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Study of Treatment Effects in Village-Level Studies

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ICRISAT
Science with a human face

International Crops Research Institute for the Semi-Arid Tropics

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Abstract

Village-Level Studies (VLS) are one of the most efficient ways to understand rural farming systems and also help identify the socioeconomic and institutional constraints faced by the farming community. ICRISAT initiated longitudinal VLS in three important and contrasting production regions in India's semi-arid tropics (SAT) in the mid-1970s. These 'first generation' studies continued between 1975 and 1985 and were then discontinued. They were revived during 2001-2002 after a gap of 17 years, and this second round of studies is referred to as 'second generation' VLS.

The basic aim of these studies is to monitor the same households as they evolve and respond to normal development opportunities, without any deliberate intervention in their lives. Precautions are taken to keep the effect of an outsider's presence in the village to a minimum so that it will not influence household behavior. Some social science researchers believe that a continuous engagement of VLS sample households may enlarge the horizons of the respondents, rendering them more progressive and knowledgeable than the non-VLS households. They also presume that the presence of a resident investigator in the study village and continuous association with ICRISAT research staff might create some 'treatment effect' on VLS households. These hypotheses need to be tested by using indicators of treatment effect. The present study was initiated to ascertain whether the VLS activity has had any effect in terms of improving the welfare of the people in the study villages. The detailed analysis of census and sample household data in both first and second generation VLS led us to conclude that there are no treatment effects occurring due to engagement of households or villages by the VLS research team.

Chapter 1

Introduction

1.1 What are village-level studies?

ICRISAT Village Level Studies (VLS) mainly focus on the dynamics of and prospects for agricultural and economic development in semi-arid regions in India, where more than 37% of the population lives (Rao et al., 2005). These people depend heavily on rainfed agriculture for their sustenance. These studies provide a hard microeconomic look at what has happened in recent times to such households in predominantly dryland agricultural villages in India's SAT. The main objective of the studies is to enhance the understanding of the dynamics of agricultural development in one of the poorest rural regions. Village-level studies are one of the most efficient ways to understand farming systems in rural areas and also help to identify the socioeconomic and institutional constraints faced by the farming community.

Developing countries like India are well endowed with survey information and secondary data, but much of it is aggregative, partial, cross-sectional and concentrated on non-SAT regions (Walker and Ryan 1990). There is an element of panel but at a higher level of aggregation, ie, at mandal-, district- and state level. Therefore, a consistent household time-series database on a representative cross section of SAT villages is particularly the need of the hour. The benchmark households and villages could be used to enhance the understanding of development in the Indian SAT and to test hypotheses relevant to the design of technology and policies for improvement of the economic well-being of rural poor in the SAT. ICRISAT longitudinal village studies were designed to suit multidisciplinary research work where agrobiological and social scientists can work together in the real farm situation. Different researchers have made use of the data from village studies to achieve their objectives and followed different approaches and methodologies. However, the major theme in all of them is to understand the socioeconomic, agrobiological and institutional constraints to agricultural development in the SAT area.

1.2 What is the basic philosophy of village level studies?

The basic philosophy of these studies is to monitor the same/panel households as they evolve and respond to normal opportunities for development. The aim is to capture the changes in livelihood options and development pathways of the households under the normal development context without any deliberate intervention in their lives or villages. It was generally considered that the effect of an outsider's presence in the village (resident investigator) is kept to the minimum so that it will not lead to changes in household behavior. However, the VLS villages become a locus for biological investigations, which can have the effect of making them more technologically progressive than the surrounding villages. It was, however, seen that this was not the case. Efforts were made to make the biological research analytically descriptive and diagnostic and not normative with very little purpose of demonstration. Improving the availability (at cost) of the seed of some high-yielding varieties (HYVs) was the main tangible intervention on the part of the resident investigator during the period between 1975 and 1985. As a part of agrobiological studies, none of the agronomic experiments was subsidized. Investigators often chose farmers outside the panel to spread the potential benefits of the research activities across more households in the village. Thus, relying on the village data to estimate the spread of HYVs would lead to overestimates for the region. Availability of improved genotypes is important

in India's SAT, and can clearly make a difference to household welfare. However, as the experiences during the first generation VLS (1975-85) made abundantly clear, nature was niggardly in India's SAT. The prospect of abrupt, green revolution-type technical change was unlikely, particularly in the regions covered in the study.

With this philosophy in mind, longitudinal village studies were initiated in three important and contrasting production regions in India's SAT in the mid-1970s. In the early 1980s, the approach was extended to two other regions in India's SAT and to three regions in West Africa's SAT. These studies began at the microscopic level of individuals and fields, were aggregated to socioeconomic groups and villages, and ultimately progressed to regional contrasts. Between 1975 and 1985, ICRISAT carried out surveys in these ten villages from the SAT, and these studies have come to be known as the ICRISAT VLS. To achieve the above goals, information was gathered with the help of twelve designed questionnaires from the selected 40 households in each location over a ten-year period, now constituting the world-famous "ICRISAT VLS Panel Data."

The objectives of ICRISAT VLS are limited in scope and in size. The information gathered from these studies would help generate prospective technologies that are feasible and acceptable to the farmers. Second, VLS locations may also help in testing and modifying the technologies generated by ICRISAT. In brief, VLS are primarily designed to collect relevant farm-level data to assist ICRISAT's research system in its task of generating new technologies suited to the needs and means of the SAT farmers. This is achieved through observing and monitoring why farmers do what they do. The gathered information is analyzed by the global scientific community for studying various aspects of farming in the SAT. This unique dataset has clearly been an important International Public Good (IPG) and was critical for the understanding of the microdynamics of rural populations and agricultural systems in the Indian SAT. Several changes swept through the SAT of India over the 17 years period between 1984-85, when the first generation VLS was suspended, and 2001-2002, when the second generation VLS surveys were resumed.

1.3 First generation village-level studies (1975–1985)

The ICRISAT Economics Program initiated the VLS in six villages in Andhra Pradesh (AP) and Maharashtra states in India in May 1975. It was later extended to Gujarat (two villages) in 1980 and Madhya Pradesh (two villages) in 1981 in India and also to a few villages in Africa. In each of these ten villages, a sample of 40 households was randomly chosen to represent all the socioeconomic groups in the village. These studies, which were conducted by ICRISAT in these ten villages during the period between 1975 and 1985, are referred to as 'first generation' VLS.

India's SAT and the study regions

India's SAT is vast and encompasses about fifteen to twenty large regions, each made up of several districts. Based on cropping, soil and climatic criteria, five contrasting dryland agricultural regions were selected for the study: the Telangana region in AP, the Bombay Deccan and Vidarbha regions in Maharashtra, the Northern region in Gujarat and the Bhopal region in Madhya Pradesh. Districts representative of those regions included Mahabubnagar in the Telangana region, Solapur in the Bombay Deccan, Akola in the Vidarbha region, Sabarkantha in Northern Gujarat and Raisen in the Bhopal region. Table 1 shows the salient agricultural features of the selected districts. However, in this paper, we are confining ourselves more to three specific districts, namely, Mahabubnagar, Solapur and

Akola, because data were collected in these locations between 1975 and 1985. In the remaining two districts, data were collected only between 1980 and 1985.

Table 1. Salient agricultural features in the selected regions.

Characteristic	Region				
District	Mahabubnagar	Solapur	Akola	Sabarkantha	Raisen
State	Andhra Pradesh	Maharashtra	Maharashtra	Gujarat	Madhya Pradesh
Soils	Red soils (Alfisols)	Deep black heavy clay soils (Vertisols)	Medium deep black clay soils (Inceptisols)	Medium black and gray black	Deep Vertisols
Rainfall*	Un-assured, 630mm, 31% CV	Un-assured, 630mm, 35% CV	Assured, 890mm, 22% CV	760mm, NA	1200mm, NA
Major crops	Kharif, or rainy season, sorghum, castor, pearl millet, paddy, pigeonpea, groundnut	Rabi, or postrainy season, sorghum, pigeonpea, minor pulses	Cotton, sorghum, mung bean, pigeonpea and wheat	Groundnut, pearl millet, sorghum, wheat and paddy	Wheat, chickpea, lentil, linseed and soybean
Selected villages	Aurepalle and Dokur	Shirapur and Kalman	Kanzara and Kinkheda	Boriya and Rampura	Papda and Rampura Kalan

*The mean rainfall estimates and their coefficients of variation (CVs) in percent refer to ten annual observations collected in one study village from each region from 1975/76-1984-85.

Selection of households

In total, 40 respondent households were selected to ensure representation of all categories of households: labor, small farmers, medium farmers and large farmers. For labor households, a random selection of 10 households was made from among those who operated less than 0.2 ha of land, and whose main occupation and source of income was hiring out of labor. In the case of farming households (cultivators/farmers), the purpose was to give proper representation to small, medium and large farmers. In view of the differences in land: man ratios, average sizes of operational landholding and land productivity among the selected villages, a common criterion for classification of farm-size groups was not followed in all villages. To ensure equal probability of households of different size groups joining the sample, the cultivators in the village were divided into three strata, each with an identical number of households. From each of these, 10 households were randomly selected. The details of farm-size classification based on operational holding in hectares are given in Table 2 and those related to sample are detailed in Table 3.

Table 2. Farm size classification based on operational land holding (ha).

Village	Small	Medium	Large
Aurepalle	0.20-2.50	2.51-5.26	>5.26
Dokur	0.20-1.01	1.02-3.04	> 3.04
Shirapur	0.20-2.50	2.51-5.87	> 5.87
Kalman	0.20-6.07	6.08-10.77	> 10.77
Kanzara	0.20-2.26	2.27-5.59	> 5.59
Kinkheda	0.20-3.00	3.01-5.60	> 5.60

Table 3. Sample size in six VLS villages, 1975-85.

Village	Labor	Small	Medium	Large	Total
Aurepalle	10	10	10	10	40
Dokur	10	10	10	10	40
Shirapur	10	10	10	10	40
Kalman	10	10	10	10	40
Kanzara	10	10	10	10	40
Kinkheda	10	10	10	10	40
Total	60	60	60	60	240

Survey instruments for data collection

Information regarding farming, transactions and employment was collected from each respondent household with the help of a designed worksheet which was later transferred to code sheets. Some of the information was collected annually, usually at the beginning of the cropping year, ie, July, while other information was collected at a regular interval of 3-4 weeks. The details of the survey instruments used for data collection are presented in Table 4.

Table 4. Types of questionnaire used for data collection.

S. No.	Schedule code	Name of the questionnaire	Frequency of data collection
1.	VLS-A	Household census schedule	Beginning and closing of the study
2.	VLS-C	Household member schedule	Beginning of the cropping year (July)
3	VLS-D	Plot and crop rotation schedule	Beginning of the cropping year (July)
4	VLS-E	Animal inventory schedule	Beginning of the cropping year (July)
5	VLS-F	Farm implements and machinery inventory schedule	Beginning of the cropping year (July)
6	VLS-G	Farm building inventory schedule	Beginning of the cropping year (July)
7	VLS-H	Cultivation schedule	Every 3-4 weeks
8	VLS-K	Labor, draft animal, machinery utilization schedule	Every 3-4 weeks
9	VLS-L	Household transaction schedule	Every 3-4 weeks
10	VLS-M	Monthly price schedule	First week of every month
11	VLS-N	Stock inventory schedule	Beginning of the cropping year (July)
12	VLS-Y*	Plot and cultivation schedule	Every 3-4 weeks
13	VLS-P	Debt and credit schedule	Beginning of the cropping year (July)
14	VLS-Z	Livestock consumption schedule	Every 3-4 weeks

* Modules VLS-D and VLS-H combined and named VLS-Y

Data collection and the resident investigator

The concept of a resident investigator was central to the village studies, with one investigator posted at each study village. The investigator was mainly responsible for collecting and coding data on the worksheets. Data on household transactions, labor, draft power utilization and crop cultivation by plot were canvassed at 3-4 week intervals. Information on the composition of the household, which crops were sown to which plots in which season, credit and debt, stocks, livestock, implements and machinery and farm buildings was updated annually.

The "routine" data contained in the nine schedules were collected for the complete 10-year period in one village from each region: Aurepalle in Mahabubnagar, Shirapur in Sholapur and Kanzara in Akola. These villages are arbitrarily referred to as the "continuous" villages. In 1978, routine data collection was stopped in the companion study villages in these districts. These are called the "closed" villages and include Dokur in Mahabubnagar, Kalman in Sholapur and Kinkheda in Akola districts. Special-purpose surveys and on-farm investigations were still carried out in those villages after 1978. The similarity of findings emerging from the first two years' data between villages in the same study district was the main reason for stopping routine data collection in the closed villages. The sharpest within-region contrast among the three village pairs was noticed between Aurepalle, which was predominantly rainfed, and Dokur, with a high percentage of irrigated area. To better understand those inter-village differences, data collection was continued in Dokur during 1977-78 also by the resident investigator to collect information on the nine schedules for one more year.

Aurepalle, Shirapur and Kanzara are continuous villages and information was collected from them about resources, income, consumption and wealth for each household and details of inputs, labor use and output, cropping patterns by plot during 1975-76 to 1984-85. Kalman, Dokur and Kinkheda are closed villages and information was collected on resources, cropping pattern and wealth for each household and input-output details by plot for the period between 1975-76 and 1977-78 by the high frequency method of data collection, while for the remaining period (1978-79 to 1984-85) it was collected by the retrospective method of data collection.

GES data availability by village and year

The EFGNP data availability for general endowments {animal inventory (E), farm implement inventory (F), farm building inventory (G), stock inventory (N) and financial assets/liabilities (P) files} by village and year is presented in Table 5. The sum of the value reported in E, F, G, N and P indicates the wealth of households. This module data collection was stopped from 1981-82 in closed villages while it was continued in continuous villages till 1984-85. However, the data for closed villages from 1981-82 was collected by the retrospective method till 1984-85.

Table 5. GES (General endowment schedule) data availability by village and year.

Village	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Aurepalle (A)	√	√	√	√	√	√	√	√	√	√
Dokur (B)	√	√	√	√	√	√	X	X	X	X
Shirapur (C)	√	√	√	√	√	√	√	√	√	√
Kalman (D)	√	√	√	√	√	√	X	X	X	X
Kanzara (E)	√	√	√	√	√	√	√	√	√	√
Kinkheda (F)	√	√	√	√	√	√	X	X	X	X

E- Animal inventory file, F - Farm Implement inventory file, G- Farm building inventory file, N - Stock inventory, P- Financial Assets/Liabilities files

Transaction (L) schedule data availability by village and year

The data availability for transaction schedule by village and year is presented in Table 6. This module collects information about household expenditure and earnings during the cropping year. The collection of this data was stopped from 1978-79 in all closed villages except in Dokur, where it was continued for one more year. It was continued for the continuous villages until 1984-85. However, the data for

closed villages from 1978-79 was collected by the retrospective method till 1983-84 without a resident investigator in the village.

Table 6. Transaction schedule data availability by village and year.

Village	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Aurepalle (A)	√	√	√	√	√	√	√	√	√	√
Dokur (B)	√	√	√	√	X	X	X	X	X	X
Shirapur (C)	√	√	√	√	√	√	√	√	√	√
Kalman (D)	√	√	√	X	X	X	X	X	X	X
Kanzara (E)	√	√	√	√	√	√	√	√	√	√
Kinkheda (F)	√	√	√	X	X	X	X	X	X	X

Crop-plot (Y) schedule data availability by village and year

The plot and cultivation module collects information about inputs and outputs by plot during the cropping year (Table 7). Data have been collected regularly in all six villages for a period of five cropping years (1975-76 to 1979-80). Since 1980-81, data collection on this aspect continued only in the continuous villages. The data for closed villages from 1980-81 to 1983-84 was collected by the retrospective method. It was again collected for only the continuous villages in 1984-85.

Table 7. Crop-plot data availability by village and year.

Village	1975	1976	1977	1978	1979	**1980**	**1981**	**1982**	**1983**	**1984**
Aurepalle (A)	√	√	√	√	√	√	√	√	√	√
Dokur (B)	√	√	√	√	√	X	X	X	√	X
Shirapur (C)	√	√	√	√	√	√	√	√	√	√
Kalman (D)	√	√	√	√	√	X	X	X	√	X
Kanzara (E)	√	√	√	√	√	√	√	√	√	√
Kinkheda (F)	√	√	√	√	√	X	X	X	√	X

Employment (K) schedule data availability by village and year

The employment module collects information about each household member participating in the labor market for both farm and nonfarm activities during the cropping year (Table 8). From 1978-79 onward, collection of data in this module was continued only in the three continuous villages. However, the data for closed villages were collected by the retrospective method till 1984-85.

Table 8. Employment (K) schedule data availability by village and year.

Village	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Aurepalle (A)	√	√	√	√	√	√	√	√	√	√
Dokur (B)	√	√	√	X	X	X	X	X	X	X
Shirapur (C)	√	√	√	√	√	√	√	√	√	√
Kalman (D)	√	√	√	X	X	X	X	X	X	X
Kanzara (E)	√	√	√	√	√	√	√	√	X	√
Kinkheda (F)	√	√	√	X	X	X	X	X	X	X

1.4 Second generation village-level studies (2001-02 onward)

Some intermittent surveys were carried out in 1989, 1993 and 2000 in some of the villages and they added information on some aspects to the panel data on 240 households. The VLS were resumed from 2001-02 onward in the six villages of AP and Maharashtra that were studied during 1975-85, and this study is referred to as 'second generation' VLS. During 2002, focus group meetings were conducted with different social groups in the six VLS villages to identify the important concerns of the village communities on which the research questions could be focused in the surveys taken up with reference to cropping year 2001-02.

Changes in methodology

A comparison of the sample frame and the research methods followed in the first generation (1975-85) and the second generation (2001 onward) is presented in Table 9.

Table 9. Changes in VLS methodology between 1975-85 and 2001-02 onward.

Changes	Methodology in 1975-85	Methodology 2001-02 onward
Sample size	40 households each from 6 villages –10 each from landless, small, medium and large farms 240 sample households	15% of population using probability proportion to size method 446 sample households in 2001-04 and 592 in 2007-08
Frequency of data collection	Triweekly rounds of data collection by resident investigators	Annual survey (2001-02 to 2003-04), Bi-annual Survey (2004-05 and 2007-08) & Triweekly Rounds (2005-07)
Survey instruments	Modules on Endowments, Employment, Transactions, Cultivation, Livestock & Monthly Price Schedules	Additional modules on Investments for Natural Resources Development, Impact of Government Programs, Migration, Livestock Economics, etc.

Enlarged sample, 2001-2005

The number of sample households was increased from 240 in the first generation to 446 in 2001-05 and subsequently to about 600 since 2005-06. The sample structure across different categories of households is presented in Table 10. A fresh census of all households was taken and the sample was enlarged to make it representative and to cover about 15% of the households, using probability proportional to the number of households in different size groups of land ownership. Care was taken to include all the sample households of the earlier rounds and at least one split-off in the old households where the head of the household is no longer alive. After accommodating all these households, the balance sample units were drawn randomly from the population using the probability proportion to size method. New modules were added to the traditional modules figuring in the first generation VLS.

Table 10. Comparison of sample structure between 1975-85 and 2001-05.

S. No	Village	Landless		Small		Medium		Large		Total	
		Old	New	Old	New	Old	New	Old	New	Old	New
1	Aurepalle	10	25	10	21	10	37	10	17	40	100
2	Dokur	10	20	10	31	10	15	10	14	40	80
3	Shirapur	10	22	10	43	10	17	10	6	40	88
4	Kalman	10	24	10	53	10	14	10	3	40	94
5	Kanzara	10	13	10	20	10	14	10	5	40	52
6	Kinkheda	10	8	10	14	10	6	10	4	40	32
	Total	60	112	60	182	60	103	60	49	240	446

The sample size has doubled or more than doubled in the four larger villages belonging to Mahabubnagar (AP) and Solapur (Maharashtra) districts. Among the two Akola villages, sample size increased by 30% in Kanzara, but fell by 25% in Kinkheda. In all the four Maharashtra villages, the number of large farms in the sample has fallen, and the proportion of small farms has increased greatly, followed by landless and medium-sized households. The proportion of newly added households was very high in landless and small (174 households) farm categories when compared to the medium and large (32 households) farm categories. The sample distribution reflects the fact that the average size of holding is falling even in the SAT areas due to population pressure on land. Over time, the large and medium farms are becoming smaller due to fragmentation and subdivision.

Tracking survey, 2005

A massive effort was launched to track all the members of the original households (1975-84) in the six VLS villages. The sample was extended to 600 households to include all the split-offs from the original households residing in the village. Similarly, information is being collected from all the temporary and permanent migrants from the villages whenever they return to villages on festival or social occasions. Attempts were also made to track the migrants residing in the nearby villages, districts and cities.

Sample size, 2005-06

During the 2005-06 survey, the sample size increased to 590 households (Table 11), a 32% increase as compared with 2004-05. All the split-offs of the sample households in the first generation VLS were identified during the tracking survey in 2005, and were added to the sample. The number of households tracked and added to the sample was higher in the large farm category followed by landless, small and medium farm categories. The data were collected during 2005-06 using a high frequency method of visiting the sample households once in 3-4 weeks and collecting information on many of the modules.

Table 11. Comparison of sample structure between 2004-05 and 2005-06.

Village	Landless		Small		Medium		Large		Total	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
Aurepalle	25	39	21	23	37	31	17	30	100	123
Dokur	20	23	31	23	15	19	14	29	80	94
Shirapur	22	37	43	69	17	27	6	12	88	145
Kalman	24	28	53	61	14	17	3	4	94	110
Kanzara	13	17	20	22	14	16	5	9	52	64
Kinkheda	8	11	14	23	6	9	4	11	32	54
Total	112	155	182	221	103	119	49	95	446	590

Sample size, 2006-07

The sample size during the 2006-07 survey had further increased to 599 households (Table 12), as 10 migrant households who had returned to the villages were added to the 2005-06 study samples. One large household which migrated out of the village was dropped during the 2006-07 survey. The data were collected in 2006-07, also using a high frequency method of data collection.

Table 12. Comparison of sample structure between 2005-06 and 2006-07.

Village	Landless		Small		Medium		Large		Total	
	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07
Aurepalle	40	44	23	27	30	31	30	31	123	133
Dokur	23	25	23	24	19	20	29	29	94	98
Shirapur	37	34	69	74	27	27	12	10	145	145
Kalman	28	30	61	54	17	18	4	4	110	106
Kanzara	17	15	22	23	16	15	9	10	64	63
Kinkheda	10	9	23	26	10	9	11	10	54	54
Total	155	157	221	228	119	120	95	94	590	599

Sample size, 2007-08

The sample size during the 2007-08 survey was 592 households (Table 13). Seven migrant households were dropped during this survey. This reduction in sample size was more pronounced in the landless labor category. The data were collected during 2007-08 using biannual surveys.

Table 13. Comparison of sample structure between 2006-07 and 2007-08.

Village	Landless		Small		Medium		Large		Total	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
Aurepalle	44	41	27	27	31	31	31	31	133	130
Dokur	25	25	24	24	20	20	29	29	98	98
Shirapur	34	34	74	73	27	27	10	10	145	144
Kalman	30	26	54	54	18	18	4	4	106	102
Kanzara	15	15	23	23	15	15	10	10	63	63
Kinkheda	9	10	26	26	9	9	10	10	54	55
Total	157	151	228	227	120	120	94	94	599	592

Sample structure during 1975-2008

The changes in the sample structure of VLS households over the period of 1975-2008 are represented in Table 14 and Figure 1. The sample size grew from 240 households in 1975-85 to 599 households in 2006-07 but dropped back to 592 households in 2007-08. This enlarged sample gives a broader and more representative picture of the 6 VLS villages than the fixed sample of 40 households per village studied in first generation VLS. The fixed sample of 40 per village was chosen irrespective of the size of the village. Although there was about 5% attrition in the old sample households, a big effort was made to track and include all the split-offs in the village in the panel dataset after 2005. The panel dataset spanning more than three decades (1975-08) is expected to explain many intergenerational issues such as returns to investments on education and health, adoption of SAT technologies, and
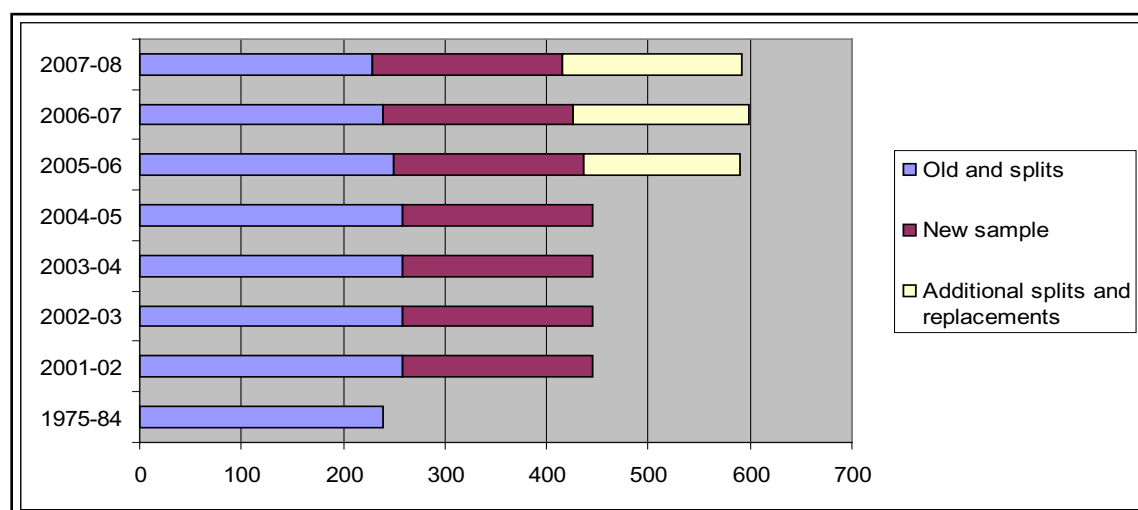
Figure 1. Sample structure between 1975 and 2008.

coping strategies when income shocks occur. The issue of social networks was also addressed to some extent. Thus, this unique, long-term panel dataset has the potential to provide answers to several nagging theoretical and empirical questions relating to household economics in SAT.

Table 14. Detailed sample structure between 1975-76 and 2007-08.

Year	Old sample (75-85) and their splits-offs	New sample added in 2001-02	Additional splits and replacements identified in 2005 tracking survey	Total
1975-84	240	0	0	240
2001-02	259	187	0	446
2002-03	259	187	0	446
2003-04	259	187	0	446
2004-05	259	187	0	446
2005-06	249	187	154	590
2006-07	239	187	173	599
2007-08	229	187	176	592

1.5 Purpose and plan of this study

Broadly, the present study was planned to analyze whether the VLS activity has had any effect on improvement in the welfare of the people in the study villages. The basic philosophy of VLS was to capture the changes in livelihood options and development pathways of the households without any deliberate interventions in their lives or villages. However, the continuous association of ICRISAT research staff with these villages since 1975 raised several suspicions about 'treatment effect' on VLS sample households. Some researchers presume that the presence of a resident investigator in the village and the continuous interactions with him might have created some impact on the progressiveness of sample households compared to non-VLS households. Similarly, they believe that the VLS villages should be more progressive than neighboring villages. This study attempted to test these hypotheses by using some indicators of welfare or progressiveness of farmers. Both VLS panel data and village census surveys at different years were used for assessing the treatment effects. Due to certain limitations in the VLS dataset, the study is confined to only three pairs of villages situated at Mahabubnagar, Solapur and Akola districts of SAT India.

The study plan

The study has been organized into four chapters. Chapter 1 introduces the rationale behind VLS, their basic philosophy, the first generation and second generation VLS, and the reason the present study was undertaken. Chapter 2 explains the treatment effect and the possibility of this occurring in ICRISAT VLS. It also discusses possible levels of treatment effects in VLS and indicators of treatment effect. Chapter 3 summarizes the results obtained from both village census surveys and VLS panel data. Finally, the main findings of the study and proposal for future consideration are highlighted in Chapter 4.

Chapter 2

Treatment Effects

2.1 What is treatment effect?

Some social science researchers believe that continuous engagement of households in a village may enlarge the horizons of the respondents and may make them more progressive and knowledgeable than the others. The presence of a resident investigator is also suspected to have an influence on the village. Two kinds of effects are foreseen. All the villagers may interact with the resident investigators and other supervisory staff frequently visiting the village and get up-to-date information on agricultural technologies. These interactions may lead to the entire village becoming more progressive than neighboring villages. By the same token of logic, the respondent households who interact with the investigator once or twice every month may gain a further edge in terms of their knowledge of technologies and may be leading the technology adoption process. These are only hypotheses which need to be tested by using some indicators of treatment effects. ICRISAT panel households and resident investigators, being unique, are eminently suited to undergo the test of treatment effects.

2.2 Possibility of treatment effect in village-level studies

Although the philosophy of VLS was to track the households as they evolve and respond to normal development opportunities, onlookers conjecture that the long association between ICRISAT research staff and villagers in these villages may have some treatment effects. While no deliberate schemes were introduced by ICRISAT staff to hasten the process of development in these villages, one cannot rule out some exchange of information through their interactions. Since the sample households spend considerable time answering the queries of investigators, the latter may feel obliged to share some information about new technologies with the respondents. In order to test the suitability of some varieties to the field conditions, investigators of ICRISAT did occasionally give some small samples of seed for trials in the villages. These were intended to test the suitability of the new seeds but not to have a big demonstration effect. The seed was never given in bulk for large-scale trials, and not all new seeds gave better results than the locally used seeds. In fact, when farmers wanted seeds in substantial quantities, they were actually sold to them at the market price. Given the semi-arid environment and the risky dryland conditions, these limited trials had only marginal effect on the level of productivity. Unlike Green Revolution technologies in irrigated areas, where new technologies spread like wildfire, the performance of the components of technology in VLS, which were taken up for limited trials, was neither impressive nor created a large visual impact. The adoption of the practices, at best, attained saturation at low levels of adoption. Over time, these technologies crept into neighboring villages as well through market forces or government schemes. Due to these reasons, the limited exposure to knowledge and trails facilitated by the investigators and research staff did not make these villages any more progressive than their neighboring ones. Yet, it is necessary to investigate if any treatment effects were caused.

2.3 Possible levels of treatment effects

As already discussed, one may suspect that continual interaction with the respondent household may make them more progressive and prosperous. This can only be tested by comparing the respondent

households with those that are not in the sample (Fig.2). This is the first level of treatment effect which needs to be investigated. As a logical corollary, if direct interaction with research staff makes the households progressive, it can be expected that the length of interaction will influence the degree of progressiveness. In the VLS sample, there are some households that were tracked for 17 years, while others interacted with the investigators only for 7 years. There are also some households which remained in the sample only for three to four years. The second level of treatment effect can be assessed by comparing the households with varying lengths of exposure with the investigators. As initially surmised, it can also be tested whether the VLS villages are any more progressive than their neighboring ones with similar resource endowments. This can be the third level of treatment effect, if found to exist at all.
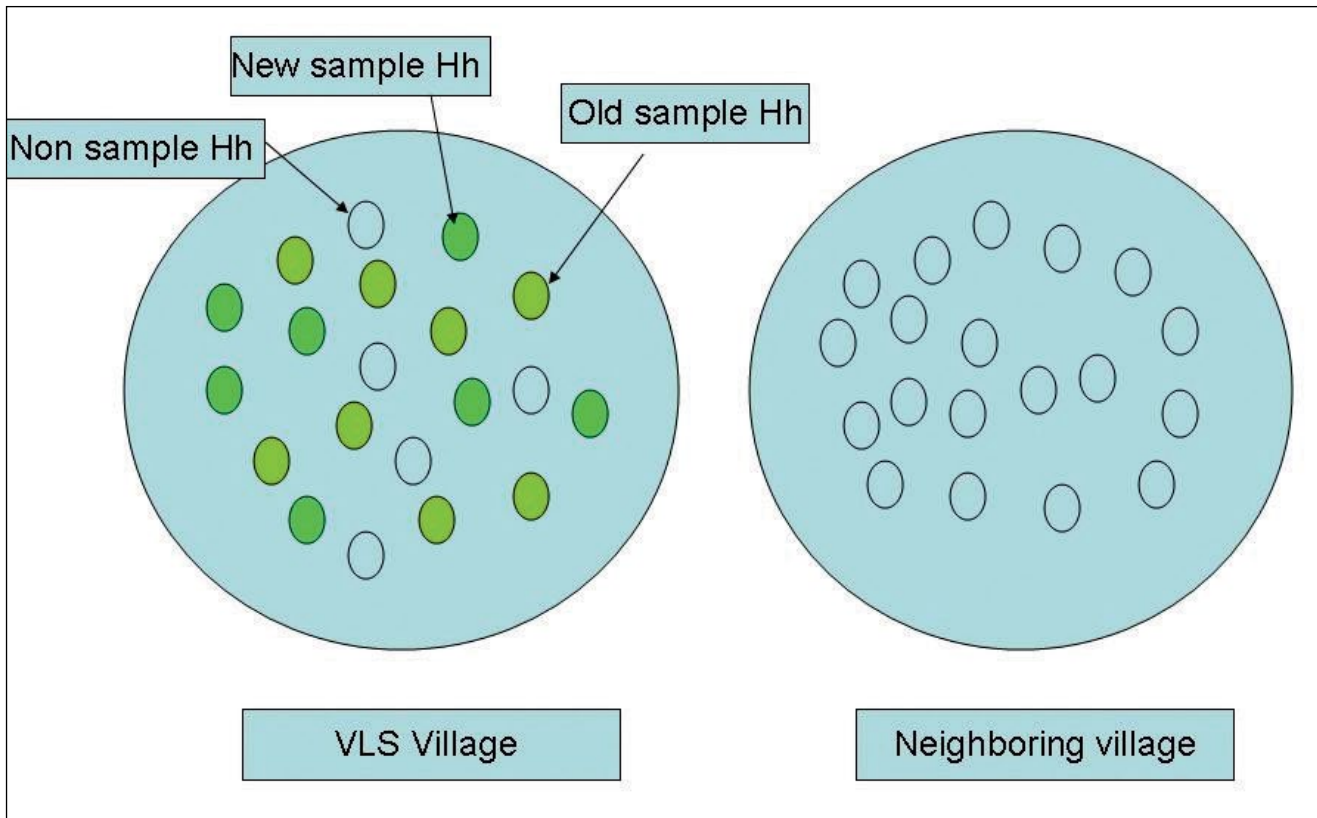
Figure 2. Different levels of treatment effect.

2.4 Indicators of treatment effects

The net impact of treatment effects should be found in the levels of income, wealth status, rate of growth in asset values, size of holding, consumption expenditure and incidence of poverty. Since we have no data collected from the neighboring villages, we cannot venture to assess the third level of treatment effect. The available data allows us to assess only the first and second levels of treatment effects.

Methodology followed for measuring the treatment effects

Village census is the only source of information about VLS households and non-VLS households at a single point in time. There is also some information about the nonrespondents from the census data

collected at certain intervals. The census information can be analyzed to compare the respondents with nonrespondents at two points in time, ie, 2000/2002 and again in 2007.There were also censuses of households conducted during 1985 (only for the three continuous villages) and 1989 for all the six villages (however, the data on the 1989 census for Dokur village is not available). Among the four census surveys conducted at different times (1985, 1989, 2000/2002 and 2007), the indicator available for comparison among respondent and nonrespondent sample households is only the extent of owned land holding (in hectares). This indicator was analyzed and compared to measure the first-level treatment effect in VLS villages. However, it may only indicate whether the sample was representative of the population. Because of the arbitrary decision to take 10 households each from landless, small, medium and large farm groups, the representation to all categories of farmers was ensured by arranging the landowners in descending order and labeling the bottom one-third as the small farmers, the middle one-third as the medium farmers and the top one-third as the large farmers. However, the landless households were given a share of 25% only in the sample, while their number was actually about one-third of the total number of households in the villages. As a result, the sample drawn consisted of richer households than in the population. However, the rate of change in the assets of sample households and non-sample households can be considered an indicator of treatment effect.

To capture the second level of treatment effect in the six VLS villages, data periods were split into two and analyzed separately. The details are summarized below:

- Comparison of first generation VLS dataset (1975-85) between continuous and closed villages sample households should give a measure of second-level treatment effect (Fig 3.). As hypothesized, the length of association of households with ICRISAT staff is supposed to influence the degree of progressiveness of the household. The length of association of households with ICRISAT staff was greater in continuous villages (10 years: 1975-85) when compared with the closed villages where it was only for three to five years (1975-80). Three indicators of treatment effect were studied with this dataset. They are: average annual gross income per household, per capita income of the household, and extent of asset values per household (in rupees).

- Comparison of second generation VLS dataset (2001-07) between the original sample households (1975-85) or their split-offs (in households where the original household head is no longer alive) with the newly added sample households during 2001-02 (Fig 3.). 259 households out of the 446 sample households in 2001-02 belonged to original households or their split-offs. The original households have had a longer association with ICRISAT staff over a period of 17 years, while the newly added sample households (187) had an association of only 7 years (2001-07). We have used five indicators of treatment effect for comparison of households belonging to the two different groups. They are: total assets of household, owned land holding, annual income of the households, annual consumption expenditure of the households and the incidence of income poverty.

The two datasets were collated, compared and analyzed with respective indicators of treatment effect and the results are presented in Chapter 3.
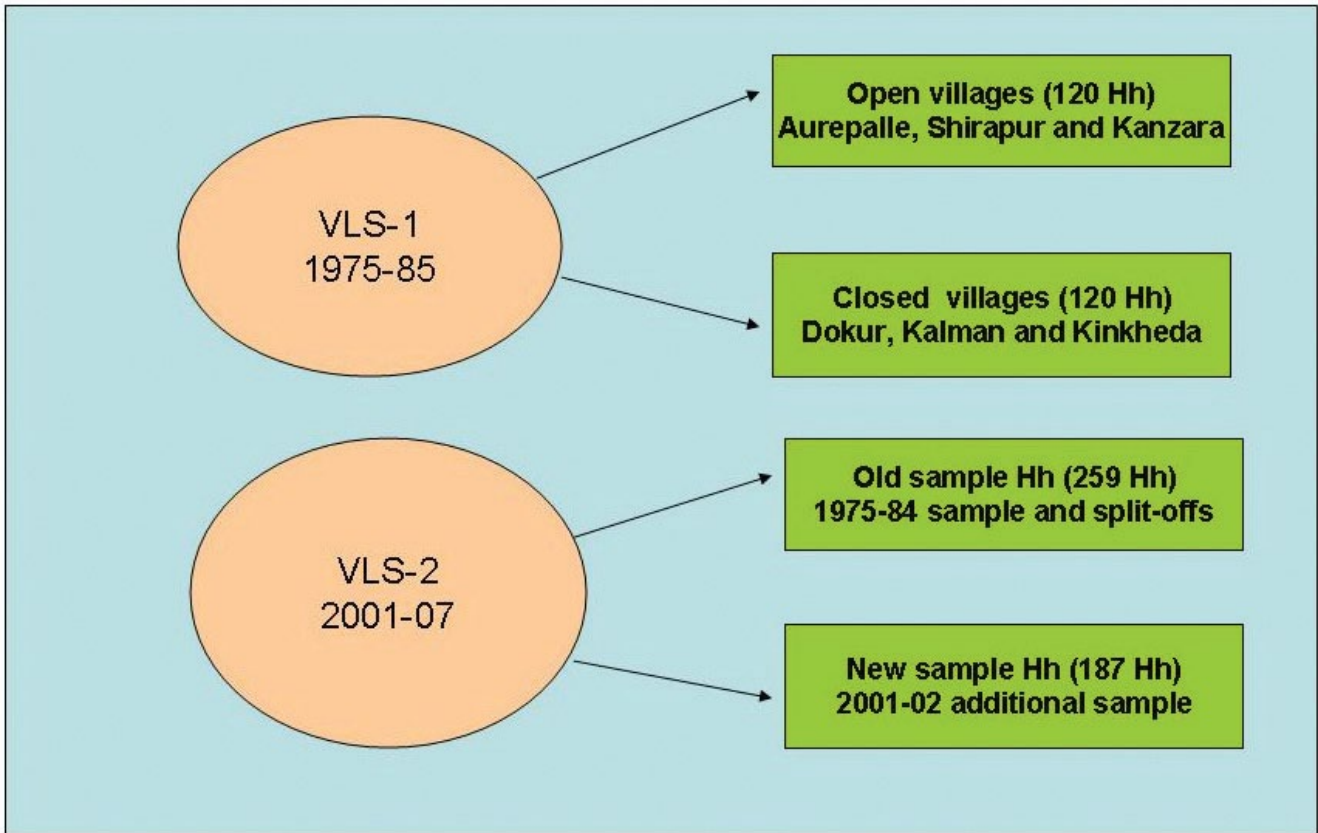
Figure 3. Measurement of second-level effect.

Chapter 3

Results and Discussion

3.1 Results from first-level treatment effect

As explained in the previous chapter, census data were used for assessing the first-level treatment effect by comparing respondent and nonrespondent households. Owned land holding per household is the single common measurable and comparable indicator of treatment effect available through all the different censuses conducted over the years. The following are the results emanating from different census surveys, presented in descending order of time period.

2007 census survey

The most recent census survey was conducted during the cropping year 2007-08 in the six VLS villages with a well structured questionnaire. The average size of own land holding per household across different size groups was compared between VLS respondents and non-VLS households. The results are analyzed and presented by village in Tables 15 through 20.

Aurepalle village

A comparison of land holdings of VLS sample and non-VLS households is presented in Table 15. 130 households representing 16.9% of the total number of 765 households were included in the sample. The weighted average size of own land holding of sample households was 1.54 ha. The remaining 635 households, which were outside the VLS sample, had a weighted average land holding size of 1.21 ha. As all the split-offs of the original VLS households were added to the sample in 2005-06, the sample became biased once again. The ownership holdings in the sample were larger than those of the non-sample households in landless and small farm categories, but the opposite was true in the medium and large farm categories. However, the weighted average ownership holding of the sample farmers was larger than of the non-sample households. The weighted average land holding of the all households in the village was 1.26 ha only. Thus, it can be safely concluded that the households included in the VLS sample had a larger land holding than those that of non-VLS households in the village. The t-test results confirm that there is no significant difference in the mean own land holdings between the VLS sample and non-VLS households.

Table 15. Aurepalle census comparison, 2007.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	41	0.73	157	0.04	198	0.20
Small	27	0.89	227	0.65	254	0.65
Medium	31	1.70	202	1.74	233	1.74
Large	31	3.00	49	5.59	80	4.66
Overall	130	1.54	635	1.21	765	1.26
t- test			-0.315 (0.763)			

Note: The figure in parentheses indicates two-tailed significance value

Dokur village

Dokur census data for 2007 on own land holding was compared between VLS sample households and non-VLS households and the results are presented in Table 16. Ninety-eight out of 516 households were included in the VLS sample, constituting 18.9% of the total number of households. The weighted average size of own land holding of VLS sample households (1.26 ha) was slightly higher than that of the non-sample households (1.13 ha). The average size of own holding of the entire village households was the same as that of the non-sample households. Like Aurepalle, in Dokur too, the ownership holdings of landless and small farm households in the sample were larger than those of the non-sample households. Although the ownership holdings of the medium and large farm households in the non-sample were larger than those in the sample, the weighted average size of ownership holding was larger for the sample. This bias resurfaced after the split-offs of the original VLS households were added to the sample in 2005-06. Due to this, the VLS sample households had a higher ownership holding than that of non-VLS households. However, the differences in their mean values were not statistically significant.

Table 16. Dokur census comparison, 2007.

Category	VLS sample	Own land holding (ha)	Non-VLS Households (Hh)	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	25	0.40	124	0.04	149	0.08
Small	24	0.69	136	0.57	160	0.57
Medium	20	1.42	106	1.50	126	1.50
Large	29	2.43	52	4.29	81	3.64
Overall	98	1.26	418	1.13	516	1.13
t- test			-0.347 (0.745)			

Note: The figure in parentheses indicates two-tailed significance value

Shirapur village

The own land holdings of 2007 Shirapur census data for VLS sample and non-VLS households were compared and the results are presented in Table 17. The VLS sample for Shirapur included 144 out of 547 households. The sampling fraction was about 26%. The weighted average size of own land holding of VLS sample households was 1.5 ha, while that of non-VLS households (403 households) was 1.26 ha. The pooled weighted average of own land holding in the village population was 1.34 ha. When compared with Aurepalle and Dokur villages, the landless households in both the sample as well as the non-sample households did not possess any land. The ownership holdings of small and medium farm households in the sample were larger than those of the corresponding households in the non-sample. Although the land holding of the non-sample households from the large farm category was higher than that of the sample households, the weighted average size of the ownership holding of the sample households was larger than that of the non-sample households. However, the differences in their mean own holdings were not statistically significant. Just as in the Mahabubnagar villages, the sample became distorted after the inclusion of spilt-offs of original VLS households in 2005-06.

Table 17. Shirapur census comparison, 2007.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	34	0.00	187	0.00	221	0.00
Small	73	1.26	123	1.05	196	1.13
Medium	27	3.04	73	3.00	100	3.00
Large	10	3.93	20	8.14	30	6.64
Overall	144	1.50	403	1.26	547	1.34
t- test	-	-	-0.493 (0.639)		-	-
Note: The figure in parentheses indicates two-tailed significance value						

Kalman village

Land holdings in the census data of Kalman village in 2007 were compared between VLS sample households and non-VLS households and the results are presented in Table 18. One hundred and two households (about 15.4% of the total) were included in the VLS sample. In Kalman also, the ownership holdings of the sample farmers belonging to landless, small and medium categories were larger than those of the corresponding groups in the non-sample. The converse was the case with respect to the large farm household category. However, the weighted average size of the ownership holding was larger for the sample households when compared with the non-sample households. Addition of split-offs of original VLS households to the sample in 2005-06 rendered the sample more biased in favor of richer households. Due to this, the weighted average size of own land holding of VLS sample (2.63 ha) was more than that of the non-VLS households (2.06 ha). However, differences in these mean values were not statistically significant. The weighted average size of own land holding in the population was 2.15 ha.

Table 18. Kalman census comparison, 2007.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	26	0.04	145	0.00	171	0.04
Small	54	2.02	311	1.70	365	1.74
Medium	18	5.18	87	4.94	105	4.98
Large	4	10.32	15	12.47	19	12.02
Overall	102	2.63	558	2.06	660	2.15
t- test	-	-	-0.108 (0.917)		-	-
Note: The figure in parentheses indicates two-tailed significance value						

Kanzara village

Census data of Kanzara in 2007 was compared between VLS sample households and non-VLS households with respect to own land holding, and the results are presented in Table 19. About 19.7% (63 out of 320) of the households were included in the sample. The weighted average size of ownership holding of the sample households was larger than that of the non-sample households in the 2007 census. The ownership holding was bigger for the sample households only in the case of landless households. In all the three cultivator categories, the ownership holdings

of the non-sample households were larger than those of the corresponding groups belonging to the sample households. However, the weighted average size of ownership holding was larger for the sample households as compared to that of the non-sample households. The addition of split-offs of the original VLS households to the sample in 2005-06 rendered the sample more biased in favor of the richer households. It can be concluded that the VLS sample households are better off than the non-VLS households in the village as far as own land holding is concerned. However, the differences in their mean values were not statistically significant.

Table 19. Kanzara census comparison, 2007

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	15	0.69	102	0.00	117	0.08
Small	23	1.05	85	1.09	108	1.09
Medium	15	1.86	50	2.75	65	2.55
Large	10	6.40	20	9.31	30	8.18
Overall	63	1.98	257	1.62	320	1.66
t-test	-0.320 (0.760)					

Note: The figure in parentheses indicates two-tailed significance value

Kinkheda village

The comparison of Kinkheda census data of 2007 between VLS sample households and non-VLS households is presented in Table 20. The VLS sample (55 households) represents 29.2% of the total number of households (188) in the village. This sampling fraction of Kinkheda village is the highest among the six VLS villages. Just as in the other five villages, the ownership holding of the sample households was bigger than that of the non-sample households. Among the categories of farms, only landless and medium farm households in the sample had bigger land holdings than the non-sample households. In the small and large farm categories, the ownership holdings of non-sample households were bigger than those of the sample households. Yet, the weighted average size of ownership holding was much bigger in sample households than that of the non-sample households. However, the differences in their mean values were not statistically significant.

Table 20. Kinkheda census comparison, 2007

Category	VLS sample	Own land holding (ha)	Non-VLS |Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	10	0.69	46	0.00	56	0.12
Small	26	1.01	48	1.05	74	1.05
Medium	9	3.28	27	2.67	36	2.87
Large	10	4.98	12	7.17	22	5.95
Overall	55	2.55	133	1.58	188	1.86
t- test	-0.124 (0.905)					

Note: The figure in parentheses indicates two-tailed significance value

Summary of results from the 2007 census survey

As already discussed, all the six VLS villages showed similar results when the land holdings of VLS sample households were compared with those of non-VLS households. The weighted average size of own land holding of the VLS sample households was higher than that of the non-VLS households in all the six villages. It was also higher than the average holding size of the entire village population. This was mainly due to underrepresentation of landless households in the sample rather than their actual proportion in the village population. Cultivator households received more than proportional representation in the samples of all six villages. This finally led to selection of households with higher land holdings in the VLS samples of all the six villages. However, t-test results have concluded that the difference in their mean values were not statistically significant in all the six villages. In this scenario, we can safely conclude that there is no first-level treatment effect between the VLS sample households and non-VLS households.

A comparison of size of land holding of those households in the sample with those that are not in the sample at one point of time (2007) could give information about their status at that point of time. One can compare the rates of growth in the average sizes of land holding of those who are in the sample and those who are not between two points in time when censuses were conducted. A study of land holdings in the census year of 2000/2002 would be useful before assessing the rate of growth in the land holding between two points of time.

2000/2002 census survey

This census survey was conducted during 2000 in AP villages (Aurepalle and Dokur) while it was conducted in 2002 for the four villages (Shirapur, Kalman, Kanzara and Kinkheda) in Maharashtra. The censuses were conducted in AP villages just before launching of the Overseas Development Institute (ODI) study in 2000-01. In the Maharashtra villages, these census surveys were conducted in 2001-02, before the revival of second generation VLS. A well designed questionnaire was used for this purpose. During the revival in 2001-02, the VLS samples were enlarged to give at least 15% representation using probability proportion to size method of sampling. The selection of households in 2001-02 was done based on operational land holdings in order to remain consistent with the methodology followed in the first generation VLS. However, for the purpose of the present study, the ownership holding recorded in censuses conducted in 2000/2002 were used. This compromise was made as the census data was focused on ownership holding rather than on operational land holding. The average sizes of own land holding across different size groups was compared between VLS households and non-VLS households. The analysis was done by village and the results are presented in Tables 21 through 26.

Aurepalle village

The census data on own land holding for Aurepalle village in 2000 was compared between VLS sample households and non-VLS households and the results are presented in Table 21. The VLS sample households (100 households) represented about 15.3% of the total households (651) in the village. The weighted average size of own land holding of the VLS sample was 1.70 ha. However, the same for the 551 households that were outside the VLS sample was 1.78 ha. The sample households had a slightly lower holding than non-sample households in terms of ownership holding. However, the differences in their mean own land holdings were not statistically significant. The operational holding was 1.62 ha for the sample households and 1.58 ha for the non-sample households. This was because

farmers kept some part of their holding fallow. While the sample was representative of the population in terms of operational holding, it was not with respect to owned land holding.

In the 1975 census, there were 146 landless households which represented 30.7% of the total number (476 households) (Appendix Table 1). However, they were given only 25% weightage in the sample. The cultivator households that formed 67.6% of the total households in the village got a 75% share in the sample. This bias in the sample was corrected in the 2001-02 samples to a considerable extent. However, some discrepancy remained due to the use of operational holding for delineation of size groups.

Table 21. Aurepalle census comparison, 2000.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	25	0.4 (0.16)	193	0.85 (0.0)	218	0.85 (0.08)
Small	21	0.97 (0.85)	264	1.30 (1.30)	285	1.26 (1.30)
Medium	37	2.02 (1.98)	63	3.28 (3.68)	100	2.79 (3.04)
Large	17	3.77 (3.97)	31	8.83 (9.64)	48	7.04 (7.61)
Total	100	1.70 (1.62)	551	1.78 (1.58)	651	1.78 (1.62)
t- test	-0.897 (0.404)*					

Note: The figure in parentheses indicate operational land holding.
* Two-tailed significance value

Dokur village

The census data on own land holding for Dokur village in 2000 was compared between VLS sample households and non-VLS households and the results are presented in Table 22. Eighty VLS sample households (about 15.3%) were included in the study out of the total number of 521 households in the village. This representative sample of 80 households was chosen using probability proportion to size method, but based on operational land holding criterion during 2001-02. However, when the own land holding of sample and outside-sample households was computed, some discrepancy cropped up. The weighted average size of own land holding (1.05 ha) of the VLS sample was slightly less than that of the non-VLS households (1.17 ha), but the differences in their mean values were not statistically significant. In both the sample and non-sample households, the operational holding was smaller than the ownership holding due to the practice of fallowing. The landless households leased out land to others while the large farmers increased their operational holding by leasing more land. For the small farmers, the ownership and operational holdings were of the same size. Medium farm households in the sample leased out some land while those not in the sample leased some land.

As per the 1975 census, about 72% (226 out of 313) of the households in the village were cultivators (Appendix Table 1). However, their representation in the sample was 75%. This slight gap was corrected by adding sufficient number of landless households in the sample during 2001-02, but a small inconsistency in the own land holding still exists between the sample and the population.

Table 22. Dokur census comparison, 2000

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	20	0.24 (0.04)	133	0.40 (0.04)	153	0.04 (0.04)
Small	31	0.53 (0.53)	171	0.57 (0.57)	202	0.57 (0.57)
Medium	15	1.17 (1.13)	91	1.78 (1.86)	106	1.70 (1.78)
Large	14	3.12 (3.20)	46	4.66 (4.78)	60	4.29 (4.41)
Total	80	1.05 (0.97)	441	1.17 (1.09)	521	1.17 (1.09)
t- test			-0.498 (0.636)*			

Note: The figures in parentheses indicate operational land holding
* Two-tailed significance value

Shirapur village

The 2002 census data on own land holding for Shirapur village was compared between VLS sample households and non-VLS households and the results are presented in Table 23. Around 15% (88 households) of the total number (587 households) was chosen for the sample in the village. The weighted average size of own land holding (1.58 ha) of the VLS sample households was more than that of households outside the VLS sample (1.26 ha) in the village. However, their mean own land holdings were not statistically different from each other. In Shirapur, operational holding was larger than ownership holding, both in the sample and non-sample households. Perhaps the villagers are able to lease the land from neighboring villages to increase their operational holding. Sample farmers have both ownership and operational holdings larger than for the non-sample households.

According to the 1975 census, 183 households (62% of the total 297 households) belonged to cultivators group (Appendix Table 1). However, their share in the sample was higher at 75%. The landless households, which had 32% share in the total village population, got only a 25% weight in the sample. These discrepancies in the old sample were corrected during the selection of sample for the second generation VLS, ie, 2001-02 onward.

Table 23. Shirapur census comparison, 2002.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	22	0.0 (0.0)	203	0.0 (0.0)	225	0.0 (0.0)
Small	43	1.09 (1.13)	221	1.21 (1.26)	264	1.21 (1.21)
Medium	17	2.96 (3.12)	54	3.56 (3.97)	71	3.40 (3.77)
Large	6	6.96 (7.77)	21	7.81 (8.83)	27	7.61 (8.58)
Total	88	1.58 (1.70)	499	1.26 (1.34)	587	1.30 (1.42)
t-test			-0.171 (0.870)*			

Note: The figures in parentheses indicate operational land holding
* Two-tailed significance value

Kalman village

The 2002 census data on own land holdings for Kalman village was compared between VLS sample households and non-VLS households and the results are presented in Table 24. From the 630

households in the village, 94 were chosen for the VLS sample, accounting for about 15% of the total. The non-VLS households had slightly higher average size of own land holding (2.31 ha) than that of the VLS sample households (2.15 ha) in Kalman village. However, they are not statistically different from each other. The average size of own land of all the households in the village (2.27 ha) was also higher than that of the VLS sample. In the sample households, the ownership and operational holdings were the same for landless, small and medium households. However, the operational holding of the large farm households was slightly larger than the ownership holdings. In non-sample households, the operational holding was larger than the ownership holding in medium farm households only.

As per the census conducted in 1975, 37% (156 households) of the total number of village households (423) belonged to the landless labor category (Appendix Table 1). However, their representation in the sample was only 25%. The cultivators, who represented only 50% (211 households) of the total, got a share of 75% in the old VLS sample. This huge discrepancy in the representation of the sample was rectified in 2001-02 while drawing the new sample.

Table 24. Kalman census comparison, 2002

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	24	0.16 (0.16)	94	0.0 (0.0)	118	0.0 (0.0)
Small	53	1.90 (1.90)	406	2.27 (2.27)	459	2.23 (2.23)
Medium	14	5.10 (5.10)	28	7.53 (7.89)	42	6.72 (6.96)
Large	3	9.31 (10.65)	8	14.01(14.01)	11	12.71 (13.08)
Total	94	2.15 (2.23)	536	2.31 (2.31)	630	2.27 (2.31)
t –test			-0.494 (0.639)*			

Note: The figures in parentheses indicate operational land holding
* Two-tailed significance value

Kanzara village

The 2002 census data on own land holding for Kanzara village was compared between VLS sample households and non-VLS households and the results are presented in Table 25. Fifty-two households were selected for the sample from the 339 households in the village, accounting for 15.3% of the total. The sample households have higher ownership and operational holdings than the non-sample households. However, the differences in their mean values were not statistically significant. Since the additions to the sample in 2001-02 were only a few, the sample continued to be biased. Among the sample households, labor households have leased out the land, while the three size groups of cultivators leased land to increase their operational holding. However, in the non-sample households, only the large farmers leased out land, while the other three groups have leased land to increase their operational holding.

With reference to the 1975 census, 54 households (32% of the total of 169 households) belonged to the landless category (Appendix Table 1). However, their representation in the sample was only 25%. One hundred and nine households of cultivator group which represented 64% in the village population got 75% weightage in the sample. These inconsistencies in the sample were rectified during 2001-02 when the second generation VLS were resumed.

Table 25. Kanzara census comparison, 2002.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	13	0.45 (0.0)	109	0.0 (0.20)	122	0.04 (0.20)
Small	20	1.21 (1.30)	109	1.34 (1.38)	129	1.30 (1.34)
Medium	14	3.44 (3.52)	47	3.44 (3.56)	61	3.44 (3.52)
Large	5	9.15 (10.04)	22	9.15 (8.02)	27	9.15 (8.38)
Total	52	2.39 (2.43)	287	1.78 (1.78)	339	1.86 (1.90)
t- test			0.029 (0.978)*			

Note: The figures in parentheses indicate operational land holding
* Two-tailed significance value

Kinkheda village

The 2002 census data on own land holdings for Kinkheda village was compared between VLS sample households and non-VLS households and the results are presented in Table 26. Of the 170 households in the village, 32 (18.8%) were chosen for the sample. As no additions were made to the sample in Kinkheda, the bias in the old VLS sample continued in the second generation also. Both the ownership as well as operational holdings were larger for the sample households. However, differences in the mean own land holdings between sample and non-sample households were not statistically significant. In the sample households, the operational and ownership holdings were the same for landless, small and large farm households, but the operational holding was smaller than the ownership holding for the medium farm households. In the non-sample households, the ownership and operational holdings were the same for the large farm households. However, the operational holding was larger than the ownership holding in the other three size groups.

According to the 1975 census, 55 households (38%) were classified as landless labor in the 143 households existing in the village (Appendix Table 1). However, the weightage given for them in the sample was only 25%. On the other hand, 83 households (58%) of the village population were classified as cultivators, but they represented a 75% share in the sample. This bias in the sample was set right during 2001-02 when the sample was enlarged.

Table 26. Kinkheda census comparison, 2002.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	8	0.40 (0.40)	26	0.0 (0.04)	34	0.08 (0.12)
Small	14	1.17 (1.17)	94	1.38 (1.42)	108	1.38 (1.38)
Medium	6	3.24 (2.96)	11	4.01 (4.33)	17	3.77 (3.85)
Large	4	8.70 (8.70)	7	10.53 (10.53)	11	9.84 (9.84)
Total	32	2.31 (2.27)	138	1.78 (1.90)	170	1.90 (1.94)
t- test	-0.199 (0.848)*					

Note: The figures in parentheses indicate operational land holding
* Two-tailed significance value

Summary of results from the 2000/2002 census survey

The selection of additional sample units was done during 2002 based on 2000/2002 census data. The criterion used for this purpose was operational land holding of the household. About 15% households were included in the sample using probability proportion to size method of sampling. Thus, 446 households were chosen from a population of 2876 households in all the six villages combined. In order to maintain consistency with the first generation VLS sample, operational holding was considered. However, the indicator in the study to capture the first-level treatment effect between VLS sample households and non-VLS households was own land holding. Among the six villages whose census data was analyzed, none of the villages is truly representative of its population. Inconsistencies were observed in representation of different size groups in the sample in all the six villages after changing the criterion from operational to own land holding. The VLS sample households were poorer in own land holding when compared to non-VLS households in Aurepalle, Dokur and Kalman villages. However, in Shirapur, Kanzara and Kinkheda villages, this trend was reversed. Differences in their mean own land holding values were not statistically significant in any of the six VLS villages.

Rate of growth between 2007 and 2000/2002 census surveys

The rate of growth in mean own land holdings between 2007 and 2000/2002 was computed by village and results are presented in Table 27. The results proved that there is no systematic pattern in growth between VLS sample households and non-VLS households during the study period.

Table 27. Growth rates in own land holdings, 2002-2007.

Village	2007 census			2000/02 census			Rate of growth		
	VLS	Non-VLS	Overall	VLS	Non-VLS	Overall	VLS	Non-VLS	Overall
Aurepalle	3.8	3.0	3.1	4.2	4.4	4.4	-9.5	-31.8	-29.5
Dokur	3.1	2.8	2.8	2.6	2.9	2.9	19.2	-3.4	-3.4
Shirapur	3.7	3.1	3.3	3.9	3.1	3.2	-5.1	0.0	3.1
Kalman	6.5	5.1	5.3	5.3	5.7	5.6	22.6	-10.5	-5.4
Kanzara	4.9	4.0	4.1	5.9	4.4	4.6	-16.9	-9.1	-10.9
Kinkheda	6.3	3.9	4.6	5.7	4.4	4.7	10.5	-11.4	-2.1

Summary of results from the 1989 census survey

This census survey was done in 1989 just before the beginning of the surveys in six VLS villages. These data are available for five villages while the data for Dokur could not be traced. However, a survey was done in 1989 in all the six villages. During the 1989 survey, the sample size was increased to 48 households per village. Equal representation was given to all the four categories of landless, small, medium and large farms. From each farm category, three old sample households (1975-84) and nine new households were selected from the census. Thus, in each village, the sample consisted of 12 old sample households and 36 new households. The details of the sample in 1989 are presented in Table 28. The results of analysis are presented in Appendix Tables 2 through 6. However, the results are discussed in this chapter.

Table 28. Sample size in six VLS villages, 1989.

Village	Labor	Small	Medium	Large	Total
Aurepalle	12	12	12	12	48
Dokur	12	12	12	12	48
Shirapur	12	12	12	12	48
Kalman	12	12	12	12	48
Kanzara	12	12	12	12	48
Kinkheda	12	12	12	12	48
Total	72	72	72	72	288

Just as in the 2000/2002 census, the average size of own land holding across different size groups was compared between VLS respondents and non-VLS households for capturing the first-level treatment effect. Among the five villages analyzed, none of the villages was representative of their population. Inconsistencies were noted between their shares in sample and population. The ratio of the samples to the populations ranged between 7% and 27% of the respective populations. The share of VLS sample to the total population was the highest at 27% in Kinkheda, while it was the lowest at 7.3% in Kalman. The weighted average size of own land holding of VLS sample households was higher than that of non-VLS households in Shirapur, Kalman and Kinkheda, while this value was lower than that of non-VLS households in Aurepalle and Kanzara. However, differences in their mean values were not statistically significant in any of the five villages. Due to the arbitrary decision of giving equal weightages to the four categories of households, the sample was not truly representative of their populations.

Summary of results from the 1985 census survey

This census survey was conducted just after the first generation VLS (1975-85) were completed. These surveys were only conducted in the three continuous villages (Aurepalle, Shirapur and Kanzara). The VLS sample size was 40 households per village. The data were analyzed and the results are presented in the Appendix Tables 7 through 9. Only the summary of the results is discussed in this chapter. Among the three continuous villages for which data were analyzed, the VLS sample households were better off in having higher own land holding than the non-VLS households, but differences in their mean values were not statistically significant from each other. In addition, the limitation of nonrepresentative nature of the sample still exists. The results clearly showed that in all the three villages, the landless labor households were under-represented with respect to their actual shares in the population. This led to excessive representation of cultivator households in the sample. Hence, the differences in ownership land holding are more due to distorted samples than because of actual treatment effect.

Synthesis of results from various census surveys

The analysis of data from all the four census surveys (2007, 2000/2002, 1989 and 1985) revealed that the ownership holdings were generally larger for sample households than the non-sample households. The reason was that the criterion followed for selection of households from 1975 to date was operational land holding, which does not form an accurate stratum for the classification of households. Values of operational land holding are highly variable from year to year and even from season to season. Perhaps own land holding would be a better stratum for classification of households due to less variability between years–own land holding is more reliable, measurable and comparable. There is information on this variable in all the census surveys. We have data on ownership holding for

both VLS sample households and non-VLS households at all points of time. The results, in general, indicated that the VLS sample households are wealthier (as measured by own land holding) than the non-VLS households. However, differences in their mean values were not statistically significant in all the villages across different census surveys. The main reason for differences in land holdings was the under-weightage given in the sample to landless labor households relative to their actual shares in the population.

3.2 Results from second-level treatment effect

As discussed in Chapter 2, second-level treatment effects could be measured using both the first and the second generation VLS datasets.

Comparison of first generation VLS dataset (1975-85)

To measure the second-level treatment effect, comparisons were made between the continuous and closed villages during the period 1975-85. Three indicators of treatment effects were used for this purpose. The results for these indicators are presented below:

a. Annual gross income per household (Rs)

The annual income per household was analyzed from the data reported in transaction module (L), input-out (Y) module and employment (K) module. The income dataset was available for continuous villages for the period 1975-76 to 1984-85 while it was available only for the period 1975-76 to 1983-84 for closed villages. The growth rates in annual income data were computed and are presented in Table 29.

Table 29. Comparison of growth rates in annual gross incomes between continuous and closed villages (Rs).

Year	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkheda
1975-76	2524	3245	2453	2607	3766	3242
1976-77	2038	3874	3379	3059	4265	3493
1977-78	4047	3635	3692	3520	5441	3928
1978-79	3779	4493	3382	3698	4276	3994
1979-80	4021	3991	3854	4216	4217	4344
1980-81	3491	3769	2856	4435	4168	4483
1981-82	3475	3442	3555	5268	5655	4636
1982-83	4020	3724	4107	5103	6186	6469
1983-84	4260	3528	3080	4368	6868	5797
Mean	3517	3744	3373	4030	4982	4487
Std .dev	757	360	513	890	1085	1048
Growth rate	6.45	-0.11	2.11	7.95	6.13	8.00
t – test	-0.813 (0.433)		-1.920 (0.077)*		0.985 (0.339)	

Note: The figures in parentheses indicate two-tailed significance values
*Significant at 10% level

Among the six VLS villages, the annual gross income in most of the years as well as the nine-year mean was the highest in Kanzara village. Kanzara was closely followed by Dokur in the first four years while Kinkheda reached the second place from 1979 onward. The lowest income was observed in Shirapur during the base year as well as in the end year. It remained at the bottom place for most years. Kalman also reported low incomes in the first four years but picked up from 1979-80. Dokur had higher incomes than Aurepalle in the first half of the data series but the position was reversed during the second half. The gross income in 1983-84 was the highest in Kanzara, followed by Kinkheda and Kalman villages. During the period 1975-84, the rate of growth was the highest (8% per annum) for Kinkheda while it was the lowest at -0.11% per annum for Dokur.

Between the two AP villages, the rate of growth was higher in the continuous village (Aurepalle). Dokur village had higher gross income than Aurepalle village in 1975-76. Due to drying up of tanks, wells and borewells, the area under paddy came down significantly in Dokur during the 1980s due to which the average household income fell short of that of Aurepalle. However, the mean gross income value was higher (6.4%) in Dokur village, though the dispersion of gross income values showed high standard deviation in Aurepalle village compared to Dokur. The independent t-sample test was applied to the dataset for testing the difference between the two sample means. The results concluded that there is no significant difference between mean gross income values of the two AP villages.

Between the two Solapur villages, the initial as well as the end values of annual gross income were higher in Kalman. In fact, the average household income was consistently higher in Kalman than in Shirapur except for the two years 1976-77 and 1977-78. The rate of growth in the annual gross income was higher in the closed village (Kalman) than in the continuous village (Shirapur). High standard deviation in gross income values were observed in Kalman as compared to Shirapur. The independent t-sample test result summarizes that the difference between two sample means was significant at 10% level. However, the mean gross income per household was higher in Kalman (closed) as compared to Shirapur (open), so we can safely conclude that there is no treatment effect between the two Solapur villages.

Similarly, when we compare the two Akola villages, the initial and end values of gross annual income were higher in Kanzara. However, the rate of growth was higher in the closed village (Kinkheda) at 8.00% per annum than in the continuous village (Kanzara) at 6.13 % per annum. The average gross income per household was higher (11.0%) in Kanzara when compared to Kinkheda. The standard deviation in gross comes was also high in Kanzara. However, there was no significant difference in mean gross income values of the two villages. Thus, we can safely conclude that the length of association with ICRISAT staff in continuous villages did not contribute in any way to the annual gross income as compared to that in the closed villages.

In the same way, the datasets were also tested by applying a simple econometric equation. As hypothesized in Chapter 2, continuous association with ICRISAT research staff would make the households more progressive than the non-associated households. The basic presumption is that continuous villages have progressed more than closed villages during the period 1975-85. If this were true, the gap between gross incomes should have widened during the study period. So, this was taken as a dependent variable (differences in mean gross incomes between a pair of villages) and regressed against two explanatory variables, ie, time and a treatment dummy. Since both open and closed villages were exposed to the same kind of treatment between 1975 and 1978, the value of the dummy was taken as '0', otherwise, the value of the dummy was assigned as '1'.

The model of the regression equation is specified as:

$$X_{t,a} - X_{t,na} = \alpha + \beta_t + \psi\ D + \mu_i$$

$X_{t,a:}$ Mean gross income value of continuous households at time 't'

$X_{t,na:}$ Mean gross income value of closed households at time 't'

't': time trend

ψD: dummy for treatment ('0' from 1975 to 1978, otherwise '1')

$\mu_{i:}$ Error term

Table 30. Determinants of differences in gross income.

Item	AP villages	Solapur villages	Akola villages
Intercept	-1258.8*	432.8	588.1
Time trend	271.9**	-160.1	174.0
	(1.941)	(-1.459)	(1.349)
Treatment-dummy	-492.1	-434.5	-1445.1**
	(-0.641)	(-0.723)	(-2.045)
R-square	0.522	0.692	0.430

Note: The figures in parentheses indicate t-values
* Significant at 5% level ** Significant at 10% level

The determinants of differences in mean gross incomes between three pairs of villages are summarized in Table 30. Among the three regression equations, the best fit was observed in the Solapur pair of villages, which exhibited the highest R-square value of 0.692. However, none of the explanatory variables were significant in the equation. Both time trend and treatment dummy coefficients showed negative sign; however, they are not statistically significant. The next best fit was observed in AP villages, where the value of R-square was 0.522. Time trend showed a positive relationship and was statistically significant at 10% level, which indicates that as time progresses the gap in mean gross income values have widened. The treatment dummy showed a negative sign but was not statistically significant. The equation fitted between Akola villages showed an R-square value of 0.430. Among the two explanatory variables, treatment dummy showed a negative relation with difference in mean gross incomes and is significant at 10% level. Time trend showed a positive sign but was not significant. Overall, it can be concluded that the treatment dummy showed a negative relationship with gap in mean gross incomes in all the three regression equations.

b. Annual per capita income (Rs)

The per capita incomes were calculated by dividing the annual average gross income of the household by the average family size in that year. The per capita incomes of the households were compared between continuous and closed villages for the period 1975-76 to 1983-84. The results for the six VLS villages are presented in Table 31. The mean per capita income was the highest in Kinkheda, followed by Kanzara and Kalman villages, and was the lowest in Shirapur at Rs.551. The mean per capita incomes of the two Mahabubnagar villages were Rs.623 in Aurepalle and Rs.624 in Dokur. The gap between the two villages narrowed because of the increase in the size of family in Dokur towards the end of the study period. The average size of the family in Aurepalle during 1975-76 was 5.7 and it increased to 6.0 till 1982-83 but slipped down to 5.2 in 1983-84. In Dokur, it increased from 5.5 in 1975-76 to 6.5 in 1983-84. The rate of growth in per capita income was positive and quite high in the

continuous village (Aurepalle) as compared to the closed village (Dokur), where it was negative. This was due to consecutive droughts that occurred in Dokur village, due to which the tanks did not get filled up and paddy area decreased. Between the two Solapur villages, the mean per capita income was higher in the closed village (Kalman) than in the continuous village (Shirapur).

Table 31. Comparison of annual per capita incomes (Rs) between continuous and closed villages, 1975-76 to 1983-84.

Year	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkheda
1975-76	446	586	374	434	648	632
1976-77	388	629	515	514	726	660
1977-78	745	602	515	590	900	743
1978-79	700	767	564	607	684	689
1979-80	710	644	692	730	650	768
1980-81	615	649	464	765	678	781
1981-82	613	597	591	850	845	938
1982-83	673	600	694	834	903	1219
1983-84	714	542	550	711	1060	1017
Mean	623	624	551	671	788	827
Std .dev	125	63	102.2	143.1	145.0	193.5
Growth rate	5.15	-1.06	4.29	7.59	4.23	7.49
t- test	-0.029 (0.978)		-2.039 (0.060)*		-0.486 (0.634)	

Note: The figures in parentheses indicate two-tailed significance values
*Significant at 10% level

Similarly, the rate of growth during the study period was higher at 7.59% per annum in Kalman when compared to Shirapur, where it was 4.29% per annum. This happened despite a decrease in the average family size in Shirapur village from 6.6 in 1975-76 to 5.9 towards the end of the study period. However, in Kalman, average family size increased from 6.0 to 6.1 during 1975-84. Between the two Akola villages, the mean per capita income as well as its rate of growth was higher in Kinkheda (closed village) than in Kanzara (continuous village). The average family size increased in Kanzara from 5.8 to 6.4 while it also increased from 5.1 to 5.7 in Kinkheda during the study period. Except Dokur, the other two closed villages performed better than their companion continuous villages in the respective regions. The t-test results also conclude that the mean per capita incomes were not significantly different from their companion villages in AP villages and Akola villages. However, in the Solapur villages, the mean per capita incomes of Shirapur and Kalman were significantly different at 10% level. However, the mean per capita income of Kalman (closed village) was much higher (21.7%) than Shirapur (open village). Thus, we can infer safely from the results that the treatment effect was not observed in the six VLS villages during the first generation.

Table 32. Determinants of differences in per capita income.

Item	A.P villages	Solapur villages	Akola villages
Intercept	-173.282**	0.667	82.846
Time trend	46.974 (1.882)	-22.667 (-1.077)	-1.590 (-0.058)
Treatment-dummy	-94.385 (-0.690)	-10.333 (-0.090)	-171.179 (-1.148)
R-square	0.491	0.405	0.423

Note: The figures in parentheses indicate t-values
* Significant at 5% level ** Significant at 10% level

The determinants of differences in mean per capita incomes between three pairs of villages are summarized in Table 32. The regression model that was fitted above for analyzing the gross incomes data was again applied on per capita incomes. The results showed that none of the explanatory variables were statistically significant in the three equations. However, the common feature was that the treatment dummy showed a negative relationship with difference in the mean capita incomes between the three pairs of villages. So, we can safely conclude that the differences in mean per capita incomes between pairs of villages were decreasing as the length of association with ICRISAT staff increased.

c. Annual gross and per capita incomes by village and size group

The annual gross and per capita incomes by village and size group for each of the six VLS villages are presented in Tables 33 through 38.

Table 33. Aurepalle gross and per capita incomes by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	856	221	1626	259	2054	340	5562	964
1976-77	685	173	1554	282	1864	332	4050	763
1977-78	1360	374	1896	340	3840	643	9092	1623
1978-79	1278	349	2073	374	3670	639	8096	1439
1979-80	1205	273	2336	410	3143	552	9400	1603
1980-81	1319	333	2615	434	3281	507	6751	1184
1981-82	1173	270	2583	438	3169	503	6973	1241
1982-83	1364	290	3311	554	4017	598	7389	1251
1983-84	1241	270	2823	491	4591	690	8386	1407
Mean	1165	284	2313	398	3292	534	7300	1275
Growth rate	5.63	2.79	9.28	9.13	8.73	6.67	4.66	3.85

* Annual Gross Income ** Per Capita Income

Growth rates in household income and in per capita income were positive in all the size groups (Table 33). However, due to an increase in the family sizes in all size groups, the rate of growth in per capita income was slower than that in household income.

Table 34. Dokur gross and per capita incomes by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	1468	398	1890	455	4303	857	5319	634
1976-77	1357	421	1332	304	4412	824	8396	966
1977-78	1569	478	1745	368	3074	661	8152	901
1978-79	2236	601	2463	509	4300	871	8974	1087
1979-80	1904	463	2039	409	3917	779	8106	927
1980-81	1964	450	2358	460	5074	991	5680	697
1981-82	2078	476	2216	418	4685	885	4791	609
1982-83	1817	405	2279	433	5111	878	5689	682
1983-84	2096	442	2177	407	3964	671	5876	648
Mean	1832	459	2055	418	4316	824	6776	795
Growth rate	4.66	0.01	4.45	1.29	1.89	-0.13	-3.74	-3.58

* Annual Gross Income ** Per Capita Income

In the case of landless households and small farmers, the growth rates in both household incomes as well as per capita income were positive (Table 34), but in the case of medium farms, the household income grew at a positive rate while the per capita income registered a small negative growth. Both the household income as well as the per capita income of the large farmers registered negative growth rates. In all the cases, owing to increases in family sizes, the growth in per capita income was less than that in household income.

Table 35. Shirapur gross and per capita incomes by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	1261	291	2022	436	2076	279	4454	492
1976-77	2167	443	2641	546	3345	434	5365	636
1977-78	3496	544	2215	491	3344	411	5712	613
1978-79	2520	449	3423	715	3058	450	4528	642
1979-80	2802	499	2976	693	4673	728	4964	850
1980-81	2600	429	2414	509	3182	448	3230	468
1981-82	2636	408	2891	666	3884	530	4807	761
1982-83	3778	574	3142	734	4058	617	5448	852
1983-84	1784	355	2710	585	3058	498	4766	762
Mean	2560	444	2715	597	3409	488	4808	675
Growth rate	4.29	1.60	3.18	3.97	4.20	6.68	-0.61	4.68

* Annual Gross Income ** Per Capita Income

Landless labor households registered a smaller growth rate in per capita income than in household income due to increase in the family size (Table 35). However, in all the three cultivator groups, per capita income increased faster than household income due to reduction in the family sizes. This difference was quite sharp in large farm households where household income growth was negative but the same in per capita income was positive and high.

Table 36. Kalman gross and per capita incomes by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	1213	214	2411	464	2737	468	3787	545
1976-77	1423	275	3483	668	3406	569	3923	544
1977-78	1744	327	3506	705	3413	572	5766	822
1978-79	1911	388	3288	593	4170	710	5423	735
1979-80	2484	551	4136	799	4608	815	5462	736
1980-81	2523	534	4135	782	5610	966	5400	774
1981-82	2515	463	4421	832	6879	1047	7141	1037
1982-83	2846	514	4276	802	6242	918	6935	1077
1983-84	2890	629	4033	707	5003	739	5612	772
Mean	2172	433	3743	706	4674	756	5494	782
Growth rate	11.56	12.76	5.77	4.85	10.39	8.29	6.37	6.82

* Annual Gross Income ** Per Capita Income

In medium farm households, the growth rate in per capita income was slower than that in household income due to increased family size (Table 36). In all the other three categories, per capita income grew faster than household income due to reduced family sizes.

Table 37. Kanzara gross and per capita incomes by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	1302	322	2451	541	2885	497	8427	1230
1976-77	1740	502	3009	613	3292	572	9019	1219
1977-78	2584	711	3851	835	3865	644	11463	1411
1978-79	1369	350	3328	666	3229	548	9180	1170
1979-80	1244	322	3170	627	2543	531	9912	1122
1980-81	1621	512	2557	491	2594	570	9899	1137
1981-82	2595	657	3889	719	3013	599	13124	1404
1982-83	2906	719	4099	756	2794	604	14946	1535
1983-84	2509	700	5215	982	3691	877	16056	1682
Mean	1986	533	3508	692	3101	605	11336	1323
Growth rate	7.50	7.62	6.37	4.10	-0.37	3.96	7.68	3.23

* Annual Gross Income ** Per Capita Income

In landless and medium farm households where family sizes decreased, growth in per capita income was higher than that in household income (Table 37). However, in the case of small and large farmers, the converse was true due to increased family sizes.

Table 38. Kinkheda gross and per capita incomes by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	1798	391	2198	445	2935	626	6038	1068
1976-77	2214	452	2615	479	2669	549	6473	1160
1977-78	1887	373	3091	564	3425	749	7310	1285
1978-79	2028	471	3475	671	3403	669	6872	925
1979-80	2541	530	3454	620	4012	820	7187	1080
1980-81	3089	701	3359	532	4159	799	7186	1085
1981-82	3332	668	3965	623	4661	1251	6456	1218
1982-83	3308	662	4799	743	7837	1882	9617	1479
1983-84	3380	631	3819	594	6715	1494	9033	1273
Mean	2620	542	3419	586	4424	982	7352	1175
Growth rate	9.21	8.01	7.78	4.15	13.05	14.99	4.42	2.50

* Annual Gross Income ** Per Capita Income

With the exception of medium farm households, family sizes increased in all other categories in Kinkheda village, due to which the per capita incomes grew slower than the household incomes (Table 38).

d. Comparison between an average household in continuous villages and closed villages

A comparison was made between an average household (defined as the average of three villages in the same category, ie, closed or open) in continuous villages (average of Aurepalle, Shirapur and Kanzara) with an average household in closed villages (average of Dokur, Kalman and Kinkheda). The results are presented in Table 39. In terms of both household income as well as per capita income, an average household in closed villages reported slightly higher growth rates than that in continuous villages. However, the mean gross income of an average household in continuous villages did not differ from mean gross income of an average household in the closed villages. Similarly, the per capita incomes also did not show any differences between them. These results clearly lend support to absence of treatment effect between open and closed villages.

Table 39. Comparison of an average household in continuous villages with closed villages.

Year	Annual gross income		Per capita income	
	Average of three continuous villages	Average of three closed villages	Average of three continuous villages	Average of three closed villages
1975-76	2914	3031	489	551
1976-77	3227	3475	543	601
1977-78	4393	3694	720	645
1978-79	3812	4062	649	688
1979-80	4031	4184	684	714
1980-81	3505	4229	586	732
1981-82	4228	4449	683	795
1982-83	4771	5099	757	884
1983-84	4736	4564	775	757
Mean	3957	4087	654	707
Std. dev	650.4	618.1	97.1	101.2
Growth rate	5.05	5.48	4.47	4.97
t- test	-0.435 (0.670)		-1.142 (0.270)	

Note: The figures in parentheses indicate two-tailed significance values

e. Income growth of an average household in continuous villages by size group

A detailed income growth by size group was calculated for an average household in three continuous villages and the results are presented in Table 40. In landless labor and small and large farms, per capita income grew slower than household income due to increases in family size. However, in medium farm households, per capita income increased faster than the household income due to a reduction in the family size.

Similarly, the detailed income growth by size group was calculated for an average household in three closed villages and the results are presented in Table 41. In all the size groups, the per capita income of an average household in closed villages grew slower than that of household incomes due to increased family sizes over the study period. The landless labor and medium farm households in closed villages experienced a faster growth in income than those in continuous villages. However, the small and large farmers performed better in continuous villages.

Table 40. Income growth of an average household in continuous villages by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	1140	278	2033	412	2338	372	6148	895
1976-77	1531	373	2401	480	2834	446	6145	873
1977-78	2480	543	2654	555	3683	566	8756	1216
1978-79	1722	383	2941	585	3319	546	7268	1084
1979-80	1750	365	2827	577	3453	604	8092	1192
1980-81	1847	425	2529	478	3019	508	6627	930
1981-82	2135	445	3121	608	3355	544	8301	1135
1982-83	2683	528	3517	681	3623	606	9261	1213
1983-84	1845	442	3583	686	3780	688	9736	1284
Mean	1904	420	2845	562	3267	542	7815	1091
Growth rate	5.79	4.43	6.16	5.24	4.04	5.54	4.90	3.63

* Annual Gross Income ** Per Capita Income

Table 41. Income growth of an average household in closed villages by size group, 1975-84.

Year	Landless labor		Small		Medium		Large	
	AGI*	PCI**	AGI	PCI	AGI	PCI	AGI	PCI
1975-76	1493	334	2166	455	3325	650	5048	749
1976-77	1665	383	2477	484	3496	647	6264	890
1977-78	1733	393	2781	546	3304	661	7076	1003
1978-79	2058	487	3075	591	3958	750	7090	916
1979-80	2310	515	3210	609	4179	805	6918	914
1980-81	2525	562	3284	591	4948	919	6089	852
1981-82	2642	536	3534	624	5408	1061	6129	955
1982-83	2657	527	3785	659	6397	1226	7414	1079
1983-84	2789	567	3343	569	5227	968	6840	898
Mean	2208	478	3073	570	4471	854	6541	917
Growth rate	8.60	6.61	6.10	3.56	8.39	8.07	2.16	1.91

* Annual Gross Income ** Per Capita Income

f. Comparison of asset values and their growth between continuous and closed villages (Rs)

A comparison of asset values, net worth and their growth was made between continuous villages and closed villages and the results are presented region wise in Tables 42 to 44.

Table 42. Comparison of asset values and their growth between Aurepalle and Dokur villages (Rs).

Year	Aurepalle				Dokur			
	Land values	Non-land assets	Total assets	Net worth	Land values	Non-land assets	Total assets	Net worth
1975-76	11216	5454	16670	15046	13675	8355	22029	22100
1976-77	11647	6120	17767	16007	12809	8799	21608	21299
1977-78	17400	7280	24680	23673	13679	8992	22670	22915
1978-79	19980	7742	27722	26595	16876	9683	26559	26086
1979-80	18096	10236	28332	29561	19321	10496	29817	29528
1980-81	21078	11459	32537	32539	27718	12166	39884	38089
1981-82	23270	12284	35553	36671	27737	12423	40159	40105
1982-83	24457	14041	38579	40222	33952	14599	48552	51074
1983-84	32675	15909	48584	51710	39649	16702	56351	55984
1984-85	34540	17535	52075	55842	42475	20902	63376	61509
Mean	21436	10806	32250	32787	24789	12312	37101	36869
Std dev	7749.4	4178.5	11815.8	13695.7	11144.6	4049	15087.8	14950.5
Growth rate	12.65	14.25	13.17	15.46	16.01	10.22	13.96	13.94
	Land values		Non-land assets		Total assets		Net worth	
t- test	-0.781 (0.445)		-0.818 (0.424)		-0.800 (0.434)		-0.637 (0.532)	

Note: The figures in parentheses indicate two-tailed significance values

The comparison of asset values, net worth and their growth between two Mahabubnagar villages is presented in Table 42. In absolute values, the mean asset values were higher in Dokur than in Aurepalle. In Aurepalle, the values of non-land assets increased faster than those of land assets, while land values appreciated faster than the non-land assets in Dokur village. Dokur reported slightly higher growth than Aurepalle in terms of asset values, while Aurepalle performed better with respect to the net worth of the households. However, the t-test results confirm that there is no significant difference in mean asset and net worth values between the two companion villages.

Table 43. Comparison of asset values and their growth between Shirapur and Kalman (Rs).

Year	Shirapur				Kalman			
	Land values	Non-land assets	Total assets	Net worth	Land values	Non-land assets	Total assets	Net worth
1975-76	18791	7060	25851	24756	18530	4882	23412	21749
1976-77	19289	6578	25867	24629	17464	5547	23011	21272
1977-78	21603	6541	28144	26737	17894	4917	22811	20537
1978-79	21191	6661	27852	26269	26227	6268	32495	30246
1979-80	22685	7227	29912	27183	25438	7013	32451	30448
1980-81	22161	8304	30465	29430	40529	9028	49557	48073
1981-82	33263	9330	42593	41899	40324	11723	52047	51112
1982-83	35319	9481	44800	44463	41248	12958	54206	53426
1983-84	35466	10460	45926	45118	39898	14611	54509	53697
1984-85	34751	13197	47948	47275	39898	15841	55739	53121
Mean	26452	8484	34936	33776	30745	9279	40024	38368
Std dev	7218.2	2165.3	9143	9570.4	10565.4	4183.9	14410.8	14723.6
Growth rate	8.58	7.47	8.33	8.91	11.94	15.90	12.89	13.80
	Land values		Non-land assets		Total assets		Net worth	
t- test	-1.061 (0.305)		-0.534 (0.602)		-0.943 (0.361)		-0.827 (0.421)	

Note: The figures in parentheses indicate two-tailed significance values

The comparison of asset values, net worth and their growth between the two Solapur villages of Kalman and Shirapur is presented in Table 43. Kalman reported higher mean values both with respect to total assets as well as net worth. In Shirapur, land values appreciated faster than non-land assets, while in the reverse was true in Kalman. The closed village, Kalman, performed better than the continuous village with respect to the growth in both the asset values as well as the net worth of an average household. However, the t-test results safely concluded that there is no significant difference in mean asset and net worth values between the two villages.

Table 44. Comparison of assets values and their growth between Kanzara and Kinkheda villages (Rs).

Year	Kanzara				Kinkheda			
	Land values	Non-land assets	Total assets	Net worth	Land values	Non-land assets	Total assets	Net worth
1975-76	18327	6863	25190	25370	16654	5076	21730	21858
1976-77	18125	9568	27693	27692	16406	6385	22791	22847
1977-78	18021	7887	25908	25804	16539	6021	22560	22023
1978-79	18403	9146	27549	26813	15361	6670	22031	21340
1979-80	19544	9794	29338	28424	15230	6418	21648	20423
1980-81	19013	10623	29636	29243	24675	7254	31929	31738
1981-82	17280	12769	30049	30129	31451	8506	39957	38616
1982-83	23014	13149	36163	39089	33483	9829	43312	41686
1983-84	28126	15095	43221	45933	36017	10949	46966	46165
1984-85	27039	12524	39563	42924	35379	11771	47150	48025
Mean	20689	10742	31431	32142	24120	7888	32007	31472
Std dev	3962	2583.3	6106	7566.1	9058	2268	11208.7	11186.1
Growth rate	4.70	7.70	5.68	6.72	11.83	9.28	11.17	11.13

	Land values	Non-land assets	Total assets	Net worth
t –test	-1.097 (0.294)	2.625 (0.017)*	-0.143 (0.888)	0.157 (0.877)

Note: The figures in parentheses indicate two-tailed significance values
* Significant at 1% level

A comparison of asset values, net worth and their growth between the two Akola villages is presented in Table 44. The closed village, Kinkheda, reported higher mean values than Kanzara (continuous village) with respect to both total assets and net worth. In both the villages, the net worth value was higher than the asset values due to positive net savings. Kanzara reported a faster growth in non-land asset values, while land values increased faster than the non-land assets in Kinkheda. Kinkheda reported a faster growth with respect to both asset values as well as net worth of households. The t-test results have proved that there is no significant difference in mean land values, total assets and net worth of households between this pair of villages. However, there is a difference in mean non-land assets values, which is statistically significant at 1% level. Overall, the results show that there is no treatment effect between continuous and closed villages.

Table 45. Determinants of differences in total assets.

Item	A.P villages	Solapur villages	Akola villages
Intercept	616.8	4139.4	8380.2*
Time trend	-1506.9*	-298.4	-2238.4**
	(-2.375)	(-0.335)	(-2.922)
Treatment-dummy	4028.9	-10837.5**	4792.5
	(1.013)	(-1.942)	(0.998)
R-square	0.526	0.659	0.657

Note: The figures in parentheses indicate t-values
* Significant at 5% level ** Significant at 10% level

The determinants of differences in total assets across the three pairs of villages are presented in Table 45. Among the three equations, the best fit was observed in the Solapur villages. The treatment dummy

showed a negative and statistically significant (at 10%) relationship with the differences in mean asset values of those two villages. However, in the remaining two regressions, time trend showed a negative and significant relationship with the absolute differences in total asset values. This indicates that over time, differences in the mean asset values have become narrow. The treatment dummy showed a positive sign but it was not statistically significant. Overall, we can safely conclude that there is no treatment effect in continuous villages when compared to their companion villages.

Table 46. Determinants of differences in net worth.

Item	AP villages	Solapur villages	Akola villages
Intercept	-2220.5	4412.1	7247.4*
Time trend	-821.0	-112.0	-1600.70**
	(-1.177)	(-0.127)	(-2.075)
Treatment-dummy	3791.5	-11982.8**	3180.6
	(0.867)	(-2.163)	(0.658)
R-square	0.167	0.668	0.502

Note: The figures in parentheses indicate t-values
* Significant at 5% level ** Significant at 10% level

The determinants of differences in net worth between the three pairs of villages are summarized in Table 46. The regression equation fitted against a pair of Solapur villages showed the highest R-square value of 0.668. Both time trend and treatment dummy exhibited a negative relationship with the differences in mean net worth values. However the former was not significant and the latter was significant at 10% level. The next best fit was observed in Akola villages with R-square value of 0.502. Time trend showed a negative and significant relationship at 10% level, but the treatment dummy was positive and statistically not significant. The regression equation on AP villages was rather a poor fit and none of the explanatory variables were significant.

g. Comparison of asset values and their growth between an average household in continuous villages with an average household in closed villages (Rs)

The asset values of an average household in continuous villages were averaged over the three continuous villages and were compared with the same for the closed villages (Table 47). The mean asset values as well as the net worth of an average household were higher for the closed villages than that for continuous villages. The growth in non-land assets was faster than that in land values in continuous villages. However, in the closed villages, land values grew faster than the non-land asset values. An average household in closed villages reported faster growth than that in continuous villages with respect to both total asset values as well as net worth. Overall, the t-test results show that mean differences in asset and net worth values of an average household in continuous and closed villages were not significant.

Table 47. Comparison of asset values and their growth between an average household in continuous villages and in closed villages.

Year	Average continuous village				Average closed village			
	Land values	Non-land assets	Total assets	Net worth	Land values	Non-land assets	Total assets	Net worth
1975-76	16111	6459	22570	21724	16286	6104	22390	21902
1976-77	16354	7422	23775	22776	15560	6910	22470	21806
1977-78	19008	7236	26244	25405	16037	6643	22680	21825
1978-79	19858	7850	27707	26559	19488	7540	27028	25891
1979-80	20108	9086	29194	28389	19996	7976	27972	26800
1980-81	20751	10129	30879	30404	30974	9483	40457	39300
1981-82	24604	11461	36065	36233	33171	10884	44054	43278
1982-83	27597	12224	39847	41258	36228	12462	48690	48729
1983-84	32089	13821	45910	47587	38521	14087	52609	51949
1984-85	32110	14419	46529	48680	39251	16171	55422	54218
Mean	22859	10011	32872	32902	26551	9826	36377	35570
Std dev	5962.5	2858	8771	9978	9950.8	3460	13283.5	13326.1
Growth rate	8.50	9.81	8.89	10.08	13.14	11.64	12.73	13.01

	Land values	Non-land assets	Total assets	Net worth
t- test	-1.006 (0.330)	0.130 (0.898)	-0.696 (0.496)	-0.507 (0.619)

Note: The figures in parentheses indicate two-tailed significance values

Thus, the results of income growth analysis as well as asset growth analysis did not lend support to the existence of any treatment effects in continuous villages which experienced a longer exposure than the relatively shorter exposure of closed villages.

Table 48. Determinants of differences in total assets and net worth in an average household of continuous and closed villages.

Item	Total assets	Net worth
Intercept	4378.8	3146.6
Time trend	-1347.9** (-2.165)	-844.6 (-1.324)
Treatment-dummy	-671.7 (-0.172)	-1670.4(-0.418)
R-square	0.676	0.525

Note: The figures in parentheses indicate t-values
* Significant at 5% level ** Significant at 10% level

The determinants of differences in total assets and net worth of an average household between continuous and closed villages are presented in Table 48. The results safely conclude that there is no treatment effect in VLS villages.

Comparison of second generation dataset (2001-2007)

a. Changes in asset values, 2001-2007

The details of changes in asset values of the sample households between 2001-02 and 2007-08 are presented in Table 49. No comparison is possible in Kinkheda because no new sample units were

added in 2001-02. The average asset values decreased in Shirapur village between 2001 and 2007. In the other four villages, Aurepalle, Dokur, Kalman and Kanzara, the asset values increased during the six-year period. The asset values of old sample households were higher than those of the new sample households both in 2001 as well as in 2007. They were higher for new sample households only in Kanzara. In all the cases, the rate of growth in asset values was higher for the new sample households than that for the old sample households. The rate of growth in asset values was, on an average, 98.5% for new households, while it was only 49.0% for old sample households. The results indicated that the old sample households were drawn from relatively richer households but they experienced slower growth rates in asset values than the new sample households over the six-year period.

Table 49. Changes in asset values, 2001-07.

Village	Total sample	Assets per Hh in 2001 (Rs)		Assets per Hh in 2007 (Rs)		% change	
		Old sample	New sample	Old sample	New sample	Old	New
Aurepalle	100	210292 (52)	144174 (48)	870316 (45)	675360 (47)	314	368
Dokur	80	255951 (35)	72040 (45)	546663 (32)	266293 (37)	113	269
Shirapur	88	419331 (44)	334838 (44)	291985 (43)	280650 (41)	-30	-16
Kalman	94	297159 (47)	219045 (47)	275169 (41)	277396 (43)	-7	26
Kanzara	52	369905 (49)	576927 (3)	325071 (44)	791775 (2)	-12	37
Average		310290 (227)	197438 (187)	462429 (205)	391841 (170)	49.0	98.5
Kinkheda	32	227030 (32)	-	197755 (30)	-	-12	-

Note: The figures in parentheses indicate number of households in the sample. The old and new sample households were categorized as they were in 2001-02. There was attrition in both the samples of old and new VLS households.

b. Changes in average own land holding (ha), 2001-07

The changes in average own land holdings of the sample households between 2001-02 and 2007-08 are compared and presented in Table 50. The old VLS households had higher average sizes of holdings than the new VLS households in all the villages except in Shirapur. The average size of holding of old VLS households declined in Aurepalle, Dokur and Shirapur. While it increased in Kalman, it was unchanged in Kanzara. The average decline in the land holding of old VLS households was by 2.6%. The average size of holding of new VLS households declined only in Shirapur. In the other four villages, it showed an increase; the average increase in the land holding of new VLS households was 17% across the five villages.

Table 50. Changes in average own land holding (ha), 2001-07.

Village	Total sample	Average own land 2001		Average own land 2007		Change	
		Old sample	New sample	Old sample	New sample	Old	New
Aurepalle	100	2.04 (52)	1.44 (48)	1.87 (45)	1.58 (47)	-0.41	+0.35
Dokur	80	2.20 (35)	0.49 (45)	1.78 (32)	0.69 (37)	-1.03	+0.50
Shirapur	88	1.56 (44)	1.74 (44)	1.51 (43)	1.68 (41)	-0.14	-0.16
Kalman	94	2.67 (47)	1.95 (47)	3.04 (41)	2.40 (43)	+0.90	+1.12
Kanzara	52	2.50 (49)	1.75(3)	2.50(44)	4.25 (2)	0	+6.17
Average		2.20 (227)	1.42 (187)	2.15 (205)	1.65 (170)	-0.14 (-2.6%)	+0.58 (+17%)
Kinkheda	32	2.15 (32)	-	2.51 (30)	-		-

Note: The figures in parentheses indicate number of households in the sample. The old and new sample households were categorized as they were in 2001-02.

c. Changes in annual income (Rs)

The detailed analysis of changes in the annual incomes of the sample households between 2001-02 and 2007-08 are presented in Table 51. The average household income of old VLS households was about the same as that of new VLS households in both 2001 and 2007. In 2001, the average household income of old VLS households was higher than that in new VLS households only in Dokur. In 2007, the average household income of old VLS households was higher than that of new VLS households in Aurepalle and Dokur. The same was higher for new households in Maharashtra villages. The percentage increases in household incomes were about the same for both the old and new VLS households. The income levels do not seem to have a bearing on the wealth levels-while the asset values were higher for old VLS households, the income levels did not differ much between old and new VLS households.

Table 51. Changes in the annual incomes (Rs), 2001-07.

Village	Total sample	Average annual income 2001 (Rs)		Average annual income 2007 (Rs)		% Change	
		Old sample	New sample	Old sample	New sample	Old	New
Aurepalle	100	25363 (52)	28520 (48)	82048 (45)	81722 (47)	223.5	186.5
Dokur	80	34236 (35)	22461 (45)	91359 (32)	64097 (37)	166.8	185.4
Shirapur	88	49491 (44)	61028 (44)	148219 (43)	191227 (41)	199.5	213.3
Kalman	94	35512 (47)	44092 (47)	100248 (41)	111621 (43)	182.3	153.2
Kanzara	52	54448 (49)	104460 (3)	134795 (44)	219195 (2)	147.6	109.8
Average	-	39788 (227)	39843 (187)	112343 (205)	113476 (170)	182.4	184.8
Kinkheda	32	36578 (32)	-	71554 (30)	-	95.6	-

Note: The figures in parentheses indicate number of households in the sample. The old and new samples households were categorized as they were in 2001-02.

d. Changes in consumption expenditure

The details of consumption expenditure of the sample households between 2001-02 and 2007-08 are presented in Table 52. In 2001, the average consumption expenditure was higher for old VLS households than for the new VLS households. This position was reversed in 2007, when the new VLS households had higher consumption expenditures. In 2001, the expenditure of old VLS households was higher in Aurepalle, Dokur and Kanzara. In 2007, it was higher for old VLS households only in Aurepalle and Dokur. The consumption expenditure of old VLS households declined in Aurepalle and Dokur, while that of new VLS households declined only in Shirapur. The increase in consumption expenditure of old VLS households was only 4% while it was 24.2% for the new VLS households during the six-year period. The percentage increase in consumption expenditure was quite modest while that in income was substantial. Accumulation of savings over the years might be one of the reasons for increase in the asset values of households, besides appreciation of assets and other factors.

Table 52. Changes in consumption expenditure (Rs), 2001-07.

Village	Total sample	Average annual expenditure 2001 (Rs)		Average annual expenditure 2007 (Rs)		% Change	
		Old sample	New sample	Old sample	New sample	Old	New
Aurepalle	100	27803 (52)	20929 (48)	27336 (45)	25717 (47)	-1.71	22.9
Dokur	80	30717 (35)	17515 (45)	30552 (32)	24787 (37)	-0.54	41.5
Shirapur	88	31663 (44)	39157 (44)	33086 (43)	35756 (41)	4.49	-9.51
Kalman	94	37044 (47)	40267 (47)	38556 (41)	57956 (43)	4.08	43.92
Kanzara	52	32714 (49)	18156 (3)	36503 (44)	42555 (2)	11.58	134.38
Average	-	31974 (227)	29212 (187)	33256 (205)	36288 (170)	4.00	24.22
Kinkheda	32	29752 (32)	-	35147 (30)	-	18.13	-

Note: The figures in parentheses indicate number of households in the sample. The old and new sample households were categorized as they were in 2001-02.

e. Changes in the incidence of income poverty

The details of changes in the incidence of income poverty in the sample households between 2001-02 and 2007-08 are presented in Table 53. Due to increases in income, the incidence of poverty decreased in both old and new VLS households between 2001 and 2007. In 2001, a relatively higher proportion of new VLS households were poor. However, in 2007, the incidence of poverty was about the same in both the old and new VLS households. There was a faster reduction in the incidence of poverty in Aurepalle, Shirapur and Dokur. In Kanzara, where the incidence of poverty was low even in 2001, there was only a marginal reduction in the proportion of the poor below the poverty line. It can be concluded that there was a slightly faster reduction in the incidence of poverty in the new VLS households than the old VLS households.

Table 53. Changes in the incidence of income poverty, 2001-07.

Village	Total sample	2001 (no of Hh) (Rs.22140 income line)		2007 (no of Hh) (Rs.29565 income line)		Change	
		Old sample	New sample	Old sample	New sample	Old	New
Aurepalle	100	25 (52)	22 (48)	7 (45)	8 (47)	-18	-14
Dokur	80	13 (35)	24 (45)	4 (32)	6 (37)	-9	-18
Shirapur	88	15 (44)	12 (44)	1 (43)	0 (41)	-14	-12
Kalman	94	17 (47)	16 (47)	9 (41)	7 (43)	-8	-9
Kanzara	52	7 (49)	1 (3)	5 (44)	0 (2)	-2	-1
Total		77 (227)	75 (187)	26 (205)	21 (170)	-51	-54
% of poor		34	40	12.6	12.3		
Kinkheda	32	10 (32)	-	7 (30)	-	-3	-

Note: The figures in parentheses indicate number of households in the sample. The old and new sample households were categorized as they were in 2001-02.

As no treatment effect was found in terms of asset values, own land holding, income and consumption levels, and poverty incidence between the sample households which had a longer exposure to the VLS investigators and research staff and those that had a shorter exposure, no further analysis was done with respect to factors like adoption of technology, literacy levels, yields and nutritional levels. Since there were no differences in income levels, it was felt unnecessary to probe into technology adoption and yields. Similarly, as the consumption expenditures were nearly equal, differences in nutrition levels were not probed.

3.3 Results from third-level treatment effect

In order to assess the third-level treatment effect, the differences in the progressiveness between VLS villages and neighboring villages have to be probed. So far, no surveys have been carried out in the neighboring villages to judge the third-level treatment effect. To save on costs, it might be useful to conduct participatory rural appraisals in the villages adjoining the six VLS villages to get an impression about the relative progressiveness of the VLS villages' vis-à-vis the neighboring ones. If some preliminary indications are available, they can be followed up with systematic surveys.

Chapter 4

Summary and Conclusions

4.1 Summary of different treatment effects

During the planning and review meeting held at ICRISAT from July 9-11, 2008, Dr. Hans P Binswanger suggested that we examine the 'treatments effects in Village-level Studies'. His suggestion was to undertake an analysis for ascertaining whether the VLS activity has had any effect on improving the welfare of the people in the study villages. Data from 1975 to 2007-08 was examined for this purpose.

Two types of effects were considered in order to examine the hypothesis that continuous engagement through surveys of households in a village may expand the horizons of the respondents and make them significantly more progressive and knowledgeable than others in the community. For example, respondent households who interact with the investigator once or twice every month may gain a further edge in terms of their knowledge of technologies and may be leading the technology adoption process in the village. Another possible effect relates to interactions between villagers and interviewers resulting in the entire village becoming more progressive than the neighboring villages. This set of hypotheses was tested by measuring certain indicators of treatment effects such as income, consumption expenditure, wealth status, rate of growth in asset values, size of holding and incidence of poverty. The data available from the VLS household panel enabled us to assess the treatment effects. The census data collected in 1985, 1989, 2000/2002 and 2007 were also analyzed to study the differences between respondents and nonrespondents.

Using the above information, the treatment effects were tested in two stages. In the first stage, the respondent households were compared with the nonrespondents to get an idea about the first level of treatment effect. At the second stage, households with varying lengths of exposure to the investigators were analyzed to determine whether direct interaction for different lengths of time influenced the degree of progressiveness. In the VLS sample, some households were tracked for 17 years, others for 7 years, and the remaining for 3-4 years. The possible third-level effect was not assessed because of lack of survey information about the villages neighboring the VLS villages.

The results suggest that there is no treatment effect noted in the six sample VLS villages. In 2007 census data, it was found that both the old VLS households as well as the sample since 2005 were not representative of the village and had a higher average ownership holding than the nonrespondents. The households that were added in 2001-02 were largely drawn from poorer households to make the sample more representative of the population. These new sample households had a lower average size of holding. The sample became biased again when the split-offs from the original VLS households were added to the sample in 2005. However, the differences in the size of ownership holding were attributable more to bias in the sample than to treatment effects resulting from different lengths of exposure to investigators and data collection process. The results obtained from t-test also proved that there is no significant difference in the mean own land holdings between sample and non-VLS households.

In 2000/2002 census data, the ownership land holding data were compared between sample respondents and non-sample households. In Aurepalle, Dokur and Kalman, the average ownership

holding was slightly higher in the case of non-sample households, while in Shirapur, Kanzara and Kinkheda, sample households reported a slightly higher ownership holding than non-sample households. The bias present in the sample during the first generation VLS (with more representation to cultivators, less representation to landless households and zero representation to nonagricultural households) was corrected to a large extent by making the sample more representative of the village population. However, while the sample was drawn using operational holding as the criterion, the treatment effects were studied using ownership holding, which is a better indicator of household wealth. The small differences noted in the average ownership holdings of the respondent and non-sample households were attributable more to the change in the concept of land rather than to any treatment effect. The t-test results also lend support to this statement.

In the 1989 Census, the weighted average size of own land holding of VLS sample households was higher than that of non-VLS households in Shirapur, Kalman and Kinkheda, but lower than that of non-VLS households in Aurepalle and Kanzara. Due to the arbitrary decision of giving equal weightage to the four categories of households, the sample was not representative of their populations. Hence, the first-level treatment effect among them could not be studied.

Similarly, in the 1985 Census, among the three continuous villages for which data were analyzed, the VLS sample households were better off in terms of having higher own land holding than the non-VLS households. However, the limitation of nonrepresentative nature of the sample still exists. The results clearly showed that, in all the three villages, the landless labor households were under-represented with respect to their actual shares in the population. This phenomenon led to excessive representation of cultivator households in the sample. Hence, the differences in ownership land holding are more due to distorted samples than to treatment effect. However, the differences in their mean own land holding values were not statistically significant.

A comparison was made between the continuous and closed pairs of villages in the three districts of Mahabubnagar, Solapur and Akola. If any treatment effect has to be seen, it is expected that the continuous villages will report a faster rate of growth in assets and incomes than the closed villages. The continuous villages had constant interaction with investigators and research staff of ICRISAT for 10 years, while this interaction was limited to 3-5 years in the closed villages. However, the closed villages in Maharashtra reported a faster appreciation of assets as well as growth in incomes than the continuous villages. The sample households in Kalman reported faster growth in assets and income than those in Shirapur. Similarly, the sample households in Kinkheda recorded a faster growth in assets and incomes than Kanzara village. In the Mahabubnagar villages, sample households in Aurepalle reported a faster growth in incomes than the same in Dokur during the period 1975-84. However, both the villages reported similar growth rates with respect to asset values. Thus, we believe that the households in different villages responded to the development opportunities available to them and reported different rates of growth in assets and incomes. No systematic effect in favor of continuous villages was found even during the first generation VLS. The results obtained using t-test also conclude that the differences in their mean values were not statistically significant from each other. Similarly, the regression results also prove that the treatment dummy showed a negative relationship with differences in the respective indicator mean values (in most of the cases). So we can safely conclude that there is no treatment effect in VLS villages.

In fact, when the growth percentage in asset values of new VLS households that were added in 2001-02 were compared with that of the old VLS households for the period 2001-02 to 2007-08, it was higher for the new VLS households which had much shorter exposure when compared with the old VLS

households with much longer exposure. The evidence that was analyzed did not give any indication that there are any treatment effects in the six VLS villages.

The analysis of census and sample data from both the second generation as well as the first generation VLS led us to conclude that there are no treatment effects due to engagement of households or villages by the VLS research team.

4.2 Proposal for future consideration

To capture the third-level treatment effect, comparisons of VLS villages with the neighboring ones have to be made by conducting surveys in them. Initially, participatory rural appraisals may be conducted in the villages neighboring VLS villages, if any significant differences are found with respect to technology adoption, income and consumption levels, detailed surveys can be conducted to study the treatment effect between VLS and neighboring villages.

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Appendix

Table 1. Total and selected no. of households in Six VLS villages, 1975-76.

Village	No. of households				Sampling fraction (%)			
	Labor	Cultivators	Others	Total	Labor	Cultivators	Others	Total
Aurepalle	146 (30)	322 (68)	8 (2)	476 (100)	6.8	9.3	0	8.4
Dokur	76 (24)	226 (72)	11 (4)	313 (100)	13.1	13.2	0	12.8
Shirapur	97 (32)	183 (62)	17 (6)	297 (100)	10.3	16.4	0	13.5
Kalman	156 (37)	211 (50)	56 (13)	423 (100)	6.4	14.2	0	9.5
Kanzara	54 (32)	109 (64)	6 (4)	169 (100)	18.5	27.5	0	23.7
Kinkheda	55 (38)	83 (58)	5 (4)	143 (100)	18.2	27.5	0	23.7

Note: Figures in parentheses are the percentage of households in each category Others includes artisans, shop keepers, traders etc.

Table 2. Aurepalle census comparison, 1989.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	7	0.0	124	0.0	131	0.0
Small	32	1.01	356	1.17	388	1.17
Medium	11	3.44	87	3.77	98	3.72
Large	2	8.50	45	11.50	47	11.38
Over all	52	1.70	612	2.06	664	2.02
t-test	-0.271 (0.795)					

Note: The figure in the parentheses indicates two-tailed significance value

Table 3. Shirapur census comparison, 1989.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	7	0.0	133	0.0	140	0.0
Small	25	1.38	165	1.26	190	1.26
Medium	7	4.62	66	3.77	73	3.85
Large	7	8.87	41	10.69	48	10.45
Over all	46	2.79	405	2.23	451	2.27
t-test	-0.069 (0.947)					

Note: The figure in parentheses indicates two-tailed significance value

Table 4. Kalman census comparison, 1989.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	5	0.0	125	0.0	130	0.0
Small	31	3.04	325	2.59	356	2.63
Medium	3	7.17	50	7.57	53	7.53
Large	3	14.37	26	16.72	29	16.48
Over all	42	3.77	526	3.16	568	3.20
t-test	-0.120 (0.909)					

Note: The figure in parentheses indicates two-tailed significance value

Table 5. Kanzara census comparison, 1989.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	16	0.0	81	0.0	97	0.0
Small	19	1.38	84	1.38	103	1.38
Medium	8	3.36	50	3.44	58	3.44
Large	5	8.26	29	10.93	34	10.53
Over all	48	1.94	244	2.47	292	2.39
t-test	-0.227 (0.828)					

Note: The figure in parentheses indicates two-tailed significance value

Table 6. Kinkheda census comparison, 1989.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	13	0.0	53	0.0	66	0.0
Small	19	1.54	41	1.58	60	1.58
Medium	7	4.37	13	3.93	20	4.09
Large	6	12.91	15	11.38	21	11.82
Over all	45	3.08	122	2.35	167	2.55
t- test	0.127 (0.903)					

Note: The figure in parentheses indicates two-tailed significance value

Table 7. Aurepalle census comparison, 1985.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	9	0.0	120	0.0	129	0.0
Small	17	1.17	306	1.34	323	1.34
Medium	16	3.40	98	3.72	114	3.68
Large	10	8.91	26	10.04	36	9.72
Over all	52	3.12	550	1.90	602	1.98
t-test	-0.136 (0.896)					

Note: The figure in parentheses indicates two-tailed significance value

Table 8. Shirapur census comparison, 1985.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	7	0.0	97	0.0	104	0.0
Small	13	1.34	154	1.46	167	1.42
Medium	12	3.93	69	4.01	81	4.01
Large	7	7.98	46	12.59	53	11.98
Over all	39	3.08	366	2.96	405	2.96
t- test	-0.363 (0.729)					

Note: The figure in parentheses indicates two-tailed significance value

Table 9. Kanzara census comparison, 1985.

Category	VLS sample	Own land holding (ha)	Non-VLS Hh	Own land holding (ha)	Total Hh	Own land holding (ha)
Landless	8	0.0	62	0.0	70	0.0
Small	13	1.62	71	1.21	84	1.21
Medium	9	3.24	42	3.64	51	3.64
Large	11	12.96	23	10.93	34	11.74
Over all	41	4.45	198	2.43	239	2.83
t- test	0.133 (0.898)					

Note: The figure in parentheses indicates two-tailed significance value

About ICRISAT

ICRISAT
Science with a human face

The International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger and a degraded environment through better agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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