METHODS OF ASSESSMENT OF RURAL POVERTY, PROJECTS AND PROGRAMME IMPACT

A HANDBOOK FOR PRACTITIONERS IN RURAL SUPPORT PROGRAMMES

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CONTENTS

INTRODUCTION[1]

The Rural Support Programmes (RSPs) in Pakistan have established active partnership with numerous rural communities to reduce poverty. This partnership, as a credible complement to the on-going development activities initiated by governments, is based on the principle of direct participation by the members of community organisations (COs) in a multifaceted programme. Generally, the support programme (a) organises the rural poor through social mobilisation, (b) builds capacity of the indigenous leadership, (c) trains a large cadre of rural activists and service providers, and (d) fosters a framework of grassroots institutions enabling them to:

- improve and build the community infrastructure;
- get access to social services and small loans;
- develop human and natural resources; and
- establish linkages with the public and private sector agencies.

The rapid expansion of RSPs in the country, and the well-deserved recognition of the participatory approach to empower the poor, has inevitably drawn attention to the claims by RSPs with regard to their achievements. In particular, the questions focus on the socio-economic conditions of rural communities, in particular the members of COs, cost-effectiveness of RSPs, and the impact of RSPs on the standard of living of rural households participating in the COs.

This Handbook describes various methods of assessment of rural poverty, investment projects, and programme impact and their applications in the context of RSPs. It is divided into three chapters. In the first chapter, the focus is on the methods of assessment of poverty, including major characteristics of the rural poor. As an illustrative example, it includes the socio-economic profiles of a sample of villages and rural households in the districts covered by the Sindh Rural Support Organisation (SRSO). The second chapter focuses on the appraisal methods for projects or project components with respect to their financial and economic profitability, cost-effectiveness and distribution of project benefits. In the final chapter, various methods to assess the impact of RSP interventions on the standard of living of rural people are discussed. It includes a case study of the (economic) impact of the National Rural Support Programme (NRSP) on a sample of rural households.

The purpose of the Handbook is to familiarise the practitioners of Monitoring and Evaluation (M&E) in RSPs with some of the basic techniques and methods that they can use whether they conduct the studies themselves or get outsiders to do for them. The references used in the Handbook and cited at the end should be of additional help since they contain useful information about the theory and practice of assessment methods for poverty, investment projects and programme impact.

[1] I am grateful to Zafaruddin Ahmed of the Rural Support Programmes Network (RSPN) for suggesting the idea and to the professionals of RSPs who participated in the training programme in April 2004 for inspiring me to write this Handbook. I am indebted to Shoaib Sultan Khan, Chairman of the Board of RSPN, for his constant encouragement and trust. Comments by Zafaruddin Ahmed and Shoaib Sultan Khan on an earlier draft of the Handbook are gratefully acknowledged. However, I take full responsibility for this draft.

CHAPTER 1. ASSESSMENT OF RURAL POVERTY

In this chapter, we first identify the key dimensions of poverty. Then we outline the methods by which we can assess the incidence, depth and severity of poverty. Finally, we discuss the data requirements and interpretation of the data on the socio-economic conditions of sample villages and households surveyed in the districts covered by SRSO.

1. Poverty Defined

What is *well-being*? It is a state in which an individual enjoys substantive freedoms to lead the kind of life he or she values.[2] Severe deprivation of *human capabilities* is poverty and it is multidimensional. There are at least four dimensions of poverty and we discuss each of them briefly:[3]

- Income poverty
- Social deprivation (poor health and education)
- Vulnerability (capacity to absorb shocks)
- Powerlessness (voicelessness)

Income poverty: We owe it to S. Rowntree who measured poverty in the city of York (England) and published the results in 1899. His measure was based on a concept of absolute poverty—a minimum level of consumption considered necessary for (humane) living—and the data were drawn from a survey of household income and expenditure. This tradition has continued and refined by economists. In this context, several important issues need to be considered closely. Absolute poverty is a normative (subjective) concept, based on the conditions of a society or community at a given point in time. The societal notion about the minimum consumption necessary can be debated in both space and time.

- Poverty line can be defined in terms of just food consumption—say expressed in terms of calorie intake per day—or a basket of consumption goods that includes food to meet the "basic needs".
- Food consumption has to be adjusted according to age, gender and work status of individuals in the household.
- Household sizes differ so the consumption level has to be normalised to compare households.
- Prices of food and other goods, if included, should be considered to find the level of income or expenditure required to meet the basic needs. Prices can differ between regions or between rural and urban areas.

[2] See Sen (1999), Chapter 1.

[3] See World Bank (2001) and Maxwell (1999). In the context of Pakistan, see the Center for Research on Poverty Reduction and Income Distribution (2002) and United Nations Development Programme (2003).

- Poverty measured in terms of households can be deceptive since there may be serious inequalities of consumption or expenditure within the household.
- National poverty lines, expressed in real terms, are difficult enough to establish, it is harder to compare absolute poverty levels between countries. The World Bank uses two international poverty lines: $1 and $2 per capita per day (in 1993 prices). There are many problems in this approach (World Bank 2001).

Social Deprivation: Measuring income poverty is not enough. It should be combined with indicators of health and education. Life expectancy and infant mortality are good indicators of the state of health. Access to safe drinking water and sanitation should be added as measures of health. The net enrolment rates at the primary and secondary school levels and the rate of adult literacy can serve as good indicators of education. The United Nations Development Programme (UNDP) has developed a composite and comparable measure of poverty across developing countries. It is called the Human Poverty Index (HPI) which includes three measures of poverty: *longevity* (probability at birth of not surviving to age 40); *knowledge* (adult illiteracy rate); and *overall economic provisioning* (percentage of people not using safe water and percentage of children underweight for age).

Vulnerability: It means the risk that a household or individual will experience an episode of income or health poverty over time. But vulnerability also means the probability of being exposed to a number of other risks (violence, crime, natural disaster, being pulled out of school, loosing job, or loosing entitlement). Vulnerability is hard to measure since it is dynamic. However, panel data at the household level can yield useful information. Vulnerability can be used as a differentiating characteristic of permanent and transitory poverty.

Voicelessness or powerlessness: Participatory methods to elicit opinions of the poor, the extent of civil and political liberties, and the state of governance are ways to measure the powerlessness of the poor. The World Bank has collected qualitative data from several countries that reflect perceptions of the poor in their own voices and words.

To understand the determinants of poverty, we should look at people's assets, returns to or productivity of those assets, and the volatility of returns. Assets include (i) *human*: skills, talents and health, (ii) *natural*: land or such resources, (iii) *physical*: access to infrastructure, (iv) *financial*: savings or access to credit, and (v) *social*: networks of contacts and reciprocal obligations that can be used when needed and political influence on resources. The returns to these assets depend on access to markets and all of the global and local influences on these returns. They also depend on the performance of institutions of the society and state. Political forces, including public policy, legal statues and their enforcement determine access to assets and their returns. Volatility of returns results from market fluctuations, weather conditions, and political conditions (such as lawlessness and civil unrest). Volatility affects not only returns to assets but the value of assets, as shocks undermine health, destroy natural and physical assets, and deplete savings.

2. Measurement of Poverty

The "poverty ranking" given in the Situation Analysis Reports of RSPs cannot be used as a measure of absolute or relative poverty among rural households for several reasons. For one thing, the RSPs depend almost entirely on the community to define and identify the poor and non-poor without using verifiable economic and social indicators. The members of COs are

asked to rank (classify) the village households into five categories: (1) destitute, (2) very poor, (3) poor, (4) better off, and (5) well to do. This assessment creates at least two problems. First, to facilitate the formation of a CO, the perceived pro-poor bias of RSPs can inflate the number of members regarded as poor and very poor. Second, the number of the poor and very poor cannot be compared across villages (or regions) and aggregated because the assessment is location-specific.

In the context of RSPs, poverty assessment should use the concept of *poverty line* and include its correlates such as literacy and educational achievement, state of health, and access to sanitation and safe water. While the concept of poverty line has many limitations, it does give us a good measure of absolute poverty, defined normatively, in space and time. The basic issue is to define the poverty line in terms of the level of income (or expenditure) required for an individual (or household) to meet the "basic needs". These basic needs can include simply a basket of food (providing a certain level of daily energy) or food with other goods that are regarded necessary for humane existence. The incidence, depth and severity of (income) poverty can be measured by the following methods.[4]

1. *Headcount of the poor* is the proportion of those below the poverty line in the total population:

   H = q/n, where q is the number of the poor (with income below the poverty line) and n is the total population (poor + non-poor).

2. *Poverty gap ratio* is the sum of income gap ratios of the population below the poverty line divided by the population of the poor:

   PGR = $1/n \sum[(z - y_i)/z]$, where z is the poverty line income, y_i is the income of each poor person and n is the population of the poor. PGR is an index of the income transfer required to get every poor person out of poverty.

3. *Severity of poverty* takes into account the distribution of income among the poor and is measured by the squared proportionate poverty gap ratio:

   SP = $1/n \sum[(z - y_1/z)^2 + (z - y_2/z)^2 + (z - y_3/z)^2 + \ldots. + (z - y_q/z)^2]$, where z is the poverty line income level, y_1 to y_q is the income level of the poor and n is the population of the poor.

The RSP professionals would be well advised to use the generally accepted poverty line (income) for the rural areas of Pakistan. They should consult the studies on poverty done by the Center for Research in Poverty Reduction and Income Distribution (CRPRID) in the Planning Commission, Pakistan Institute of Development Economics (PIDE) in Islamabad, Social Policy and Development Centre (SPDC) in Karachi, and Mahbub ul Haq Human Development Centre (MHHDC) in Islamabad.

[4] Since the poor are not equally poor, it is important to rank them in relation to the chosen poverty line. For example, a person or household may be regarded as very poor, as distinct from the poor, if the expenditure or income level is less than one-half of the poverty line expenditure or income. The relationship of the poor to the poverty line is quite dynamic, depending on how close the poor are to the poverty line and what is happening to their economic circumstances. Finally, poverty may be a transitory phenomenon for both the poor and non-poor populations.

3. Data Requirements

RSPs have interest in assessing the level and severity of poverty in rural communities, including the members of COs and those who are not members. The poverty profile of communities would allow the RSPs to compare the state of absolute poverty of CO members with that of the overall community that includes both members and non-members. The best approach to achieve the objective is to draw a stratified random sample of villages and households. Since the sample can also be used to assess the impact of a support programme, we suggest two stratification schemes.[5]

1. For *new* support programmes or new areas/regions of an on-going support programme
    a. random sample of *treatment* villages (villages with new CO)
        i. random sample of members of CO (in each selected village)
        ii. random sample of non-members (in each selected village)
    b. random sample of *control* villages (villages without CO)
        i. random sample of households (in each selected village)

2. For *on-going* support programmes (with no baseline data)
    a. random sample of *treatment* villages (villages with old CO)
        i. random sample of members of CO (in each selected village)
        ii. random sample of non-members (in each selected village)
    b. random sample of *control* villages (villages with new CO)
        i. random sample of members of CO (in each selected village)
        ii. random sample of non-members (in each selected village)

The important point is that the sample design should be representative of the population both at the village and households levels. The size of sample is of secondary importance as long as a reasonably large number of observations (cases) are included to draw statistical inferences. A sampling expert can help determine the appropriate design and size of the sample for villages (communities) and households.

The socio-economic profile of the sample villages and households can serve two purposes simultaneously. *First*, we can estimate the incidence, depth and severity of poverty, with associated social characteristics of the poor people (households), in communities with or without the support programme. *Second*, we can use the same data as the baseline to estimate the impact of the support programme on the standard of living of participating households. In this context, an important point is that the socio-economic data should be collected at least at two points in time. One is at the time of introduction of the programme in an area and the other is a follow-up after the programme interventions have had time to make their impact on the standard of living. As we explain in Chapter 3, an assessment of the programme impact is quite difficult without the socio-economic data collected at two points in time. Reflexive comparisons—comparing situations before and after the programme interventions—depend on recollections

[5] The first alternative has been used in the 2004 baseline survey of villages and households in the areas covered by SRSO. The second alternative was used in the 2001 follow-up (one-time) survey of villages and households in some of the areas covered by NRSP. The details of the sample of SRSO survey and the socio-economic profile of villages and households are discussed in the next section. See Khan (2001) for details of the NRSP regional sample and the socio-economic profile of villages and households based on the cross-section data collected in 2001. In Chapter 3 of the Handbook, the cross-section data for NRSP are also used for the assessment of its impact on rural households.

after considerable lapse of time and may attribute to the programme changes that were brought about by other factors. We need sufficient controls for capturing the counterfactual or what would have happened without the programme.

An appropriate method for collecting the necessary information (data) about the sample villages and households is to conduct a survey, eliciting both quantitative and qualitative information (data) that can be used to draw the socio-economic (poverty) profile of communities included in the sample to represent the population. A structured questionnaire should be developed separately for villages and households. These questionnaires should be parsimonious in terms of their demand on resources and time, particularly of respondents. In fact, the questionnaires should accommodate the requirements of information at two points in time, baseline and follow-up, and can be used for the assessment of poverty and impact of the programme. In Appendix I, we show a sample of the village and household questionnaires that were used in the SRSO baseline survey. Several aspects of the socio-economic conditions at the village and household levels are included in the questionnaires.

Villages

- physical infrastructure
- access to economic social services
- prices of food commodities
- data on COs (if formed)

Households

- age, education, profession of head of household (respondent)
- demographic composition of household (age and gender distribution)
- work status of household members (by age and gender)
- educational achievement of adults (by age and gender)
- schooling of children (by age and gender)
- health status of household members (by age and gender)
- household income from different sources (current or last year)
- food consumption (by major commodities on a weekly basis)
- household expenditure on different needs (current or last year)
- number and value of household assets(land, livestock, machinery, consumer durables, savings, jewellery)
- value of loans taken from informal and formal sources (current or last year)
- use of loans for different purposes (production, consumption, etc.)
- household debt (loans outstanding at present)
- housing facilities (house structure, drainage, electricity, fuel, etc.)
- perceptions of men and women about problems at the household and village levels
- membership in CO (duration, savings, etc.) and its benefits

In order to minimise errors in the data (information), several procedures should be in place and followed scrupulously. Let us note here the important ones.

- Give good training to enumerators who should be (i) familiar with the area and communities, (ii) proficient in comprehending and speaking the local language or dialect, and (iii) courteous and empathetic during interviews. The training should include (i) a clear explanation for each question and its substantive meaning and (ii) techniques for asking questions and probing the answers.
- Pre-test the village and household questionnaires in one or two randomly selected villages and a handful of households in those village(s) and, if necessary, modify the questionnaires.
- Take appointments for visits and interviews according to the convenience of respondents and arrive according to the agreed schedule. The respondents should know in advance the purpose of visit and the time that they may have to spend for the exercise. In addition, the team leader should introduce the team and inform the gathered villagers about the purpose of the survey and individual interviews.
- Interview each respondent separately (privately) for no more than 45 minutes. Do not impose the interview on a respondent who is either unwilling or does not have the necessary information. Make sure there are alternate respondents, randomly selected, to answer the questions.
- It is important that enumerators make the respondents feel comfortable, create a friendly environment to get the best information (data). Do not feed answers to or second-guess the respondents while tactfully probing the answers. Repeat the questions in different forms (phrases) to make sure that respondents have the same understanding that the enumerators have of each question. The enumerators should never confront the respondents and create the impression that a particular answer or response is wilfully crafted. Accept the best guess or response that the respondents have given.

It may be a good idea to supplement the survey data (information) by qualitative analysis, say, some well-crafted and in-depth case studies of households and villages with respect to the intra-village and intra-household dynamics and disparities.

4. Data Processing and Interpretation of Results

The collected data about villages and households should be entered into a database that can be used to process and interpret the results. We can analyse the data and test hypotheses with the help of any good statistical package like the Statistical Package for Social Sciences (SPSS). We illustrate here the use of survey data and analyse the socio-economic profiles of villages and households.

The baseline data were collected in March 2004 from a sample of villages and households in the areas covered by the Sindh Rural Support Organisation (SRSO). SRSO is the latest of the ten rural support programmes (RSPs) that work in partnership with over one million rural people through their male and female community organisations (COs) in all provinces of Pakistan, Azad Kashmir and Northern Areas. SRSO started its work in July 2003 in five districts of upper Sindh—Sukkur, Gothki, Khairpur, Shikarpur, and Jacobabad. It has helped rural communities to form 253 COs with 3,745 members in seven Union Councils (UCs) of these

districts. These COs have saved Rs. 585,000 and SRSO has given Rs. 3,314,000 in loans to CO members for a variety of productive investments.[6]

The five districts of upper Sindh are quite diverse in many respects, although their agriculture depends mainly on water drawn through canals from the Indus. Their diversity manifests, for example, in the extent to which their economies are dependent on farming, links to urban markets, and the state of physical and social infrastructure and services. Most rural communities are also distinct in terms of their social structure that depends mainly on tribal lineage or kinship and the ownership and control of agricultural land. In these districts, agriculture plays an important role in the rural economy, but this role depends on the supply of water, incidence of waterlogging and salinity, and links to markets. In many villages, there is mixed farming, though it is dominated by the date palm plantations and other fruits and vegetables in some areas. The dominance of farming in people's life is reflected by the extent to which household labour is involved in the cultivation of land and casual work on and off farms. Long-term employment (service) in the private and public sector is far more evident in communities that are close to the urban centres or are peri-urban themselves. There are visible differences in the density of physical and social infrastructure, including services for health care and education, between rural communities by location. But there is far less diversity in the quality of the infrastructure and services used by people in the villages.

We analyse the socio-economic conditions of a sample of 307 households from 20 villages in the five districts where SRSO has been involved since its inception in mid-2003. A survey of the sample villages and households was conducted in March 2004 to collect the data for the analysis. The sample was stratified in two steps. In the first step, names of 15 villages were drawn randomly from the list of male COs (MCOs), allocating three MCO villages to each district. In addition names of five villages without COs were randomly drawn from the list of villages in Union Councils where the support programme has been introduced. Each selected village without the CO is in close proximity of a CO village in the sample. We designate as "treatment" villages those with a CO working in partnership with SRSO and are expected to continue to participate in the support programme. We call the second group of villages as "control" villages since they are not part of the programme. In the second step of sampling, in each treatment village, names of 12 persons were randomly drawn from the list of MCO members for interviews. In addition, six adult residents of each MCO village who were not members of the MCO and eight adult residents in each control village were selected for the interview. In the case of these two categories of non-members—those living in the treatment and control villages—every attempt was made to select the individuals randomly for interviews. We designate the sample MCO members as the "treatment group" and the other two as the "control group". The difference between the two groups of individuals is simply that the first group is in the programme (participants) and the second group is not (non-participants). The sample size and its distribution by villages (with and without COs) are given in Appendix II.

The interpreted results of the survey can be used for two purposes. First, they provide a reasonably representative socio-economic profile, including the incidence, depth and severity of poverty, of rural households in the five districts of upper Sindh. In other words, they can help us

[6] These numbers are as of March 31, 2004. It should also be noted that the National Rural Support Programme (NRSP) worked with rural communities in three Union Councils of Sukkur from 1998 to 2003. Since its establishment SRSO has continued its partnership with the pre-existing COs and has helped in the formation of new COs both in these Union Councils and in one Union Council each of the other four districts.

address the question about the state of poverty in rural communities in general and the COs in particular. Second, these results can be used as the baseline data for assessing the impact of SRSO activities (interventions) on the standard of living of participants in the programme (CO members) in say seven to ten years from now. In fact, the sample was designed with this objective, hence includes respondents from the treatment and control groups.

Table 1. Sample Community Organisations

Description of MCO	Sukkur	Gothki	Khairpur	Shikarpur	Jacobabad	Total
Number of MCOs	3	3	3	3	3	15
Number of members	52	55	47	48	50	252
Average number of Members per MCO (March 31, 2004)	17	18	16	16	17	17
Average number of months	26	2.3	3.3	7.3	2.3	8.3
minimum	17	1	1	7	1	1
maximum	41	5	6	8	5	41
Average number of members at start	17	17	15	15	15	16
Total savings on March 31, 2004 (Rs.)	25,000	8,200	6,500	12,900	10,800	63,400
Average MCO savings:						
at start (Rs.)	1,000	1,900	1,167	1,167	1,000	1,247
at present (Rs.)	8,333	2,733	2,167	4,300	3,600	4,227
Average savings per MCO member:						
at start (Rs.)	59	110	78	78	67	79
at present (Rs.)	481	149	138	269	216	252
Total amount of loans (Rs.)	458,000	--	--	40,000	--	498,000
Average loan per						
MCO (Rs.)	152,667	--	--	13,333	--	83,000
member (Rs.)	8,808	--	--	833	--	4,980
CPIs (Rs.)	223,631	--	--	--	--	223,631

4.1 Profile of Sample Villages

As stated earlier, the sample includes 15 villages with MCOs—three in each of the five districts—labelled as treatment villages. Let us look at some of the important features of the sample MCOs. In Table 1, there are 252 MCO members with an average of 17 members per MCO. The membership has not changed by much since the start of each MCO with the total rising from 238 to 252. Most MCOs have been formed since September 2003, except for the MCOs in Sukkur which were formed during 1998 and 2002 as part of the regional work of NRSP. The sample MCOs have saved Rs. 63,400, with Rs. 4,227 per MCO and Rs. 252 per MCO member. So far SRSO has given Rs. 498,000 in loans to members of six MCOs, three each

in Sukkur and Shikarpur districts. In addition, it has contributed Rs.223,631 in the construction of community infrastructure projects in two MCOs of Sukkur.

Table 2. Physical and Social Infrastructure and Services in Sample Villages, 2004

Infrastructure/ Service	Number of Treatment Villages					Number of Control Villages				
	up to 1 KM	>1-3	>3-5	>5 KM	Average Distance (KM)	up to 1 KM	>1-3	>3-5	>5 KM	Average Distance (KM)
Asphalt Road	14	1	--	--	1.0	4	--	--	--	1.1
Bus/Wagon Stop	12	3	--	--	1.3	2	2	--	--	1.8
Railway Station	--	1	1	13	8.7	--	--	--	4	10.8
Mandi/Market	--	1	2	12	12.1	--	--	--	4	11.3
Factory	1	1	2	11	10.3	--	1	--	3	8.5
Post Office	5	8	--	2	3.1	--	2	--	2	7.5
Public Call Office (PCO)	6	8	--	1	2.5	1	2	--	1	5.3
Bank	--	5	2	8	8.7	--	--	--	4	13.0
Agriculture Office	--	1	--	14	13.2	--	1	--	3	10.8
Veterinary Office	--	5	4	6	6.0	--	1	1	2	8.0
Dispensary (RHC)	6	6	2	1	2.5	--	3	1	--	2.9
Hospital (UHC)	1	3	2	9	9.3	--	2	--	2	7.8
Medical Store	6	7	--	2	3.0	--	2	--	2	7.8
Physician	8	5	--	2	3.4	--	2	--	2	7.8
Lady Health Visitor	8	4	1	2	3.1	--	2	--	2	7.8
Other Health Worker	10	5	--	--	1.5	1	2	1	--	2.4
Primary School: Male	14	1	--	--	1.1	3	1	--	--	1.3
Female	9	6	--	--	1.6	3	--	--	1	4.5
Middle School: Male	7	7	1	--	2.1	1	1	1	1	5.8
Female	4	8	--	3	4.1	--	1	1	2	7.0
High School: Male	5	7	1	2	3.2	--	1	1	2	7.0
Female	3	7	1	4	5.4	--	1	--	3	8.5
College: Male	1	1	1	12	12.5	--	--	--	4	13.0
Female	1	1	1	12	12.5	--	--	--	4	13.0
Library	3	2	--	10	10.6	--	--	--	4	13.0

We have not taken inventory of the resources—land, livestock, and water—and the agricultural production in the sample villages. The SA Reports contain this information about the Union Councils in which SRSO is actively involved with community organisations. We focus here on the physical and economic infrastructure and social services that have a direct bearing on the quality of life of rural people in both the treatment and control villages. As shown in Table 2, all of the sample villages are well connected to the road transport system. They have access to asphalt roads of reasonable quality within one KM and can get on buses and wagons within 2 KM from the village. Very few of the sample villages have a bank, *mandi*, factory, railway

station or agriculture office at less than 5 KM: the distance ranges from 9 to 13 KM. However, most of them have a basic veterinary dispensary (office) within 6 to 8 KM. Almost all treatment villages have a post office and Public Call Office (PCO) within 3 KM, but a majority of the control villages have these facilities at a distance of 5 to 8 KM.

People living in the majority of treatment villages can get to a dispensary, physician, lady health visitor, other health worker (e.g. dispenser, *hakim*), and medical store within 3 KM, but for people in the control villages the distance to similar health services, except for dispensary (or RHC), exceeds 5 KM. It should be noted that people in both types of villages are about 8-9 KM from a full-fledged hospital facility (UHC). Inadequate and poor quality of health care services, particularly for females, are regarded by almost everyone as one of the major constraints on their well-being. If we look at the education facilities, there is a primary school for boys within one KM of each village. The distance of primary school for girls is a bit longer, and for one control village it is about 15 KM. Some primary schools have both boys and girls. For middle schools, the average distance goes up for both boys and girls, and the discrepancy in the location of school for boys and girls widens significantly. In terms of the distance to a middle school for both boys and girls, the treatment villages are far better served than the control villages. A similar pattern seems to exist for high schools: the average distance goes up for both boys and girls, especially for those living in the control villages. In addition to the problem of distances to schools—requiring long walks or expensive transport—particularly for girls, most respondents are not happy with the quality of education for their children in rural schools. The low school enrolment rates of children indicated by the data in the next section reflect the combined effects of high cost and low quality on one hand and the poverty of households on the other.

Table 3. Village Infrastructure, 2004

Infrastructure	Number of Treatment Villages		Number of Control Villages		Number of All Villages	
	Yes	No	Yes	No	Yes	No
Electricity	14	1	2	2	16	3
Telephone	9	6	1	3	10	9
Piped water	0	15	0	4	0	19
Tubewell	6	9	0	4	6	13
Hand pump	15	0	4	0	19	0
Drains	1	14	0	4	1	18
Paved pathway	8	7	1	3	9	10
Shops or market	11	4	3	1	14	5

When we look at the data for the village infrastructure, shown in Table 3, that directly affects the daily life of people, it is obvious that lack of sanitation—e.g. absence of drains for waste disposal and paved pathways—and inadequate supply of potable water are the most acute deficiencies. Only one treatment village has any kind of drains and no village has piped water supply. One-half of the treatment villages and only one control village have a paved pathway inside the village. All villages have hand pumps, but their number is limited and the quality of

water is not always reliable since the groundwater in many areas contains high levels of salt and impurities. A vast majority of the treatment villages have electricity and more than one-half has a couple of telephones. However, only one-half of the control villages have electricity and one-quarter have a telephone connection. Most villages have at least one general store (or grocery shop) that stocks a variety of goods that villagers can buy to meet their occasional or urgent needs.

4.2 Profile of Sample Households

In this section we analyse the socio-economic characteristics of the sample households, including the age, education and work status of respondents representing each household. The analysis highlights the differences between participating and non-participating households in the surveyed villages with respect to these characteristics and the state of poverty in particular. Since the sample is reasonably large and probably quite representative, the results analysed here should be of help to our understanding of the living conditions in the programme area.

1. Age, education and profession of respondents

All 307 respondents interviewed are males and a vast majority of them are heads of households, except some who were represented by alternates because they were not available. The survey was restricted to males because of the constraints on resources and the fact that generally men dominate the income-generation and decision-making processes. Admittedly the exclusion of female respondents may reduce its value for a good understanding of the problems specific to females. We have, however, interviewed in each sample village at least three women about their perceptions of problems to compare them with the perceptions of men.

As shown in Table 4, the average age of respondents is 39 years, ranging between 38 and 41 years. The differences in the average age are not significant between members and non-members in the CO villages and non-participating control villages. Overall 70 per cent of the respondents are not more than 45 years old, but the proportions range from 74 per cent among members, 62 per cent among non-members, and 69 per cent among non-participants. A significant proportion (19 per cent) of respondents is in the age group of 16-25 years, especially among the non-participating households (26 per cent), but the proportion of those above 55 years ranges between 10 and 15 per cent.

Sixty-four per cent of the respondents are literate, a somewhat higher proportion compared with the adult males in the sample (57 per cent) and the national average (Table 5). However, there is significant difference in the proportions between the sub-samples, with the average of 65 per cent in treatment villages and 56 per cent in control villages. Similarly, in the treatment villages, 71 per cent of members and only 52 per cent of non-members are literate. In other words, the proportion of literate respondents is much higher among the participating than non-participating households. Nine per cent of respondents are literate but report no schooling, with little difference between respondents in the sub-samples. Fifty-five per cent of respondents have had some level of schooling, but the proportion among participants is 63 per cent and 44 per cent among non-participants; the lowest proportion (41per cent) is among non-members in the treatment villages. There are two important features of the literate respondents who have finished some level of schooling. First, nearly one-quarter of respondents have finished primary school and the difference between the sub-samples is quite small, ranging from 21 to 24 per cent.

Second, nearly 27 per cent of respondents have completed matriculation or higher level of education, with 35 per cent among the participating, but only14 per cent among non-participating households.

Table 4. Age of Respondents

Respondent	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Average age	38.0	41.3	39.2	38.3	38.0	40.5	39.1
Total number of Respondents	178	90	268	39	178	129	307
% age group:							
16-25	19.7	13.3	17.5	25.6	19.7	17.1	18.6
26-35	30.3	30.0	30.2	28.2	30.3	29.5	30.0
36-45	24.2	18.9	22.4	15.4	24.2	17.8	21.5
46-55	15.7	23.3	18.3	15.4	15.7	20.9	17.9
56-65	7.3	8.9	7.8	12.8	7.3	10.1	8.5
>65	2.8	5.5	3.7	2.6	2.8	4.7	3.6

Table 5. Literacy Level of Respondents (Per cent)

Respondent	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Not Literate	28.7	47.8	35.0	43.6	28.7	46.4	36.2
Literate but no schooling	8.3	11.0	9.3	7.7	8.3	10.1	9.1
Schooling	63.0	41.2	55.7	48.7	63.0	43.5	54.7
Primary	24.2	22.2	23.5	20.5	24.2	21.7	23.1
Middle	2.8	7.8	4.5	7.7	2.8	7.8	4.9
Matriculation	16.9	5.6	13.1	7.7	16.9	6.2	12.4
post-Matriculation	19.1	5.6	14.6	12.8	19.1	7.8	14.3

As shown in Table 6, a very small proportion (4 per cent) of respondents reports not working, with 3 per cent for the participating and 5 per cent for non-participating respondents. Farming and labour, especially on farms, are the two main professions: 52 per cent are involved in farming and 20 per cent engaged in casual labour. However, there is substantial difference between the respondents from the participating and non-participating households: just under two-

thirds from the participating households but 80 per cent from non-participating households are involved in farming and labour. The proportion of respondents from the non-participating households in treatment villages is 79 per cent and 82 per cent in control villages. The reported difference between the participating and non-participating respondents is largely in farming. The proportion of respondents working in long-term employment and business is almost the same (11 per cent for each) for the overall sample and the participating respondents. But the proportions for non-participants in the treatment and control villages are 16 and 13 per cent, respectively. Also, only 3 per cent of non-participants in the control villages are in service and 6 per cent of non-participants in the treatment villages are in business.

Table 6. Profession of Respondents (Per cent)

Respondent	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Farming	46.1	53.3	48.5	76.9	46.1	60.5	52.1
Labour	20.2	25.6	22.0	5.1	20.2	19.4	19.9
Service	14.6	10.0	13.1	2.6	14.6	7.8	11.7
Business	14.0	5.6	11.2	10.3	14.0	7.0	11.1
Other Work	1.7		1.1		1.7		1.0
Not Working	3.4	5.8	4.1	5.1	3.4	5.4	4.2

2. Demographic structure of households and work status of households members

The sample households have a population of 2,250, of which 45 per cent are adults (over 18 years) and nearly 54 per cent are males (Table 7). The male-female ratio is unexpectedly high (115:100), largely because of the discrepancy in the sample of non-participating households in the control villages (127:100). The male-female difference between members and non-members in the treatment villages is very small (113:100 and 111:100). The average size of household in the sample is 7 persons with little difference between the member and non-member households in treatment villages, but in control villages the average size is 11 persons. The average size of the poor households is larger (8 persons) than of the non-poor (6.5 persons) with the same pattern observed for households in all sub-samples. It seems that family size seems to fall as the level of income per capita rises and this relationship is statistically significant. It should be noted that the average number of children (up 18 years) per household across the board is higher than the average number of adults and it is quite significant in the households of control villages.

As stated earlier, 45 per cent of the overall population is of adults, with 43 per cent in control villages, and 45 and 48 per cent in the member and non-member households of treatment villages. But there is almost no difference in the proportion of adults in the participating and non-participating households. The very young—up to the age of 10 years—make up 39 per cent of the household population; there is little difference in the proportion of the young in the member and non-member households in treatment villages, but it is nearly 44 per cent in the control

villages. A significant feature of the household composition is that nearly 46 per cent of the population is of the very young and old—up to 10 years and over 55 years—and the "dependency" ratio is 84 per cent.[7] The proportion of dependants is 52 per cent in the population of households in control villages and 44 per cent in both the member and non-member households of treatment villages.

Table 7. Demographic Composition of Households

Sex and Age	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Number of households	178	90	268	39	178	129	307
Total population	1174	653	1827	423	1174	1076	2250
Male	622	344	966	237	622	581	1203
Female	552	309	861	186	552	495	1047
Male:Female	112.7	111.3	112.2	127.4	112.7	117.4	114.9
Adults	524	314	838	180	524	494	1018
	(44.6)	(48.1)	(45.9)	(42.6)	(44.6)	(45.9)	(45.2)
Male	266	158	424	93	266	251	517
Female	258	156	414	86	258	243	501
over 55 yrs in population (%)	6.0	6.6	6.2	8.0	6.0	7.2	6.5
Children	650	339	989	243	650	582	1232
	(55.4)	(51.9)	(54.1)	(57.4)	(55.4)	(54.1)	(54.8)
Male	356	186	542	144	356	330	686
Female	294	153	447	99	294	252	546
up to 10 yrs in population (%)	38.2	37.4	37.9	43.5	38.2	39.8	39.0
Average size of HH	6.6	7.3	6.8	10.9	6.6	8.3	7.3
Adults/HH	2.9	3.5	3.1	4.6	2.9	3.8	3.3
Number of:							
poor households	89	57	146	25	89	82	171
poor population	668	438	1106	260	668	698	1366
Average size of poor households	7.5	7.7	7.6	10.4	7.5	8.5	8.0

In Table 8, we classify the household population of those over 10 years into (i) three age groups, over 10 to 18 years, over 18 to 55 years and over 55 years, and (ii) three occupational states, not working, engaged in household work, and working outside the household. Fifty-seven per cent of the household population in the sample—with 54 per cent in the control villages and 60 per cent in the non-member households of treatment villages—is of persons in the age groups of over 10 years. It should be added in passing that, in many rural households, children of lower

[7] It is the ratio of population in the age groups of up to 10 years + over 55 years to those in the age groups of over 10 to 55 years. However, it is higher (106:100) in the households of control villages and almost the same (79:100) for member and non-member households of treatment villages.

ages (8-10 years) make substantial contribution to the household economy. Let us first make some general observations. Two-thirds of the population of over 10 years is in the age group of 18-55, with 63 per cent in the control and 68 per cent in treatment villages with almost no difference between the member and non-member households. The age group of over 10 to 18 years constitutes 19 per cent of the three age groups, much more in the households of control villages (nearly one-quarter) and 18 per cent in both the member and non-member households of treatment villages. The population of those over 55 years is 14 per cent in the overall sample, with the same proportion in the treatment villages, but 12 per cent in the control villages.

Table 8. Work Status of Household Members

Work Status	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
All over 10 years	662	391	1053	230	662	621	1283
Not working	134	83	217	54	134	137	271
(%)	(20.2)	(21.2)	(20.6)	(23.5)	(20.2)	(22.1)	(21.1)
>55 years	65	40	105	18	65	58	123
>18-55 years	35	22	57	12	35	34	69
>10-18 years	34	21	55	24	34	45	79
Household work	270	156	426	88	270	244	514
(%)	(40.8)	(39.9)	(40.5)	(38.3)	(40.8)	(39.3)	(40.1)
>55 years	18	7	28	4	18	11	29
>18-55 years	201	121	322	67	201	188	389
>10-18 years	51	28	79	17	51	45	96
Working	258	152	410	88	258	240	498
(%)	(39.0)	(38.9)	(38.9)	(38.3)	(39.0)	(38.6)	(38.8)
>55 years	13	7	20	5	13	12	25
>18-55 years	211	127	338	67	211	194	405
>10-18 years	34	18	52	16	34	34	68
% own farm	22.9	19.1	21.5	26.1	22.9	21.7	22.3
% farm labour	24.0	38.8	29.5	42.0	24.0	40.0	31.7
% service/job	18.2	9.2	14.9	5.7	18.2	7.9	13.3
% off-farm labour	19.4	27.6	22.4	18.2	19.4	24.2	21.7
% business	13.2	2.6	9.3	8.0	13.2	4.6	9.0
% multiple work	2.3	2.6	2.4	0.0	2.3	1.7	2.0

In the overall sample, looking at the work status of those classified in the three working-age groups, just over 21 per cent of those in the working-age groups are not at work, with 24 per cent of them in the control villages and 21 per cent in treatment villages. A high proportion of those not working is in the age groups of over 55 years, followed by those in the 10-18 year age groups. Those not working in the higher age groups are unemployed, sick, aged or involved in household work (females in particular). A high proportion of the 10-18 year age groups is either

working in the household (mostly girls) or going to school (boys and girls). Women almost exclusively do the household work, which includes many chores outside the boundary of the house. Forty per cent of the working-age population is involved in household work. The differences between participants and non-participants are very small, ranging from 38 per cent in control villages to 40 per cent in treatment villages. Over three-quarters of the household workers are in the age groups of 18-55 years, with 74 per cent in the member households and 78 per cent in the non-member households of treatment villages. A significant proportion of girls in the age groups of over 10 to 18 years is also involved in household work.

Those working outside the household are nearly 39 per cent of the population in the working-age groups and there is almost no difference in the proportion among the participating and non-participating households. As expected, mostly men in the age groups of over 18 to 55 years are working. They constitute about 82 per cent of the three working-age groups, with 82 and 84 per cent among members and non-members in the treatment villages and 76 per cent in the control villages. The occupational distribution shows some interesting features. First, casual labour, both on and off farm, involves over 53 per cent of workers, with 66 per cent in the non-member households of treatment villages and 60 per cent in the control villages. The proportion is much lower (43 per cent) for workers in the member households of treatment villages. Second, a high proportion of casual labour is in fact engaged on farms: as high as 42 and 39 per cent of all work in the non-participating households. Third, 22 per cent of the people at work are cultivating their own farms, with 26 per cent in the control villages and 19 per cent in the non-member households of treatment villages. Fourth, long-term employment (service) involves only 13 per cent of workers, with 6 per cent in the control villages and 18 per cent in the member households of treatment villages. Fifth, only 9 per cent of workers report business as their major occupation, but only 3 per cent among non-members in the treatment villages and 8 per cent in the control villages. Finally, multiple work is quite limited in that only 2 per cent of workers in the sample report more than one activity.

3. Adult literacy and schooling of children

Literacy among adults in the sample households is low compared to the respondents (heads of households or their alternates) and the national average. As shown in Table 9, only 35 per cent of the adults are literate, with only 24 per cent of them in the control villages. The proportions are 30 and 42 per cent for the non-member and member households in treatment villages, respectively. The difference between the participating and non-participating households in the sample is quite significant: 42 and 28 per cent, respectively. As expected, the literacy rate among women is far lower than among men: whereas 57 per cent of adult men are literate only 13 per cent among adult women are literate. Male literacy is highest in the member households (67 per cent) followed by 51 per cent in the non-member households of treatment villages and 42 per cent in the households of control villages. In other words, the participating households have a far higher proportion of literate males (67 per cent) than do non-participating households (47 per cent). Female literacy is particularly low (3 per cent) in the control villages and among non-members in the treatment villages (9 per cent). The proportions in the participating and non-participating households are 17 and 7 per cent, respectively. Finally, it should be noted that the adult literacy rate, for both males and females, among the poor households in the overall sample and in each sub-sample is lower than the average for all households across the board.

Table 9. Adult Literacy in Households

Literacy Level	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Not literate adults	302	220	522	137	302	357	659
Per cent of adult population							
all households	57.6	70.1	62.2	76.1	57.6	72.2	64.7
poor households	70.9	74.2	72.3	83.3	70.9	77.6	74.5
Male adults	88	78	166	54	88	132	220
Per cent of male population							
all households	33.1	49.4	39.2	58.0	33.1	52.6	42.6
poor households	48.9	52.5	50.4	68.4	48.9	58.2	54.0
Female adults	214	142	356	83	214	225	438
Per cent of female population							
all households	82.9	91.0	86.0	96.5	82.9	92.6	87.0
poor households	92.6	96.9	94.4	98.2	92.6	97.4	95.2
Literate adults (all HH)	210	96	306	42	210	138	348
Per cent of literate							
primary school	32.4	40.6	35.0	31.0	32.4	37.7	34.5
middle school	6.7	12.5	8.5	9.5	6.7	11.6	8.6
high school	22.9	20.8	22.2	16.7	22.9	19.6	21.6
post-matriculation	28.1	13.5	23.5	19.0	28.1	15.2	23.0
no schooling	10.0	12.5	10.8	23.8	10.0	15.9	12.4

In the overall sample, over one-third of literate adults have completed primary school, but their proportion is much higher (41 per cent) in the non-member households of treatment villages. Two other important features of the literate adult population should be noted as well. First, the proportion of those with middle school education is quite low (9 per cent) for the sample, with 7 per cent in the member households and 13 per cent in the non-member households of treatment villages. Second, 45 per cent of the literate adults have achieved matriculation and higher level certificates, with 51 per cent of the participants and 35 per cent of non-participants. Third, almost one-quarter of the literate adults in control villages have no schooling, but the proportion in the treatment villages is only 10 and 13 per cent among members and non-members, respectively. The disparity between male and female adults in the level of literacy and schooling are a reflection of the fact that the opportunities available to females are far more limited on both the demand and supply sides.

The data on schooling of children (up 18 years) represent a far less disappointing picture. As shown in Table 10, overall 53 per cent of the children are not in school, with nearly two-thirds in the households of control villages. In the treatment villages, member households send 55 per cent of their children to school but the proportion in non-member households is 42 per cent. In this respect, the disparity between boys and girls is quite striking. While 46 per cent of

the boys are not in school, the proportion for girls not in school is 63 per cent. The proportions of both boys and girls not going to school differ significantly between the sub-samples. In the case of boys, only 35 per cent from households in the control villages but 63 and 53 per cent of member and non-member households, respectively, in the treatment villages are in school. For girls, while in the overall sample 38 per cent are in school, their proportion is 30 per cent in the control villages and 45 and 27 per cent in the member and non-member households, respectively, of treatment villages. These numbers are somewhat misleading since they include children in the age groups of up to 5 years or those who are normally too young to go to school.

Table 10. Schooling of Children in Households

Children in School	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
All Children	650	339	989	243	650	582	1232
Children not in school	294	198	492	162	294	360	654
% of all children not in school	45.2	58.4	49.7	66.7	45.2	61.9	53.1
% of male children not in school	37.1	46.8	40.4	64.6	37.1	54.5	45.5
up to 5 years	62.3	72.5	65.8	93.2	62.3	80.5	70.8
>5 to 10 years	22.1	35.0	26.6	50.8	22.1	42.9	32.8
>10-18 years	23.0	28.1	24.7	53.7	23.0	38.8	30.3
% of female children not in school	55.1	72.5	61.1	69.7	55.1	71.4	62.6
up to 5 years	74.1	81.3	76.7	82.2	74.1	81.7	77.8
>5 to 10 years	33.0	62.7	43.4	61.1	33.0	62.1	47.0
>10 to 18 years	54.5	71.1	59.5	62.6	54.5	66.1	59.0
Per cent of >18 – 24 years not in school	47.5	40.7	44.5	33.3	47.5	38.2	42.6
% of males	43.8	39.2	41.7	29.6	43.8	35.9	39.4
% of females	51.8	42.5	47.9	38.9	51.8	41.4	46.5
Children not in school in poor households per cent of:							
all children	47.3	59.9	51.9	74.7	47.3	65.3	56.1
male children	35.2	51.5	41.4	78.3	35.2	61.8	48.4
female children	61.9	69.8	64.8	69.8	61.9	69.8	65.7

If we turn to the schooling of children in the school-going age groups, we see that participation of boys in the age groups of over 5 to 10 years and over 10-18 years is 67 and 70 per cent, respectively. But for girls the rates are 53 and 41 per cent in the two age groups. There are differences in the school enrolment of both boys and girls if we examine closely the data for the sub-samples. Take first the case of male children. The lowest proportion in school for the two age groups is in the households of control villages (49 and 46 per cent) and the highest proportions are in the member households (78 and 77 per cent) with 65 and 72 per cent in the

non-member households of treatment villages. In the case of girls, the lowest enrolment rate in the two age groups is in the non-member households of treatment villages (37 and 29 per cent, respectively) and the highest proportion is in the member households of treatment villages (67 and 46 per cent). In the households of control villages, the proportions are 39 and 37 per cent, respectively. It should be noted that the school enrolment rates for both boys and girls in the two age groups are substantially higher in the participating households than in non-participating households. The school enrolment rate for both male and female children in the poor households is lower than the average rate for the overall sample and sub-samples, except for male children in the member households and female children in non-member households of treatment villages.

The school enrolment data for the young adults in the age groups of over 18-24 years show that, in the overall sample, 57 per cent of them are in a school or college. The proportion ranges from 52 per cent (in the member households of treatment villages) to 67 per cent (in the households of control villages). The ratio for males in school (61 per cent) is higher than for females (53 per cent) in the sample households and similar male-female disparity exists in the sub-samples as well. An important point is that the enrolment rate in these age groups is lower in the participating households compared with non-participating households.

4. State of health and physical environment

In order to assess the health of household members in the sample, we gave the respondents three states and asked them to place each household member in one of these categories. The first two, labelled as "good" and "fair", are regarded as healthy states, and the third one, labelled as "poor", indicates chronic and acute ailments. According to the respondents' perceptions, shown in Table 11, nearly 89 per cent of the population enjoys good health with very little difference between the participating and non-participating households. However, a higher proportion of males than females, and children than adults, are in good health; the difference between children and adults is more significant. These differences are more visible in the non-participating than participating households. People in fair health make up 7 per cent of the population, with 6 per cent in the control villages and more than 8 per cent in the non-member households of treatment villages. The difference between adults and children in the proportions in fair health is quite wide: 11-16 per cent for adults and 1-3 per cent for children. The male-female difference is, however, quite small. People suffering from poor health account for only 3 per cent of the sample population, with the same divide by gender and age as in the first two states of health. We have also recorded the number of deaths by gender and age reported by respondents in the last one year. Their reported numbers constitute between 0.5 to 2 per cent of the household population, with difference between adults and children but with little difference between males and females.

The physical environment and amenities of life for the households, as shown in Table 12, are wholly inadequate both in numbers and quality. Just over one-third of households have a *pucca* (brick or concrete) structure as living space, except in the control villages where their proportion is about 44 per cent. A much higher proportion of respondents (48 per cent) and their families live in *katcha* (mud-based) structure, with over 54 per cent among the non-participants and 43 per cent among participants. A sizeable proportion of families (15 per cent) live in mixed structures—part *pucca* and part *katcha*—with only 3 per cent in the control villages and nearly 20 percent among members in the treatment villages. Over 80 per cent of the homes have up to two room—average is 1.75 rooms—with 89 per cent among non-members in the treatment

villages. It should be added that one-fifth of the homes of members in the treatment villages and those in the control villages have three to four rooms. Given the large average family size, the living space is obviously quite congested for the sample population.

Table 11. Health Status of Household Members

Health Status	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Per cent in good health	89.0	86.3	88.0	92.0	89.0	88.3	88.6
male	89.6	88.0	89.1	92.6	89.6	90.0	89.8
female	88.2	84.3	86.8	90.2	88.2	86.5	87.4
adults	82.2	76.5	80.0	82.9	82.2	78.8	80.5
children	94.5	95.4	94.8	98.0	94.5	96.4	95.5
Per cent in fair health	6.5	8.4	7.2	6.2	6.5	7.6	7.0
male	6.6	7.1	6.8	6.2	6.6	6.7	6.6
female	6.4	9.7	7.6	6.6	6.4	8.6	7.4
adults	10.6	16.0	12.7	12.7	10.6	14.9	12.7
children	3.1	1.2	2.4	1.6	3.1	1.4	2.3
Per cent in poor health	3.3	3.3	3.3	1.5	3.3	2.6	3.0
male	2.5	2.6	2.5	0.8	2.5	1.9	2.2
female	4.1	4.1	4.1	2.7	4.1	3.6	3.9
adults	5.7	4.9	5.4	3.3	5.7	4.4	5.0
children	1.3	1.7	1.4	0.4	1.3	1.2	1.2
Per cent died (2003)	1.3	2.1	1.6	0.5	1.3	1.5	1.4
male	1.3	2.3	1.7	o.4	1.3	1.5	1.4
female	1.3	1.9	1.5	0.5	1.3	1.4	1.3
adults	1.5	2.5	1.9	1.1	1.5	2.0	1.8
children	1.1	1.7	1.3	0.0	1.1	1.0	1.1

Supply of good quality potable water and proper sanitation—drainage and waste disposal—are critical factors affecting the health of any population. Fewer than 16 per cent of the homes have piped water supply. A vast majority of the villagers depend on hand pumps and wells that are located at walking distance, but the quality of groundwater is quite unreliable because of high salt concentration in several areas. As in other areas of Pakistan, generally women, with young girls and boys, fetch water irrespective of the distance or the amount required for the household. With regard to the sanitary conditions, only 62 per cent of the homes have indoor latrine. A slightly higher proportion of the member households (69 per cent) and a much lower proportion of households in the control villages (46 per cent) have indoor latrine. The poor state of waste disposal is reflected by the fact that only 20 per cent of homes, with only

10 per cent in the control villages, have drainage facility. A vast majority of villagers depends on scavengers and nature for waste disposal. Fuel wood is the main source of energy—electricity and fossil fuels are scarce and expensive—for nearly 88 per cent of the households. A reasonably high proportion of homes (79 per cent) has electricity with 83 per cent among members and 64 per cent among those in the control villages. According to the respondents, electricity supply is limited, unreliable, and expensive.

Table 12. Facilities for Household Members

House Facilities	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
All households	178	90	268	39	178	129	307
% Pucca structure	37.1	32.2	35.4	43.6	37.1	35.7	36.5
% Katcha structure	42.7	54.4	46.6	53.8	42.7	54.3	47.6
%P+K structure	19.7	12.2	17.2	2.6	19.7	9.3	15.3
Average number of rooms	1.79	1.56	1.71	2.03	1.79	1.70	1.75
up to 2	78.7	88.9	82.4	76.9	78.7	84.4	81.4
3-4	20.2	11.1	17.0	18.0	20.2	13.2	17.3
5 or more	1.2	0.0	0.6	5.2	1.2	2.4	1.3
Water supply							
% Piped	16.3	14.4	15.7	15.4	16.3	14.7	15.6
% Well	81.5	81.1	81.3	82.1	81.5	81.4	81.4
% other	3.2	4.5	3.0	3.5	3.2	3.9	3.0
Latrine							
% inside	68.5	56.7	64.6	46.2	68.5	53.5	62.2
% outside	31.5	43.2	35.5	53.8	31.5	46.5	37.8
Drainage							
% yes	21.9	18.9	20.9	10.3	21.9	16.3	19.5
% no	78.1	81.1	79.1	89.7	78.1	83.7	80.5
Electricity							
% yes	82.6	76.7	80.6	64.1	82.6	72.9	78.5
% no	17.4	23.3	19.4	35.9	17.4	27.1	21.5
Fuel used							
% Wood	86.5	84.4	85.8	100.0	86.5	89.1	87.6

5. Household income: sources, distribution, and poverty

The average annual income of the sample households is Rs. 71,697, ranging from Rs. 60,863 for the non-member, Rs. 70,297 for member households in the treatment villages to Rs. 103,085 for households in the control villages (Table 13). However, the average household income levels of the participating and non-participating households, Rs. 70,297 and Rs. 73,628 respectively, are not significantly different from each other. When we correct for differences in the size of household, the per capita monthly income is higher for the member households (Rs.

888) compared with households in the control villages (Rs. 792). The difference between the per capita income levels of the member and non-member households of treatment villages is statistically significant and the same applies to the difference between the per capita income levels of participating and non-participating households in the sample. The estimated per capita monthly income of Rs. 815 for the overall sample is higher than the national poverty line income (for rural areas) of Rs. 750, except for the non-member households of treatment villages.

Table 13. Household Income, 2003/2004

Household Income	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Average/HH (Rs.)	70297	60863	67129	103085	70297	73628	71697
Average/capita (Rs.)	10658	8388	9847	9504	10658	8827	9783
Per capita/month (Rs.)	888	699	821	792	888	736	815
Per cent households with income of:							
Up to Rs.500	24.2	35.6	28.0	30.8	24.2	34.1	28.3
Rs.501-600	11.8	12.2	11.9	17.9	11.8	14.0	12.7
Rs.601-700	10.7	8.9	10.1	7.7	10.7	8.5	9.8
Rs.701-750	3.4	6.7	4.5	7.7	3.4	7.0	4.9
up to Rs.750	50.0	63.3	54.5	64.1	50.0	63.6	55.7
Rs.751-800	3.4	3.3	3.4	7.7	3.4	4.7	3.9
Rs.801-1000	16.3	11.1	14.6	5.1	16.3	9.3	13.4
Rs.1001 or over	30.3	22.2	27.6	23.1	30.3	22.5	27.0
Per cent share in income:							
farming	42.6	50.4	45.0	73.9	42.6	60.4	50.4
service/job	24.7	13.2	21.2	6.1	24.7	10.2	18.4
pension	0.9	3.1	1.6	0.0	0.9	1.8	1.3
casual labour	13.5	20.4	15.6	9.7	13.5	15.9	14.6
remittances	1.6	1.1	1.5	2.2	1.6	1.6	1.6
business	13.8	10.4	12.8	3.8	13.8	7.6	11.1
rents	0.2	0.2	0.2	3.5	0.2	1.6	0.8
gift/cash	1.9	0.7	1.6	0.7	1.9	0.7	1.4
other sources	0.8	0.5	0.7	0.2	0.8	0.3	0.6

The sample data show that the distribution of income among the surveyed households is less unequal than reported for the country in that the ratio of the bottom 20 to top 20 per cent of the income receivers is 1:6.7 and the concentration ratio is 0.3258.

Share of:	Bottom 10%	2.9%
	Bottom 20%	6.8%
	Top 10%	31.9%
	Top 20%	46.1%

The household income is derived from a number of sources: 70 per cent of it produced by two to three sources. Farming makes the largest contribution to household income, ranging from 43 per cent in the member households to 50 per cent in non-member households and nearly three-quarters in the households of control villages. In other words, the non-participating households derive 61 per cent of their income from farming compared with 43 per cent for the participating households. Long-term employment makes up one-quarter of the household income in the participating households but only one-tenth in the non-participating households (with only 6 per cent in the households of control villages). Casual labour plays nearly the same role in the two groups—14-16 per cent of the household income—with one-fifth of the income in non-member households of treatment villages. Business is an unimportant source of income for households in the control villages, but makes up 14 and 11 per cent of the income in the member and non-member households, respectively, of treatment villages. Remittances, rents, gifts, and other sources account for 3-7 per cent of the household income across the board.

Table 14. Incidence, Depth and Severity of Poverty of Households

Poverty Status	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
All households	178	90	268	39	178	129	307
Poor households	89	57	146	25	89	82	171
Total population	1174	653	1827	423	1174	1076	2250
Poor Population	668	438	1106	260	668	698	1366
Per cent of households in poverty	50.0	63.3	54.5	64.1	50.0	63.6	55.7
poverty gap ratio (%)	32.5	32.9	32.6	37.6	32.5	34.7	33.4
severity of poverty	0.138	0.151	0.142	0.166	0.138	0.157	0.146
Per cent of population in poverty	56.9	67.1	60.5	61.5	56.9	64.9	60.7
Average per capita income/month (Rs.)	498	480	491	491	498	484	491

Note: The income shortfall—sum of the difference between the poverty line income and the income per capita of each poor household—is about Rs. 42,830 on a monthly basis. With an average of 8.0 persons in the poor households, it translates into a total revenue (income) transfer of Rs. 342,640 per month or Rs. 4.11 million per year—Rs. 3,010 per person or Rs. 24,045 per household—to get the poor out of poverty.

In Table 14, we show the incidence (headcount), depth (poverty gap ratio) and severity of poverty in the sample households. We use Rs. 750 per capita per month—the level used in other studies for rural areas of Pakistan—as the poverty line to separate the poor and non-poor households. In the overall sample, 56 per cent of households—171 out of 307 households—can be regarded as poor, with 50 per cent in the member households of treatment villages and almost 64 per cent in the households of control villages. The difference in the proportion of poor households between the participating and non-participating is quite large, with 50 per cent for the

former and almost 64 per cent for the latter group. The important point is that the proportion of households in poverty among CO members is lower than in the overall sample of households. Correcting for the size of household, the proportion of the poor in the population rises to 61 per cent in the overall sample—1366 in a population of 2250—and ranges from 57 per cent to 67 per cent in the member and non-member households of treatment villages. Needless to add the extent of poverty in the sample far exceeds the level reported for the rural areas of Pakistan.

The average monthly per capita income of the poor households—Rs. 491 for the overall sample with Rs. 498 for the participating and Rs. 484 for non-participating households—is significantly lower than the average income of sample households across the board. This difference is reflected in the estimates of poverty gap ratio (PGR), an index of the depth of poverty. The value of PGR is 33 per cent for the overall sample, but it is 35 per cent for the non-participating households—thanks to 38 per cent for households in the control villages—compared with 33 per cent for participating households. The severity of poverty is also higher among the non-participating households (10 per cent) compared with participating households (7 per cent).

Table 15. Household Expenditure, 2003/2004

Household Expenditure	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Average/HH (Rs.)	65280	56944	62481	87196	65280	66089	65620
Average/capita (Rs.)	9898	7848	9165	8039	9898	7923	8954
Per capita/month (Rs.)	825	654	764	670	825	660	746
Per cent share of household expenditure:							
food	60.5	65.2	61.9	58.5	60.5	62.5	61.4
clothing	6.4	5.9	6.2	6.2	6.4	6.0	6.2
housing	8.7	3.5	7.1	16.2	8.7	8.6	8.6
health care	7.7	11.9	9.0	5.3	7.7	9.3	8.4
education	4.7	1.8	3.8	5.2	4.7	3.2	4.0
social functions	6.1	5.5	5.9	4.9	6.1	5.2	5.7
transport	3.6	2.7	3.3	3.1	3.6	2.9	3.3
remittances	0.5	0.1	0.4	0.0	0.5	0.0	0.3
other purpose	1.9	3.4	2.4	0.5	1.9	2.3	2.1
Average HH expenditure of poor households:							
per capita/month	523	489	509	469	523	482	502

6. Household expenditure and food consumption

The average annual households expenditure, shown in Table 15, for the sample is Rs. 65,620, with almost no difference between the participating and non-participating households. However, there is significant difference in the expenditure levels between households in the

treatment and control villages. When we take into account the differences in the size of households in the sub-samples, the picture changes substantially. The monthly per capita expenditure for the overall sample is Rs. 746, but with significant difference between the participating and non-participating households: Rs. 825 and Rs.660, respectively. It should be noted that the monthly per capita income in the sample households across the board exceeds the expenditure level, except for the small difference in the sample of non-member households in the treatment villages. The monthly per capita expenditure of the poor households is far lower than the average of the sample households across the board and exceeds their monthly per capita income (shown in Table 14) in both the member and non-member households of treatment villages.

Food and beverages get the largest share of household expenditure, with 61 per cent in the overall sample and 65 per cent in the non-member households of treatment villages. The combined share of clothing and housing is 15 per cent with no difference between the participating and non-participating households. However, the households in control villages incur nearly 23 per cent of the expenses on these two items compared with just below 10 per cent in the non-member households of treatment villages. Health care and education jointly account for 12 per cent of the household expenditure, with little difference between the sub-samples. Less than 10 per cent of the expenditure is incurred on transport and social functions—of which the share of the former is one-half of the latter—across the board.

We collected the data on the weekly food consumption in each sample household. Given the size of the household, we estimate the daily per capita food intake separately for each category of food. Then, using the price data for food items collected in each sample village, we estimate the average daily expenses for the food consumed on per capita basis. Finally we estimate the daily per capita calorie intake, using the estimated value of food item in terms of its calorie content.[8] The estimates of the daily per capita food consumption (with calories) and expenditure on food are shown in Table 16. The average daily per capita intake for the overall sample is 2,198 calories, but it is lower for the non-participating households (2,107) compared with participating households (2,266). It is probably safe to suggest that a substantial proportion of the sample population suffer from significant undernourishment. It should be noted that nearly three-quarters of the daily calorie intake is from grains (59-62 per cent) and oils (12-13 per cent) with little difference between the sub-sample households. The daily expenditure on food in the poor households is 78 per cent of the average for all households, but it is 71 per cent of the overall average in the participating and 87 per cent in non-participating households.

7. Household assets: value and distribution

The sample households own a variety of assets with every family living in the house, whatever its description, it owns. The distribution of assets (in value) is highly skewed in the sample: 72 per cent of the total value is with the top 20 per cent compared with just under one per cent with the bottom 20 per cent of asset holders. The concentration ratio for assets is 0.676 or more than twice as high as for the household income (0.326).

[8] We use the average number of calories per kg of food eaten, except for eggs: grains (3420), pulses (3380), fats/oils (8829), vegetable (600), fruits (850), meat (1400), milk (1062), sugar (3750), and eggs (105 per egg). Our results should be used with caution because we assign equal weights to every person in the household irrespective of age and gender.

Table 16. Daily Consumption of Food in Households, 2003/2004

Food Item	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Daily per capita intake:							
Grains (grams)	393	376	388	356	393	370	384
Calories	1345	1288	1326	1216	1345	1266	1312
Pulses (grams)	24	26	25	22	24	25	24
Calories	82	88	84	73	82	83	82
Fats/Oils (grams)	33	30	32	27	33	29	31
Calories	288	265	281	241	288	258	275
Vegetables (grams)	113	95	107	80	113	90	103
Calories	68	57	64	48	68	54	62
Fruits (grams)	40	34	38	21	40	30	35
Calories	34	29	32	18	34	25	30
Meat (grams)	42	34	39	20	42	30	37
Calories	59	48	55	28	59	42	52
Milk (grams)	187	201	192	170	187	191	189
Calories	199	213	204	181	199	203	201
Eggs (number)	0.16	0.14	0.15	0.07	0.16	0.12	0.14
Calories	6	5	5	3	6	4	5
Sugar (grams)	49	48	49	42	49	46	48
Calories	185	179	183	157	185	172	179
Total calories per capita per day	2266	2172	2234	1965	2266	2107	2198
% from grains	59	59	59	62	59	60	60
% from grains + oils	72	71	72	74	72	72	72
Daily per capita food expenditure (Rs.)							
all households	16.63	14.20	15.73	13.07	16.63	13.77	15.27
poor households	11.83	12.00	11.90	11.90	11.83	11.97	12.03

The average value of assets for the sample is Rs. 471,036 per household and Rs. 64,270 per person (Table 17). The value of household assets ranges from Rs. 358,138 for the non-member households to Rs. 759,989 for households in the control villages. The differences are statistically significant between the households in control villages and those (member and non-member households) in the treatment villages. It should be added that the participating and non-participating households differ very little in this respect. Since the level of debt is reasonably low across all households, the net value of assets—difference between the value of assets and outstanding debt—is quite high. The value of assets owned by the poor households is about one-half of the value of assets of all households; it ranges from 43 per cent in the non-member households to 54 per cent in the households of control villages.

The two most valuable assets are agricultural land and the family home (including land and associated structure): they account for 85 per cent of the value of assets per household, with little difference between the sub-samples. We have classified assets into three categories:

productive assets, consumer durables and savings. The share of productive assets—land being the predominant asset—is 71 per cent, but it ranges from two-thirds in the non-member households of treatment villages to three-quarters in the households of control villages. There is, however, little difference between the participating and non-participating households. Consumer durables—house being the most valuable asset—account for one-quarter of the value of all assets. The lowest share is in the households of control villages (21 per cent) and nearly 30 per cent in the non-member households of treatment villages. Again there is little difference between the participating and non-participating households. Savings—that include the more liquid assets like jewellery, bank account, loans given, or cash—are a relatively small part of the value of household assets (4 per cent) with a range of 3 to 5 per cent. These savings are equivalent to 20 per cent of the income of non-participating and 31 of the income of participating households.

Table 17. Assets of Households

Assets	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Value of assets (Rs.):							
per HH	464809	358138	428987	759989	464809	479628	471036
per capita	70474	49361	62927	70070	70474	57502	64270
Value of assets:							
% Productive	69.7	67.4	69.3	74.6	69.7	71.7	70.5
land	62.2	56.3	60.6	65.7	62.2	60.8	61.6
livestock	3.8	7.3	4.8	5.1	3.8	6.2	4.8
machinery	1.1	2.8	1.7	3.0	1.1	2.9	1.8
business	1.6	0.8	1.4	1.7	1.6	1.3	1.5
trees	1.0	0.2	0.8	0.8	1.0	0.5	0.8
% Consumer durables	25.3	29.3	26.5	20.7	25.3	25.2	25.3
house and other structures	24.1	26.7	24.8	20.0	24.1	23.4	23.8
other	1.2	2.6	1.7	0.7	1.2	1.8	1.5
% Savings	4.7	3.3	4.4	3.0	4.7	3.0	4.1
cash/account	1.8	0.4	1.4	0.4	1.8	0.4	1.2
jewellery	2.0	2.1	2.1	1.6	2.0	1.8	2.0
loans given	0.2	0.2	0.2	0.1	0.2	0.1	0.2
other	0.7	0.6	0.7	0.9	0.7	0.7	0.7
Per cent households:							
purchased assets	15.2	15.6	15.3	20.5	15.2	17.1	16.0
sold assets	16.3	25.6	19.4	23.1	16.3	24.8	19.9
Value of assets per household (Rs.):							
purchased	19678	20450	19941	88625	19678	45241	31155
sold	13752	15239	14410	120156	13752	44746	30011
Assets of poor households (Rs.)/HH	231550	155012	201669	408219	231550	232210	231866

In the preceding year, 16 per cent of the sample households purchased and 20 per cent sold some of their assets. A higher proportion of the households in control villages (21 per cent) than other households purchased assets. With regard to the sale of assets, the proportions are 16 per cent for the member and 26 per cent for non-member households of treatment villages and 23 per cent of the households in control villages. In the overall sample, there is little difference in the values of assets purchased (Rs. 31,155) and sold (Rs. 30,011) during the year, but the values of assets both purchased and sold are much higher for households in the control villages than in the treatment villages.

Table 18. Land and Livestock Holdings of Households

Landholdings and Livestock	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Per cent of households not owning land:							
all households	61.8	66.7	63.4	38.5	61.8	58.1	60.3
poor households	71.4	66.7	70.0	57.1	71.4	63.0	68.2
Per cent of owner households:							
up to 1.0 acre	9.6	10.0	9.7	12.8	9.6	10.9	10.1
>1.0 to 2.0	4.5	7.8	5.6	12.8	4.5	9.3	6.5
>2.0 to 5.0	16.3	13.3	15.3	12.8	16.3	13.2	15.0
>5.0 to 12.5	3.9	1.1	3.0	17.9	3.9	6.2	4.9
>12.5 to 25.0	2.2	1.1	1.9	5.1	2.2	2.3	2.3
>25.0 acres	1.7	0.0	1.1	0.0	1.7	0.0	0.9
Average size of holding per owner							
all households	5.60	2.73	4.72	5.13	5.60	3.80	4.80
poor households	3.88	2.03	3.10	5.71	3.88	3.50	3.75
Per cent of households not owning livestock:							
all households	46.6	36.7	43.3	12.8	46.6	29.5	39.0
poor households	46.1	33.3	41.1	4.0	46.1	24.4	35.7
Average number of livestock/HH:							
per household	3.10	3.92	3.44	3.94	3.10	3.93	3.55
poor households	1.54	1.95	1.70	3.64	1.54	2.46	1.98

As stated earlier, agricultural land is the most valuable asset—it is also a very important symbol of social status and political power—for all households that own it. But, as shown in Table 18, 60 per cent of the sample households do not own land with almost two-thirds among the non-member households in treatment villages and 39 per cent among the households of control villages. The difference between the participating and non-participating households is quite small, with 62 per cent of households in the former and 58 per cent in the latter group are landless. The incidence of landlessness is even higher among the poor households: in the overall

sample 68 per cent of these households own no land and the proportion ranges from 57 per cent in the control villages to nearly 72 per cent in the member households. The high level of landlessness combined with an equally high level of dependence on farming indicates the importance of (sharecropping) tenancy in these villages. The average size of owner holding is about 5.0 acres per household, with about 3 acres per owner household among the non-members and nearly 6 acres among members in the treatment villages. The average size of holding for the poor land-owning households is 3.75 acres and varies from 2 acres for the non-member households to 5.6 acres for households in the control villages.

Sixty-one per cent of the sample households and 64 per cent of the poor households own livestock. A much higher proportion of households (87 per cent) in the control villages than in treatment villages own livestock. The average number of livestock per household ranges between 3 and 4: 48 per cent of all households and 53 per cent of poor households own one to four heads of livestock. The average livestock holding for the poor households is about one-half of the sample households. A striking feature in the sample of control villages is that 96 per cent of the poor households own on average about 4 heads of livestock.

Table 19. Loans Taken by Households in 2003/2004

Loans	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Average amount of loan per HH (Rs.)	52893	16754	40365	24354	52893	19154	38156
% HH taken loans	55.1	57.8	56.0	61.5	55.1	58.9	56.7
% of loan amount from:							
friends & relatives	14.7	55.9	20.7	6.9	14.7	36.3	19.4
shopkeepers	22.1	19.4	21.8	58.5	22.1	35.1	25.0
banks	38.4	15.7	35.1	12.0	38.4	14.2	33.1
co-operatives	0.0	0.0	0.0	0.0	0.0	0.0	0.0
community organisation	4.8	0.0	4.1	0.0	4.8	0.0	3.7
government	5.8	0.0	5.0	0.0	5.8	0.0	4.5
other sources	14.2	9.0	13.4	22.6	14.2	14.4	14.3

8. Household loans: amount, sources and uses

The average size of loan taken in 2003/2004 is Rs. 38,156 per household, with the largest amount (Rs. 52,893) reported by the member households and the lowest amount (Rs. 16,754) by non-members in the treatment villages (Table 19). Given the average loan size of Rs. 24,354 for households in the control villages, the difference between the participating and non-participating households is about Rs. 33,000. The average loan amount for the sample households is equivalent to 53 per cent of the annual household income, with three-quarters in the member households and less than one-quarter in the households of control villages. Fifty-seven per cent of the sample households took loans during the year with little difference in the proportions

among the member and non-member households (55 and 58 per cent), but 62 per cent of households in the control villages reported loans.

Banks appear to be the single largest source of loans, accounting for one-third of the total loan amount, especially for the member households in treatment villages. Shopkeepers and moneylenders provided one-quarter of the loan amount, but they made up 59 per cent of the loan amount borrowed by households in the control villages. Friends and relatives contributed just about one-fifth of the value of loans, but they were a major source of loans to the non-member households of treatment villages, accounting for 56 per cent of the loan amount. The contribution of community organisations is quite limited because most of them were formed recently. The share of unspecified sources of loans, most probably friends and moneylenders, is not insignificant, with 14 per cent for the overall sample and as high as 23 per cent reported by households in the control villages.

Let us look at the use of these loans in Table 20. We classify the loan use into five categories: production, consumption and social functions, housing, education and health, and repaying loan. Thirty per cent of the loan amount was used for production purposes, including purchase of farm inputs, business (material and stocks), land and livestock, and machinery. The households in control villages used 55 per cent of the loan amount for production, followed by the member (28 per cent) and non-member (21 per cent) households of treatment villages. The shares of loan amount used for business in the households in control villages and for land in the non-member households of treatment villages are quite significant. The use of loans for consumption and social functions seems to be fairly similar across the board, ranging between 20 and 24 per cent, with almost no difference between the participating and non-participating households (22 per cent each). Housing (repairs and construction) appears to be an important item in the member households, accounting for about 38 per cent of the total loan amount, with nearly 14 per cent in the other two sub-samples. Loans were important for health care in the non-member households of treatment villages, claiming 36 per cent of the borrowed amount, and almost no amount was used for education.

Table 20. Use of Loans by Households, 2003/2004

Use of Loans	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
% of loan amount used:							
productive purpose	28.3	21.1	27.1	55.2	28.3	34.8	29.6
land	3.1	13.8	4.6	10.3	3.1	12.4	5.1
livestock	1.2	0.6	1.1	0.9	1.2	0.7	1.1
machinery	4.3	0.0	3.7	0.0	4.3	0.0	3.3
farm inputs	12.3	4.4	11.1	16.1	12.3	9.1	11.6
business	7.4	2.3	6.6	27.9	7.4	12.6	8.5
consumption &social functions	22.1	24.4	22.5	19.5	22.1	22.3	22.2
housing	38.0	16.2	34.8	12.8	38.0	14.8	32.9
education & health	4.6	36.0	9.2	8.0	4.6	24.8	9.1
repaying loan	5.4	0.0	4.6	4.4	5.4	1.8	4.6
other purposes	1.6	2.4	1.7	0.0	1.6	1.5	1.6

9. Household debt

In Table 21, we show the estimated household debt in terms of both the amount of outstanding loans and number of households in debt. The average amount of debt per household is Rs. 32,590, with the highest level in the member households (Rs. 46,506) and the lowest in the non-member households (Rs. 16,017) of treatment villages. The average debt levels for the sub-samples have the same pattern as for loans shown in Table 19. The debt-income ratio for the overall sample is 45 per cent, with a range of 18 per cent (control villages) to 66 per cent (member households). The participating households have three times the debt-income ratio of non-participating households.

Forty-six percent of the sample households are in debt, with 42 per cent of the participant and 51 per cent of non-participant households. There is little difference between the non-member households in treatment villages and the households in control villages. The debt owed to various sources in terms of their shares in the outstanding amount of loans follows a similar pattern as reported for the sources of loans in Table 19.

Table 21. Current Debt of Households

Debt	Treatment Villages			Control Villages	All Villages		
	Member	Non-member	Total		Member	Non-member	Total
Average amount of debt/HH (Rs.)	46506	16017	35072	18405	46506	16777	32590
Per cent of households in debt	42.1	50.0	44.8	53.8	42.1	51.2	45.9
Per cent of debt to:							
friends & relatives	12.8	52.0	19.5	6.3	12.8	36.1	18.4
shopkeepers	18.3	20.1	18.6	54.9	18.3	32.2	21.7
banks	48.1	18.5	43.1	18.1	48.1	18.3	41.0
co-operatives	0.0	0.0	0.0	0.0	0.0	0.0	0.0
community organisation	2.6	0.0	2.2	0.0	2.6	0.0	2.0
government	7.1	0.0	5.9	0.0	7.1	0.0	5.4
other sources	11.0	9.4	10.7	20.7	11.0	13.4	11.6

10. Perceptions of problems

We interviewed men and women separately about their perceptions of problems listed by us that may seem important to them at the household and village levels. All 307 men respondents and 54 women respondents have recorded their perceptions.[9] They were asked to rank each problem on a scale ranging from zero to three, indicating the severity of problem in an ascending

[9] Three women, not selected randomly, were interviewed in each village, excluding one village each in Khairpur and Jacobabad. Fifty per cent of the men's responses reflected no opinion.

order: no problem [0], slight problem [1], serious problem [2], and very serious problem [3]. The recorded scores are shown in Table 22.

Table 22. Ranking of Problems by Men and Women

Problem	Women's perceptions					Men's perceptions					
	0	1	2	3	Responses	0	1	2	3	Responses	All
Education	21	5	19	9	54	2	47	54	41	144	307
Health care	3	8	14	29	54	3	47	62	111	223	307
Water supply	32	0	10	12	54	1	49	32	13	95	307
Drainage	2	3	24	25	54	1	55	97	83	236	307
Street pavement	19	12	23	0	54	1	78	71	29	179	307
Transport	20	0	21	13	54	3	57	38	13	111	307
Fuel supply	4	7	26	17	54	11	47	13	3	74	307
Electricity	40	3	5	6	54	2	34	18	39	93	307
Income (poverty)	4	5	24	21	54	4	68	88	75	235	307
Jobs/employment	18	14	20	2	54	3	46	70	82	201	307
Savings	5	11	26	12	54	2	81	69	66	218	307
Access to credit	24	6	19	5	54	2	61	49	22	134	307
Social cohesion	14	7	25	8	54	3	30	21	3	57	307
Organisation	9	89	14	23	54	24	33	67	26	150	307
	215	89	270	182	756	62	733	749	606	2150	4298

In the case of women the most important feature is that 60 per cent of the responses are in the serious and very serious problem categories. According to them, the most important problems are (i) poor drainage, (ii) low income (or poverty), and (iii) inadequate health care facilities, and (iv) shortage of fuel supply. It should be noted that, with inadequate health care and poor drainage, poor organisation at the community level is considered among the most serious problems by a significantly large number of women. The least important problems are (i) absence of electricity, (ii) unemployment, and (iii) paucity of water. The perceptions of men are not that different from women. Sixty-three per cent of the men's responses to the listed problems are in the serious and very serious categories. The three most important problems for men are the same as those identified by women and in the same order, namely, (i) poor drainage, (ii) low income (poverty), and (iii) inadequate health care facilities. Low level of savings and unemployment are the next set of problems of concern to them.

Chapter 1: Appendix I

1. HOUSEHOLD QUESTIONNAIRE

Respondent _____ Number_____

101Age____(yrs) 102Not Lit.__ 103Lit.__ 104Primary__ 105Middle__ 106Matric__ 107Post-Matric__
108Farming__ 109Labour__ 110Service__ 111Business__ 112Other Work__ 113Not Working__

200 Household Composition

up to one year		over 1 to 5		over 5 to 10		over 10 to18	
M	F	M	F	M	F	M	F
201___	202___	203___	204___	205___	206___	207___	208___

over 18 to 24		over 24 to 55		over 55 to 65		over 65 years	
M	F	M	F	M	F	M	F
209___	210___	211___	212___	213___	214___	215___	216___

300 Work Status

	over 10 to 18		over 18 to 55		over 55 years	
	M	F	M	F	M	F
Household Work	301___	302___	303___	304___	305___	306___
Own Farming	307___	308___	309___	310___	311___	312___
Farm Labour	313___	314___	315___	316___	317___	318___
Off-farm Labour	319___	320___	321___	322___	323___	324___
Service/Job	325___	326___	327___	328___	329___	330___
Business	331___	332___	333___	334___	335___	336___
Other	337___	338___	339___	340___	341___	342___
Not Working	343___	344___	345___	346___	347___	348___

400 Adult Literacy

	M	F
Not Literate	401___	402___
Literate	403___	404___
Primary	405___	406___
Middle	407___	408___
Matric	409___	410___
Intermediate	411___	412___
Degree	413___	414___
Diploma	415___	416___

500 Children in School

	Up to 5 years		over 5 to 10 years		over 10 to 18 years		over 18 to 24 years	
	M	F	M	F	M	F	M	F
Not in School	501___	502___	503___	504___	505___	506___	507___	508___
Primary school (1-5)	509___	510___	511___	512___	513___	514___	515___	516___
Middle school (6-8)	517___	518___	519___	520___	521___	522___	523___	524___
High school (9-10)	525___	526___	527___	528___	529___	530___	531___	532___
College (11-14)	533___	534___	535___	536___	537___	538___	539___	540___
Higher (15 & over)	541___	542___	543___	544___	545___	546___	547___	548___

600 Health Status

	up to one yr		over 1 to 5		over 5 to 10		over 10 to 18		over 18 to 55		over 55 yrs	
	M	F	M	F	M	F	M	F	M	F	M	F
Good	601___	602___	603___	604___	605___	606___	607___	608___	609___	610___	611___	612___
Fair	613___	614___	615___	616___	617___	618___	619___	620___	621___	622___	623___	624___
Poor	625___	626___	627___	628___	629___	630___	631___	632___	633___	634___	635___	636___
Death	637___	638___	639___	640___	641___	642___	643___	644___	645___	646___	647___	648___

700 Household Income (Rs.)

701Crops_____ 702Livestock_____ 703Business_____ 704Service_____
705Labour_____ 706Pension_____ 707Rents_____ 708Remittances_____
709Gift/Cash_____ 710Other_____

800 Household Expenditure (Rs.)

801Food_____ 802Clothing_____ 803Housing_____
804Health Care_____ 805Education_____ 806Social Functions_____
807Transport_____ 809Remittances_____ 809Other Expenses_____

900 Household Food Consumption (in kg per week)

901Wheat___ 902Rice___ 903Millets___ 904Maize___ 905Pulses___ 906Vegetables___ 907Fruits___
908Beef___ 909Mutton___ 910Poultry___ 911Fish___ 912Eggs (No.)___ 913Milk___ 914Sugar___
915Fat/Oils___

1000 Assets

	Number	Value (Rs.)		Number	Value (Rs.)
Land (acres)	1001____	1002_____	House	1019____	1020_____
Trees	1003____	1004_____	Other Structure	1021____	1022_____
Livestock	1005____	1006_____	Motorcycle	1023____	1024_____
Poultry	1007____	1008_____	Bicycle	1025____	1026_____
Tractor	1009____	1010_____	Sewing Machine	1027____	1028_____
Thresher	1011____	1012_____	TV/Radio	1029____	1030_____
Cart/Trolley	1013____	1014_____	Savings (cash, etc)	1031xxxxx	1032_____
Tubewell/Pump	1015____	1016_____	Loans Given	1033xxxxx	1034_____
Shop/Business	1017xxxx	1018_____	Jewellery	1035xxxxx	1036_____
			Other Assets	1037xxxxx	1038_____

1100 Assets Purchased/Sold

1101 Assets Purchased (Rs.)_____ 1102Loan___ 1103Cash/Saving___ 1104Gift___
1105Assets Sold (Rs.)_____ 1106Meet Expenditure___ 1107Repay Loan___

1200 Loans (Rs.)

	Amount Taken	Amount Owed		Amount Taken	Amount Owed
Friends/Relatives	1201_____	1202_____	Shopkeepers	1203_____	1204_____
Banks	1205_____	1206_____	Government	1207_____	1208_____
Community Org.	1209_____	1210_____	Others	1211_____	1212_____

1300 Use of Loans (Rs.)

1301Land_____ 1302Livestock_____ 1303Machinery_____
1304Farm Inputs_____ 1305Business_____ 1306Housing_____
1307Consumption_____ 1308Social Functions_____ 1309Health Care_____
1310Education_____ 1311Repay Loans_____ 1312Other Uses_____

1400 Housing Facilities

House Structure	Water Supply	Latrine	Drainage	Electricity	Fuel/Energy
1401Pucca___	1405Piped___	1409Inside___	1411Yes___	1413Yes___	1415Gas___
1402Katcha___	1406Canal___	1410Outside___	1412No___	1414No___	1416Wood___
1403P&K___	1407Well___				1417Kerosene___
1404Rooms (No.)___	1408Other___				1418Other___

1500 Major Constraints/Problems

Problem	Men	Women	Problem	Men	Women
1501Education	___	___	1502Health care	___	___
1503Water Supply	___	___	1504Drainage	___	___
1505Street Pavement	___	___	1506Transport	___	___
1507Fuel Supply	___	___	1508Electricity	___	___
1509Income (Poverty)	___	___	1510Jobs/Employment	___	___
1511Savings	___	___	1512Access to Credit	___	___
1513Social Cohesion	___	___	1514Organisation	___	___

Note: Rank each problem from 0 to 3, where 0=no problem (or not sure); 1=slight problem; 2=serious problem; and 3=very serious problem.

1600 CO Membership

Member (months) 1601_____ Training Yes1602____ No1603____ CO Saving (Rs.) 1604_____
CO Loans: (No.) 1605_____ Amount (Rs.) 1606_____ Outstanding (Rs.) 1607_____
Loan Default: Yes1608_____ No1609_____ Labour given for PPI: Yes1610_____ No1611____

1700 CO Benefits

Benefit	Men	Women	Benefits	Men	Women
1701Credit (loans)	___	___	1702Skills	___	___
1703Village Infrastructure	___	___	1704Personal Empowerment	___	___
1705Social Cohesion	___	___	1706Access to Public Services	___	___
1707Access to Technology	___	___	1708Access to Markets	___	___
1709Conflict Resolution	___	___	1710Improved Natural Resources	___	___

Note: Rank each benefit from 0 to 3, where 0=no benefit (or not sure); 1=slight benefit; 2=significant benefit; and 3=very significant benefit.

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2. VILLAGE QUESTIONNAIRE

1800 VILLAGE INFRASTRUCTURE

Electricity	Yes 1801_____	No 1802_____	Hand Pump	Yes 1809_____	No 1810____
Telephone	Yes 1803_____	No 1804_____	Drains	Yes 1811_____	No 1812____
Piped Water	Yes 1805_____	No 1806_____	Cobbled Path	Yes 1813_____	No 1814____
Tubewell	Yes 1807_____	No 1808_____	Shops/market	Yes 1815_____	No 1816____

1900 DISTANCE TO INFRASTRUCTURE AND SERVICES (KM)

Metalled Road	1901_____	Agriculture Office	1909_____	Primary School (M)	1917_____
Bus/Wagon Stop	1902_____	Veterinary Office	1910_____	Primary School (F)	1918_____
Railway Station	1903_____	Dispensary (RHC)	1911_____	Middle School (M)	1919_____
Mandi/Market	1904_____	Hospital (UHC)	1912_____	Middle School (F)	1920_____
Factory	1905_____	Medical Store	1913_____	High School (M)	1921_____
Post Office	1906_____	Medical Doctor	1914_____	High School (F)	1922_____
PCO	1907_____	Lady Health Visitor	1915_____	College (M)	1923_____
Bank	1908_____	Other Health Worker	1916_____	College (F)	1924_____
				Library	1925_____

2000 VILLAGE PRICES (RATES)

2001	Wheat	Rs._____per kg	2009	Beef	Rs._____per kg
2002	Rice	Rs._____per kg	2010	Mutton	Rs._____per kg
2003	Maize/Corn	Rs._____per kg	2011	Poultry	Rs._____per kg
2004	Millets	Rs._____per kg	2012	Eggs	Rs._____per egg
2005	Pulses	Rs._____per kg	2013	Fish	Rs._____per kg
2006	Fat/Oils	Rs._____per kg	2014	Milk	Rs._____per kg
2007	Vegetables	Rs._____per kg	2015	Sugar	Rs._____per kg
2008	Fruits	Rs._____per kg			

2100 COMMUNITY ORGANISATION STATISTICS

Started (months)2101_____ Number of Members: At start2102_____ At present2103_____
CO Savings (Rs.): at start2104_____ At present (Rs.)2105_____
Loans Disbursed: Number2106_____ Amount (Rs.)2107_____
Loans Outstanding: Number2108_____ Amount (Rs.)2109_____
PSI: Number2110____ Value (Rs.)2111_____ Training: Number2112____

Guide to Household and Village Questionnaires

NOTE: COMPLETE THE VILLAGFE QUESTIONNAIRE FIRST.

1. Household Questionnaire

1. "Household" means a family living normally together and sharing the kitchen on a regular basis. In addition, its resources (income, etc.) are pooled and controlled by one person.
2. Respondent should be either the head of household or an (adult) alternate who knows the household conditions in detail.
3. Write full name of respondent and assign a number to identify the questionnaire.
4. 101: Write number of years.
5. 102-107: Write **X** in front of only one of these.
6. 103(Lit.): It means the person (respondent) can read and write but never went to school.
7. 108-113: Write **X** in front of only one of these numbers, whichever uses most of the respondent's time.
8. 201-216: Write number of male and female household members in each of the given age groups. Include the respondent in the count as well.
9. 301-348: Write number of males and females in each age group according to their work status. Include the respondent as well. Make sure that the total number counted here matches the number of males and females shown in the household composition in the age groups of over 10 years (207-216).
10. 401-416: Write number of male and female adults (those above 18 years of age) in each category of educational achievement. Include the respondent as well. Literate means that the person can read and write but did not go to any school. Make sure that the number of male and female adults counted here matches the number of male and female adults shown in the household composition (209-216).
11. 501-548: Write number of males and females in each of the given age groups according to the current status (at the time of survey) with regard to schooling. Make sure that the number counted here for male and female children in each age group matches the number counted in the household composition for males and females in these age groups (201-210).
12. 601-636: There are three current (at the time of survey) states of health with regard to each member of the household including the respondent. Make sure that the total number of males and females in each age group matches the total number counted in the household composition (201-216).
13. 601-612: Write number of males and females in each age group that the respondent considers are in "good" health—no health problem at all—at the time of the survey.
14. 613-624: Write number of males and females in each age group that the respondent considers are in "fair" health—minor health problem—at the time of the survey.
15. 625-636: Write number of males and females in each age group that the respondent considers are in "poor" health—chronic health problem—at the time of the survey.
16. 637-648: Write number of deaths of males and females in the age groups reported for the period of 12 months preceding the survey.
17. 701-710: Write last year's (12 months preceding the survey) income in each case. Income from crops, livestock and business must exclude expenses or costs. A rule of thumb for the cost of crops is to assume that it is 35-40 per cent of the value of all crops (total output multiplied by the village price). For livestock the allowance can range from 25 to 33 per cent of the total value of output (milk and eggs). For business the allowance can range from 30-40 per cent of the total revenue (per month or per year).

18. 801-809: Write last year's (12 months preceding the survey) expenditure in each case. For food expenditure, first get the data on weekly food consumption (901-914) and multiply it by the average price of each food item (in the village) and convert it to 12 months. The average price at the village level should be collected in the village questionnaire first. Then add 10-15 per cent (for cost of beverages, cooking, etc.) to the calculated amount to get the total food expenditure.
19. 901-914: Write the amount for each item (in kilograms), except for eggs (write number of eggs) consumed on a weekly basis by all members of the household.
20. 1001-1038: Write number for each asset where applicable and in each case write the value in Rupees of the asset at the time of survey according to the respondent's estimate.
21. 1101-1105: Write the value (in Rupees) of assets purchased and sold during 12 months preceding the survey.
22. 1102, 1103, 1104: Write **X** in front of only one of these as the source of money (resources) to purchase assets during the year.
23. 1106,1107: Write **X** in front of only one as the reason for selling assets during the year.
24. 1201, 1203, 1205, 1207, 1209, 1211: Write the amount (in Rupees) of loan taken from these sources during 12 months preceding the survey.
25. 1202, 1204, 1206, 1208, 1210, 1212: Write the amount (in Rupees) of loan outstanding at the time of survey.
26. 1301-1312: Write the amount (in Rupees) of loan used in each case during 12 months preceding the survey. The total amount should not exceed the total amount of loan taken during the last 12 months (1201+1203+1205+1207+1209+1211).
27. 1401, 1402, 1403: Write **X** "in front of only of the these three.
28. 1404: Write the number of rooms in the family house.
29. 1405-1408: Write **X** in front of only one.
30. 1409,1410: Write **X** in front of only one.
31. 1411,1412: Write **X** in front of only one.
32. 1413, 1414: Write **X** in front of only one.
33. 1415-1418: Write **X** in front of only one.
34. 1501-1514: This question should be posed to every respondent. "Problem" means absence or lack of the listed infrastructure, facility, service, etc. Write 0, or 1, or 2 or 3 in front of each problem.
35. 1601-1611: These items are relevant only to members of a community organisation (CO). Check the data with the respondent—if he/she is a CO member—and the social organiser (SO).
36. 1701-1710: This question is relevant only to CO members. "Benefits" perceived by respondent of CO membership. Write 0, or 1, or 2, or 3 in front of each benefit.

2. Village Questionnaire

1. 1801-1816: Write **X** on only in front of yes or no.
2. 1901-1929: Write the distance (in KM) of each of the listed infrastructure, facility, service, starting from 0 KM (if within the village).
3. 2001-2015: Write the price (Rupees per Kg) of each item in the village at the time of survey.
4. 2100-2112: These numbers (data) are applicable only to COs and should be taken from the SO.

Chapter 1: Appendix II

Sample Villages in the Sindh Rural Support Organisation Survey

Village/CO	Union Council	District	Treatment Villages		Control Villages	All Villages
			Member	Non-member		
Jhanja	Panhwar	Sukkur	12	6		18
Nehal Khan Korie	Ali Wahan	Sukkur	12	6		18
Bajwa	Arore	Sukkur	12	6		18
Niaz Ahmed Khoso	Panhwar	Sukkur			8	8
Al-Shaikh	Ruk	Gothki	12	6		18
Sadiq Malik	Ruk	Gothki	12	6		18
Abdul Rahim Mirbhar	Ruk	Gothki	12	6		18
Allah Dad Arbani	Ruk	Gothki			8	8
Murad Ali Jatoi	Babar Loi	Khairpur	12	6		18
Fazil Shah Bukhari	Babar Loi	Khairpur	12	6		18
Al-Hussaini	Babar Loi	Khairpur	12	6		18
Mohammad Eiden Tunio	Babar Loi	Khairpur			8	8
Makhoolpur	Hamayoon	Shikarpur	12	6		18
Salehpur	Hamayoon	Shikarpur	12	6		18
Peer Bux Lehi	Hamayoon	Shikarpur	12	6		18
Ghulam Husain Katohar	Hamayoon	Shikarpur			8	8
Abdul Rahman Suthio	Mirpur Buriro	Jacobabad	12	6		18
Qadir Bux Soomro	Mirpur Buriro	Jacobabad	12	6		18
Karam Ali Lashari	Mirpur Buriro	Jacobabad	12	6		18
Mullah Sodo Buriro	Mirpur Buriro	Jacobabad			8	8
Grand Total			180	90	40	310

Note: The total number of respondents interviewed is 307. Two respondents in CO villages and one in a control village could not participate in the survey.

CHAPTER 2. ASSESSMENT OF PROJECTS AND PROGRAMME COMPONENTS

There are two basic issues in the context of assessment of projects or programme components. First, we should know if the investment in a project or programme intervention is worthwhile by comparing its costs with benefits. Second, it is important to estimate the distribution of benefits of the project or programme intervention. The appraisal of projects is done both before the decision to invest is made—*ex ante* evaluation—and after the project has been completed and its outputs (benefits) being produced and distributed—*ex post* evaluation.[10] The *ex ante* evaluation is necessary to make selection among mutually exclusive projects or components: which of the options is likely to be the best in terms of its financial or economic profitability. The *ex post* evaluation is done to assess the realised (actual) net benefits of the project and their distribution in the community. Both evaluations must compare the situations *without* and *with project* to estimate the net benefits.

Since the RSP/CO projects are generally small in size and intended to produce economic and social benefits for the community, it may not be necessary in all cases to do an *ex ante* evaluation. In the case of relatively large-scale projects, such as watercourses and small dams, land development and forestry schemes, it would be reasonable to go through the exercise to make sure that the investment is worthwhile. However, it makes good sense to conduct an *ex post* evaluation of projects to assess the net benefits and their distribution among the participants. In this chapter, we explain in simple terms some of the important issues in project evaluation of direct relevance to the RSP practitioners.

1. Costs and Benefits of Projects

All costs and benefits should be quantified, although we may not know the value of all costs and benefits. Relatively speaking costs are easier to compute than benefits. For one thing, a large proportion of the former is accrued earlier in a relatively short time, whereas benefits flow later and over a longer period. However, in both cases, we must include both direct and indirect costs and benefits. Needless to add, the direct costs and benefits are easier to identify than indirect costs and benefits. In the *ex ante* evaluation of projects, it is important to take account of uncertainty about costs and benefits by suitable sensitivity analysis. The valuation of costs and benefits of a project depends on the effect an investment project has on the supply of and demand for inputs and outputs. This effect is, however, not relevant to small projects generally implemented by RSPs/COs.

[10] Several studies can be used as guides to conduct the financial and economic analysis of projects. Perhaps the most practical one for RSPs is the Asian Development Bank's *Guidelines for the Economic Analysis of Projects* (1997). It is now incorporated in the Bank's CD-ROM titled *Economic Analysis of Projects*, Manila: Asian Development Bank, January 2001. Other useful studies are by Curry and Weiss (2000), Belli and others (2001), and Campbell and Brown (2003).

1.1. Identification of Costs and Benefits

A good starting point for identifying the costs and benefits of a project is to distinguish between financial and economic analysis. *Financial analysis* looks at the project from the perspective of the implementing agency in the public sector or private investor: it identifies the project's net money flows and assesses the ability of implementing agency (or the owner) to meet its financial obligations and to finance future investments. *Economic analysis*, on the other hand, looks at a project from the perspective of the society (country) and measures the effects of the project on the economy (community). Financial analysis assesses cost items that entail money outlays and economic analysis assesses the opportunity cost for the country. Since markets are usually distorted by private monopoly rents and government taxes, subsidies or price controls, market prices received for outputs and paid for inputs do not reflect the opportunity cost of resources to the society. For example, pollution is an economic but not financial cost and tax (or subsidy) is a financial but not economic cost. Therefore, some costs and benefits may be excluded from or included in the financial and economic analyses of projects. With respect to the cost of investment, operations, and working capital (inventories) required in a project, we can identify the following differences between financial and economic analysis.[11]

	financial analysis	economic analysis
Sunk costs	no	no
Taxes and subsidies	yes	no
Donations (volunteer services)	no	yes
Interest payments (debt service)	no	no
Depreciation	yes	yes
Physical contingencies	yes	yes
Negative externalities (pollution costs)	no	yes
Positive externalities	no	yes

1.2. Valuation of Costs and Benefits

Project outputs (goods and services) may be incremental and/or non-incremental. *Incremental output* is that which the project adds to the existing output: e.g., new traffic (freight, etc.) by reducing the cost of transport. *Non-incremental output* of a project is that which displaces other supplies. For example, a road project may draw freight traffic away from rail transport as well as lowering the cost for users: the total freight is unchanged but a higher proportion of it goes by road. The basic principles for valuation of outputs and inputs should be well understood. For outputs, the incremental output is valued by the users' willingness to pay and the non-incremental output is valued by the resource costs saved. For inputs, the incremental demand is valued by the economic cost of extra supply and the non-incremental demand is valued by the project's willingness to pay for obtaining the supplies or the existing users' willingness to pay to retain the supplies. Needless to add, the outputs and inputs of most projects do not affect the world market: they are too small.

We should also keep in mind that both outputs and inputs may be *tradable* (but not always traded) or *non-tradable* (non-traded). Tradable goods and services are those that enter

[11] Sunk costs—past is past—are excluded because they would exist without and with project. With respect to benefits, positive externalities should be taken into account in the economic analysis of projects.

into trade between countries and have implications for the balance of trade of a country. Non-tradable goods and services do not normally enter into foreign trade, hence do not affect a country's balance of trade. There are several reasons for some goods and services not traded between countries:

- physical immobility and high transport costs;
- quality difference in products sold in foreign and domestic markets; and
- government restrictions.

In the financial and economic analysis of projects, we can use both current (nominal) prices and constant (real) prices) of outputs and inputs. Current prices include inflation, but constant prices are corrected for inflation. Constant prices allow us to compare future costs and benefits in the same units as costs and benefits measured when the decision for investment is made. The common practice is to use constant and not current prices, including the discount rate: $r^* = (1+r)/(1+p) - 1$, where r is the nominal discount rate and p is the annual rate of inflation. It should be added that relative prices might change over time: prices of some goods (e.g. agriculture) may fall and prices of other goods (e.g. energy) may rise. These changes should be foreseen and accounted for.[12] Finally, financial prices may diverge from economic prices because of market distortions. Prices paid or received in the market for goods and services may not reflect their true resource (opportunity) cost to the economy (society). If there is significant unemployment of, say, unskilled labour, then the market wage may be higher than the opportunity cost of that labour. The market price of capital goods may be much lower than the true resource cost because of the overvalued exchange rate and distortions in domestic markets. Similarly, a country's currency may be overvalued because of government intervention through taxes, subsidies, etc.

Since the common practice is to use domestic prices, denominated in local currency, for financial analysis, it makes sense to do the same for economic analysis with proper adjustments in prices (shadow prices) of both tradable and non-tradable goods and services.[13] We explain these adjustments in Appendix I and illustrate the application of these concepts in the context of an irrigation project, using the relevant project appraisal criteria described in the next section.[14]

2. Criteria for Project Appraisal

Since the costs and benefits of projects flow over time, we must discount the costs and benefits that occur in the future. The fact is that the costs incurred later and benefits received earlier are preferred. Consider an example. Would you prefer to receive Rs. 1,000 today or a year later? Why would you prefer receiving this amount today? Three possible reasons ca be given for this choice:

[12] See the World Bank's report titled *Commodity Markets and the Developing Countries*, Washington, D.C.

[13] The alternative convention is to use the border (world) price expressed in either foreign or local currency.

[14] The example of irrigation project, shown in Appendix I, is adapted from Curry and Weiss (2000), Chapters 5 and 6.

- uncertainty about the future
- pure time preference
- opportunity cost of funds

Take the last factor. Say you can get a safe return of 10% per year on a deposit of Rs. 1,000 or Rs. 1,100 at the end of one year: 1,000(1+0.10) = 1,100. This is clearly preferable to receiving Rs. 1,000 a year from now. You can draw the same conclusion in another way. Receiving Rs. 1,000 a year from now is equivalent to receiving Rs. 909 today: [1,000/(1+0.10)]. Why? Because that's the amount, which if put in a bank, with interest added, results in Rs. 1,000 = 909(1+0.10). We can generalise from this example. A Rupee received today is worth more than a Rupee received after t periods, because the Rupee received today can be invested and earn interest through time. Let r be the interest rate. In one year, it adds up to (1+r); in two years, it is $(1+r)^2$, and so on. Conversely, a Rupee received one year from now will be worth 1/(1+r) today and in two periods $1/(1+r)^2$.

So the costs incurred and benefits received in the future—in different points in time—must be converted to their *present* (current) *values* with which to compare them at the time when you are making the decision (at present). The present discounted values of benefits and costs can be written:

$$PVB = \sum [1/(1+r)^{t-1} B_t]$$
$$PVC = \sum [1/(1+r)^{t-1} C_t]$$

The present discounted value of a stream of net benefit $(B_t - C_t)$ is called the net present value (NPV):

$$NPV = \sum [1/(1+r)^{t-1} (B_t - C_t)]$$

NPV of a finite annuity that pays Rupees α every year for T years, starting a year from now, will be $= \alpha/(1+r) + \alpha/(1+r)^2 + \ldots. + \alpha/(1+r)^T$.

Choosing the value of discount rate (r) is crucial in calculating the present discounted values of costs and benefits. This rate may be different for the private and public sector projects and may change over time. How do you measure the opportunity cost of capital for the society? The convention is that for a relatively rich country you use a relatively low value (5-7% per year) and for a relatively poor country you use a relatively high value (10-12% per year).

Three criteria are commonly used for estimating the financial and economic profitability of projects.[15]

1. Net Present Value (NPV) is simply the difference between the present discounted values of benefits and costs

$$NPV \equiv PVB - PVC = \sum [1/(1+r)^{t-1} (B_t - C_t)]$$

[15] The fourth criterion, payback period, measures how quickly the initial outlays are recovered or recouped given the cash flow profiles of projects—net outflow followed by net inflow of cash. It has, however, no basis in economic theory.

A project is worthwhile if NPV>0, since it generates a better return than investing in the benchmark alternative. If there are mutually exclusive projects, then choose the one with the highest NPV (surplus). The net present value criterion is the clearest and most reliable indicator of a project's feasibility. It gives a clear indication of the absolute amount by which the economy or project owners will be better off: it gives the size of surplus generated by the project. However, the highest value of NPV may not always yield the right answer because:

- there is an overall budget constraint;
- the scale and timing of projects may be quite different;
- projects being appraised can be split up into smaller separable components; and
- the discount rate is difficult to know.

2. Internal Rate of Return (IRR) is that rate at which the present value of future costs and benefits are equalised (PVB = PVC) or the NPV is zero at this rate.

$$\sum [1/(1+r)^{t-1} (B_t - C_t)] = 0 \Leftrightarrow I = IRR$$

The internal rate of return is estimated by trial and error. If IRR>r (discount rate), then the project should be undertaken. Among mutually exclusive projects, select the one with the highest IRR. The main advantage of IRR is that it offers a way of comparing projects when it is unclear what the appropriate discount rate ought to be. But there are problems with IRR:

- projects with net cash flow/benefit profiles that go from being negative to positive more than once during the lifetime of the project may have multiple IRR; and
- even if there is one (unique) IRR, it may be misleading because projects may differ widely with respect to scale, size and timing.

3. Benefit-Cost Ratio (BCR) is the ratio of the present value of benefits to the present value of costs:

$$BCR = PVB/PVC = \sum [1/(1+r)^{t-1} B_t]/\sum [1/(1+r)^{t-1} C_t]$$

Projects with BCR>1 should be undertaken and, among mutually exclusive projects, the one with the highest BCR should be selected. Of course, any project that has NPV>0 will satisfy this criterion. BCR can give misleading results to choose between mutually exclusive projects for at least two reasons:

- labelling of costs and benefits are based often on fairly arbitrary accounting rules, hence can inflate or deflate the ratio of benefits to costs; and
- projects may differ significantly in scale.

3. Least-Cost and Cost-Effectiveness Analysis

For projects that deliver the same benefits (outcomes) or their benefits can be quantified but cannot be valued—this is especially relevant to the social sector projects—we can use the least-cost and cost-effectiveness analysis, respectively. Let us consider them separately.

3.1. Least-Cost Analysis

Least-cost analysis applies to projects where the benefits can be valued or they take the form of a single commodity (e.g., treated water and power). Basically we compare the costs of mutually exclusive projects (technologies) and select the one with the lowest cost. Take a water project: either more efficient management of the existing water supply system (option A) or augmenting the water supply (option B). Here the output is the same, but the two methods are mutually exclusive options. Two approaches can be adopted.

In the first approach, estimate the present value of costs (PVC) of alternatives A and B and choose the least cost alternative. At a discount rate of 12%, the two options have the same PVC. At a discount rate lower than 12% the PVC of A has a lower PVC than B, but at a discount rate higher than 12% B has a lower PVC than A. The principle of choice between the two alternatives is that, given a discount rate (r), choose the one with the lowest PVC. It should be noted that the least-cost analysis does not address the question whether the lowest-cost alternative is necessarily acceptable. We must compare the present values of streams of benefits and costs of the lowest-cost alternative for determining its present worth.

In the second approach, we estimate the incremental cost of each alternative to identify the one with the lowest cost per unit of output during the lifetime of the project. The average incremental (economic) cost (AIC) is estimated as:

$$AIC = \sum_{t=0}^{T} [C_t/(1+r)^t] \div \sum_{t=0}^{T} [O_t/(1+r)^t]$$

where C_t = incremental cost, O_t is incremental output, and T is project life. The average incremental (economic) cost is the present value of incremental cost (difference between with and without project alternative) divided by the present value of incremental output (difference between with and without project alternative). The advantage of this method is that the discounting is reduced to one process.

3.2. Cost-Effectiveness Analysis

Cost-effectiveness analysis focuses on comparing different means (alternatives) of achieving comparable ends (outcomes) where the outcomes can be quantified but not valued. This is often the case in the education and health sector projects. The principle is to minimise the cost-effectiveness ratio (CER) over i = 1, …..*n*, where CER = cost per participant/increase in outcome and *n* is the number of alternatives. If the benefits are measured in some single non-monetary unit, say, the number of vaccines delivered, the analysis is cost-effectiveness. If the benefits consist of improvement in several dimensions, say comprehension, reading and vocabulary, then these dimensions have to be weighted and reduce to a single measure. Weights are applied to different dimensions, reflecting their relative importance to the objective of the project. It should be added that the most cost-effective alternative may not be the most effective in terms of yielding the greatest impact on a particular objective.

Let us take two examples for the education sector projects. In the first example, we show that the benefits of education can be measured by the estimated net incremental income of school leavers over their working lives. Of course, this approach only approximates the benefits since it is based on several assumptions about the future income stream that may not hold in reality. For

example, differential income may not be due only to extra education; external benefits may be there; and earnings may not reflect productivity because of labour market distortions. Let us say that the school project is based on the following facts, reasonable guesses, and credible assumptions:[16]

- school will have five years of primary and four years of secondary classes (without the project there would be three years of primary classes);
- 100 children enter the school and all children complete both levels: by year six they finish the primary level and by year 11 they start working;
- after graduation each child would earn Rs. 10,000 per year;
- without the project all children will leave school after 3 years and then work at Rs. 6,000 for 46 years;
- working life of school will be 29 years;
- costs of the project will include: Rs. 2 million for investment in the first year, operational costs of Rs. 800,00 per year, and terminal value of Rs. 500,000; and
- annual saving would be Rs. 1,000 per year (children without school would have gone to another school for 3 years).

	with project	without project
Annual Income	100xRs. 10,000/year	100xRs. 6,000/year
Cohort 1	years 11-50	years 5-50
Cohort 2	years 12-51	years 6-51
Cohort 3	years 13-52	years 7-52
↓	↓	↓
Cohort 20	years 30-69	years 24-69

The school life of 29 years implies 20 cohorts of 100 children. The first cohort would enter the work force after 11 years and retire in year 50, second cohort would enter the work force in year 12 and leave in year 51, and so on. Final cohort would enter the market in year 30 and leave in year 69. Without this school project, the first cohort would commence work in year 5 and leave in year 50, and so on with other cohorts. In Table 1, if the discount rate is 10%, then the project's NPV in financial and economic prices—with almost the same IRR (at 7%)—shows that the project should not be accepted. The project may still be worth considering if we take into account (i) positive externalities, (ii) effect on hygiene and family planning, (iii) productivity of workers in excess of wages due to increased skills and efficiency. If these are not regarded as important contributions to the society, then the project can be rejected and another school project may be considered.

[16] This numerical example is taken from Curry and Weiss (2000), pp.83-4.

Table 1. Net Present Value of School Project (discount rate: 10%)

Benefit/Cost	Financial prices	CF	Economic prices
Benefits			
worker income with project	35.30	0.9	31.77
savings in primary school costs	2.12	0.8	1.70
terminal value of school	0.06	1.0	0.06
Costs			
worker income without project	37.90	0.9	34.11
investment cost	1.82	0.9	1.57
operational costs	6.19	0.8	4.95
Net Present Value (NPV)	-8.43		-7.10
IRR	7%		7%

The second example for the education sector involves an outcome (benefit) that is hard to value.[17] We focus on, say, accounting skills: one outcome or desired benefit that can be improved by different methods. Here we can apply the cost-effectiveness analysis. Accounting skills are measured by test scores, which can be improved by one of four alternative methods.

Intervention	Increase in test scores	Cost per student (Rs.)	Cost-effectiveness ratio
1. Small groups	20	3000	150
2. Self-instruction	4	1000	250
3. Computer-assisted	15	1500	100
4. Peer tutoring	10	500	50

Peer tutoring turns out to be the most cost-effective method: its gain is one-half of the gain by small-group instruction, but at only one-sixth the cost. The problem here is that the outcomes on test scores are not the same at different costs. The largest increase in test scores is for the small-group instruction, but it is also the most expensive method. If funds were unlimited, then the most effective method should be chosen. Where funds are limited, an implicit valuation on improvements in accounting skills can be obtained where the most effective method is preferred to the most cost-effective. Comparing the two methods, the most cost-effective and most effective, an additional increase in test score of 10 can be achieved by an additional expenditure of Rs. 2,500. At the margin, it costs Rs. 250 per unit more to increase test scores by substituting the most effective for the most cost-effective method. In other words, there is an implicit value of Rs. 250 on a unit increase in the test score. Preference for the most effective over the most cost-effective method will depend on whether the value given by the decision-maker is above or below Rs. 250 per unit.

[17] Adapted from Belli and others (2001), pp.76-7.

We can take a variant of the above example in education, where the benefits consist of several dimensions of an outcome, to illustrate the use of weighted cost-effectiveness analysis.[18] Let us assume that we want to look at improvements in reading skills with three dimensions and two interventions. The weights are assigned by experts for each dimension of reading skills on a scale of 0-10 points. The scores on each dimension of outcomes are measured as percentile rankings. The weighted score, for Method I, is 1,215 = (7x75+9x40+6x55). Method II is obviously more cost-effective. This procedure is meaningful only when outcomes are scored on a comparable scale.

	Weights	Method I	Method II
Reading speed	7	75	60
Reading comprehension	9	40	65
Word knowledge	6	55	65
Weighted test score		1,215	1,395
Cost per pupil		Rs. 95	Rs. 105
Weighted cost-effectiveness ratio		12.8	13.3

Table 2. Alternative Health Care Programmes

VHW/Vaccination	Programme 1	Programme 2	Programme 3
Annual cost (Rs.)	3,000,000	2,000,000	1,600,000
Number of visits of VHW/year	2,000	2,500	2,100
Healthy life days saved/visit	10	10	10
Healthy life days saved/year	20,000	25,000	21,000
Number of vaccinations	5000	3500	2000
Healthy life days saved/VHW visit	50	50	50
Healthy life days saved/year	250,000	175,000	100,00
Total healthy life days saved/year	270,000	200,000	121,000
Cost per healthy life saved (Rs.)	11.11	10.00	13.22

Turning to the health sector, let us assume that healthy life day is the objective (benefit or outcome) and we look at a combination of vaccination and village health worker (VHW) programmes. We find out that a vaccination programme saves between 50 and 70 healthy life days per vaccination and a VHW programme would save between 7 and 15 healthy life days per VHW visit. In Table 2, we take three different combinations of vaccinations and VHW, each with different cost.[19] Programme 2 is the most cost-effective since it has the least cost at Rs.10.00 per healthy life day. However, this is not necessarily the most effective method.

[18] Adapted from Belli and others (2001), pp.79-80.

[19] Adapted from Asian Development Bank (1997), pp.143-4.

Programme 1 saves the most healthy life days. The problem is that it will do this at a higher cost. The annualised cost of Programme 1 is higher by Rs. 1,000,000 than Programme 2 and it generates 70,000 extra healthy life days. The cost of each extra day is Rs. 14.29. If the budget is limited, then the decision-maker has to make a judgement about the implicit value of each extra day of healthy life in the population. If the value placed is above Rs. 14.29, then the most effective programme (1) will be selected.

Take a second example in the health sector. Say there are two approaches to eradicate malaria in a region or community: vector control or drug therapy.

	Vector Control (I)	Drug Therapy (II)
Costs (NPV at 3%: Rs. in thousands)	1,000	800
Health impact (healthy life days in thousands)	20	18
Cost-effectiveness	50.00	44.44

Programme II is more cost-effective, but Programme I has better health impact. But be cautious. For example, you choose Programme II since it is more cost-effective, it implicitly assumes that the value placed on an additional healthy life day is less than Rs. 100: at this value the two programmes have the same NPV. A higher value, say Rs. 105, increases the divergence between the programmes in favour of Programme I.

I. $(20 \times 105) - 1{,}000 = 1{,}100$
II. $(18 \times 105) - 800 = 1{,}090$

Finally, we want to draw attention to the fact that the cost-effectiveness analysis can also be used to compare projects or interventions that produce similar outputs (benefits) undertaken by the RSPs and public sector agencies. For example, almost all RSPs give loans to CO members for a variety of purposes. Since the RSPs use comparable concepts for estimating the cost of loans, we can estimate changes in the (real) unit cost of loans and compare them over time for a given RSP or between RSPs. We can also make (unit) cost comparisons in delivering potable water using different technologies or delivery systems to rural communities.[20]

4. Environmental Effects of Projects

Most projects have some negative or positive effect on the environment since they create, directly or indirectly, demand on natural (renewable and non-renewable) resources and add (supply) waste products to the environment. These effects remain outside the calculus of the private investor—they do not appear in market transactions—for the financial appraisal of projects. However, these externalities must be included in the economic appraisal of projects because these external effects can have serious impact on society's resources and the environment. Their inclusion will also help governments design policies that tend to internalise

[20] See Khan (2004) for cost-effectiveness of the credit programme of NRSP compared with similar group-based credit programmes.

the environmental externalities. Of course, environmental concern of projects depends on their characteristics. We can place projects in three separate categories.[21]

- Projects with the objective to improve the environment: preserving wetlands, rehabilitation of a power plant to reduce gas emissions, irrigation scheme to reduce waterlogging and salinity, street pavement and drains to improve health. In these projects, assessment of environmental benefits is central to their appraisal.
- Projects with significant environmental by-products: a timber project that reduces forest cover or tree replanting that increases forest cover, project that produces industrial waste and contaminates water with effects on human health and fisheries, and a dam that displaces human and natural life. Here environmental dimension, both in its negative and positive form, should be included in the economic appraisal of projects since it may be an important externality not considered in the financial valuation of costs and benefits.
- Projects with minor environmental by-products: downstream silting or flooding from a dam, untreated waste tailings from mining, soil erosion from poor road embankments. The most important issue in the appraisal process is to maintain practical technical standards so that the projects can avoid serious negative environmental effects.

Environmental effects are not always easy to quantify and their value measured for inclusion in the costs and benefits of projects. Environmental benefits are based on the use value—valuable to users because of services—and the non-use value—intrinsic value of the environment and natural resources. These values can be estimated by (i) market-based valuation, (ii) implicit market valuation, and (iii) surveys to estimate willingness to pay to protect the environment (benefits) or willingness to accept compensation for environmental damage (costs). In all cases, we have to know two basic relationships: (i) between the project and the environmental parameters and (ii) between these parameters and production. These relationships are captured by two important concepts: dose-response relationship (DRR) and depletion premium (DP). The use of DRR can be illustrated by, say, the effect of air pollution on health:[22]

$$dH_i = b_i \times POP_i \times dA$$

where dH is the change in population at risk of health effect i; b is the slope of the dose-response curve for health impact i; POP_i is the population at risk of health effect i; and dA for the change in the relevant ambient air pollutant. This relationship can be used to estimate the positive effect on health of improved sewage collection and treatment or waste disposal.

The concept of depletion premium (DP) is used in projects that involve the exploitation of depletable resources used as outputs or inputs. Valuation of depletable resources requires inclusion of an explicit opportunity cost for depletion in addition to the normal market value or marginal extraction costs of resources. This opportunity cost is called DP: it is an amount equivalent to the present value of the opportunity cost of extracting the resource at some time in

[21] See Curry and Weiss (2000), Chapter 10.

[22] See Belli and others (2001), p.67.

the future, in addition to the economic price of the resource at present. DP for a particular year (t) can be defined:[23]

$$DP_t = [(PS_T - EC_t) \times (1+r)^t] \div [1+r]^T$$

where PS_T is the price of substitute at the time of complete exhaustion T; EC_t is the extraction cost of present resource (assumed to be constant for all years); r is the discount rate; and T is time of exhaustion of the resource (deposit). The important point is that, in the economic appraisal of projects involving depletable resources, their extraction costs should include a depletion premium.

5. Distribution of Project Benefits

It is not enough to know if the project is (was) worthwhile in terms of the return to investors and society (community) or how efficiently resources are (were) used. Projects have effects on the distribution of income as well. In the context of RSP projects (or interventions) we want to know who the gainers are and by how much do the poor gain. To estimate the income effects of a project, at least three important pieces of information are needed. First, we should know the financial costs and revenues of the project. Second, we should compute the divergence between the financial and economic costs and benefits. Economic and not financial prices cover the real income effect of a project. The divergence between financial and economic prices is due to either market distortions or externalities. Someone must gain or loose from distortions or externalities and their income change will not be picked up when we look only at the income flows based on financial analysis. The income change created by the divergence between financial and economic values should be taken into account. To trace the full distribution effect of a project requires (i) NPV based on financial values and (ii) difference between the NPV based on economic and financial values. The project's addition to national (community) income is the sum of NPV (financial) *plus* the difference between NPV (economic) and NPV (financial). Third, we should know the proportionate population of the poor among project beneficiaries and their share in the additional income. It is, therefore, important to find out who the poor are and how they might benefit from the project. The conditions of the poor should be assessed both before (*ex ante*) and after (*ex post*) the project has been implemented.

Let us take a project example, say, of irrigation or water supply, to illustrate the issue of distribution of project benefits (Table 3).[24] We use constant financial and economic prices and a discount rate of 12%. In this example, if RSP is the investor (grantor), it suffers a financial loss of which the NPV is Rs. 300,000. However, the economic analysis of the project introduces the idea of consumer surplus: economic benefits that are not incorporated in the financial assessment of the project. These benefits to water users are reflected by the difference between the cost of water without the project and the full costs with the project. This difference can be added to financial revenues as consumer surplus. The financial project statement has to be adjusted by the consumer surplus and appropriate conversion factors are used in preparing the economic statement for the project. Water users and workers on the project are the gainers and RSP is the

[23] See Asian Development Bank (1997), pp.69-72.

[24] See a similar example of a telephone project given by Asian Development Bank (1997), pp.175-8.

loser. A final issue would be to estimate the proportion of the poor among the water users and workers to assess their share in the net economic benefits from the project.

Table 3. Distribution of Net Economic Benefits from a Water Project

	Financial analysis	CF	Economic analysis	(E – F)	Water users	Labour	RSP
Benefits Total	700		1,190	490			
revenue	700	1.2	840	140			
consumer surplus	--	1.2	350	350	+350		
Costs: Total	1,000		1,040	40			
investment costs							
equipment	400	1.3	520	120			
labour	200	0.8	160	-40		+40	
operation costs							
materials	100	1.2	120	20			
labour	300	0.8	240	-60		+60	
Net Benefits	-300		150	450	-100		-200
Gainers and Losers					+250	+100	-200

6. Uncertainty in Project Appraisal

In the *ex ante* appraisal of a project, we use the most likely values—best estimates—of the included variables and parameters in estimating the future cost and benefits streams. Uncertainty about the future is always there, hence values are difficult to predict. Sensitivity analysis is a way to assess the effects of adverse changes on a project and the decision about its selection. Sensitivity analysis should be used on project items that are numerically large and for which there is substantial uncertainty: e.g., crop area, yield levels, cropping intensity, shadow prices of inputs and outputs, and shadow price of foreign exchange. Where a project looks sensitive to the value of a variable that is uncertain, mitigating action should be considered. Quantitative risk analysis associates a probability of occurrence with different values of key variables and parameters. When such variables are changed simultaneously through a random selection of outcomes, a frequency distribution for ENPV or EIRR can be produced showing the probability that a project is acceptable or not. Decision-makers will compare the scale of net economic benefits from different projects with their riskiness in selecting a single or portfolio of projects. Non-quantitative risks due to the institutional and social factors should also be identified.

6.1. Sensitivity Analysis

We can use two important indicators in terms of the impact of changes in the values of key variables and parameters on a project's NPV. Sensitivity indicator (SI) shows the relative change in a project's NPV as a result of change in the value of a variable or parameter:

$$SI = [(NPV_b - NPV_a)/NPV_b] \div [(V_b - V_a)/V_b]$$

where NPV_b and V_b are the values of NPV and the variable in the base case and NPV_a and V_a are the adjusted (sensitivity test) values. A high value of SI indicates that NPV is very sensitive to change in the value of specific variable or parameter. The second indicator generally used for sensitivity analysis is the switching value (SV):

$$SV = 100 \times [NPV_b/(NPV_b - NPV_a)] \times [(V_b - V_a)/V_b] \%$$

It shows the per cent change required in a variable (increase in the cost item or decrease in the benefit item) to reduce the ENPV to zero or EIRR to equal the discount rate. Let us illustrate the relevance of SI and SV by a numerical example. Say the price of a project output goes down from 10 to 8.5 units:

$NPV_b = 900$ and $NPV_a = 720$
$V_b = 10$ and $V_a = 8.5$

$$SI = [(900 - 720)/900] \div [(10 - 8.5)/10] = 1.333$$

$$SV = 100 \times [900/(900 - 720)] \times [(10 - 8.5)/10) = 75\%$$

The results are that (i) the change in ENPV is proportionately larger than the change in price (SI = 1.333) and (ii) the price of output would have to be lower by 75% for ENPV to go to zero or the EIRR to equal the discount rate.

Let us illustrate the use of SI and SV in the case of an irrigation project.[25] In the base case, the projected changes are (i) increased rice area, cropping intensity and rice yield, (ii) decline in the area under vegetables, (iii) long-term fall in the economic price of rice and increase in the economic price of fertiliser. At a discount rate of 12%, the project's NPV is Rs. 1.44 billion and EIRR is 19%. The case for sensitivity analysis, shown in Table 4, is based on uncertainty about several important factors:

- studies about farmers' response to improved water supply show that the projected increase in rice area, cropping intensity and yield will be lower by 9, 10 and 6 per cent, respectively;
- cropping intensity and yield levels of rice and vegetables without the project would be higher by 10%;
- prices of rice and fertiliser may also change differently: compared to the base case, 39% lower for rice and 42% higher for fertiliser;
- delay of two years in the implementation of the project;
- 10% increase in the investment cost;
- inadequate maintenance of the project, hence the last five operating years of the project are excluded;
- shadow exchange rate and wage rate factors are 10% lower and higher, respectively; and
- discount rate is 14%.

[25] For the numerical example, see Asian Development Bank (1997), Appendix 21.

Table 4. Sensitivity Analysis of Irrigation Project

Costs/Benefits	Change (%)	NPV (Rs. M)	EIRR (%)	SI	SV (%)
Base Case	---	1,440	19.0	---	---
Costs:					
investment costs	+10	1,291	17.9	1.03	97
fertiliser price	+42	753	15.8	1.13	88
Benefits:					
rice price	-39	-1,427	1.7	5.12	-20
with project:					
area	-9	1,298	18.3	1.10	-91
cropping intensity	-10	446	14.3	6.90	-14
yield level	-6	844	16.2	6.90	-14
without project:					
cropping intensity	+10	873	16.3	3.94	25
rice yield level	+10	873	16.3	3.94	25
vegetable yield level	+10	1,162	17.7	1.93	52
Two year delay in project benefits		636	14.9 (NPV falls by 75%)		
Five year loss in operating life		1,250	18.6 (NPV falls by 13%)		
Higher discount rate (14%)		889	19.0 (NPV falls by 38%)		
Shadow wage rate factor	+10	1,383	18.6	0.40	253
Shadow exchange rate	+10	1,084	17.7	2.47	-40

In Table 4, we can see that for some variables very large changes in SV are required for the decision to change: investment costs, economic price of fertiliser, crop area for rice displacing vegetables, and the shadow wage rate factor. For some other variables, while the SV is not so large, but unlikely to change the decision for the project. However, there are four variables to which the project is very sensitive: economic price of rice, cropping intensity and the rice yield with project: the projected values for these variables need only to be less than favourable by 20 and 14 per cent for the project decision to change. Delay in implementation is also important to consider. The project is very sensitive to a combination of higher investment costs (+10%), lower yields (-10%), higher fertiliser price (+10%), and lower economic price of rice (-10%). The results can be used to review the risk and means by which it can be mitigated.

We should keep in mind the limitations of sensitivity analysis. First, it does not take into account the probabilities of occurrence of events. Second, it does not take into account correlation between variables. Third, changing the values of variables by standard percentages does not necessarily have any relation to the observed or likely variability of underlying variables. In view of these limitations, other techniques for risk analysis are used.

6.2. Risk Analysis

The focus of risk analysis is to estimate the probability that the NPV of a project will fall below zero or the EIRR will be lower than the discount rate (opportunity cost of investment). For example, in an irrigation project we are uncertain about future cropping intensity, yield level and price of crop output. Risk analysis examines combination of values for these variables and the probability that they may occur. We need several pieces of information: (i) results of sensitivity analysis, (ii) range of values above or below the value in the base (best) case, (iii) upper and lower bound and a value within these bounds, and (iv) probability for each of these values to occur. We select values of the uncertain variables from the probability distributions that have been determined on the basis of past evidence or intuitive guesses from past experience. These values are combined with values of other variables used in the base case to estimate the project NPV. Finally, this calculation is repeated a number of times to provide different values of NPV. These estimates of NPV can be summarised in a distribution, in which we should look at the proportion of NPV estimates that fall below zero, hence the probability that the project may have to be rejected. The probability of achieving a less than acceptable result is part of the information needed to make a decision about the project.[26]

7. Financial Sustainability of Projects

The economic analysis of projects should include assessment of the financial sustainability of project because financial prices influence the decision of project participants. Three aspects of financial sustainability are important to consider:[27]

- availability of adequate funds to finance project expenditures;
- financial incentive necessary to ensure participation in the project; and
- recovery of some of the project costs from beneficiaries.

A financial plan (in constant prices) is required to ensure that funds are adequate to finance project expenditures: investment costs during implementation and costs of operation and maintenance. If the project generates revenues, it may be the major source of funds during the operating period. For projects that do not generate sufficient funds to operate the project, we have to look at its fiscal impact. In most public sector projects, funds may come from reallocation from other expenditures, efficiency improvement in public expenditure, taxation, and domestic or foreign borrowing. All of them can have serious consequences for the budget and liabilities. In the case of RSP projects, the liability has to be met by the annual budget, loans to users, or cost recovery through user charges. User charges for goods or services from beneficiaries involve four important issues:

- economic effect of user charges
- degree of cost recovery or revenue generated
- scope of charges between existing and new users; and
- affordability of charges by different economic (income) groups.

[26] See Curry and Weiss (2000), pp.231-5, for a useful discussion of quantitative risk analysis.

[27] See Asian Development Bank (1997), Appendix 23 and Curry and Weiss (2000), Chapter 8.

The basic principle is that the user should pay the economic cost of the good or service. However, it does not usually happen, hence the appropriate cost to users is the marginal cost of providing the good or service, including the investment cost to expand supply. The long-run marginal cost should be based on future, and not historical, costs of supply. The relevant measures to be calculated and compared for each project are (i) average incremental financial cost of supply, (ii) average incremental economic cost, and (iii) average tariff to be charged. The first two should be estimated by using an appropriate discount rate (say 12% per year). The incremental cost of supply should be charged from all users in a new project (or new component) and should be spread over the existing and new users for extension of an existing project.

If user charges are set at levels that are lower than the incremental cost of supply—say to cover only the operation and maintenance costs—the extent of subsidy should be estimated. This subsidy has to come from some other source. Subsidies may be justified for some goods and services that have positive externalities, decreasing cost activities, compensate for government policies that adversely affect well-being. Targeted subsidies may also be considered. To minimise the burden of subsidy, user charges have to take into account affordability. If user charges are the same for every user, and the charge does not cover the full cost of supply, then the better-off get the same subsidy as others who are less well-off. Those who use more should pay more and those who can afford should pay more. One of the advantages of user charges is that they tend to reduce demand, hence may affect the scale of initial investment.

For the financial sustainability of a project, participants should benefit from it. However, each participant has a standard to measure the benefit expected from participation in the project. For example, in an irrigation project, the irrigation authority and water users (farmers) have a financial stake. The basic test of financial sustainability of this project is whether the financial internal rate of return (FIRR) exceeds the opportunity cost for the participants. The economic viability of the project depends on the financial incentive for project participants: sufficient return for their financial investment or additional effort. A financial analysis of the project from the viewpoint of participants is an integral part of project appraisal and must accompany the estimation of economic returns.

Chapter 2: Appendix I

1. Methods of Estimation of Costs and Benefits for Projects

Economic values of outputs and inputs to the national economy can be estimated by trade prices. The explanation for tradable outputs and inputs is reasonably straightforward.

Output:

(i) if exported (wholly incremental), it should be valued at free-on-board (FOB) price *less* (net tax + processing + transport + distribution + handling from project site).
(ii) if import substitute (wholly non-incremental), it should be valued at cost-insurance-freight (CIF) price *plus* (net tax + transport + distribution +handling to market) *less* (transport + distribution + handling from market to project).

Input:

(i) where the project demand increases imports into the economy, directly or indirectly, the input is incremental and should be priced at CIF price *plus* (net tax +transport + distribution + handling to project site).
(ii) where the project demand substitutes for exports, directly or indirectly, the input is non-incremental and should be valued at FOB price *less* (net tax + processing + transport + distribution + handling from production site to port) *plus* (net tax + processing + transport + distribution + handling from production site to project site).

The economic value in each case will depend on how well markets are functioning. For tradable goods, domestic market prices may diverge from their world prices because of overvalued exchange rate, taxes, subsidies, and quantitative restrictions. World price of a good shows opportunity of selling or buying it in any quantity. But identification of world prices is not easy. Marketing agencies or suppliers can provide world prices, but the World Bank's estimates are perhaps the most reliable. Since inputs and outputs of a small project will not affect world market prices, we should the long-run prices.

The domestic price values differ from border price equivalent values because of market distortions in trade. The economic price of foreign exchange—shadow exchange rate (SER)—rather than the actual price of foreign exchange—official exchange rate (OER)—should be used in the economic valuation of goods and services. SER is the weighted average of imports and exports in domestic prices to the border price equivalent value of the same goods and services. SER is greater than OER to the extent that domestic market prices exceed their border price equivalent value. The conversion factor for the shadow exchange rate (CFSER) is SER/OER.[28]

	Year 0		Year 0
Exchange rate (Rs.)	8.96	*Effective exchange rate*	
Exports ($ million)	61.40	For exports (P_x)	8.96
Imports ($ million)	56.10	For imports (P_m)	11.51
Import duties ($ million)	15.95	*Weights*	
Duties as % of imports	28.40	For P_x (%)	26.70

[28] This numerical example is cited in Belli and others (2001), pp.236-7.

Subsidies	0.00	For P_m (%)	73.30
		Shadow exchange rate	10.83
		CFSER	1.21

The explanation in this example is straightforward. There are duties on imports but no subsidies and exports are free of taxes and subsidies.[29] The effective exchange rate for exports is the same as the official exchange rate, but for imports it is higher by the extent of duties as % of imports. The weights for exports and imports are determined by first estimating the elasticity of import and export, assumed in this case to be 1.5 for import and 0.5 for export, and then multiplying the volume of exports and imports by their respective price elasticity of demand. The ratio of each in the estimated quantity is then used as its weight. SER is calculated by multiplying the effective exchange rate (P_x and P_m) by respective weights and adding the products: SCSER (or SER/OER) = 8.96/10.83 = 1.21.

The valuation of non-tradable outputs and inputs is more complicated. Of course, non-tradable goods and services may have incremental and non-incremental effects. The value of the output supplied will be the weighted-average of the values of incremental and non-incremental effects on total supply. Similarly, the economic value of a non-tradable input will be a weighted average value of the incremental and non-incremental components of the extra demand: incremental effect is valued through resource costs to the economy and non-incremental effect is valued through the willingness-to-pay (WTP) of users. It is important to add that estimating the economic (shadow) prices of non-tradable goods and services can be quite time-consuming, hence caution should be used. The first step in valuing the non-tradable inputs is to find out if there are serious distortions in the market because of taxes, subsidies, price controls, unemployment, and market concentration. Let us examine the examples of land and labour.

Land is unlike other non-tradable inputs since its supply is completely inelastic: any land used for the project is taken away from other uses even if it is for speculation. Since land market is quite imperfect, market price is hard to determine. To measure the value of land in its alternative uses we must impute a price. A good way to get around the problem is to estimate the NPV of the rental price of land.

$$P_n = R/(r - g)$$

where P_n is the imputed value of land, R is the annual rent or income, r is the interest rate (the opportunity cost of capital), and g is the expected real growth rate of rental price. A note of caution here: this may undervalue land since the demand for land may not be simply for its rent or income.

The market wage of labour may not reflect the opportunity cost of labour because of legal provisions on wage (say minimum wage law), labour immobility, and unemployment. However, the shadow wage rate cannot be equated by the marginal product of labour: no one wants to work for free since some reservation wage exists below which people prefer to be unemployed. The reservation wage depends on people's income situation, value attached to leisure and other non-wage activities, and the nature of employment in the project. In addition, labour markets for different kinds of workers—unskilled, semiskilled and skilled—may have very different conditions of demand and supply (levels of unemployment). If the market for certain kind of labour is relatively distortion free (i.e. without significant taxes on income or not subject to the minimum wage law) and incidence of unemployment is low, then the going wage rate will do the job. If there is, however, substantial unemployment, say of unskilled labour, then the market wage has to be adjusted downward to get the shadow wage rate.[30]

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[29] It should be noted that we add imports and exports by taking into account taxes and subsidies on imports and exports: $[(M + T_m - S_m) + (X + S_x - T_x)]$.

[30] We can safely assume that the economic (shadow) prices of land and labour used for public sector projects in the region/area are applicable to the RSP/CO projects as well unless we have strong evidence to the contrary. In that case, we have to work out the economic values of land and labour separately based on local conditions.

We need a conversion factor (CF) to make the financial and economic prices equivalent: CF = economic price/financial price. This principle applies to all outputs and inputs, including tradable and non-tradable goods and services.

2. Financial and Economic Analysis of Irrigation Project: An Illustrative Example

We illustrate here the financial and economic analysis of an irrigation project with the world market price numeraire and domestic market price numeraire.

2.1 World Market Price Numeraire

A. Financial Analysis

1. Irrigate 10,000 hectares that are rainfed.
2. Two crops are grown: wheat (imported) and maize (exported).
   6000 hectares in wheat and 4000 hectares in maize
3. The Irrigation Authority—government monopoly—will run the irrigation project.
4. Total investment costs are Rs.50 million (constant prices) spread over three years.
5. Operations will begin in 4 years and will have working life of 22 years.
6. Operating costs will be Rs.1000 per hectare. A tariff equal to the operating cost will be imposed on water users.
7. For the Irrigation Authority the project is a loss-making proposition at financial

Year	1	2	3	4……	25
Investment Cost	15.0	15.0	20.0	0	0
Operating Cost	0	0	0	10.0	10.0
Revenue	0	0	0	10.0	10.0
Net Revenue	-15.0	-15.0	-15.0	0	0

*Financial NPV at 10% = -41.06.

8. The yield levels for farmers without and with project are assumed as follows:
   without project: wheat (3000 kg/ha) and maize (5400 kg/ha) and would remain constant for 5 years and then decline at 5% per year (fertility decline)
   with project: pre-project yield levels of wheat and maize will rise by 20% per year in the second year of project operations and this growth continues for 4 years and then remain constant.
9. Farmers' costs (in constant prices) will increase as a result of the project (fertiliser + irrigation water):

	without project		with project	
	wheat	maize	wheat	maize
Local materials	1000	1400	1000	1400
Farmers' time	1600	1800	2000	2200
Fertiliser	0	0	1400	1600
Irrigation water	0	0	1000	1000

10. Farmers will sell their wheat and maize output to a state-run agency that fixes farmgate prices. The constant border parity prices of the two crops are calculated as follows:

Wheat (CIF price Rs./kg)	1.20	Maize (FOB price RS./kg)	0.90
Transport			
Border to consumers	0.09		
Farmgate to consumers	0.04		
Farm to border			0.10
Price paid to farmer	0.80		0.65

11. The result is a financial NPV of Rs. 56.7 million at 10 per cent discount rate and FIRR of 23.3%.

B. Economic Analysis

1. For economic analysis, project costs are converted from foreign, local and labour costs into economic categories: traded, non-traded and labour (treated as unskilled). Proportions are as follows:

	Investment Costs (%)	Operating Costs (%)
Traded	60.5	70.0
Non-traded	17.5	20
Labour	22.0	10

2. In case of farmers' costs:

local materials	non-traded
fertiliser (imported)	subsidised price (30% below CIF price)
labour	wage rate (full employment assumed)

3. National discount rate is 10%.
4. Foreign trade data for a recent year are as follows:

Total imports	Rs.800 million
Total exports	Rs.500
Taxes on imports	Rs.200
Subsidies on imports	Rs.40
No export taxes	

We can get a rough estimate of the standard conversion factor (SCF): (800+500) ÷ [(800+200-40) + (500)] = 0.89. This SCF can be used to value all non-traded items and labour.

5. Project benefits are the incremental farm output (wheat and maize output) valued at border parity prices of wheat and maize (Rs. per kg):

	Wheat (CIF)		Maize (FOB)
	1.20		0.90
plus		*minus*	
net transport cost	0.05xSCF		0.1xSCF
Border parity price	1.24		0.81

6. These border parity prices when compared with the financial prices received by farmers give us the crop conversion factor:

Wheat	1.24/0.80 = 1.56
Maize	0.81/0.65 = 1.25

These crop conversion factors allow farmers' revenue from crop sales to be converted into a flow of economic benefits from the fourth year. Commodity price projections are used to estimate the crop conversion factors, allowing for relative price changes in future. Crop conversion factor for wheat falls to 1.48 in the sixth year and for maize rises to 1.35 in the tenth year.

7. Economic costs include (i) costs of irrigation project and (ii) incremental farm (crop) costs, excluding water charges. Water charge since it is included in the cost of supplying water for the project.
8. Farm costs are converted from financial to economic values by the following conversion factors:

Foreign exchange/traded	1.0
Non-traded	SCF
Project labour	SCF
Farmers' time	SCF
Fertiliser	1.43 (1.0/0.7 = 1.43)

In the world price system, all non-traded costs are adjusted by SCF. Fertiliser is the only item with a specific conversion factor: its financial price paid by farmers is only 70 per cent of the world price So its conversion in a world price system is 1.0/0.7 = 1.43.

9. In economic terms, at world market prices, NPV of the irrigation project is Rs.79 million (at 10% discount rate) and EIRR is 18 per cent. The project has a high economic return, but its financial sustainability is questionable. From economic point of view, there are two implications: First, the Irrigation Authority should charge farmers the full cost of water which will remove the subsidy and encourage more efficient use of water. Second, pay farmers a higher proportion of the economic value of crops and not implicitly tax farmers' output.

Table 1. Financial Analysis (costs and benefits to farmers)

Year →	1	2	3	4 to 24	25
Costs					
With project					
Wheat					
Local material					
Farmers' time					
Fertiliser					
Irrigation water					
Maize					
Local material					
Farmers' time					
Fertiliser					
Irrigation water					
A. Total Costs					
Without project					
Wheat					
Local material					
Farmers' time					
Maize					
Local material					
Farmers' time					
B. Total Costs					
Incremental Costs (A – B)					
Production (million kg)					
Without project					
Wheat					
Maize					
With project					
Wheat					
Maize					
Incremental Output					
Wheat					
Maize					
Value of Incremental Output to farmers (at farmgate prices)					
Wheat					
Maize					
Total Incremental Value					
Net Benefits					

NPV: Rs.56.7 million (at 10% discount rate)
FIRR: 23.3%

Table .2. Economic Analysis (World Price System)

Year →	1	2	3	4 to 24	25
PROJECT COSTS					
With project					
1. Investment					
Traded					
Non-traded					
Unskilled labour					
2. Operating Costs					
Traded					
Non-traded					
Unskilled labour					
3. Farmers' Costs					
(Wheat & Maize)					
Local material					
Farmers' time					
Fertiliser					
Irrigation water					
Total Costs					
Without project					
Farmers' Costs					
(Wheat & Maize)					
Local material					
Farmers' time					
Total Costs					
Incremental Costs					
PROJECT BENEFITS					
Incremental value to					
Farmers (prices received)					
Wheat					
Maize					
Border Parity Price					
Wheat					
Maize					
Price Paid to Farmers					
Wheat					
Maize					
Crop Conversion Factor					
(BPP/Price to Farmers)					
Wheat					
Maize					
Incremental Value					
to the Economy					
(value of incremental					
output at price received					
by farmers multiplied					
by CCF)					
Total Value					
Incremental Costs					
Net Benefits					

NPV (at 10% discount rate) = Rs. 79.2 million
EIRR: 17.8%

2.2 Domestic Market Price Numeraire

1. Here we use the domestic price numeraire for the same irrigation project. For the purpose of economic analysis, as before, project costs are converted from foreign, local and labour costs into economic categories (traded, non-traded and labour). The breakdown of costs is:

	Investment Costs (%)	Operating Costs (%)
Traded	60.5	70
Non-traded	17.5	20
Labour	22.0	10

2. All local materials are treated as non-traded for farmers' costs. Fertiliser is imported and sold by a government agency at 30 per cent below the CIF price. The labour market is judged to be reasonably competitive.
3. The national discount rate is 10%. For foreign trade the same data are applied as before. The standard conversion factor (SCF) is: (800+500) ÷ [(800+200-40) + (500)] = 0.89 and is used to value all non-traded items and labour.
4. For comparability the conversion factor (CF) for foreign exchange is 1/SCF = 1.123. All foreign exchange effects are re-valued by the foreign exchange CF (1.123). For comparability with the world price analysis, non-traded goods and labour are valued in economic terms by their unadjusted financial prices since in the world price analysis they were re-valued by the SCF.
5. Project benefits are incremental farm output valued at border parity prices (BPP) derived from:

Wheat	CIF price	1.2 x SER/OER
	plus net transport	0.05
BPP		1.40 (Rs. per kg)
Maize	FOB price	0.90 x SER/OER
	minus transport	0.10
BPP		0.91 (Rs. per kg)

SER/OER or 1/SCF = 1.123 by comparison with prices paid to farmers. These border parity prices give us the crop conversion factors:

Wheat	1.40/0.8 = 1.75
Maize	0.91/0.65 = 1.40

These conversion factors allow farmers' financial revenue from crops to be converted into a flow of economic benefits. Future relative price shifts for wheat and maize are taken into account.
6. Economic costs include (i) costs of the irrigation project and (ii) incremental crop costs excluding water charges.
7. Financial values of the project and farm costs are converted by the following factors:

Foreign exchange/trades	SER/OER
Non-traded	1.0
Project labour	1.0
Farmers' time	1.0
Fertiliser	1.43xSER/OER

In the world price system all non-traded costs and labour were adjusted by SCF. Here all traded items are adjusted by SER/OER and non-traded items and labour have a conversion of unity: they valued at their

financial prices. Fertiliser is the only item with a specific conversion factor because the financial price paid by farmers is only 70 per cent of its CIF price or its conversion is 1.0/0.70 = 1.43.

8. Using the domestic price numeraire, in economic terms, NPV of the project is Rs.89 million at a 10% discount rate and the EIRR is 17.8%. The EIRR is the same as in the world price system and the economic NPV is comparable: Rs.79.2 million (in world price system) x 1.123 (foreign exchange conversion factor) = Rs.89.0 million (domestic price system NPV). It should be added that the values of financial NPV and FERR remain the unchanged.

Table 3. Financial Analysis (Domestic Price System)

Year →	1	2	3	4 to 24	25
Costs					
With project					
Wheat					
Local material					
Farmers' time					
Fertiliser					
Irrigation water					
Maize					
Local material					
Farmers' time					
Fertiliser					
Irrigation water					
A. Total Costs					
Without project					
Wheat					
Local material					
Farmers' time					
Maize					
Local material					
Farmers' time					
B. Total Costs					
Incremental Costs (A – B)					
Production (million kg)					
Without project					
Wheat					
Maize					
With project					
Wheat					
Maize					
Incremental Output					
Wheat					
Maize					
Value of Incremental Output to farmers (at farmgate prices)					
Wheat					
Maize					
Total Incremental Value					
Net Benefits					

NPV: Rs.56.7 million (at 10% discount rate)
FIRR: 23.3%

Table 4. Economic Analysis (Domestic Price System)

Year →	1	2	3	4 to 24	25
PROJECT COSTS					
With project					
1. Investment					
Traded					
Non-traded					
Unskilled labour					
2. Operating Costs					
Traded					
Non-traded					
Unskilled labour					
3. Farmers' Costs					
(Wheat & Maize)					
Local material					
Farmers' time					
Fertiliser					
Irrigation water					
Total Costs					
Without project					
Farmers' Costs					
(Wheat & Maize)					
Local material					
Farmers' time					
Total Costs					
Incremental Costs					
PROJECT BENEFITS					
Incremental value to Farmers (prices received)					
Wheat					
Maize					
Border Parity Price					
Wheat					
Maize					
Price Paid to Farmers					
Wheat					
Maize					
Crop Conversion Factor (BPP/Price to Farmers)					
Wheat					
Maize					
Incremental Value to the Economy (value of incremental output at price received by farmers multiplied by CCF)					
Total Value					
Incremental Costs					
Net Benefits					

Economic NPV = Rs.89 million (at 10% discount rate)
EIRR: 17.8%

CHAPTER 3. ASSESSMENT OF PROGRAMME IMPACT ON RURAL HOUSEHOLDS

What difference do the RSP interventions, support projects and services, make in the standard of living of rural people? It depends on several factors, e.g., how well is the programme designed and targeted? How well are the activities monitored? What necessary adjustments are made in the programme? How cost-effective are the projects and activities? Impact assessment is a systematic analysis of significant changes due to the programme or its activities.[31] Put it another way: what would have happened had the programme not been undertaken? To determine the *counterfactual*, it is necessary to net out the effect of programme interventions from other factors or sources of change.

It is by no means easy to identify the attributed change due to the interventions of a multifaceted RSP. The starting point is to address the counterfactual, or the issue of causality, by comparing the combined scenarios of (i) *without and with* and (ii) *before and after* the programme interventions. We can capture the *without and with* programme conditions by comparing the *treatment* and *control* groups of individuals or households. The treatment group includes those (i.e. CO members) who participate in the programme and receive benefits and the control group consists of those who do not participate in the programme or receive its benefits. The only difference between the two groups is programme participation. The problem *ex ante* is to find *equivalent* treatment and control groups of individuals or households. The *before and after* the programme conditions can be analysed by using the baseline and follow-up data.[32]

In this chapter, we analyse the conceptual and practical issues regarding impact assessment, including application of the quantitative methods for impact assessment. Also, we highlight the importance of qualitative analysis of relationships, processes and events that can complement and enrich our understanding of the results obtained from quantitative analysis. We conclude the chapter with an illustrative example of impact assessment from NRSP, using the cross-section data collected in 2001 from a sample of villages and households in some areas covered by NRSP.

1. Indicators of Impact Assessment

What has changed and why? What kind of change should be examined and assessed? In other words, we have to be clear about the objectives of the programme so that we can identify the outcome measures to be used for impact assessment. For example, a rural support programme

[31] There are several general studies of methods to assess the impact of development programmes and projects. Two of these seem to be of direct relevance to RSPs: Roche (1999) and Baker (2000). Also, see Clarke and Dawson (1999), Gray (2004), and Rossi, Lipsey and Freeman (2004). These three books treat in great depth the complex conceptual and practical issues involved in research on impact assessment (evaluation).

[32] The baseline and follow-up surveys of both the treatment and control groups allow for control of contemporaneous events and provide control for measuring the programme impact. We can do the difference-in-difference (double-difference) estimation. If the baseline data are not collected, we can use the cross-section data (drawn from a follow-up survey) for the treatment and control groups. This would, however, require statistical controls with instrumental variables.

provides support and services to rural communities in different forms to help reduce poverty and enhance their empowerment through participatory organisations. In this context, we can identify several indicators (measures of outcome) of change and for analytical convenience place them into three interrelated groups.

1. Economic well-being: at the individual or household level, we can examine several variables like assets, income, occupation, expenditure, food consumption, savings and investment, and debt.
2. Social well-being: we can include at the family (household) level such variables as age and gender composition, adult literacy, educational achievement, school enrolment, state of health, sanitation, family planning, and access to potable water, waste disposal, and sources of energy.
3. Political well-being: we can examine here the state of "empowerment" reflected by the degree of participation in and influence on decisions at the family, community and national levels and the access to community resources (infrastructure and services).

In the context of impact assessment of the RSP interventions, we should focus on individuals, households and communities. Some of the indicators are directly, even objectively, measurable (quantifiable) while others may not be as easily amenable to measurement directly, hence require proxy variables or subjective (normative) judgements.

2. Methods of Impact Assessment

As shown in Table 1, we can use *quantitative* and *qualitative* methods for impact assessment. We should combine the two methods to make the analysis as complete as the data (information) would permit. As the name suggests, the *quantitative method* uses directly measurable data that allow statistical testing of causal inferences or hypotheses. In this method three different designs can be used with varying degrees of validity and robustness of results.

1. *Experimental* design: It requires complete *ex ante* random assignment of subjects, equivalent treatment and control groups; it allows the researcher to manipulate independent variables to observe their effect on dependent variables.
2. *Quasi-experimental* design: It is based on non-random assignment of subjects, non-equivalent treatment and control groups, in which the researcher must use various controls to reduce the errors for statistical inferences.
3. *Non-experimental* design: It uses either no or flawed controls, hence its results are of little value for impact assessment.

The *qualitative method* involves examination of the process, behaviour and conditions perceived by individuals or groups being studied. This method is used to determine the impact by reliance on something other than the counterfactual to make causal inference. It takes the form of social and institutional analysis through in-depth study of selected issues, cases or events and insights into the beneficiary perspectives that the quantitative method cannot adequately address. We will describe briefly the strengths and limitations of qualitative methods after we analyse the issues and problems related to the application of quantitative methods.

Table 1. Typology of Research Designs for Impact Assessment

Research Design	Intervention Assignment	Type of Control	Data Collection Strategy
Quantitative Method			
1. Experimental Design	random assignment controlled by researcher	treatment and control groups randomly; selected	before and after and during programme outcome measures; minimum: after-intervention
2. Quasi-experimental Design			
i. Regression discontinuity	non-random but fixed and known to researcher	selection held constant	before and after programme outcome measures; minimum: after-intervention
ii. Matched controls	non-random and not known to researcher	treatment group matched with control group	before and after programme outcome measures; minimum after-intervention
iii. Statistical controls	non-random and non-equivalent	treatment and control groups compared by statistical controls and instrumental variables	before and after programme outcome measures; minimum: after-intervention
iv. Generic controls	non-random	treatment group compared with outcome measures in general population	after-intervention outcome measures plus available "norms" of outcome levels in general population
3. Non-experimental Design	non-random	no controls	before and after-intervention or after-intervention outcome measures
Qualitative Method	non-random	no controls	case studies; textual data; direct observation; focus groups; semi-structured interviews; participatory methods

Note: The quantitative research designs are applicable to the partial-coverage programmes. They can also be used for the full-coverage programmes with (i) before and after measures for the treatment group only; (ii) cross-section (after-intervention) data for the non-uniform programmes; (iii) panel and time-series data for pre-intervention, during and after-intervention for the treatment groups or large aggregates.

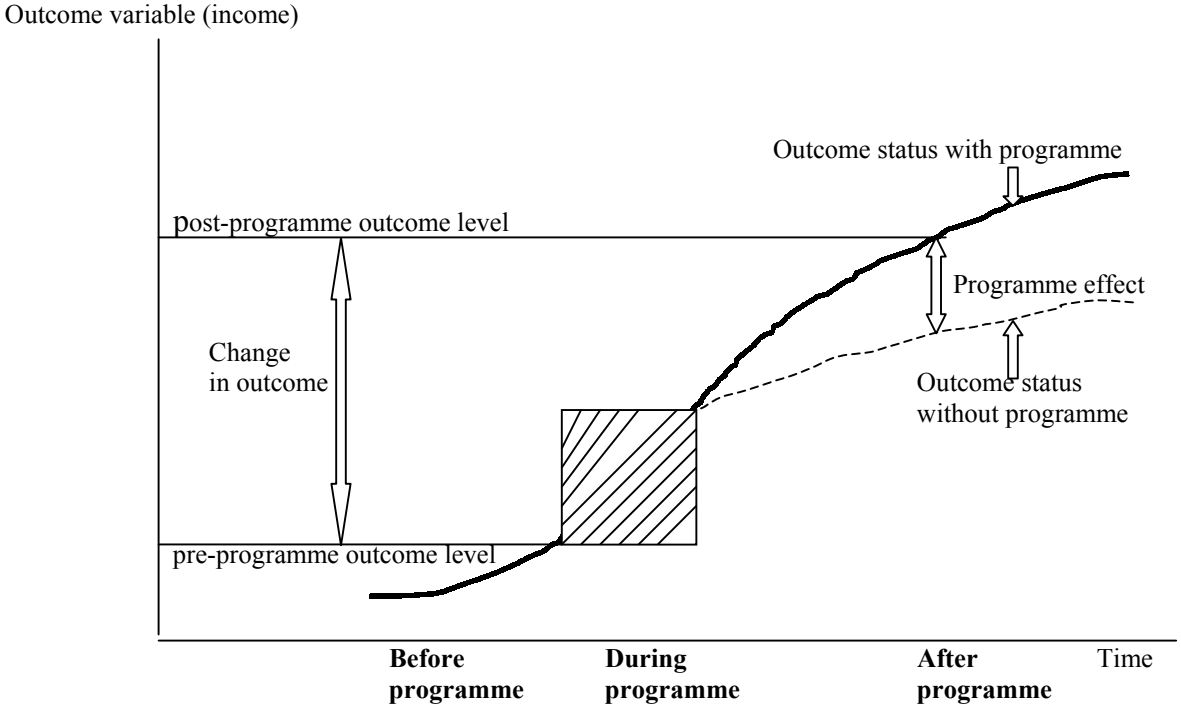
2.1. Quantitative Methods for impact assessment

We illustrate the concept of *programme effect* in Figure 1.[33] The outcome variable, say household income, is measured on the vertical and time on the horizontal axis. Two trajectories

[33] Adapted from Rossi, Lipsey and Freeman (2004), Chapter 7.

of change in income are depicted: the one in solid line if the household participates in the programme and the other in dashed line if the household does not participate in the programme. The *programme effect* is the difference between the upper and lower trajectories of income growth, with and without participation in the programme. It is, however, impossible to simultaneously observe the outcome (income) for the participating household with and without the programme. We can observe the outcome after programme participation (say after 5-7 years) and then somehow assume (or estimate) what the outcome (income) would have been without the programme. Since the outcome without the programme is hypothetical and not observed for the participating household it has to be inferred rather than measured or observed. We have to construct a counterfactual to capture the change in outcome (income) of the participating household had it not participated in the programme. We will review the methods by which the counterfactual can be estimated.

Figure 1. Change in Outcome and Programme Effect



We can start with some basic ideas underlying the measurement of impact of a support programme on the standard of living of rural people.[34] The net effect (impact) of a programme can be summarised in the following form.

$$\text{net effect} = \left[\text{gross effect}\right] - \left[(\text{confounding factor effects}) + (\text{design effects})\right]$$

[34] See Rossi, Lipsey and Freeman (2004), Chapters 8-10 for an extensive discussion of the application of quantitative methods for impact assessment.

The net effect (say change in household income) of programme interventions is estimated as the gross effect (total change in the income level) during the pre- and post-programme period *less* the sum of the effects of confounding factors (processes, programmes) and errors in design (sample and data). The confounding factors may include (i) uncontrolled selection, where participation in the programme is voluntary and not at random for individuals and villages and (ii) endogenous changes, natural sequences of events and presence of other programmes in the same area. The design effects result from the research process itself and can threaten the validity of impact assessment. They can influence significantly the size of change due to the programme. In this the size and design of the sample, choice of outcome indicators, validity of collected data, and missing information are the critical factors. The more we can control the confounding factors and design effects the more reliable the results are likely to be.

The impact assessment strategy will depend on whether the programme has *full coverage* or *partial coverage*. For programmes that have full coverage—it is difficult to find anyone who is not participating in the programme—the main strategy is to use reflexive controls or simply compare the *before and after* conditions of participants. The impact assessment formula for the reflexive designs is:

$$\begin{aligned}\text{net effect} = {} & \left[\text{outcome for participants after}\right] - \left[\text{outcome for participants before}\right] \pm \\ & \left[\text{effects of other processes working during intervention}\right] + \\ & \left[\text{stochastic and design effects}\right]\end{aligned}$$

The critical term here is the effect of other processes at work during the programme interventions. The presumption in the reflexive controls is that no changes in the outcome variables have occurred in the time between (before and after) observations other than those induced by programme interventions. This makes the reflexive control vulnerable to such influences because there is no control for these effects. In general reflexive controls should not be used when control groups can be constructed. We can use a reflexive design to make comparisons between non-uniform programmes in terms of their impact, but it is not the same thing as comparing the before and after conditions in the same programme.

Our focus here is on the *partial-coverage* programmes for which a number of strategies are available. We restrict the discussion to this category of programmes because the RSPs do not include everyone from the community in the programme as CO member and they do not cover all communities (villages) in a region. In other words, we can find or construct comparison (control) groups of households and villages.

As stated earlier, we can use three designs for quantitative analysis with varying degrees of validity and confidence about the results: experimental, quasi-experimental and non-experimental. In Table 2, we illustrate the options in each design. It is obvious that the validity of results, hence level of confidence, falls as we move from the experimental to non-experimental design. We discuss the experimental and quasi-experimental methods.[35]

[35] The *non-experimental design* is any of the options that either compares before and after the programme conditions of treatment group alone, or does not correct for the non-equivalence between treatment and control groups, or compares only after the programme conditions of the non-equivalent groups (treatment and control) groups. All of these variants would produce invalid or worthless results.

Table 2. Classification of Quantitative Methods for Impact Assessment

Group	Assignment	Controls	Outcome (e.g. income level) pre-programme	Outcome (e.g. income level) post-programme
Experimental Design				
1. Treatment	random	no	yes	yes
Control	random	no	yes	yes
Two groups (equivalent by random assignment): pre- and post-programme outcomes compared				
2. Treatment	random	no	no	yes
Control	random	no	no	yes
Two groups (equivalent by random assignment): only post-programme outcomes compared				
Quasi-experimental Design				
1. Treatment	non-random	yes	yes	yes
Control	non-random	yes	yes	yes
Two groups (non-equivalent, but equivalence achieved by using controls): pre- and post-programme outcomes compared				
Non-experimental Design				
1. Treatment	non-random	no	yes	yes
One group (treatment): pre-and post-programme outcomes compared				
2. Treatment	non-random	no	no	yes
One group (treatment): only post-programme outcomes compared				
3. Treatment	non-random	no	yes	yes
Control	non-random	no	yes	yes
Two groups (non-equivalent, but no controls are used): pre-and post-programme outcomes compared				
4. Treatment	non-random	no	no	yes
Control	non-random	no	no	yes
Two groups (non-equivalent, but no controls are used): post-programme outcomes compared				

2.1.1. Experimental design for impact assessment

The *experimental design* is the most robust of the three designs since it meets two basic conditions for replicability. First, the subjects are assigned randomly or the treatment and control groups (households) are drawn randomly from the same population: everyone has equal chance to be selected for treatment. In other words, the treatment and control groups are *equivalent*, hence the likely biases and dependent variables are controlled. Second, the independent variables can be manipulated to see their effect on dependent variables. In addition, we can test the results statistically.

In the experimental design the net effect of an intervention (or programme) can be conceptualised as the difference between participants (treatment group) and comparable non-participants (control group). Given perfect comparability (equivalence), the two groups will face

the same extraneous (confounding) factors and endogenous changes. Only the programme (interventions) and design effects can be inferred as the cause of the differences between them. The net effect of the programme can be estimated:

$$\text{net effect} = \left[\text{gross effect on participants}\right] - \left[\text{gross effect on non-participants}\right] \pm \left[\text{stochastic and design effects}\right]$$

The experimental design has three serious problems, hence used sparsely in assessing the impact of social and economic programmes on people's living conditions. First, randomisation is too expensive and difficult to monitor. Second, it raises ethical problems if treatment is withheld for the control group. Third, it is inapplicable retrospectively to programmes that are under way.[36]

2.1.2. Quasi-experimental design for impact assessment

The basic method for impact assessment in the *quasi-experimental* design is different from the one used in the experimental design because of the non-equivalence between treatment and control groups.

$$\text{net effect} = \left[\text{gross effect on participants}\right] - \left[\text{gross effect on non-participants}\right] \pm \left[\text{uncontrolled differences}\right] \pm \left[\text{stochastic and design effects}\right]$$

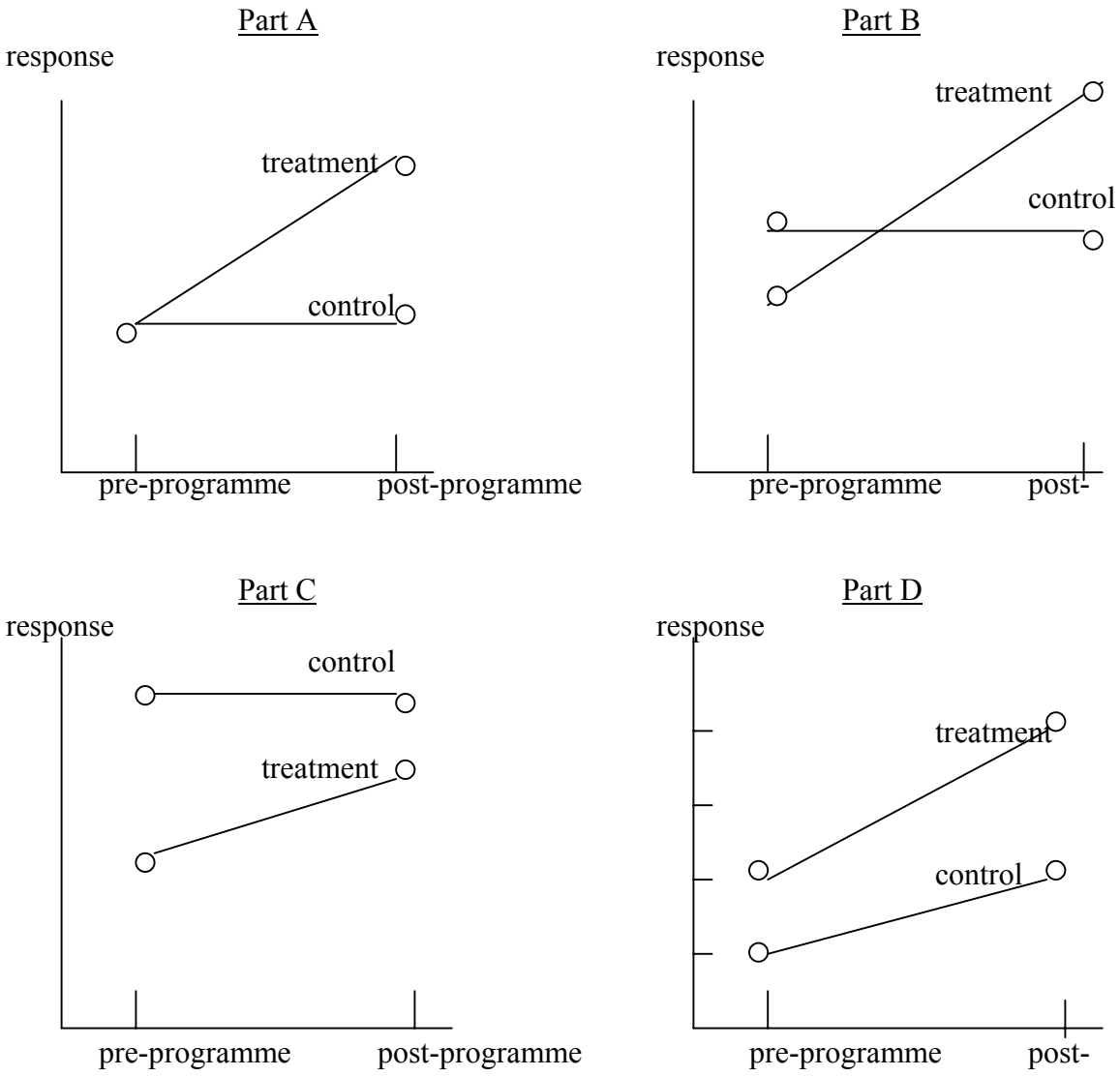
The unbiased estimates of the net effects of a quasi-experimental design will depend on the extent to which the uncontrolled differences (selection biases) have been reduced. The results of the quasi-experimental design are less robust than of the experimental design because the treatment and control groups are not randomly assigned but selected from the existing (intact) groups. In this case we have to find ways to establish the equivalence among non-equivalent groups—since they may differ in both the observable and unobservable characteristics—and reduce the selection bias. Matching these groups by different techniques can improve the validity of this design.

The analysis of results based on a sample of non-equivalent treatment and control groups can be difficult. In Figure 2, we illustrate the problem for these groups, using four scenarios in the pre- and post-programme settings. In part A, the treatment and control groups exhibit the same state (performance) before the programme, but the first group improves its performance over time. Here they can be compared since their state was the same at the beginning. A similar situation exists in part B: the control group was in a better state at the beginning but made no improvement, whereas the treatment group is far ahead after the programme. It would be difficult to suggest that this process occurred by chance alone. The results in parts C and D are, however, hard to explain. In Part C, the performance of treatment group has improved but the lack of improvement in the control group may be due to the "ceiling effect": it is not possible to improve above this level. Therefore, it cannot be inferred that the improvement made by the treatment

[36] See details in Gray (2004) and Rossi, Lipsey and Freeman (2004), Chapter 8.

group is due to the programme. In part D, the performance of both groups has improved in the same (100 per cent) proportion. The higher level reached by the treatment group is of no significance in terms of the effect of the programme.

Figure 2. Interpretation of Impact Assessment



There are several ways in which the control group can be constructed to establish its equivalence with the treatment group. There are four commonly used methods of controls.[37]

1. Matched controls: Take comparison groups very similar to the programme participants by either individual matching or aggregate matching.
2. Regression-discontinuity controls: It is also called the "cutting point" method in which a point is used along a continuum (say income level) to divide the groups over and under

[37] See Rossi, Lipsey and Freeman (2004), Chapter 9 and Baker (2000), Chapter 3.

the point. Selection of participants is not voluntary, but based on eligibility tests that use a cutting point as the criterion.

3. Statistical controls: Statistical procedures are used to identify and measure those control variables that may represent important initial differences between the treatment and control groups and create a statistical representation of the overall relationship among control variables and outcome variables. Multivariate models involve two types of control variables. The first type of controls has to do with those characteristics related to the outcome variable, say the initial education difference will affect income level in the absence of intervention. The second type is related to the selection bias (voluntary selection and programme placement). Instrumental variables are used to predict (i) programme participation and (ii) how the outcome indicator varies from the predicted values.
4. Generic controls: Very few aggregate measures of social behaviour and processes exist that can be used as generic controls or measures that can serve to represent control group outcomes. These controls are unreliable, hence used only as the last resort or when other controls are not available.

Since the quasi-experimental design does not face the same practical and ethical problems that the experimental design does, it is used quite commonly with results that depend on the controls used to reduce the non-equivalence between treatment and control groups. In fact, this design is also used for the cross-section data if the baseline (before the programme) data are missing for the two groups. The quasi-experimental design seems to be the only reasonable approach to assess the impact of programmes with partial coverage. However, unlike the experimental design, the quasi-experimental design has to address two likely sources of bias in its application to the rural support programmes. First, there may be a *selection bias* (self-selection) in that the treatment and control groups differ in both observable and unobservable characteristics that may influence the outcomes with or without the programme. Second, there may be a systematic difference between villages with or without the programme because the programme *placement may be endogenous*. We therefore need instrumental variables to control for these biases.

The statistical controls to address the issue of non-equivalence between the treatment (participating) and control (non-participating) groups of individuals or households can be analysed and used in two alternatives scenarios in terms of the available data. In the first scenario, we have the *baseline* and *follow-up* (two points in time) data for both the treatment and control groups with regard to their characteristics and outcomes. In the second scenario, we have only the follow-up (cross-section) but not the baseline data for the two groups. In Appendix I, we illustrate the use of statistical controls in the quasi-experimental design using the two scenarios.

2.2. Qualitative Methods for Impact Assessment

Since the core of impact assessment is to test the counterfactual, the qualitative methods have to rely on something other than the counterfactual to make causal inference. They are, therefore, generally used in conjunction with quantitative methods because the latter cannot reveal the *processes* by which the change attributed to the programme is inferred (or observed). Why do the inferred or observed changes occur? What processes intervened between inputs and

outputs? These questions are not answered by the quantitative methods. Qualitative research has a number of characteristics:[38]

- its main focus is to understand the ways in which people act and account for their actions;
- it is conducted through intense contact within a field or real-life setting;
- its role is to gain a "holistic" or integrated overview, including the perceptions of participants; and
- qualitative data are open to multiple interpretation.

In the qualitative analysis of impact assessment, one important approach is to include the participants' knowledge about local conditions, define their relationship with the programme, and identify changes that they attribute to the programme. In some studies they would participate in all stages, including designing, selecting indicators, collecting data, and analysis of the data. There are several potential benefits of the qualitative methods for impact assessment. They are flexible, can be tailored to the needs of assessment using open-ended approaches, can be carried out quickly using rapid assessment techniques, and can enhance the results of quantitative methods by giving perceptions of participants about the conditions and processes that may have affected the impact of a programme. We should, however, be aware of their drawbacks. The reliability and validity of qualitative data (and information) are highly sensitive to the methodological skills, training and sensitivity of the researcher. In addition, if the control group is not included in the study, or the sample is either too small or non-representative, the results will be either invalid or not generalisable for the population. The reliability of qualitative research can be strengthened by using multiple cases or by supporting assertions using numerous examples or by verifying the analysis using other researchers.

3. Data Instruments and Approaches

A wide variety of instruments and approaches can be used to collect the data required for impact assessment. The data requirements for the quantitative and qualitative methods are not necessarily the same: the former method requires the data in either pre-coded categories or numeric form and the latter method uses descriptive text without categorisation. This does not mean that the data instruments for the two methods are mutually exclusive. Normally we should use a mix of data instruments to generate the necessary information for both the quantitative and qualitative analysis of impact assessment. In Table 3, we show several data collection instruments with their strengths and weaknesses.[39]

[38] See Gray (2004), Chapter 13 for a detailed discussion of conceptual frameworks and techniques, as used in ethnography, for qualitative analysis. Also, see Roche (1999), Chapter 4.

[39] See Baker (2000), pp.32-33 and Roche (1999), Chapter 4.

Table 3. Data Collection Instruments and Approaches

Instrument	Definition and Use	Advantages	Disadvantages
Case studies	why and how questions can be addressed by a descriptive or explanatory story	can use with a full range of evidence from interviews, observation, documents and add explanatory power when focus is on processes, events and institutions	good ones difficult to do; require specialised research and writing skills; results not generalisable; difficult to replicate; and time consuming
Focus groups	focussed discussions with treatment group to find their perspectives and compare them with abstract concepts to write set of structured questions for assessment of impact	advantages similar to interviews; specially useful if participant interaction is desired; and useful way of identifying hierarchical influences	can be expensive and time consuming; must be sensitive to mixing of hierarchical levels; and not generalisable
Interviews	ask questions of one or more persons: formal and informal, closed or open-ended, face-to-face	people explain experiences in their own way & words; flexible to allow probing; and specially useful if language is a problem	time consuming; can be expensive; can be biased if not done properly
Observations	recording observations about what, who and how; it can be direct or participatory	provides descriptive information on context and observed changes	quality of data depend on observer's skills for observation and writing; findings open to interpretation; and requires considerable time to observe change
Questionnaires	set of survey questions whose answers are coded consistently	can reach large numbers simultaneously; allow respondents time to think for answers; impose uniformity; and make data compilation and comparison easy	quality of responses depend on clarity of questions; forces respondents to put answers in given categories; and sometimes difficult to persuade people to respond
Documents	reviewing secondary sources for data and information in records, correspondence, databases	can identify issues for further investigation or give evidence of action, change or impact; and can be inexpensive	can be time consuming

In the quantitative approach, questionnaire is the most commonly used data instrument. It is important that only experienced persons should design the survey questionnaire since the

responses can be very sensitive to the structure and format of questions. Several factors should be taken into account in designing the questionnaire:

- objective of the study (programme impact assessment);
- measures of outcome or socio-economic indicators (income, expenditure, assets, demography, education and health, services);
- timing of the survey (baseline and follow-up);
- nature of respondents (i.e. treatment and control groups);
- nature of programme (interventions or activities);
- programme placement (villages); and
- statistical tests (inferences).

Generally we require four basic types of information to analyse the impact of programmes:

- classification of nominal data with respondents differentiated by programme participation (treatment and control groups);
- outcome variables to measure the programme impact;
- quality of support and services; and
- characteristics of individuals and households that affect participation in a project or the impact produced.

The questionnaires used for the assessment of poverty in the sample villages and households of SRSO, discussed in Chapter 1, can be used as samples for the baseline and follow-up surveys, respectively. Of course, the questionnaire should be pre-tested (pilot tested) to ensure that all relevant information is collected. The data entry programmes should be ready at the time of pre-testing of questionnaires. Enumerators should receive good training to get the best answers while keeping the confidence and respect of respondents.

4. Sampling of Treatment and Control Groups

In Chapter 1, we have discussed the issue of sample design for surveys to draw the poverty profile of rural households. In the context of impact assessment, it is important to add that the follow-up survey should include preferably the same respondents from both the treatment and control groups that were interviewed in the baseline survey. However, if some respondents from either group have moved out of or moved into the programme then the sample for the follow-up survey should make appropriate replacements with reasonable assurance that new respondents in the two categories have similar if not identical characteristics as those they have replaced. We should adopt the same procedure in the follow-up survey with regard to the selection of villages if some of them have changed in terms of their relationship to the programme. In the following section, we reproduce the results of a study of impact assessment of the National Rural Support Programme (NRSP), using only the follow-up (cross-section) data since the baseline data were not collected.[40]

[40] See Khan (2001) for details of the NRSP survey and analysis of the data used for (i) the socio-economic profile of a sample of villages and households and (ii) the assessment of impact of the programme on sample households.

5. Impact Assessment with Cross-section Data: A Case Study of NRSP

NRSP started its partnership with rural communities in 8 districts of the provinces of Punjab, Sindh and Balochistan in Pakistan and Azad Kashmir in early 1993. We conducted a sample survey of the socio-economic conditions of villages and households during the months of February and March in 2001. A sample of 360 households was drawn from 24 villages (12 treatment villages and 12 control villages) in three NRSP Regions, namely, Badin/Mirpurkhas (Sindh), Khushab and Rawalpindi (Punjab). The treatment villages refer to those villages that have had a CO for five to eight years and control villages refer to those proximate villages with new COs where no programme intervention had been effected. In each of the selected treatment and control villages, a random sample was drawn of both the CO member and non-member residents.

We estimate the specification of Eq.(2), given in Appendix I, using the cross-section data on several socio-economic variables, to capture the economic impact of NRSP on the standard of living of the households of CO members in treatment villages. We use the following dependent and independent variables in the ordinary least-squares (OLS) regressions.

Dependent Variables

1. (ln) Household income
2. (ln) Household expenditure
3. (ln) Farm income
4. (ln) Net worth of household
5. (ln) Consumer durables
6. (ln) Household savings
7. Children in school

Independent Variables

1. Age of respondent
2. Education of respondent (dummy variable, D_1 to D_5)
3. Profession of respondent (dummy variable, D_1 to D_4)
4. Village fixed effects (dummy variable, D_1 to D_{23})
5. Number of months of CO membership in treatment villages
6. Members of CO in treatment villages (dummy variable, D_1)
7. Non-members in treatment villages (dummy variable, D_2)
8. Non-members in control villages (dummy variable, D_4)

The regression estimates in Table 4 show that the coefficient for the number of months of CO membership in the treatment villages is positive and statistically significant in all economic outcomes except one—the net worth of households—for which it is positive but not significant. In other words, partnership with NRSP has a positive impact on the CO member households in terms of their total and farm income, total expenditure, consumer durables, household savings, and children in school. For example, each month of CO membership in the treatment villages makes a difference of 0.6 per cent to the household income. This means that the household income in any year would be lower by about 7.5 per cent were this programme not available to the member household. Similar interpretation applies to the effect of NRSP activities on the other indicators of wellbeing, except the net worth, of the member household. It should also be noted that the coefficient for the dummy variable D_1—assigned to the CO members in treatment

villages—is not significantly different from the coefficient for members in the control villages on the dependent variables, except for the household net worth and consumer durables. Finally, it seems that the age of the head of household matters in only two outcomes, i.e. the net worth and savings.

Table 4. Economic Impact of NRSP on Rural Households

Dependent variable	Age of respondent	Months of CO member-ship in treat-ment village	Member of CO in treat-ment village (D_1)	Non-member in treatment village (D_2)	Non-member in control village (D_3)
(ln) Household income (n=360)	.00445 (1.596)	.00591* (2.547)	.00173 (.005)	.282 (.830)	.117 (1.026)
(ln) Household expenditure (n=360)	.00327 (1.246)	.00490** (2.239)	.0873 (.251)	.347 (1.085)	.199** (1.859)
(ln) Farm income (n=330)	.00119 (.278)	.00711** (1.963)	-0.131 (-.228)	-.126 (-.239)	-.0152 (-.087)
(ln) Net worth (n=216)	.0182* (3.056)	.00170 (.389)	-2.987* (-3.027)	-3.358* (-3.531)	-.0157 (-.059)
(ln) Consumer durables (n=360)	.0108* (3.636)	.00770* (3.103)	-1.689* (-4.277)	-1.466* (-4.045)	.0793 (.653)
(ln) Household savings (n=275)	.00189 (.228)	.0206* (3.369)	.543 (.527)	2.104** (2.174)	.977* (2.579)
Children in school (n=240)	-.0103 (-1.593)	.0115** (2.402)	-.260 (-.336)	.447 (.631)	-.372 (-1.352)

Notes: 1.'t' ratios are in parentheses.
2. Significance levels are: *99%; and **95%.

It is safe to conclude that the economic impact of the support programme on rural households is substantially large and probably makes a significant difference to the households close to the poverty line. This conclusion holds particularly for those rural households that participate in the COs on a sustained basis over a long period. What is perhaps more important, but not quantifiable, is that the support programme has mobilised through the COs the latent energies and resources of individuals and communities to overcome many constraints. This is evident in almost all of the functional COs in terms of their ability to resolve internal disputes and conflicts, manage and operate the community resources, claim and acquire resources and services from the public sector, and establish linkages with the private sector agencies. Put it differently. Community organisation can be a very effective rural institution to empower its members and enhance the community's physical, human and social capital.

Chapter 3: Appendix I

1. Impact Assessment with the Baseline and Follow-up Data

In case we have observations on the pre- and post-programme conditions—baseline and follow-up surveys are conducted—for both the treatment and control groups, we can estimate the programme impact by the double-difference (difference-in-difference) method in three steps:

1. Treatment group: $Y_{Ta} - Y_{Tb} = 1/N_T \sum (y_{ia} - y_{ib})$

where the change in outcome (e.g. income = Y) is due to natural and other events and the programme.

2. Control Group: $Y_{Ca} - Y_{Cb} = 1/N_C \sum (y_{ja} - y_{jb})$

where the change in outcome (e.g. income =Y) is due to natural and other events. The impact of the programme will then be:

3. Programme Impact (PI) $= (Y_{Ta} - Y_{Tb}) - (Y_{Ca} - Y_{Cb})$
$= dY_T - dY_C$

If the baseline data are not available, then we must collect the data in a follow-up survey of participants and non-participants (members and non-members) in villages with (i) active COs involved in the programme for some time and (ii) COs which have yet to start receiving the programme interventions. In this case, first compute the difference between members and non-members in the old CO. This difference represents the difference in outcome (e.g. income) between those in the village who have participated and others who have not participated in the programme.

$$Y_{Tm} - Y_{Tnm} = 1/N_{Tm} \sum y_i - 1/N_{Tnm} \sum y_i$$

This represents the difference in outcome between CO members and non-members when only members benefit from the programme. Then compute the difference between members and non-members in the village with new CO.

$$Y_{Cm} - Y_{Cnm} = 1/N_{Cm} \sum y_j - 1/N_{Cnm} \sum y_j$$

This represents the "natural" difference in outcome between members and non-members. The impact of the programme then is:

Programme Impact (PI) $= (Y_{Tm} - Y_{Tnm}) - (Y_{Cm} - Y_{Cnm})$
$= dY_T - dY_C$

Let us now turn to the regression techniques to estimate the programme impact using the double-difference method but taking into account heterogeneity. Without heterogeneity, we can obtain the results by regressing the outcome on group dummies. Assume that:

$\delta_i = 0$ if observation i is from baseline (before) and $\delta_i = 1$ if it is from follow-up (after); and
$T_i = 0$ if in treatment group, $T_i = 0$ if in control group.

Then regress the outcome y (income) on δ (before and after) and T (with and without) and the product δT:

$y_i = a + b\delta_i + cT_i + d\delta_i T_i + \varepsilon_i$

where:

$y_{Ta} = a + b + c + d$	outcome for treatment group after intervention
$y_{Tb} = a + c$	outcome for treatment group before intervention
$y_{Ca} = a + b$	outcome for control group after intervention
$y_{Cb} = a$	outcome for control group before intervention

The programme impact is d. Add the control variables X in interaction with the impact to account for the heterogeneity of impact on the population.

$y_i = a + eX_i + b\delta_i + cT_i + d\delta_i T_i + fX_i d\delta_i T_i + \varepsilon_i$

where the impact with heterogeneity is $= d + fX_i$ and it varies with the values of X.

As stated earlier, the problem gets more complicated when there may be biases due to *non-random selection* and *programme placement*. Say the treatment variable is endogenous, reflecting the selection and placement biases, when some unobserved characteristics explain both participation in the programme and outcomes. The value of parameter c in treatment T_i is not only the effect of the programme but also the effect of unobserved characteristics on performance. We want to control for the joint effects of some unobservable characteristics that both explain the choice to participate in the programme and values of the outcome. We have to use *instrumental variables* by which we can separate the choice to participate in the programme from the effects on the outcome. When we use the ordinary least squares (OLS) regression estimation, there is concern that the parameter estimates will be biased because the right-hand side (independent) variables are not exogenous. Exogeneity means that the independent variables are independent of choices for participation and so they are not correlated with the error term or the error term is the same for participants and non-participants. Non-random placement of the programme introduces a bias that affects the estimate based on the regression.

2. Impact Assessment without Baseline Data

We now examine the problems and their solutions, using the case when we have the cross-section (post-programme) but not the baseline (pre-programme) data. The biases due to non-random placement of the programme and self-selection of individuals in the programme can be corrected by using a quasi-experimental design in which the sample of households includes members and non-members from villages with the programme and randomly selected households from villages without the programme. In this method, availability of the programme is the identifying variable. It is recognised that there may be systematic differences between the included and excluded villages because the programme placement may be non-random (endogenous). The estimation of village fixed effects can control for the unobserved differences between villages.

The second problem in evaluating the success of a support programme is that a potential CO member must decide that he/she wants to participate in the CO and must be accepted by other villagers who have self-selected. Therefore, it is likely that there are significant differences between CO members and non-members in the same village. If such differences can be observed and measured (e.g. age, education, profession), they can be controlled for when estimating the impact of the programme. However, since other differences between villagers cannot be observed, such as entrepreneurship, attitudes toward the role of women, trustworthiness, a direct comparison of CO members and non-members will yield biased estimates of the impact. This bias results because the same unobservable characteristics that lead some people to join the CO will also affect the impact outcomes (measures) such as household income.

Khandker (1998) and Coleman (1999), in their separate studies of micro-finance through group lending in Bangladesh and Thailand, estimate the impact by correcting for the biases due to programme

placement and self-selection of borrowers.[41] They use a quasi-experimental design in which they sample members and non-members from villages with a lending programme and randomly selected households from villages without a programme. They also recognise that there may be systematic differences between the two types of villages because the programme placement may be endogenous. Therefore, they use the village *fixed effects* estimation to control for the unobserved differences between villages. The basic impact assessment equation is:

$$Y_{ij} = \alpha X_{ij} + \beta V_j + \gamma M_{ij} + \delta T_{ij} + \mu_{ij} \qquad (1)$$

where,

Y_{ij} = outcome variable for impact measurement;
X_{ij} = vector of household characteristics;
V_j = vector of village characteristics;
M_{ij} = membership dummy variable equal to 1 if household ij self-selects into the programme, and 0 otherwise;
T_{ij} = dummy variable equal to 1 if self-selected member has access to the programme, and 0 otherwise; and
α, β, δ, and γ are the parameters to be estimated.

The membership dummy variable, M_{ij}, can be taken as a proxy for the unobservable characteristics that lead households to self-select into the CO. The variable T_{ij} measures availability of the support programme to CO members who have self-selected, which is exogenous to the household, but may not be exogenous with respect to the village. In this specification, δ measures the average impact of the support programme on Y_{ij}. The specification in Eq. (1) eliminates the correlation between T_{ij} and μ_{ij} due to self-selection at the household level because M_{ij} captures the unobservable household characteristics. Since the RSP may not have selected the villages randomly for CO formation, there would be a positive correlation between T_{ij} and μ_{ij} and the estimates for δ will be biased. The bias can be eliminated by the village fixed effects estimation of Eq. (1).

The empirical model in Eq. (1) can be improved by recognising that CO members in the treatment villages have received support and services for different periods, some longer than others. Since the cumulative amount that a CO member can borrow grows and he/she can also receive more of other benefits with the passage of time, greater impact should be expected in villages with older COs. This can be addressed by rewriting Eq. (1).

$$Yij = \alpha X_{ij} + \beta V_j + \gamma M_{ij} + \delta COMOS_{ij} + \mu_{ij} \qquad (2)$$

where $COMOS_{ij}$—number of months that treatment members have been in the CO—replaces the treatment (dummy) variable T_{ij}. $COMOS_{ij}$ is zero for members in the control villages and for non-members in the treatment and control villages.[42]

[41] See Khandker (1998) and Coleman (1999). For a general application of the regression models with different controls to analyse the impact of projects and programmes, see Baker (2000), Chapter 3.

[42] Implicit in this approach is the assumption that there are no spillover effects to the non-members in treatment villages. To the extent that such effects exist, they are captured by the village fixed effects rather than by programme effects.

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