.86 per cent 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 area of Tamil Nadusample, 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 comm. crop	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 in 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 groundnut varieties on the sample farms of Tamil Nadu is summarized in Table 3.32. In Erode district sample, CO-2 is the most popular variety in both the adopted and control villages. It occupied 52 per cent of the groundnut area of the sample farms from the adopted villages. Its share was slightly lower at 48 per cent in case of the sample farms of control villages. VRI-2 was the next most popular variety in Erode district, occupying 33 per cent area in the adopted villages and 34 per cent in the control villages. TMV-2 covered 9 per cent area in the adopted villages and 13 per cent area in the control villages. JL-24 had 3 per cent share in both the villages, while TMV-7 came next with 2 per cent share in both the sets of villages. TMV-1

occupied one per cent share on the sample farms of adopted villages in Erode district. In Thiruvannamalai district sample, POL-2 was the most popular variety in the adopted villages, with a share of 55 per cent in the total groundnut area. TMV-7 was also popular with a share of 44 per cent. The remainder of one per cent area was under JL-24. 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 per cent in the groundnut area of the sample farms. TMV-7 stood next with a share of 40 per cent. JL-24 had the remaining share of one per cent area under it.

3.2.5 Economics of Groundnut and other crops

Tamil Nadu is known for high yields of groundnut. One of the reasons for it is the irrigation support it receives in many parts of the state. The perceived yield of groundnut is generally higher in Thiruvannamalai district sample than in Erode district sample (Table 3.33).

Table 3.33: Perceived yield levels of groundnut in Tamil Nadu sample, 2007-08 (kg per ha)

Season	Rainfed/ Irrigated	Good/Bad year	Erode		Thiruvannamalai		Pooled	
			A	C	A	C	A	C
Kharif	Rainfed	Good	1065	852	951	1363	1008	1107
		Bad	687	520	679	690	683	605
		Best yield	1282	1084	1667	1986	1475	1535
	Irrigated	Good	1450	1067	1638	1729	1544	1398
		Bad	946	574	720	718	833	646
		Best yield	1798	1396	2203	2232	2001	1814
Rabi/summer	Rainfed	Good	852	683	1447	1263	1150	973
		Bad	484	426	1020	795	752	611
		Best yield	1010	872	1895	1497	1453	1185
	Irrigated	Good	1124	837	1675	1712	1400	1275
		Bad	650	467	877	904	764	686
		Best yield	1257	1057	2253	2305	1755	1681

The perceived yields of groundnut are much higher in the adopted villages than in control villages of Erode district. But the converse is true in case of Thiruvannamalai district sample. The yields of groundnut perceived by the sample farms in control villages were generally higher than those perceived by those from the adopted villages of Thiruvannamalai district. In the rainy season, the perceived yields of groundnut were around 1000 to 1100 kg per hectare under rain fed condition. But, in a bad season, the yield can go down to 600 to 700 kg per hectare. The best yields recorded were around 1500kgs per hectare under rain fed condition. Under irrigated condition, the normal yields are perceived to go up to about 1400 to 1600kgs per hectare. But

under bad seasonal conditions, the perceived yields of groundnut under irrigated condition are only a shade better than that under rain fed condition. But the best yields perceived from irrigated crop are around 1800 to 2000 kg per hectare.

In the post-rainy/summer season, perceived normal yields of rain fed groundnut are around 1000 to 1100 kgs per hectare. In other states, it is not possible to grow groundnut under rain fed condition during the post-rainy season. But, in Tamil Nadu, rainfall is distributed between south-west and north-east monsoons. And, it is possible to grow groundnut in the post-rainy season i.e., from October to January months. But when weather conditions are unfavorable, the yields can dip to 600 to 750kgs per hectare. The best yields perceived for post-rainy season under rain fed condition range between 1200 and 1450kgs per hectare. Under irrigated condition, the good yields are perceived to be between 1275 and 1400kg per hectare. The perceived yields are quite low around 700kgs per hectare under bad weather conditions even with the support of irrigation. The best yields perceived under irrigation support are around 1700 kg per hectare.

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)	1382	1000	883	1493
Variable cost (Rs/ha)	12726	11577	12495	11718
Fixed cost (Rs/ha)	2500	2269	2249	2700
Total cost (Rs/ha)	15226	13846	14744	14418
Gross returns (Rs/ha)	40280	29579	25863	42505
Net returns (Rs/ha)	25054	15733	11119	28087
Benefit cost ratio	2.65	2.14	1.75	2.95

Just as in case of perceived yields, the average yield of groundnut reported was higher in case of adopted villages than in control villages of Erode district (Table 3.34). In Thiruvannamalai district, the yield was much higher in case of control villages than in adopted villages. In both the districts, the cost of cultivation was slightly higher on the sample farms of adopted villages than those of control villages. The highest net returns were reported for the sample farms from the control villages of Thiruvannamalai district. The benefit-cost ratio was also highest in this case. In Erode district, the benefit-cost ratio was higher in case of adopted villages than in case of control villages. In Thiruvannamalai district, the benefit-cost ratio reported for adopted villages was much lower than that reported for control villages due to lower yield obtained.

3.2.6 Sources of information about technology

The important sources of information about technology to the sample farmers 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 to the farmers. About 50 per cent or more of the farmers obtained information about technology from the input dealers. Next important source of information about technology were neighbors, friends and relatives. Media provided information on technology to the sample farmers from adopted villages of both the districts when compared to those from the control villages. In a relative sense, more sample farmers from both adopted and control villages of Thiruvannamalai district obtained information about technology when compared with those from Erode district.

Table 3.35: Sources of information about technology, Tamil Nadu sample, 2007-08
(Percent 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 (Garette 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 adopted villages of Erode district and control villages of Thiruvannamalai district gave top preference to the high yielding nature of the varieties (Table 3.36). Sample farmers from control villages of Erode district ranked pest

resistance as the most preferred agronomic trait over high yield. In the same way, sample farmers from adopted villages of Thiruvannamalai district rated drought resistance as the most desired agronomic trait over high yielding nature. In general, high yield, pest resistance and drought resistance are the top production traits rated by the farmers from the four groups of villages. High recovery and short duration were also rated by one or two groups of farmers. High oil content and disease resistance were the other desired production traits preferred by the farmers.

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

Market Preferred	Erode		Thiruvannamalai	
	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 Grain 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 adopted and control villages in Erode district (Table 3.37). In Thiruvannamalai district, sample farmers preferred those varieties which fetch a higher price. The varieties which face low fluctuations in market price and those with big grain size were also preferred by the sample farmers, besides high demand and fetching higher price.

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

Traits	Erode (%)		Thiruvannamalai (%)	
	Adopted	Control	Adopted	Control
Better Taste	26	30	9	8
Better Yield	24	17	11	12
Big Grain Size	26	12	10	9
Disease & 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 sample farmers were asked to indicate the price premium they would pay for the varieties incorporating the desired traits, sample farmers from adopted villages of Erode district expressed willingness to pay higher price premiums than those from other groups of villages (Table 3.38). In general, respondents from Erode district showed their preparedness to pay

higher price premiums over the ruling seed prices in the market. The sample farmers from the adopted villages of Erode district expressed their preparedness to pay a premium of 26 per cent to the seeds incorporating the desired traits of either better taste or big grain size. They also expressed readiness to pay 24 per cent more for the varieties incorporating either high yield or drought resistance or high oil content. Seeds with pest and disease resistance would fetch 23 per cent more over the ruling seed price, while those with high recovery would be bought at a price premium of 19 per cent. Sample farmers from control villages of Erode district indicated that they would pay 30 per cent more for the varieties with better taste; 27 per cent more for the varieties with drought resistance; 22 per cent more for the varieties with pest and disease resistance; 21 per cent more for the varieties with high oil content; 17 per cent each more for the varieties with better yield and high recovery; and 12 per cent more for the varieties with big grain size. The sample farmers from the adopted villages of Thiruvannamalai district indicated that they would pay 12 per cent higher price for the varieties having drought resistance and 11 per cent more for each of the traits of better yield and high oil content. Varieties incorporating each of the traits of big grain size, pest and disease resistance and high recovery would be bought at a price premium of 10 per cent. The price premium they were prepared for the trait of better taste was only 9 per cent. The sample farmers from control villages of Thiruvannamalai district were prepared to pay 12 per cent price premium for each of the traits of high yield and high oil content. They would pay 10 per cent more for drought resistance and 9 per cent more for the trait of big grain size. The other three desired traits of better taste, pest and disease resistance and high recovery would fetch price premium of 8 per cent each.

3.2.8 Gender analysis

Table 3.39: Ownership of assets by gender, Tamil Nadu sample, 2007-08

Resource	Gender	Erode		Thiruvannamalai	
		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 domination of males in land ownership was total in case of the adopted villages of Erode district and the control villages of both the study districts. In case of the

adopted villages of Thiruvannamalai district, land is held in the name of female members. But, some of the livestock were owned by the female members in case of all the village groups. Because of the role played by women in livestock rearing, some of the livestock in some of the sample households are owned by the female members. In the same way, some of the farm machinery and implements were also owned by the female members of the households. So, unlike the case of land, which is the preserve of male members, some of the livestock and farm machinery are owned by the women in case of the sample farms of Tamil Nadu districts.

Table 3.40: Decision making by Gender, Tamil Nadu sample, 2007-08

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

The decisions relating to the use of land are taken by the male members of the households. Most of the decisions relating to the use of farm machinery are also taken by them (see Table 3.40). But women have some say regarding the decisions about livestock in some of the households in all the four village groups. They also influence the decisions relating to labor use and hiring in

some households. 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 district. But the domination of males even in these social aspects is evident in case of the adopted and control villages of Thiruvannamalai district.

Table 3.41: Performance of operations by Gender, Tamil Nadu sample, 2007-08

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

Although women neither own many assets nor have a clinching role in the decisions about farm management, they do contribute labor for the farm operations in a significant way (see Table 41). They participate in farm operations like hand weeding, field cleaning, harvesting main crop and pod separation in a big way. They also lend a helping hand in other operations like sowing and fertilizer application. Their participation is, however, limited incase of field preparation and plant protection measures.

A research study conducted in ICRISAT by Feldstien (1998) showed that adoption of new varieties and technologies resulted in increased groundnut production as well as household incomes, but resulted in a greater workload for women in shelling the pods of increased production. Since family is an economic unit, both men and women share the tasks in a way that maximize the benefits to the family. But the lack of ownership of assets and influence in decision making is perceived to be an indication of 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 it is a profitable crop as indicated by the high benefit cost ratios. But, its yield and profitability need to be further enhanced to retain its competitive edge relative to other competing crops. The Farmer Participatory Varietal Selection (FPVS) trials aim to try new varieties on the farmers' fields so that they can select the varieties with the traits preferred by them. It was experienced earlier that some of the high yielding varieties did not become popular with the farmers because of un-desirable market traits. If an opportunity is provided to farmers, they are 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 it is 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 in a village, farmers in the village and visitors will be in a position to assess the average performance of these varieties in the village. They can also assess the pod characteristics like size, shape, color and shelling percentage. Since the 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 in a position to accord scores to 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 or the other, it is possible that the fertility status and management ability of the farmers may influence the performance of some varieties. For this reason, the analysis is restricted to only mother trials so that the results will not be clouded by the un-controllable factors like soil fertility and management ability.

4.1 Karnataka

Mother- baby trials were conducted at both the locations in Raichur and Chitrdurga districts. In Raichur district, these trials were conducted in all the adopted villages from the three talukas of Raichur, Deodurg and Lingsugur. In case of Chitradurga district, the FPVS trials were conducted in nine different villages. For the sake of appropriate comparison, only the results of mother trials were analysed.

4.1.1 Results of FPVS trials in Karnataka

The results from mother trials conducted in Raichur district 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 than that of TMV-2. Of all the varieties tried in the mother trial, ICGV 00350, gave the best yield of 1382 kg, which was 55 per cent higher than that of 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, have been released a few years back but have not been accepted by the farmers because of the undesirable pod characteristics of these varieties, despite their higher yield potential. R-2001-2 gave a 37 per cent higher yield than TMV-2, while the margin of advantage with R-2001-2 was 32 per cent higher when compared with the local check. ICGV91114 gave 11 per cent higher yield than TMV-2. It is also shorter in 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 District during 2009-10

Sl. No.	Entry	Yield in Kg per hectare				% increase in yield over check variety (TMV-2)
		Raichur	Deodurga	Lingasugur	Mean	
1	ICGV00350	1478	1378	1289	1382	54.98
2	R-2001-2	1361	1433	1245	1235	37.14
3	R-2001-3	1300	1183	1097	1193	32.04
4	ICGV91114	1046	1027	994	1022	11.29
5	Local check (TMV-2)	944	1000	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 district was much wider. As many as 10 new varieties were tried in the mother trials conducted in Chitradurga district. The results from mother trials conducted in Chitradurga district are presented in Table 4.2. As many as four 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 also reported significantly higher yield than TMV-2. While ICGV00350 also reported higher yield, it was not significantly higher than the local check. ICGV91114 gave lower yield than local check variety by a few kg, but this difference was not statistically significant.

Table 4.2 Average pod yields of different varieties in mother trials conducted in Chitradurga district, 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 not accepted R2001-02 and R2001-03 because of their undesirable pod characteristics, although they were released a few years back. They now have other options like ICGV 00350, ICGV 91114 and Chinthamani-2, which are accepted by the farmers in FPVS trials. The State Government of Karnataka has to drop its fixation for TMV 2 and take up seed production of these varieties in a big way and make it available to the farmers. It would be possible to increase the average yields of groundnut in Raichur and Chitradurga districts by introducing these varieties along with better agronomic and crop protection package and provision of life saving 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 districts because these districts grow only bunch varieties of groundnut. Besides these, FPVS trials were also conducted in Namakkal district for semi-spreading types (runners) of groundnut varieties (Virginia Bunch). This was done because spreading varieties are predominantly grown in Namakkal district. In 2008, the FPVS trials were conducted with a large number of entries. In 2009, some of the entries were dropped and 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 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 district

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

Genotypes	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			
	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								
CHINTHAMANI	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 district 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 per cent higher yield than TMV-7. R2001-03 and R2001-02 followed it with 26 and 22 per cent higher yields respectively over the check variety. ICGV91114 yielded 20 per cent higher than the local check, TMV-7. TVG0004 gave 15 per cent higher yield than TMV-7, while TMV Gn13 and VRIGn-6 gave 11 per cent higher yield than the check variety. Chinthamani also yielded four per cent more than the check variety. Since the FPVS were conducted on a large number of plots, the average yields computed for different varieties are more dependable. Many changes were made in 2009 FPVS trials. A new promising variety, ICGV00351 was added and four of the varieties, R 2001-03, ICGV91114, VRIGn-6 and Chinthamani, were dropped from the 2009 trials. The check variety, TMV-7, was also dropped and TMVGn-13 was designated as the check variety. ICGV00351variety was the best performing one, with a 36 per cent yield increase over the check variety, TMV GN-13. R2001-02 gave the next best performance with a 32 per cent higher yield over the check variety. Both VG0104 and TVG 0004 also gave a 16 per cent higher yield each over the check variety. The strategy for FPVS was changed again in 2010. The best performing variety in 2009 trials, ICGV 00351 was alone retained as the improved variety. The check variety was again changed to VRI-2 from TMV Gn13. Paired comparison was conducted

between these varieties over 103 sites in 2010. ICGV 00351 variety gave a 30 per cent higher yield over VRI-2. Because of the improvement of 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 per hectare and it increased to 1220 kg per hectare in 2009. The same variety, ICGV 00351, reported a higher yield of 2197 kg per hectare in 2010 compared to 1220 kg per hectare in the previous season.

4.2.2 FPVS trials in Thiruvannamalai district

The results of FPVS trials in Thiruvannamalai district conducted from 2008 through 2010 are summarized in Table 4.4. In 2008 season, FPVS trials were conducted with seven new varieties and TMV-7 as the check variety. All the seven varieties gave significantly higher yield than TMV-7. R2001-02 variety turned out the best performance with a 76 per cent higher yield than the local check. It was followed by ICGV00351 with a 64 per cent yield advantage over the local. R2001-03 and TVG 004 also recorded impressive performance with 56 and 52 per cent higher yields over the local. Chinthamani, ICGV 91114 and TMV Gn13 also gave increases of 46, 27 and 17 per cent yield increases over TMV-7 respectively. Just as in case of Erode district, the strategy for FPVS was changed in 2009 season. The local check was changed from TMV-7 to TMVGn-13, which yielded 17 per cent higher yield in 2008 over TMV-7. VG0104 was added to the trial and R2001-03, ICGV91114 and Chinthamani were dropped from 2009 trial. R2001-02 stood top in 2009 also with a 26 per cent higher yield over TMVGn-13. ICGV00351 also gave a close performance by recording 25 per cent higher yield over the check variety. But TVG0004 gave a mere 10 per cent yield advantage over the local check. VG0104 was just at par with the check variety with a just one per cent higher yield. These conclusions are only indicative as they are based on absolute differences. Since the breeders did not estimate the critical difference, we cannot draw definitive conclusions about the superiority of the varieties. This is more so 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 trial in 2010. Although R2001-02 and R2001-03 varieties gave higher yield in both 2008 and 2009, they were not included due to their undesirable pod characteristics. ICGV 00351 and TVG 0004 were chosen because of strong preference of farmers for them. In 2010 season, TVG 0004 gave a 19 per cent higher yield over the local check, but ICGV 00351 was just at par with the local check, TMVGn-13. Just as in case of Erode district, the seasonal conditions improved from 2008 to 2009 and further to 2010. The three varieties, ICGV 00351, TVG 0004 and TMV Gn13, which were there in all the three seasons, gave higher yields in 2010 compared to the earlier two seasons.

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

Genotypes	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			
	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
CHINTHAMANI	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 districts

(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
CHINTHAMANI	6	5	7	7	6	7
TMV7	6	4	6	7	6	7

The ranking of Spanish bunch varieties by the farmers of Erode and Thiruvannamalai district based on the desired traits, is presented in Table 4.5. ICGV 00351 was ranked top with respect to all the five desired traits, and, it received the overall rank of 9 out of a maximum of 10. TVG 0004 got a consistently higher ranking over 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 with a rank of 8 out of 10. All 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 up on ICGV 00351 as the most preferred variety. It is required to get this variety

released by the state Government of Tamil Nadu and take up the production and distribution of seed to the groundnut farmers in Erode and Thiruvannamalai districts.

4.1.3 FPVS trials in Namakkal district

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 2008 FPVs trials. ICGV87846 gave the outstanding result by recording 85 per cent higher yield over the local check. ICGV98369 turned out the next best performance with a 54 per cent increased yield over the local check. The other five varieties, ICGV 97115, VRI 7, ICGV 98370, ICGV 86325 and ICGV 96217, also yielded 44 to 29 per cent higher yields over the local check variety, TMV-1. In the next two seasons, all the new varieties other than ICGV 87846 were dropped from the trial. Paired comparisons were conducted between ICGV 87846 and TMV-1 in the two seasons. In 2009, ICGV 87846 yielded 58 per cent higher yield over the local check. In 2010, the margin of advantage with ICGV 97846 dropped to 32 per cent. In Namakkal district, seasonal conditions fluctuated between seasons. When compared to 2008, both ICGV 87846 and TMV-1 recorded lower yield in 2009 season. But, both of them reported highest yields of all the three seasons in 2010. Since, ICGV 87846 gave a consistently superior performance over TMV-1 in all the three seasons, the answer for a preferred high yielding variety was easily found. Since farmers have no reservation about this variety, the task cut out before the extension system is to multiply its seed and make it available to the farmers growing semi-spreading types of groundnut. It is sure to create an impact on the yields and incomes of groundnut farmers in Namakkal district.

Table 4.6: Yield performance of Virginia Bunch genotypes in Namakkal district

	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 Farmer Participatory Varietal Selection (FPVS) and other components of groundnut production technology like balanced use of fertilizers, optimum plant population and weed and pest control practices, have been picked up by the farmers. It was also assessed if the adoption of improved cultivars, if any, has created any impact on the groundnut yields and incomes of the sample farmers. The same sample of farmers chosen for base line surveys in 2007-08 was retained for the early adoption surveys in 2009-10 as well. In one way, it is too premature to assess this impact because the process of FPVS was continuing from 2008 through 2010. A final conclusion has not been reached in many cases. Even where some varieties were identified, they were not yet released by the concerned state Governments. Unless the varieties are released, they cannot enter the seed chain. This is an important limitation of this study. But since it was decided to conduct the adoption survey in 2009-10, irrespective of the fact whether the varieties were released by the government or 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. In an anxiety to reach a large number of farmers, the researchers have given only two kg of pods of the promising varieties in the first year. But, given the high seed requirement of groundnut, it can only be expected to have a limited or no impact on the farmers. But, as the phase 1 of TL-II project has come to an end, the early adoption surveys were commissioned to learn lessons for a better planning of the phase 2.

5.1: Karnataka

5.1.1: Changes in cropping pattern and groundnut areas

The cropping patterns of the sample farmers in Raichur district of Karnataka during the base line year (2007-08) and early adoption survey year (2009-10) are presented in Table 5.1. The share of groundnut in the cropping pattern remained constant. In the adopted villages, its share remained constant at 15.8 per cent during the rainy season. The area under paddy, pigeon pea and sun flower increased at the expense of other crops in the adopted villages during the rainy season. In the post rainy season, the share of groundnut increased slightly from 63.6 per cent to 63.8 per cent. Area under sorghum increased in the post rainy season at the expense of other crops. 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 per cent to 19.7 per cent. The area under pigeon pea, 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 district, 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 ground nut remained largely remained intact in the study villages.

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

Season and crops	Baseline (07-08)		Early adoption (09-10)	
	Adopted	Control	Adopted	Control
Rainy season				
Pearl millet	33	14	29	15
Paddy	0	9	6	8
Pigeon pea	20	5	25	13
Vegetables	21	3	21	0
Cotton	11	6	11	8
Sun flower	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)

Season and crops	Baseline (07-08)		Early adoption (09-10)	
	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 adopted and control villages of Chitradurga district during 2007-08 and 2009-10 are presented in Table 5.2. Due to drought conditions, the cropped area in adopted villages decreased marginally in both the seasons. But the cropped areas in control villages of Chitradurga district were not affected in either of the seasons. But the relative position of groundnut in the cropped areas during rainy season remained intact in both the adopted and control villages of Chitradurga district. In the adopted villages, the cropped areas under paddy, onion, sun flower and groundnut marginally declined in the rainy season, while the area under other crops increased slightly. During the post-rainy season, the area under sun flower declined while that under other crops increased in the adopted villages. In the control villages, the areas under paddy, ground nut and sun flower increased marginally during the rainy season. During the post-rainy season, the area under sun flower increased slightly at the expense of the area under other crops in the control villages. Despite these minor changes, the pre-eminent position of ground nut in the rainy season remained unaffected.

5.1.2 Trends in early adoption

Table 5.3: Variety- wise cultivation of Groundnut in Raichur sample – Early Adoption Survey, 2009-10

Crop Name	Season	Variety	Adopted		Control		Both	
			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 district during rainy season of 2009-10 is detailed in Table 5.3. Just as in case of base line 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 93 hectares area. The new varieties made a small dent in about five per cent of the area. Five farmers planted R2001-02 variety in four hectares area. A lone farmer grew the new variety ICGV00350 in one hectare area. Thus only six out of 71 farmers adopted the improved varieties in only five hectares out of a total of 98 hectares under groundnut. In the control villages also, 31 farmers remained with TMV-2 and grew it in 53 hectares area. Only two farmers cultivated R2001-02 in a total area of one hectare. Another farmer tried ICGV00350 in one hectare area. In the total sample, 96 farmers grew TMV-2 in 146 hectares area, while nine farmers adopted the new varieties of R2001-02 and ICGV00350 in seven hectares area. Thus, only 4.6 per cent ground nut area was under new varieties introduced through FPVS and only 8.6 per cent farmers in the sample adopted them in some area or the other. This low adoption might be due to inability of the

farmers to access the information about new cultivars and in developing a conviction about their superiority.

Table 5.4: Variety- wise cultivation of Groundnut in Chitradurga sample, 2009-10

Crop Name	Season	Variety	Adopted		Control		Both	
			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 new ground nut varieties by the sample farms of Chitrdurga district are captured in Table 5.4. The strangle hold of TMV-2 was evident in Chitradurga district also. In the adopted villages, 80 out of 87 farmers persisted with TMV-2 in 2009-10 also, despite the FPVs trials that demonstrated the superiority of new varieties. TMV-2 variety covered 97 out of 108 hectares area under groundnut in the adopted villages. Only five farmers grew ICGV91114 in nine hectares area. Another two farmers adopted R2001-02 in two hectares area. In the control villages, 34 out of 37 farmers continued with TMV-2 and grew it in 51 out of 55 hectares area under groundnut. Only two farmers tried ICGV91114 in a total of three hectares area. A lone farmer cultivated R2001-02 in one hectare area. The coverage of groundnut area with new varieties in 2009-10 was only 10.2 per cent in the adopted villages and 7.3 per cent in the control villages. In the pooled sample of Chitradurga district, only 8.1 per cent of the sample farmers adopted the new varieties in 9.2 per cent of the area.

Table 5.5: Changes in Yield levels of Groundnut in Karnataka sample (Kg/ha)

Variety	Baseline		Early Adoption	
	Raichur	Chitradurga	Raichur	Chitradurga
TMV-2	1240	782	1297	846
ICGV91114	-	-	-	1350
R2001-2	-	-	1473	1250
ICGV00350	-	-	1401	-

Table 5.5 presents a comparative picture of yield of groundnut by variety in the base line and early adoption survey years. In the base line survey year (2007-08), only TMV-2 was grown. Its weighted average yield was considerably higher at 1240 kg per hectare in Raichur district than in Chitradurga district (846 kg). It was because groundnut was largely a post-rainy season crop grown under irrigation in

Raichur district, while it was purely a rain fed crop grown in rainy season in Chitradurga district. The weighted average yield of TMV-2 variety of groundnut improved to 1297 kg per hectare in Raichur district, registering an increase of 4.6 per cent between 2007-08 and 2009-10. The yield improvement of TMV-2 was better in case of Chitradurga district, where the yield increased by 8.2 per cent to reach 846 kg per hectare in the same period. The high yielding variety, R2001-02 yielded 1473 kg in Raichur district and 1250 kg per hectare in Chitradurga district. Another new variety, ICGV 00351 yielded 1401 kg per hectare in Raichur district, while the improved variety, ICGV 91114 recorded a yield of 1350 kg per hectare in Chitradurga district.

5.1.3: Unit cost reduction due to the impact of technology

The economics of TMV-2 variety of groundnut during 2009-10 in the two study districts of Karnataka are presented in Table 5.6. The cost of cultivation of TMV-2 was much higher in Raichur district than in Chitradurga district. The weighted average yield of groundnut was also much higher in Raichur district than in Chitradurga district. The net return was higher in Raichur district but the benefit cost ratio was higher in Chitradurga district because of a lower cost of cultivation. The unit cost of production was also much lower in Chitradurga district.

Table 5.6: Economics of TMV-2 variety of Groundnut, 2009-10 (Rs per ha)

Costs and returns	Raichur sample	Chitradurga sample	Pooled sample
Cost of cultivation (Rs/ha)	27571	15628	21600
Grain yield of groundnut (kg/ha)	1297	846	1072
Gross returns (Rs/ha)	38348	25014	31681
Net returns (Rs/ha)	10777	9386	10081
Benefit cost ratio	1.39	1.60	1.47
COP (Rs per 100 kg)	2126	1847	2015

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)	30390	23850	27120
Grain yield of groundnut (kg/ha)	1452	1330	1391
Gross returns (Rs/ha)	42843	41769	42306
Net returns (Rs/ha)	12453	17919	15186
Benefit cost ratio	1.41	1.91	1.66
COP (Rs per 100 kg)	2093	1793	1950

The economics of 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 district than in Chitradurga district. Due to a lower cost of cultivation in Chitradurga district, the net returns as well as

the benefit cost ratio of the improved varieties was much higher in Chitradurga district. As a consequence, the unit cost of production of improved varieties was also much lower in Chitradurga district, just as was the case 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 per 100 kg	2429	1861	2145
Cost of production in early adoption (2009-10) Rs per 100 kg	2124	1842	1983
Reduction in cost of production	305	19	162
Percentage 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 years period. The improved varieties which made small dent on the sample farms reported better yields than TMV-2. But, because their adoption was limited to only about 5 per cent area in Raichur sample and about 10 per cent area in Chitradurga sample, the weighted average unit cost of production dropped only marginally. In Raichur district, it fell by 12.6 per cent, while the drop was quite marginal by 1.0 per cent in Chitradurga district. For the pooled sample, the drop in unit cost of production was by 7.6 per cent.

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 districts 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 district was Rs. 8631 per hectare. For the total area of 1.13 hectares under groundnut, the total net return was Rs. 9753 per farm. In 2009-10, the area under groundnut per farm remained the same at 1.13 hectares. The area under TMV-2 variety slightly decreased to 1.08 hectares. The net return from one hectare of TMV-2 increased to Rs. 10777 in 2009-10. The total net return from TMV-2 was Rs. 11639. The return from a hectare of groundnut under improved varieties was higher at Rs. 12453. Since only 0.05 hectare was under improved varieties on a sample farm, the net income from the part under improved varieties was only Rs. 623. The total return from groundnut crop was Rs. 12262 per farm. The increased income from groundnut was Rs.2509 per farm, when compared with the base line return of Rs. 9753. It worked out to an increase of 25.7 per cent in the two years period. This increase was due to an increase in yield by 5.2 per cent and an increase in price by 9.8 per cent. The increased income from groundnut represented a 5 per cent increase over the net crop income of a sample farm in Raichur district in 2007-08.

Table 5.9: Impact of Groundnut technology on farmers' income, Karnataka sample

Item	Raichur		Chitradurga	
	Baseline	Early adoption	Baseline	Early adoption
Area under Gnut (ha per 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 per ha)	8631	10777	4842	9386
Net returns from TMV-2 (Rs per farm)	9753	11639	5859	10418
Area under improved varieties	0	0.05	0	0.1
Net returns from improved varieties (Rs per ha)	0	12453	0	17919
Net returns from improved varieties (Rs per farm)	0	623	0	1792
Total net return from groundnut (Rs per farm)	9753	12262	5859	12210
Increased net return	-	2509	-	6351
% 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 district, 1.21 hectares 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 one hectare of TMV-2 was Rs. 4842 per hectare. The total net return from groundnut in 2007-08 was Rs. 5859 per sample farm. In 2009-10, the net return from one hectare under TMV-2 increased to Rs. 9386. The area under TMV-2 in 2009-10 dropped to 1.11 hectares. So, the income from TMV-2 component worked out to Rs. 10418 per farm. The area under improved varieties of groundnut was 0.1 hectare. Since the net returns from improved varieties of groundnut was Rs. 17919 per hectare, the net return contribution of improved varieties worked out to Rs. 1792 per farm. Thus, the total net return from groundnut totaled to Rs. 12210 per farm. It represented an increase of Rs. 6351 per farm. It worked out to a 108 per cent increase over the base line income from groundnut per farm. Such a big increase was possible because of a 14.4 per cent increase in yield and an 18.8 per cent increase in price over the period of two years. This substantial increase in net return worked out to a 17 per cent increase over the net crop income of a sample household in 2007-08.Yield increase was noted in case of TMV-2 also and it could be because of better agronomy or because of better seasonal conditions in 2009-10. We have deflated neither the cost of production nor the groundnut price for inflation. Since both have moved up by about the same proportion, we have left the analysis at nominal prices level.

5.1.5: Factors influencing adoption of technology

The single most factor that influences the adoption of technology is its profitability vis-à-vis other competing crops or technologies. The margin of advantage determines the speed at which the technology spreads to the farmers. If the margin of advantage is very high, the farmers lose no time in adopting it. They will take interest in procuring the seeds or other inputs required and adopt it to harness the innovators' premium. But if the margin of advantage is low or uncertain, it requires on the part of extension officials to demonstrate it for some seasons so that the farmers develop a conviction about the technology. One-time demonstrations will not convince the farmers when the margin of advantage is either low or uncertain. Since groundnut is largely a rain fed crop, some uncertainty is always there about the performance of technology. The quantum and distribution of rainfall influences the productivity of all rain fed crops but specifically, groundnut as it is predominantly grown 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 adoption of GPT technology resulted in giving 38% higher yields from 1.6 to 2.2 t/ha, generated 38% more net income (adopters – Rs.21,470/ha and non-adopters - Rs.15580/ha), and reduced the unit cost by 16% from 4.58/kg to 3.86/kg (Joshi and Bantilan, 1998). The technology also contributed in improving the natural resource base and eases certain women specific agricultural operations (Bantilan et al., 2005). In an another study Bantilan *et al.,* (1999) found that major factors influencing adoption of improved groundnut varieties are 30-50% more yield potential of pod and fodder, timely availability of seed, duration of the crop, irrigation, awareness about the cultivar, high oil and shelling percentage etc. Besides field demonstrations, support services for production and distribution of seeds of new varieties are required to facilitate the spread of technology. Since farmers are looking for seed supply from the markets, some persistent efforts are required to organize seed production and distribution of varieties.

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 see only for a small number of farmers. In Tamil Nadu, paired comparison trials were organized with one ruling variety and one most promising variety. But, in Karnataka, FPVS trials were conducted for only one season. If demonstrations are conducted with the most promising variety for one or more seasons, they will motivate the farmers to try and take advantage of new varieties. Repeated demonstrations help the farmers in developing conviction about the superiority of variety in different seasons. Campaign through mass media, farmer field schools and distribution of seed in mini-kits also help in popularizing the varieties.

The varieties, R2001-02 and R2001-03 have been released a few years ago. But they were not accepted by the farmers because of their undesirable pod characteristics. These varieties were again tried in FPVS trials. They yielded better but were not liked by the farmers. Farmers are reluctant to leave TMV-2 because of its desirable pod characteristics. Farmers want varieties which yield better but retain the good pod characteristics of TMV-2. It needs to be seen if the new variety, ICGV 00350 would be liked for high yield and marketability by the farmers. Some more demonstrations are needed to convince the farmers. Then, 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 seed supply is not ensured, the new varieties will vanish from the scene without getting a chance of fair trial by the farmers.

The results clearly establish that seed availability is the binding constraint in popularizing the varieties which have done well in the FPVS. Farmers have to be encouraged with some support to take-up 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 affected. In such a situation, farmers have a tendency to dispose-off the produce of improved varieties in the market and try to look for seed in the market during the next season. Adequate storage facilities in the villages will create an incentive to retain the produce of improved varieties because the viability will be ensured till the next sowing season.

Bantilan *et al.,(*1999) concluded that area under ICRISAT groundnut varieties was low (1-5%) in both the states (Andhra Pradesh and Maharashtra) due to non-availability of seed, lack of awareness and long duration of cultivars. Promotion and extension through NARS, and ensuring timely seed supply will definitely enhance the adoption of ICRISAT varieties in 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 districts between 2007-08 and 2009-10 are documented in Table 5.10. In both the districts, 2009-10 turned out to be a drought year. The cropped area in Erode district fell from 264 to 216 hectares, which represents a decline of 18.2 per cent. The area under sole crop of groundnut decreased from 148 hectares to 67 hectares (a sharp drop by 54.7 per cent). In the same way, the area under groundnut inter crops fell from 64 to 40 hectares, marking a reduction by 37.5 per cent. The area under sesamum and other crops like maize increased. The share of groundnut in the cropped area dropped from 80.3 per cent in 2007-08 to 49.5 per cent in 2009-10. It is partly on account of weather aberrations and partly due to shift to more profitable crops.

Table 5.10: Changes in cropping pattern, Tamil Nadu Sample

Season and Crop	Erode		Thiruvannamalai	
	Baseline (07-08)	Early adoption (09-10)	Baseline (07-08)	Early adoption (09-10)
Groundnut sole (ha)	148	67	130	44
Groundnut intercrop (ha)	64	40	59	94
Paddy (ha)	-	-	13	20
Sesamum (ha)	7	32	4	3
Others (ha)	45	77	7	26
Total area (ha)	264	216	213	187

The cropped area in Thiruvannamalai district also declined from 213 hectares to 187 hectares between 2007-08 and 2009-10 (see Table 5.10). The cropped area fell by 12.2 per cent due to unfavorable seasonal conditions. The area under sole crop of groundnut decreased from 130 hectares in 2007-08 to 44 hectares in 2009-10. But the area under intercropping of groundnut increased from 59 hectares to 94 hectares in the same period. The total area under groundnut based cropping system decreased from 189 hectares to 138 hectares. The share of groundnut in the cropped area dropped from 88.7 per cent in 2007-08 to 73.8 per cent. Weather factors as well as market factors caused this reduction in groundnut area by 27 per cent. Area under other crops and paddy increased in this period. Whether this is a seasonal aberration or a reversal trend can be understood only by looking at the groundnut and total cropped areas in the subsequent years.

5.2.2 Trends in early adoption

The composition of groundnut varieties in the base line survey year (2007-08) and early adoption survey year (2009-10) is presented for the sample farms of Erode and Thiruvannamalai districts in Table 5.11. In Erode district, CO-2 occupied 48.1 per cent area in 2007-08 and it was followed by VRI-2 (33.5 per cent), TMV-2 (10.4 per cent). JL-24, TMV-7 and TMV-1 occupied minor areas. In 2009-10, VRI-2 covered 62.5 per cent area, followed by CO-2 (32.7 per cent) and TMV-7 (1.9 per cent). There was a token presence of new varieties in less than one per cent area. In Thiruvannamalai district sample, POL-2 and TMV-7 were the popular varieties in 2007-08, occupying 56.6 per cent and 42.3 per cent areas respectively. The remaining 1.1 per cent area was under JL-24. In 2009-10 also, the same varieties held sway over the groundnut farmers in the sample. POL-2 covered 64.5 per cent area and TMV-7 had 21 per cent share in the groundnut area. CO-2 accounted for 13.8 per cent share. New varieties had a token adoption in 0.7 per cent 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 seems to be shifting to more profitable crops in the absence of sustained efforts for popularizing high yielding new varieties.

Table 5.11: Change in Composition of Groundnut Varieties, Tamil Nadu sample (ha)

Variety	Erode		Thiruvannamalai	
	Baseline (07-08)	Early Adoption (09-10)	Baseline (07-08)	Early Adoption (09-10)
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

But there were signs of hope as indicated by the promising yields of new varieties. The details of yields by groundnut variety in the base line and early adoption survey years are furnished in Table 5.12. In Erode district, CO-2 yielded 1382 kg per hectare in the adopted villages of Erode district during 2007-08. In control villages of the same district, this variety recorded an average yield of 1000 kg per hectare. The same variety yielded only 1286 kg per hectare, on an average, in 2009-10. In the same year, the new variety, TVG 0004 yielded almost twice that much. But, of course, it was tried in a small area of only one hectare. But it indicated good potential and merits further testing in a larger area in the subsequent years. In Thiruvannamalai district, yields are reported for POL-2 for the baseline and early adoption survey years. In adopted villages, POL -2 recorded a yield of 883 kg per hectare in 2007-08. In the control villages, the yield of POL-2 was as high as 1493 kg per hectare. In 2009-10, the yield figures got reversed. In adopted villages, POL-2 recorded a yield of 1527 kg per hectare, showing an increase of 73 per cent over that reported in base line year. But, in the control villages, it fell to 1152 kg per hectare, showing a drop of 22.8 per cent. The weighted average yield of POL-2 was 1086 kg per hectare in 2007-08 and 1402 kg per hectare in 2009-10. The new variety, ICGV 00351, was tried in small areas and, it yielded 1522 kg per hectare in adopted villages and 1864 kg per hectare in control villages. Thus, its yield averaged to 1693 kg per hectare in 2009-10. It represents an increase of 20.8 per cent higher yield over the weighted average yield of POL-2. Thus, it indicated some good potential for achieving higher yields and, hence, merits more widespread testing by bulking the seed.

Table 5.12: Groundnut Yields by Variety, Tamil Nadu Sample (Kg/ha)

Variety	Erode		Thiruvannamalai	
	Baseline (07-08)	Early Adoption (09-10)	Baseline (07-08)	Early Adoption (09-10)
CO-2				
Adopted	1382	1286	-	-
Control	1000	-	-	-
POL-2				
Adopted	-	-	883	1527
Control	-	-	1493	1152
TVG 0004				
Adopted	-	2482	-	-
Control	-	-	-	-
ICGV00351				
Adopted				1522
Control				1864

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 district, the cost of cultivation of CO-2 increased by 18.2 per cent. The average yield increased by 2.5 per cent. The price of groundnut also went up by 13.6 per cent over the two years period. As a result, the gross returns went up by 16.4 per cent. The net returns per hectare increased by Rs. 3342 per hectare, 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 district. The net returns per hectare showed up from Rs. 16775 in 2007-08 to Rs. 26657 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)

Costs and Returns	Erode (CO-2)		Thiruvannamalai (POL-2)	
	Baseline (07-08)	Early Adoption (09-10)	Baseline (07-08)	Early Adoption (09-10)
Fixed Cost	2423	2600	2399	2550
Variable Cost	12343	14860	12236	14240
Total Cost	14766	17460	14635	16790
Yield (Kg/ha)	1255	1286	1086	1402
Gross Return	36713	42749	31410	43447
Net Return	21947	25289	16775	26657
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)	T.V malai (ICGV00351)
Variable cost (Rs/ha)	17847	16777
Fixed cost (Rs/ha)	2750	2618
Total cost (Rs/ha)	20597	19395
Yield (kg per ha)	2482	1693
Gross returns (Rs/ha)	54481	48423
Net returns (Rs/ha)	33884	29028
BCR	2.65	2.50

The improved varieties were grown in small areas only due to the limitation of seed availability. However, they showed promising returns which are presented in Table 5.14. In Erode district, TVG0004 recorded very high yield of 2482 kg per hectare. Despite higher cost of cultivation, the net returns were quite impressive at Rs. 33884 per hectare. It also reported a high benefit cost ratio of 2.65. Compared to this, the new variety suitable to Thiruvannamalai district, ICGV00351, recorded a lower yield of 1693 kg per hectare. Its net return of Rs. 29028 per hectare was higher than that for POL-2 in the same district during 2009-10. However, the benefit cost ratio for this variety 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 (TVMalai)	
	Baseline (07-08)	Early Adoption (09-10)	Baseline (07-08)	Early Adoption (09-10)
CO-2 in Erode and POL-2 in TVMalai total cost (Rs./ha)	14766	17460	14635	16790
Yield of groundnut (kg/ha)	1255	1286	1086	1402
Cost of groundnut production (Rs/100kg)	1177	1358	1232	1198
TVG0004 in Erode and ICGV00351in TVMalai total cost (Rs/ha)	-	20597	-	19395
Yield of groundnut(kg/ha)	-	2482	-	1693
Cost of groundnut production (Rs/100kg)	-	830	-	1146

The unit costs of production for different varieties of groundnut were worked out and presented in Table 5.15. For CO-2 variety in Erode district, the unit cost of production increased from Rs. 1177 per 100 kg in 2007-08 to Rs. 1358 in 2009-10. In Thiruvannamalai (TVMalai) district, the

unit cost of production of POL-2 marginally decreased from Rs. 1232 per 100 kg in 2007-08 to Rs. 1198 per 100 kg in 2009-10. Although the unit cost of production increased in case of Erode district in nominal terms, it may actually show a decline in real terms if it is deflated by the rate of inflation. 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 district, cultivation of TVG0004 can bring down the unit cost of production by 39 per cent. In case of ICGV00351 in Thiruvannamalai district, the reduction in unit cost of production would be more modest by 4.3 per cent, when compared to that of POL-2.

5.2.4 Impact of groundnut technology on farmers' income

In the earlier section, we discussed the potential for unit cost reduction 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. 2009-10 seasons were afflicted by drought conditions due to which the cropped area decreased. The area under groundnut fell drastically either because of weather factors or because of more profitable alternatives available to the farmers. Because of a reduction in the area of groundnut per sample farm, the net return earned from groundnut registered a decline. This decline was much sharper in Erode district sample than in case of Thiruvannamalai district sample (see Table 5.16).

In Erode district, the area under groundnut per sample farm fell by one half between 2007-08 and 2009-10. In 2007-08, the area under groundnut per sample farm was 1.57 hectares per farm. The net return per hectare from the traditional varieties was Rs. 21947 in 2007-08. Hence, the income from groundnut per farm was Rs.34457. In 2009-10, the area under groundnut per sample farm dropped to 0.79 ha. The net return per hectare from the traditional varieties increased to Rs. 25289 in 2009-10. Out of 0.79 ha under groundnut, 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. 19725. From the 0.01 ha under improved varieties, the income was Rs. 339. Thus, the total income from 0.79 ha under groundnut added up to Rs. 20064. Thus the income from groundnut decreased by Rs. 14393, and it represented a short fall by 41.8 per cent. While the area under groundnut fell by 50 per cent, correspondingly the income fell by 41.8 per cent. During the two years period, yield of groundnut on the sample farms increased by 3.4 per cent and the price of groundnut increased by 13.6 per cent.

In case of Thiruvannamalai district sample, the area under groundnut decreased from 1.4 hectares per farm in 2007-08 to 1.02 hectares per farm in 2009-10. In 2007-08, the net return from one hectare of traditional varieties was Rs. 16775. The income from groundnut per farm was Rs. 23485 in 2007-08. In 2009-10, the income per hectare from traditional varieties

increased to Rs. 26657. Out of 1.02 hectares area under groundnut, 1.01 hectares area was under traditional varieties. The income from traditional varieties of groundnut worked out to Rs. 26924. From the 0.1 hectare area under improved varieties, a net income of Rs. 290 is obtained. The total income earned from groundnut per farm added up to Rs. 27214. The income from groundnut was increased by 15.9 per cent over the two years period, despite the decline in the area under groundnut by 27.1 per cent. It was made possible by an increase of 29.4 per cent in yield and a 7.2 per cent increase in the price of groundnut.

Table 5.16: Impact of Groundnut Technology on Farmers' Income, Tamil Nadu Sample

Impact Indicator	Erode		Thiruvannamalai	
	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)	21947	25289	16775	26657
Net income from traditional varieties (Rs./farm)	34457	19725	23485	26924
Area under improved varieties (ha/farm)	0	0.01	0	0.01
Net income from improved varieties (Rs./ha)	-	33884	-	29028
Net Income from improved varieties (Rs./farm)	0	339	0	290
Total Net income from groundnut(Rs./farm)	34457	20064	23485	27214
Increase in net income (percent)	-	-41.8	-	15.9
Increase in yield (percent)	-	3.4	-	29.4
Increase in price (percent)	-	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

The best bet for any variety to become popular with the farmers is its profitability. Higher the margin of profit, faster will be the uptake of technology. In Tamil Nadu, the process of FPVS continued over three seasons, from 2007-08 to 2009-10. While it took three years to reach a conclusion about the performance of technology, the early adoption survey was taken up even

before that. Sustained testing and demonstration of technology is required to convince the farmers about the technology.

Supply of seed is a facilitating factor to hasten the spread of technology. Farmers are no more preserving their own seeds. Because the viability of groundnut seed does not last long, farmers are depending on the market for seed supply. Unless the new varieties are formally released, they cannot enter the seed chain. Release of variety, production and supply of seed are critical supporting factors for popularization of the technology.

A case study conducted in Tuban, Indonesia by Subba Rao *et al.,* (1993) on adoption of groundnut production technology revealed that the economic benefits of new package gave 120% higher yield and 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 presence of subsidy.

5.2.6: Constraints in the adoption of technologies

The results clearly establish that seed availability is the binding constraint in popularizing the varieties which have done well in the FPVS. Farmers have to be encouraged with some support to take-up 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 affected. In such a situation, farmers have a tendency to dispose-off the produce of improved varieties in the market and try to look for seed in the market during the next season. Adequate storage facilities in the villages will create an incentive to retain the produce of improved varieties because the viability will be ensured till the next sowing season. Perhaps, it will also improve farmer to farmer seed supply as was anticipated in the strategy of TL-II. The bulky nature of groundnut seed is another big constraint, which limits its adoption and multiplication process. Because of the limited available storage facilities, farmers in general buy the seed from market just before the sowings time. They just look for timely availability of seed from traders and ignore about seed quality issues.

Farmers do face several constraints in the adoption of technologies. The first one is about getting a proper assessment of technology. More trials and demonstrations are required on the new varieties and technologies so that the farmers can assess its mean and variability of performance in terms of yield, quality, price etc., In several cases, farmers are compelled to buy seed from traders who sell non-descript 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. But they are eluding the farmers. If new varieties like TVG 0004 and ICGV 00351 can outperform the ruling varieties, farmers would adopt them if they hope to get a reasonable return on the additional investment. If these varieties are sure to give better returns, the research system should get its act together for getting them released officially. Their official release itself does not guarantee you that they will enter the seed chain immediately. Their seed will be multiplied and distributed to the farmers at cost or at some subsidy to attract the farmers. After conducting FPVS trials, sample farmers in the adopted villages were provided small quantities of pods (2 kg per farmer). In order to cover a large number of farmers, each one was given only 2 kg of pods. The seed requirement is very high in case of groundnut. Such small quantities of seed do not motivate the farmers to bulk the seed through repeated multiplication and grow 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, the new varieties cannot be expected to spread fast on their own.

Chapter 6

Synthesis and Lessons Learnt

6.1 Synthesis of results

Under phase I of TL-2 project, Raichur and Chitradurga districts in Karnataka and 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 and three more villages were chosen as non- intervention villages and 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 base line survey was conducted during 2007-08, immediately after the cropping season to assess the socio-economic status of the farmers, adoption and yield levels and benefit cost ratios of groundnut vis-à-vis other competing crops. Farmer Participatory Varietal Selection (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 taken up for seed multiplication. The farmers were supplied with small quantities of seed so that they will multiply the seeds and bulk the supply so that they can gradually switch over to the preferred varieties. In 2009-10, an early adoption survey was commissioned to assess the dent the new varieties are making and whether this adoption has caused any improvement in their yields and incomes.

The baseline study found that groundnut crop had a dominant presence in the cropping pattern and contributed significantly to the crop incomes of the farmers. But 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 ruling variety as check variety. The FPVS results established that the new varieties out-yielded the check varieties. But farmers did not always select the varieties with the highest yield potential. For instance, farmers in Raichur district were not in favor of R2001-02 and R2001-03, despite their high yield potential because of their bad pod characteristics and low market acceptance. In Chitradurga district, ICGV 91114 yielded at par with TMV-2 in FPVS trials. Yet, it was preferred by the farmers over R2001-02 because of short duration, drought tolerance and good pod characteristics. ICGV00351in Erode district and TVG0004 in Thiruvannamalai district performed well and were also liked by the farmers. The FPVS process ended in one season in Karnataka but it continued for three seasons in Tamil Nadu to reach a logical conclusion. After initial screening,

the varieties tried in the trials were pruned in the second season and paired comparisons were tested in the third season. This elaborate process of FPVS identified that ICGV00351 has a potential in Erode district to replace the old varieties and increase the yields. Similarly, TVG0004 for Thiruvannamalai district and ICGV 87846 for Namakkal district hold promise to achieve a substantial yield impact. These varieties did well not only in FPVS but also in farmers' fields. Yet, they failed to spread to many farmers by 2009-10, when the early adoption surveys were conducted. These varieties were not yet released by the respective State Variety Release Committee. Only after official release, they can enter the seed production and distribution chain of the state agencies supporting agriculture.

In Karnataka, the seasonal conditions in 2009-10 were sub-normal but the area under groundnut remained the same. Due to better production practices, slightly higher yields were obtained with the traditional varieties also. The new varieties were grown in small areas but they reported better yields and higher net returns when compared with the traditional varieties. With increases in groundnut yields and prices, the net returns per hectare increased when compared to the base line survey year. Despite increases in cost of cultivation, the net returns were higher within 2009-10 with both traditional and new varieties. Yet, the impact on yield and income was limited due to slow spread of the new varieties. But the total net returns from groundnut per sample farm increased to some extent. 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 bad due to which the cropped area declined and the area under groundnut also shrank either because of weather aberration or because of competition from other competing crops. In Thiruvannamalai district, the area under groundnut fell by a quarter. Yet, due to higher yields reported by the traditional varieties and new varieties in very small areas and higher prices of groundnut, the total net returns from groundnut crop increased per sample farm. But, in Erode district, where the groundnut area fell by one half, the total net returns from groundnut crop dropped by about 42 per cent. This was despite small increases in yield as well as in prices. The economics of improved varieties pointed to a good potential but it was so far wasted due to lack of support in seed production and distribution. It can be expected that good impact can materialize if the new varieties are released officially and they enter the seed chain. The limited effort in providing small quantities of groundnut seed to the farmers by the project staff did not yield the expected benefit. Perhaps, the small quantities werenot adequate to enthuse the farmers for growing and bulking the seed.

6.2: Lessons Learnt from Phase I of TL-II Project

One important lesson was not to hasten the conduct of early adoption study even before the process of FPVS was completed. Certainly, the results of the early adoption study are a little

disappointing to the TL-II staff, although only such results can be expected in the absence of their ability to influence the state government in releasing the varieties and putting them in the seed chain. After first year of FPVS was completed in 2008-09, there was only one season before the early adoption study was conducted. Just one season was inadequate for bulking of seed and growing it in appreciable areas. Extensive paired demonstration of FPVS with 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 for taking-up new cultivars.

Another lesson to be learnt is to get the new promising varieties released by the concerned State Variety Release Committee rather quickly. Normally, perhaps testing of the varieties for two to three seasons may be required for the committee to release the varieties. On the strength of FPVS results and field performance, it can be lobbied to shorten the process of variety release.

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 can be involved for increasing the production and distribution of seeds, it should help in reaching more farmers quickly. One can also try community seed systems approach to hasten the process of diffusion of the varieties selected by the farmers in the FPVS trials.

Government departments should be approached to extend the benefit of subsidy for the new varieties instead of extending the same repeatedly year after year for the same old and ruling varieties. Many a new technology has spread initially on the crutches of subsidy for one or two seasons. Farmers are used to subsidy culture and may not like to pay non-subsidized price for the new varieties.

If all these elements of development strategy are combined with research efforts, the impact of technology can be demonstrated much more quickly than it happened during the phase I of TL-II project.

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References

Bantilan, MCS, Nigam, SN, Rao, YM, Chopde, VK, Rao, GDN and Deb, UK 1999 Adoption of improved groundnut varieties in India.SEPP Annual Report Vol. 2,Patancheru 502 324, Andhra Pradesh, India, International Crops Research Institute for the Semi-Arid Tropics.Mimeo.

Bantilan MCS, DEB ,UK and Nigam SN 2003. Impacts of genetic improvement in Groundnut, Pages 293-313 in crop variety improvement and its effects on productivity: the impact of international agricultural research (Evenson R and Gollin D, eds.). Wallingford, UK: CAB International

Bantilan, MCS, Anupama, KV, and Joshi PK, Assessing Economic and environmental impacts of NRM technologies: an empirical application using the economic surplus Approach. CAB international 2005, Natural Resource Management in Agriculture: Methods for Assessing Economic and Environmental Impacts(edsB.shiferaw,HA Freeman and SMSwinton).

Feldstein 1998 An inventory of gender-related research and training in the consultative group on international agricultural research (CGIAR) centers 1996-1998. At htpp://www.PRGA POGRAM.ORG accessed on 20 July 2011.

FAO data base 2012 (www.fao.org)

Joshi, PK and Bantilan, MCS 1998. Impact assessment of crop and resource management Technology: a case of groundnut production technology (In En. Summaries in En, Fr.) Impact Series no.2, Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics, 60 Pp,ISBN 92-9066-376-6. Order code ISE 002.

Padmaja R, Bantilan MCS, Parthasarathy D and Gandhi BVJ. 2006. Gender and social capital mediated technology adoption. Impact Series no. 12.Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 48 pp. ISBN 92-9066-494-0. Order code ISE 012.

Subba Rao K.V., Economic Evaluation and Adoption of Groundnut production Technology in Tuban, Indonesia: A Case Study. (Bantilan & Joshi 1993, Evaluating ICRISAT Research Impact) Socioeconomics and policy division, ICRISAT Asia centre, Patancheru, 502 324, Andhra Pradesh, India.