

Shyampura Lift Irrigation

A case Study

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Shyampura Lift Irrigation: A Case Study¹

Background

Introduction to the case study

The Central India Initiative (CInI)-Phase II aims at exploring what has worked and what has not (and of course why) in promoting water based livelihoods initiatives in Central Indian Tribal Highlands; and contribute to preparing a strategy for pushing agricultural intensification in these regions.

This case study looks at a lift irrigation (LI) system in Udaipur district of Rajasthan. The sponsoring agency was Seva Mandir. The LI command covered 16 ha of land, and had 27 families as beneficiaries. The system was installed in 1991 and was operational between 1994 and 1999. Subsequent years saw consecutive droughts, and thus the system remained unused after 1999.

The system cost was Rs 517,000, including the charges for electrification. The recurring charges for electricity were Rs 25/hour of pump use. In addition an annual charge of app. Rs 3000 was incurred on account of repairs and maintenance- this was to be shared equally among all 27 families. The unit irrigation cost for irrigating 1 ha land, including the power and maintenance charges, would be around Rs 580 for 1 season (3 irrigations).

The significant impacts included:

- The area under cropping, production and productivity indices of all major crops increased. In case of wheat for instance the increase in production was around 800%.
- The beneficiaries moved closer to food security- farmers with more than 3 bighas of land were able to be food-secure; for farmers with 1-2 bighas of irrigated lands, the food deficit and the number of days of migration required to attain it, was nearly halved.
- The out migration reduced significantly, with all women now not migrating. The migration for men too changed- and was now for shorter duration and to nearby villages.
- The number of large livestock nearly doubled.
- The enrolment of girl children increased and reached 91% in 5-10 age group, and 62% in 11-15 age-group.

The LI at Shyampura can be considered a success in terms of production related impacts. However according to performance on equity related parameters (people paying a cess to Village Development Fund- GVK, or returning a Seva Mandir loan, or in involvement of women in the LI) the performance was less than satisfactory.

The system also worked well for five years, years in which the stream, on which the LI is located, had water. In the subsequent years the system was not used, as there was no water in the stream. It is difficult to envisage a long term impact on peoples livelihoods under these conditions.

¹ This case study has been authored by Anuradha Viswanath. The inputs of Seva Mandir staff and village community are gratefully acknowledged.

Locale²

Note: The section on locale and the following section on Community, attempts to profile the region (Udaipur district and Jhadol tehsil), and specifically the village Shyampura. The LI scheme had a significant impact on the cropping patterns, area, production and productivity of crops, as well on livestock. These details are detailed later, specifically in section on impacts).

Location:

Shyampura village is located in Udaipur District of South Rajasthan, amongst the Arawali hill ranges. Administratively the area is a part of the Jhadol Panchayat Samiti, and is a part of the Bicchiwada Panchayat. It is located app. 80 Km south-west of the district headquarters. Bicchiwada is linked to Udaipur by a metalled road, and a 5 km kuccha (unmetalled) road links Shyampura to Bicchiwada.

In reference to river basins, the village is located near the line dividing the "watershed-of-India"³. The village is located at the origins of river Wakal, an early tributary of River Sabarmati. The village is located on the eastern face of the range, and the upper reaches are the forest areas.

The settlement pattern in the region is characterized by a scattering of large-multi caste villages with control of good arable lands, surrounded by tribal villages located within undulating areas, with most lands there being forest lands. This is a pattern that has been repeated across all Tribal areas across India. "A unique feature of the geographical distribution of tribals in India is the simultaneous occurrence of high density and their existence as a numerical minority of the region's population. This is true of all major regions of tribal concentration, except the Northeast."⁴

Shyampura, like most tribal villages in the area, is divided into hamlets (*fala*), and the habitation is dispersed. The large hamlets include Kala, Wada, and Khurd *fala*. Seva Mandir's presence is most intense in Kala *fala*, where the Lift Irrigation command area is located. Here there are 60 HH, with 180 adults and 240 children. Voter list for Shyampura records 335 persons, with 7 more females than men. The female-male ratio is 1042: 1000⁵ in Shyampura. All inhabitants of Kala *fala* are tribal, and the dominant *gotras* are Vadheras and Angaris.

There is stratification along economic lines and along *gotra* levels. The households belonging to traditional ruling classes or the new rulers ("peoples representatives") have appropriated large assets. Though as a whole, majority of the households are still at the bottom end of the poverty scale, there is economic stratification distinguishing the poor from the very poor.

Shyampura has a primary school up to 5th standard, and a Balwadi is attached to it, and there are two NFE centers in the village. Other facilities like Primary Health Center, Post office and the Middle School (upto class 8th) are located in Bicchiwada. Village Phalasiya, another Panchayat HQ, is 4-5 km away has a larger market, two banks and higher education facilities. The veterinary center and the police station are also located in Phalasiya.⁶ There are 3 hand pumps in at Kala *fala*, all of which are non-functional. The last hand pump became dysfunctional when ground water levels dropped below 50m last summer. Two individuals in the hamlet also own bore-wells. Two anicuts have been constructed in Shyampura with Seva Mandir assistance to restrict runoff.

² This section is derived from the "Programme Preparation Study for the Indo-German Watershed Development Programme in Rajasthan", GiTEC and Seva Mandir, 2002.

³ The Bay of Bengal watershed from the Arabian sea watershed.

⁴ Mihir Shah, The Adivasi Question, The Hindu

⁵ Effect of Livelihood Interventions on Education, Seva Mandir, Nov 2000

⁶ Village Study of Shyampura, Ajit Kanitkar, Seva Mandir 1999

Topography

The ancient Arawali Ranges, in midst of which Shyampura is located, were formed towards the end of the Dharwar period when the marine deposits were uplifted by tectonic orogeny. There is evidence that the vast Arawali formation was uplifted again during early Paleozoic period. At this time the extent of these ranges was much larger than today, probably stretching from the Deccan to beyond the limits of the Himalayas. At present the area is characterized by low-lying hills with the inter mountain plateau occupied mainly by Precambrian metamorphic rocks and intrusions and extrusion of lava basalt, deeply dissected by streams and rivers.

The soil layer consists of very-shallow to shallow, loamy to clayey soils, which are mostly gravelly and neutral in reaction. The surface is severely eroded with significant surface stoniness. Rock outcrops are quite common. Soils with deep phases are located on foothills and in depressions. The available water capacity (AWC) is rather low.

The high runoff, consequent to degraded catchments, also contributes to low water availability.

Climate and Rainfall

The area is at the boundary of the Agro Climatic Zones IV and V (Humid/Sub Humid Southern Plain and Hill Zone), The climate of the region is characterized by moderately hot and wet summers and dry winters. The highest temperatures, well above 45° C are recorded in May, the lowest of around 10° C in December/January. The annual precipitation averages around 650mm of which 95% is received in the period from June to September, with July being the wettest month.

The monthly distribution indicates drastic variations in rainfall from year to year and within the rainy seasons. Reliability of rainfall is apparently highest in the months of July and August and lowest in September and October. From November to May no significant precipitation has ever been recorded. Generally, the rainfall pattern is erratic. Following patterns have been common in the recent years:

- Timely on set followed by long dry spells,
- Timely on set and early withdrawal,
- Late on set and early withdrawal.

The annual potential evapotranspiration demand is about 1300 mm and thus the precipitation is significantly lower than the evapotranspiration demand. The area comes under moisture deficit category.

Water

High variability of rainfall, geological situation and the relatively high relief energy limit the water availability in the area. Alluvial deposits are restricted both in depth and extent. This is reflected in the recharge patterns of shallow wells, which currently restrict the potential for lift-irrigation and supplementary irrigation mostly to the immediate post-monsoon period. In the metamorphic rock formations (gneiss, phyllites, schists etc) of the Achaean period, which have undergone a high degree of structural disturbance, the ground water is confined to fractures and fold openings of secondary nature. Most of the wells in such formations are located at bank of streams. Open wells in the area, being 8 to 10 m deep, yield 25,000 to 65,000 l/day in the monsoon- and post-monsoon period. Currently, more than 50% of wells dry up by December, even in normal years.

As the wells in the area are very shallow, there are still depths where such fractures can be tapped. Provision of a more reliable water supply generally requires well deepening through blasting in hard rock, a resource intensive activity that is beyond the capacity of most farmers. Subsequent to the consecutive drought years, new bore-wells have been dug to almost 100 m to locate reliable water supplies. Tapping deep aquifers (more than 25 m) without site-specific geo-physical investigations seems to be a risky undertaking as the success rate with new bore wells is reportedly only 15-20%.

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Recharge of wells is very slow and depends on the location of the wells with respect to topography and vicinity to surface water sources. It is observed that wells near water harvesting structures or in command areas have relatively high water tables. Wells located in the fracture zones yield rather consistent flows.

Table 1. Recharge and Draft in Jhadol.

Total Annual Recharge	Net Utilizable recharge for Irrigation	Available recharge	Total net draft as on 01.07 2001	Balance available for development	Category	% of development
Ha-m	Ha-m	Ha-m	Ha-m	Ha-m		
4540	3860	3204	1460	1744	White	38

Source: District BPLCP, NABARD, Jaipur 2002-2007 as on 01.07.2001

Frequent outcrops of fissured basalt pose an additional problem. Infiltration varies greatly and is mostly confined to fracture-zones. Infiltration rates in these zones are favorable, but groundwater flow follows small tectonic faults. In-situ recharge of shallow aquifers is therefore a rather unpredictable undertaking.

In Shyampura currently the streams are dry, and the LI well is also dry. Small quantities of water that exist are being conserved to be used as drinking water in summer months. A checkdam was constructed in the stream where a traditional weir used to be constructed, but the recharge seems to be benefiting farmers in other villages.

Increased groundwater extraction in nearby large villages, specifically Bicchiwada and Phalasiya, seems to have impacted Shyampura aquifers. The village hand pumps, one of which was 50m deep has dried up, and the only source of drinking water is a new bore-well dug by Jhalm Chand, which is 75m deep.

Land Use

The forests are the dominant land category in the area. The landform used to be under forest cover but since most of the natural vegetation has been destroyed, encroachment and uncontrolled grazing by cattle and goats appears to be the most important form of land use in most parts of Jhadol tehsil. Degradation pressure and at places cultivation of such marginal land without any soil and water conservation measures is further accelerating the loss of topsoil due to water and wind erosion.

However, subsequent to Seva Mandir's efforts in the village post 1991, the land use in Shyampura has changed. Almost all forest lands are under community management (under JFM) and large area has come under irrigation because of the LI.

Table 2. Land Use in Jhadol Tehsil, 2001

Total Area		144100	% of Total
Forest Area		77402	54
All area not av. For cultivation		48093	33
Net Sown Area		19390	13
Gross Sown Area		26970	%of NSA
Kharif Area		18331	95%
Rabi Area		8402	45%
Summer Area		70	~ 1%
Area Irrigated by Source	Wells	4030	20%
	Ponds	74	~ 1%
	Canals	0	~ 1%
	Tube well	0	~ 1%
	Others	239	~ 1%
	Total	4343	22%

Source: District Statistical Handbook

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Table 3. : Key land Use Statistics for Shyampura (Kala fala)

Forest land (all under JFM)		85 bighas	17 Ha
Arable	Total	300 bighas	60 Ha
	Irrigated	80 bighas	16 ha
	Rainfed area	220 bighas	44 Ha
Beed		60 bighas	12 ha
Other Common Lands		NIL	NIL

Source: Village PRA

Agriculture: Jhadol is single cropped to a large extent, and second crop in most instances is *heerma* (residual moisture based). Around 15% of the geographical area is cultivated, and only ~20 % of sown area is irrigated. Irrigation is principally through dug-wells that tap upper layer of soil moisture, thus is subject to extreme variations.

Cereals (Maize in the monsoons and Wheat in winter) and Pulses and oilseeds (Pigeon-pea and Black-gram in monsoons, Mustard and Bengal -gram in winters) are dominant crops. However several other crops are also cultivated- these include tubers (Ginger, Turmeric, *Rataloo*-red yam, *Suran*-elephant yam), Millets (*Maal*, *Kangni*-fox-tail millet), Fibre Crops (*Ambadi*, *Saan*-Sun Hemp), vegetables like chillies, and paddy etc. Some areas- next to the river- also have small plots of sugarcane - which is converted locally into jaggery. The district yields are among the lowest in the state- the figures quoted in some areas range around 300-400 Kg/Ha (for Maize), which are less than half of the state average.

Table 4. Productivity (kg/ha) and Harvest Prices (Rs/kg)

Major Crops in Udaipur (1999-2000)			
	Maize	Wheat	Gram
Productivity			
1998-1999	369	2323	1424
1999-2000	202	2263	1481
Price at Harvest	5.50	6.20	12.40

Source: District Statistics Handbook

For Shyampura, the nearest organized markets for agriculture produce are located in Udaipur, for grains, vegetables as well as key inputs. Small private shops exist in Phalasiya. Many traders, specifically for purchase of crops like tuar, come in from nearby Gujarat.

The district reported a total of 470392 ha for agricultural uses. More than 75% of the farmers had operational holdings of less than 2 ha. The distribution of land holdings is given below.

Table 5. Distribution of Operational Holdings – Udaipur 1995-96

Category	Number of holdings as % of total holdings	% of total area of operational holdings
0.0-1.0ha	50%	13.8%
1.0-2.0ha	24.7%	21.5%
2.0-4.0ha	16.9%	29%
4.0-10.0ha	7.5%	26.5%
> 10.0ha	1%	9.2%

Source: District Statistics Handbook

Livestock is generally of a nondescript breed kept principally for draught and dung. The villages along the main road, Bicchiwada in this case, are covered by the cooperative dairy network. This however has little impact on Shyampura. However sale of animals, especially goats/sheep, constitutes a critical part of drought-coping strategy.

For most communities livestock rearing is an important activity, however the nature of livestock rearing is different. While the agrarian communities keep animals for dairying, for the tribals the livestock serves three

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critical purposes. It provides draught power required for agricultural operations. This is critical, as agriculture operations need to be performed within very narrow time windows, and no alternatives exist. Secondly, these cattle provide dung, which as manure is the only agricultural input for most families. The animals thus serve as a means for circulating the nutrients from the non-arable lands to the arable lands. Thirdly the small ruminants, i.e. goats, are kept as a "safety deposit" and are sold in case of emergency.

Dry fodder is the main source of fodder for animals. Dried grass from forests, public and private wastelands and farm bunds is collected in the months of November and December, and stored. This fodder is used to provide supplementary stall-feeding during summers, along with crop residues. Some green (Kharif) fodder is now grown valley areas, and is exclusively for buffaloes.

Community

The dominant population group in Udaipur is the Bhil tribe. This community inhabits a broad belt that spans across South Rajasthan, North Gujarat and adjoining parts of Madhya Pradesh. Most parts of the district are characterised by dispersed tribal hamlets and villages that surround large multi-caste villages. A wide variety of communities inhabit these larger villages- Rajputs, Banias, Brahmins, Dangi Patels, etc. Most of these villages also have households that perform utility functions- potters, leather workers, iron-smiths etc. These non-tribal habitations serve as the principle hubs of local commerce and trade, and in most cases as power centres also- especially as these villages are also normally the Panchayat headquarters.

Social Structure

The Bhils constitute an endogamous tribe; divided into a number of patrilineal exogamous clans called *jats*. The clans are further divided into a number of sub-clans called *gotras*. Each clan and sub-clan has a distinctive name, which is used as identification by all people who belong to it, by birth or adoption. The names of the clans are territorial or eponymous (commemorating an incident in the life of a real or mythical ancestor). Among the Bhil clans, there does not seem to be any ordering in a definite system of rank or seniority.

The tribal family is a unilaterally related group of persons related through the father. Households are simple nuclear family groups consisting of a male head, his wife(s) and unmarried children. The children of a Bhil family behave as members of a single economic unit, but, upon marriage, separate from the parental home and manage their independent hearth and home. However, land may still remain undivided. The Bhil family freely decides its daily matters such as purchase of agricultural inputs etc., but in socio-religious matters, consultation with kinsmen takes place.

The Bhil tribe is an endogamous group and a Bhil is never allowed to marry with non-Bhils. In marriage, Bhils observe clan exogamy and thus no marriages are permissible between the persons of the same clan or worshipping the same deity. Sub-clans are also exogamous.

Bhil marriage has a unique feature as the *dapa* (bride price) is paid by the groom's family. The amount of the bride price is not fixed and varies as per the status and tradition of family. The practice is reversed in case of other communities, where dowry (to be paid by the brides family) is the norm.

The non-tribal communities are confined to the Khurd fala of Shyampura. These communities of course occupy spaces in the rigidly stratified Hindu caste (or Jati) system. As in case of tribal community, the *Jatis* are further divided into sub-clans, also called *gotras*, with similar restrictions on marriage etc. They follow a conventional joint family pattern, wherein the male head, his spouse and children, and their spouses and children form an undivided economic unit.

Health and Education

Education: Literacy rate in India has climbed to 65.38 and is 61.03% in Rajasthan. In Udaipur district it is at 59.26⁷% (COI 2001). For Shyampura the overall literacy rate is 42% with 53% males and 32% females are literate. The gap in rate between males and females is significantly low as compared to rest of the district.

In Shyampura among 6-14 year olds, 81% are undergoing education in some form or other, breakup being 76% at school, 4% at NFEs and rest through an Adult Education programme. On a comparative basis Girl-Boy education is neck to neck with 84% and 82% boys and girls studying respectively. In age group 15-25, 46% go to school, 3% to NFE and 1% to the Adult Education programme. 74% of these are males and 29% are females⁸.

The high enrolment rate is also the result of the State's massive drive towards universalization of elementary education, which has been equated at an operational level to enrolment and attendance. The State has opened numerous Para schools for this without making substantial investment in enhancing the capability of the Para-teachers.

In many villages, irrespective of enrolment figures, roughly 50% of the children in the school going age are not actually going to the school. Even more disturbing is the status of the learning level of the children. Across different kinds of schools (whether Govt. or Non. Govt.), children (and their teachers) are found to be lacking even the basic ability to read and write with comprehension. (*Source Seva Mandir studies*)

Gender: Low education, poor health and lack of social space affect the ability of women to assume greater roles and responsibility in society. There are more female marginal workers than men in the District⁹, 24.96% and 1.16% respectively. Many women and children carry out work outside the home in addition to the strenuous household duties. The literacy rate of women at 44% is much lower than that of men at 75%. In some areas like Kotra, the female literacy rate is still in single digit.

Rajasthan state also lags behind in health related indicators, especially those related to women and children. It has the dubious distinction of having one of the highest infant mortality rates in the country. Female children are exposed to a significantly higher risk of mortality and IMR for girl children was 93 as compared to 83 for boys. Maternal mortality ratio in Rajasthan at 670 (SRS 1998¹⁰) is quite high in comparison with the figures for India which are at 410 (HDR¹¹ 2000).

While lack of good services is a problem, the utilization of existing services is also low. This can be attributed to lack of awareness and conviction (leading to poor treatment seeking behavior even amongst the aware sections). Early marriages and early motherhood mean an increase in the fertility span and thus higher fertility rates. Age specific fertility rates for women in the rural areas of India is the greatest among 20-24 year olds at 249 (per 1000) while in Rajasthan it is 287.3. In case of 15-19 age group the State figures are 100.2 as compared to National fertility numbers of 74.4.

⁷ However, Seva Mandir's independent field level assessments belie the confidence in the high regional statistics. Their studies reveal that the literacy figures have been inflated because all enrolled children above the age group of 7 years have been treated as literates. This is misleading at two levels: the enrolment figures themselves are not reliable as even those who are not studying regularly are treated as enrolled, and also because mere enrolment does not necessarily translate into literacy.

⁸ Effect of Livelihood Interventions on Education, Seva Mandir, Nov 2000

⁹ District Statistical Handbook, Udaipur

¹⁰ SRS stands for Sample Registration System

¹¹ HDR stands for Human Development report

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Against the adverse sex ratio of 1000-913 in the state, the sex ratio of Udaipur is 1000-982. Many tribal blocks, Kherwara for instance, report sex ratios that are favorable to women, though large scale out-migration may have distorted the figures.

Tribal women while having some freedom of mobility and in sexual practices are still restricted in terms of their decision to have children or control over their bodies.

All these lead to the women being perceived as unimportant, weak, unintelligent and poor in decision making by the men and by themselves. This also then restricts their participation in the social domain. While being major contributors in the household economy they are hardly counted in any main decision making at the household and community level.

Malnutrition among children and women is rampant, in the former group as protein deficiency, and in the latter as anemia. A study¹² conducted on Nutritional status of rural children in South Rajasthan, showed that only 6.8% of the children get complete immunization. The study also indicated high level of illness- 24.5% of children suffered from diarrhea, 30.3 had cough or breathing difficulty and 28.1 percent had fever during the two weeks preceding the survey. It also showed high incidence of malnutrition (48.1% stunted, 19.4% wasted and 53.8% under weight.) These contribute to making them susceptible to various infectious diseases.

Health: Rajasthan state also lags behind in health related indicators for remaining population also. Among the critical health issues are Malaria, Tuberculosis and HIV/AIDS.

In Rajasthan, TB accounts for a death rate of 1 per 1,000 in rural areas. 420 persons per 100,000 population are suffering from tuberculosis of which only 358 persons are medically treated¹³. The RNTCP (Revised National Tuberculosis Control Programme) estimates the incidence of TB in Udaipur district to be 135/100,000 population, which is quite high. The data received from district tuberculosis hospital also indicates 46.7% failure in treatment under the RNTCP, the reason being inaccessibility of regular treatment facilities mainly because of periodical absence of paramedical staff in the remote areas resulting in high number of relapse cases

National Family Health Survey (NFHS-II) indicates that 4,458 persons per 100,000 population are suffering from malaria in the rural areas of Rajasthan. The Seva Mandir Referral Health Center at Kozawada reported in the year 2000 that a significant percentage (10% of the all fever cases) were of cerebral malaria, which has a higher fatality rate.

AIDS cases in India are 15,608 with 26.88 persons/1000 population getting infected with HIV each year¹⁴. Udaipur district is highly susceptible to AIDS due to the presence of National Highway-8 through the center of the district, on which sex trade is prevalent. A large number of youth and men migrate from here to nearby cities of Rajasthan and Gujarat who are also believed to be in the high risk group.

Leadership and Jati Panchayat

The Jati (community) Panchayat was a powerful tribunal. Each village or collective of villages had a Panchayat, lead by the village headman, usually a part of the founding family of the village (the first settlers). With him, there are other panchas (arbitrators), who represent different units of the village. There are also regional arbitrators apart from village level arbitrators. A number of Bhil villages come under the jurisdiction of such a regional Community Panchayat. In many cases the local Rajputs and other non-tribal

¹² Conducted in Udaipur in 2000 by ARTH (Action research and training in Health).

¹³ Source: International Institute for Population Sciences and ORC Macro-2001

¹⁴ Source: NACO (National Aids Control Organisation) the national level body working towards HIV/AIDS control in India. 2002 Data.

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leaders, have appropriated power positions in the Jati Panchayat, and would be called to arbitrate in matters that relate to purely tribal issues- i.e. marriage disputes among tribals.

The functions of the Panchayat are mainly regulatory, pertaining to social, religious and judicial issues. The authority exercised by the panchas is so great that not even a single person can take any step against the decree of the Panchayat. The punishment imposed on defaulters by the Panchayat varies according to gravity and magnitude of offence committed. In social matters, irregularities are set right in a civil way by imposition of fines and the accused is required to entertain the panchas at a feast. Excommunication is the common punishment imposed on people who take forbidden food or break the rules of exogamy and endogamy.

Arbitration of *nata* (elopement or second marriages) is often the dominant task of the Jati Panchayat. There is little evidence of active role being played by Jati Panchayat in development related issues- i.e. in cases of encroachments or damage to a common resource.

The village headman is called the *Mukhiya or Gameti*, and often is a part of the founding family in the village. This office is hereditary. The Gametis perform their obligations as social leaders in the village. They act as arbitrators in village conflicts or settlements of bride price. Bhopas, or Traditional Medicine Experts, and NGO paraworkers also are important parts of the village leadership.

The area is witnessing a dramatic change in the profile of leadership. The current crop of leaders are educated, are associated with NGO's, and also in most cases hold Panchayat offices. Majority of these new leaders are still from the traditional leadership.

Migration¹⁵

Wage earnings from migration are the most important source of income for most of the tribal families.

Migration patterns are different in different regions within the selected districts. Patterns vary from daily migration to long term out migration. There are also distinct differences between tribals and non-tribals.

Lack of irrigation, small landholdings, low soil fertility, and lack of opportunities for work in the villages force at least one to two members out of a family to migrate. Increasing population pressure and the fragmentation of land among brothers has increased the need to search wage labour as a source of cash income. 40-50% of the earnings are spent to cover the additional costs and only the remainder is available as cash for the families.

People in Udaipur migrate mainly between July and September and from December to March, when there is not much agriculture work in their fields. Farmers with very small irrigated landholdings (0.2-0.4 ha) migrate from July to September in search of labour to nearby places and work as agricultural laborers, and as wage laborer on construction sites. For the remaining months, at least one person from the family migrates. Wages paid for agriculture labour are Rs 30 to 40 per day. On construction sites, Rs 40-50 can be earned. There is a difference between rates for men and women. Migrants are generally able to find work for 18-20 days in a month. Many go to Mines in nearby area where upto 2000 Rs/month can be earned. However this entails a 24 hour work shift, and also there is a strong competition for jobs.

In Udaipur the marble mines at Kelwa and the wage opportunities at the urban centers serve as major income sources. Many persons from nearby tehsils commute to Udaipur for wage labour, spending upto 50% of the income on travel. Parts of Jhadol, including Shyampura, also witness long term migration to Gujarat. Here young tribal boys are specifically taken by contractors for cotton harvest in Gujarat. Over the last few years the economic slump and simultaneous droughts in both home state and the target area have drastically reduced the wage opportunities. In this period the dependence on government sponsored relief schemes has increased.

¹⁵ The section is based on village PRAs.

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The migrants return to the villages during peak agricultural seasons for sowing and harvesting of Kharif and Rabi crops. They also stay for festivals like Holi, Diwali and for marriages in their family (The festivals also coincide with the harvest seasons- with Diwali coinciding with Kharif harvest and Rabi sowing, and Holi coinciding with Rabi harvest). Cash income from wage labour is mostly used to repay the loans taken from the local moneylenders

The adolescent boys also migrate during summer holidays so as to earn for expenses incurred in their education. There is an increasing trend of out migration of adolescent girls.

Migration patterns depend on family size, landholding, and type of land and irrigation possibilities. In families who have larger landholdings migration is short term, usually on a daily basis, and is mainly for cash to be invested in agricultural inputs. Young adults usually commute daily in search of cash income.

Tribal Women, specially the middle aged and the elderly, usually stay back to look after the cattle and farms. These women generally work as agricultural laborers on other farms or on government development work sites, e.g. relief works. They mainly indulge in short term labour for about 20-30 days in a year. The work pressure at home is less during April and May. This is the time when they look for job-opportunities. Women from many non-tribal communities do not perform wage labour, however would continue to work for the homestead.

In case of communities like the Rajputs, and other upper castes, migration is not an acceptable practice, nor do they have the links with the destination rural job market. Such communities normally migrate to larger urban centers like Mumbai, Surat in search of wage labour. The "upper" castes however rarely migrate for wage labour, preferring to go to the larger Urban centers for jobs or seeking positions with higher status (i.e. becoming "mates-labour coordinator" on labour sites).

It also appears that these communities (as well as the more prosperous among the tribals) have a family income that is based on a mix of farm, livestock and wages, and is relatively secure against seasonal fluctuations and drought.

The fact that some community members are absent from the village for significant periods also has implications for institutional design. These are normally the most deprived sections of the village, and their extended absence often means that they have little or no say in programme design. Also as the incomes from off-village activities form an increasingly larger share of the overall family incomes, there seems to be an increasing alienation from land.

Household Income

A study¹⁶ of 400 households in a micro catchment of Girwa tehsil, Udaipur, showed that income from agriculture is 31% and that from livestock is 15%, with the remainder coming from wage labour. There is a strong variation across communities, with traditional agriculturists like Patels and Dangis showing 70% of income from land and livestock, and the tribal families receiving only 20% from these two.

People in Jhadol are dependent upon agriculture, animal husbandry and wage labour for their sustenance. Average per capita land holdings are far below 1 Ha/capita, ranging from around 0.2 ha to 2 ha, with the majority having around 0.6 ha. These low landholdings mean that agriculture contributes only a marginal amount to annual requirements, contributing only around 25%. As the calculation presented later indicate, the contribution of agriculture amounts to only around Rs 6500 in the annual incomes of App. Rs 13,000.

The Non-Farm activities are at present the most critical component of the livelihood base, contributing upto half of livelihood needs in many cases. The options include wage labour in urban centers of Rajasthan and the rural areas in the adjoining states of Gujarat and MP. The marble mines of Udaipur and Rajsamand, the

¹⁶ Status of Sub-WHS in a sub basin of Udaipur, SPWD and SOPPECOM.

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stone quarries in Bhilwara, urban construction work in larger cities also attract many short-term migrants. Most of these options are deeply exploitative and pose serious health risks.

There are few economic options that are village based. There are no local marketable crafts endemic to the region, and extraction and sale of forest produce, specially gums, honey, and herbs, is on a very limited scale consequent to degradation of forests and also because of establishment of state monopolies on many commodities.

In most cases more than 50% of the income comes from wage labour.

Women, throughout the year, collect fuel and fodder. With the depletion of forests, collecting fuel and fodder has become a strenuous activity for women and children. During winter, women and girls spend about 4 hours a day to collect fuel wood from the nearby forests. Cow dung cakes, agriculture waste (maize cobs) and dry-wood from the trees on private lands are also a source of fuel. Sale of fuel-wood head loads (called *muli*) to larger villages is also a common strategy, specially for women.

Expenditure Pattern

A subsistence requirement was calculated using inputs from a survey¹⁷ for non-food requirements and the actual food requirements. Requirements for non-food items were adjusted and inflated by 6% annually to arrive at an amount of Rs 7,889 for the year 2001. The food requirements for a family of six have been calculated to be Rs 20,900. The value of actual food consumption was calculated based on information received during the field survey. Actual food consumption amounts to a value of Rs 10,000.

The detailed calculations are given in Tables below.

Table 6. Non-Food Items Required by a Tribal Family of Six (in Rs)

Item	Amount (Rs)
Medical expenses	1,594
Education	482
Clothes, shoes, etc.	2,180
Social obligations,	
Travel expenses, others	3,633
Total per capita per annum	1,314
Total per family per annum	7,889

Source: PRA exercises, GITEC and Seva Mandir

Table 7. Values of Food Items Consumed by a Tribal Family of Six (in Rs)

Food item	Consumption per year (kg)	Price ¹⁸ per kg (Rs)	Total Cost (Rs)
Maize	1,095	5.47	5,989
Pulses	91	12.00	1,092
Vegetables	182	3.00	546
Oils	24	40.00	960
Sugar	60	16.00	960
Tea	3	150.00	450
Total per family			9,997

Source: PRA exercises, GITEC and Seva Mandir

¹⁷ Figures are taken from GoI-MoF/KfW Programme Preparation Report 'Tribal Development Programme in Dharampur Taluka, Southern Gujarat.

¹⁸ Prices are actual village level prices, taken from the surveys conducted. (GITEC and Seva Mandir)

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Table 8. Food Requirements for a Balanced Diet for a Family of Six¹⁹

Commodity	Unit	Total Requirement	Price ²⁰ Rs/Unit	Total Cost Rs
Cereals (maize)	kg	1,095	5.47	5,990
Pulses	kg	163	12.00	1,956
Roots, tubers	kg	172	3.50	602
Fruits, vegetables	kg	397	3.00	1,191
Milk	kg	492	12.00	5,904
Fats, oil	kg	79	40.00	3,160
Sugar	kg	98	16	1,568
Salt	kg	30	6	180
Spices	kg	6	60	360
Total per family per year				20,911
Total per capita per year				3485
Total per capita per day				9.68

Source: Programme Preparation Report on 'Tribal Development Programme in Dharampur Taluka, Southern Gujarat, GoI-MoF/KfW.

The calculation of the monetary gap existing between actual family income and subsistence requirements illustrates two important implications of the prevailing poverty in the area.

- It becomes clear that actual family income cannot cover the necessary food expenses over the year.
- Actual food intake is far below the recommended amounts and composition. This, in turn, explains a major part of the severe malnutrition observed in the area. Taking into consideration also intra-family distribution, the problem of access to a healthy and sufficient diet, particularly for children and women, becomes even bigger. All these are signs for a serious food security problem in the area.
- There is no provision for non-food expenses like illnesses, and social obligations. Of course there is no surplus that can be used for productive purposes like education (human capability improvement) or for assets and investments on private resource improvement. This seriously limits the potential for credit activities based on own savings.
- In order to allow for a decent living, the average family income would have to double from its current level, specially in case of the farmers with very small land holdings. This is rarely possible.

Summarizing the poverty and subsistence related figures explained above gives the following picture:

Table 9. Income Gaps in the Programme Area

Farm income	Rs 6500
Off farm income	Rs 6,500
Total family income	Rs 13,000
Government determined poverty line	Rs 20,000
Calculated subsistence requirement	Rs 28,800
Income gaps:	
between farm income and poverty line	Rs 13,500
between total income and poverty line	Rs 8000
between farm income and subsistence requirement	Rs 22,300
between total income and subsistence requirement	Rs 15,800

¹⁹ Figures are derived and slightly adjusted from GoI-MoF/KfW Programme Preparation Report 'Tribal Development Programme in Dharampur Taluka, Southern Gujarat, May 1993. Three adults (husband, wife, adolescent) assumed to be vegetarians doing moderate work will require 2,800kcal per person per day. Two children would be in the age group 7-9 (1,800kcal per head) and one child in the age group 10-12 (2,100kcal). Cereals will mainly be maize, pulses mainly black gram. For groups of food items, e.g. vegetables, an average price was assumed.

²⁰ Prices are actual village level prices, taken from the surveys conducted. (GITEC and Seva Mandir)

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Credit

Families frequently have to bridge the income gap by taking loans from local moneylenders. The interest rates charged locally vary in accordance with the nature of collateral, reliability of the loan seeker and his desperation. The rates mentioned in the PRA's ranged between 2-5%/month going upto 100%/month in one instance. A Study by Seva Mandir²¹ estimated that the average debt per family was around Rs 8000, whereas in the PRAs it appeared that most families had a debt of around 15,000 Rs (5 years of consecutive drought faced by most communities probably explains the difference). Of this only 10-20% was being used for productive purposes- i.e. loans for inputs, fodder etc. The rest was for meeting social obligations. In most cases the debt was rotated, with the balance credit amount remaining fairly constant..

Table 10. Credit Requirements

Purpose of Credit	Source of Credit	Required Amount (Rs)	Seasonality Of Credit
Food Disease	Shopkeeper / moneylender	1,000-2,000	June –Sept. April-Aug, October
	Shopkeeper / moneylender	1,000-2,000	
Clothing	Shopkeeper / moneylender	1,000-2,000	March, October, November
Agricultural inputs	Moneylenders / relatives / fellow villagers	2,000-3,000	June-August, October
Education	Moneylender	500-1,500	June, July
Marriage / ceremonies	Moneylenders / relatives / fellow villagers	20,000-50,000	March-May
Well deepening	Moneylender / relatives	5,000-10,000	April, May

Source: Village PRAs.

The dominant sources of credit in Shyampura are the traders in nearby large villages (Bicchiwada and Phalasiya). Mortgaging land was practiced earlier.

Most persons report that subsequent to LI, the amount of external debt has reduced, and credit needs are being met within the group. The 16 respondents also reported that they still do not have access to formal sources of credit on account of lengthy procedures and corruption within the system.

Food Security

Given low yields and small landholdings, agricultural production is not able to cover the basic food needs of the families. Indeed there is a net deficit at the household level as amounts available from own production or through purchases from wage earnings are not sufficient to ensure food security on household level. The Public Distribution Shops are located 4-8 km from the village and are opened irregularly. The quality of food grains is poor. Lack of ready cash required to purchase food from the PDS is another limiting factor.

The dietary pattern of families in Shyampura shows that maize is the main source of energy. The per capita consumption of cereals is significantly lower than the recommended dietary allowance (RDA) of 450grams per day. Pulses, root crops and green vegetable are consumed rarely as they have to be bought at high prices in local markets. Diets are also deficient in oils and sugar, milk and milk products, and fruits

The dietary pattern is common to tribal community all over the region and results in proteins, vitamins, and mineral deficiency. Hence, there is widespread protein energy malnutrition, vitamin A deficiency, and anemia. These nutritional deficiencies make people prone to further infectious diseases as the immunity of the bodies is reduced.

²¹ Study on SHGs, Seva Mandir Newsletter, Jun-Jul 2002

The Agency: Seva Mandir

The work area of Seva Mandir encompasses 583 villages, out of which around 480 are located in Udaipur district and the remaining 100 villages are in the adjoining Rajsamand district. This includes 67 villages in Rajsamand district where work was initiated under the DPIP²² project in 2002. Seva Mandir works with around 70,000 households, influencing the lives of approximately 3,60,000 persons directly. Majority of these persons belong to the tribal community.

Seva Mandir began work in 1969, although it was conceptualized in early 1930's. Its initial self-definition was strongly influenced by the expectation that the State would, as was constitutionally mandated, bring about social transformation, and the role of the voluntary sector was to hold the State accountable. However the experience in the early 60's made it apparent that the State was unable to cater to the basic needs of the really poor and deprived, and that the macro-policies were in-fact leading to greater economic and societal disparities.

By mid-90's Seva Mandir had divided its work in three functional categories, focussing on sustainable improvements in livelihoods, enhancement of people's capabilities and creation and strengthening of village institutions respectively. Each of these programs, while achieving its programmatic goals, was designed to build values and social capacities needed to achieve development and democracy for the poor.

The Livelihoods Program: The livelihoods program of Seva Mandir seeks to improve the productivity of the commons and farming systems. Its components deal with rehabilitation of degraded private and public wastelands; conservation of water for drinking and irrigation; and evolution of appropriate farming practices. Working on complex and contested resources, this program has become an instrument to transform social relations. It has made it worthwhile for villagers to opt out of debilitating patron-client relations and inherently unstable property relations. Further it has also created a basis for sustainable land use and for engaging the State to comply with the letter and spirit of its progressive land policies.

The Capabilities Program: Seva Mandir has a long, rich and varied experience of working on enhancing capabilities of people. It initiated its work on rural development by promoting adult education in villages. Subsequently, it also got involved in trying to ensure universal access to primary education. Its work on addressing the gender concerns and problems related to health commenced in early 1980s.

The Institution Building Program: The Institution Building program of Seva Mandir aims at fostering robust people's institutions that are effective in bringing about sustainable development in remote rural areas. While traditional community institutions did enjoy legitimacy they do not have democratic tradition, and are largely governed by hereditary leaders and the elders in the community. Such Institutions provided little social capital required for democratic development. The GVK serves as a non-historical, development oriented peoples fund, and allows the community a space wherein building of norms can happen. This initiative is central to all the activities of Seva Mandir.

Seva Mandir's organization structure is a matrix structure, with staff oriented both on functional and geographical lines. At the functional level its staff is organized in form of six resource units. These include Natural Resource Development Unit, Education Unit, Health Unit, Women and Child Development Unit, Gram Vikas Kosh Unit and People's Management School Unit. Additionally, Finance, Internal Audit and Human Resource units have also been constituted to take care of the administrative needs of the organization.

Seva Mandir's line and sector functionaries are aligned on geographical lines at the three levels: Zone; Block; and, Head Office. At present, Seva Mandir has 28 Zone Offices (spread over 5 Blocks). Each Zone Office generally facilitates work in a cluster of 15 to 25 villages. A dual reporting system, working along geographical lines and along sectoral lines is in place to facilitate smooth functioning of the organization.

²² DPIP or District Poverty Initiative Project is a World Bank initiative, implemented in selected districts of the Country.

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The experience gained during the execution of the mid-80's was taken forward during the 90's. It was decided to focus on increasing the level of integration in execution of land and water resources development activities, thus ensuring significant impacts on livelihood base of people. While in earlier plans extensive work on land and water resource development was carried out, the activities were executed by different functional units, and thus were often spread across villages. Integration of these activities both within the organization and at the village level was the focal point of the strategies developed in 90's. It was decided that watershed projects, wherever taken up, would incorporate an integrated plan for the development of all categories of lands and resources viz. Forests, Common pastures, Revenue lands, water etc. Anicuts would be constructed subsequent to catchment treatment. Agriculture research and extension works would be initiated in villages where watershed and/or lift irrigation projects are completed or underway. At the organizational level all discrete units were merged into one functional unit- the Natural Resources Development Unit. The current activities of the Unit include

1. Nursery raising for the wasteland afforestation program
2. Wasteland Development (Private, Pooled Private, Public lands including JFM and Pastures)
3. Integrated Watersheds
4. Water Resource Development (Masonry Dams, Talais)
5. Lift Irrigation
6. Agriculture and Animal husbandry program: (Participatory Varietal Selection, Intensive Vegetable Cultivation, Horticultural Program, Veterinary Camps in watershed villages)
7. Capacity Building (Community and Paraworkers)

The financial support to Seva Mandir has come principally from a consortium of donors, headed by ICCO and EZE. In addition Plan, Ford Foundation, and other donors have also supported Seva Mandir. Seva Mandir has also accessed Government funding. The budget of Seva Mandir currently is of the order of Rs 7 Cr/annum.

The Intervention

Hardware of the Intervention

This section aims to describe the following:

- The process of selection of the site- specifically why was the village Shyampura selected vis-à-vis other work villages of Seva Mandir;
- Within Shyampura which factors led to selection of the particular site and command area.
- Technical package that was developed; and,
- Cost details of the technological package

Why Lift Irrigation in Shyampura

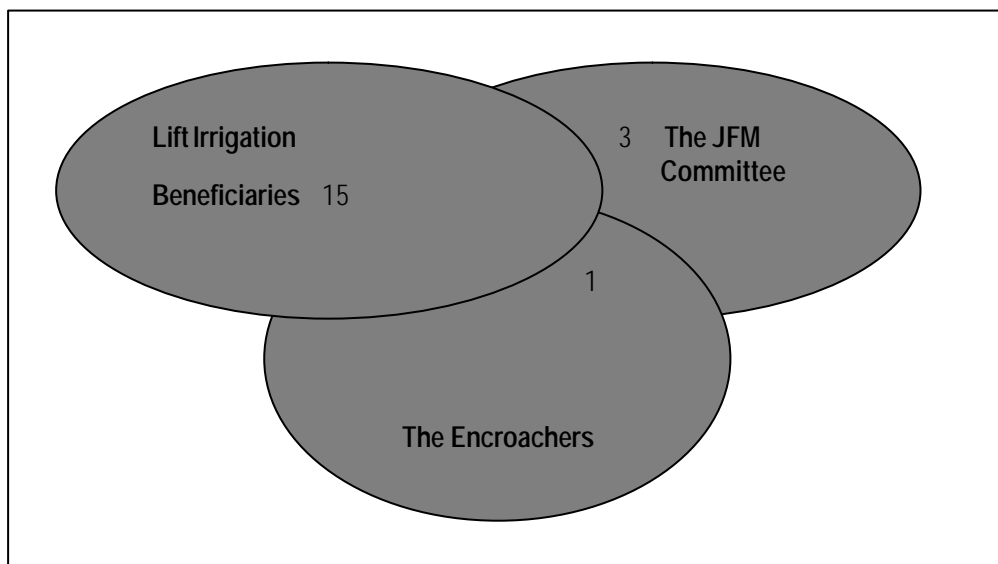
Seva Mandir has a policy of long-term involvement with the village communities.- working with them on a wide canvas of issues ranging from natural resources to reproductive health issues. There is often a trajectory that is followed in activity planning and execution, based on the level of cohesion and preparedness seen in the village, the leadership patterns and possibility of success. In Shyampura, after initiating processes on Adult Education, the building of an anicut in 1986-87 led SEVA MANDIR to plan afforestation of the anicut catchment to prevent siltation. Since the flanks of the anicut were dominated by forest lands, the decision was taken to advocate for a Joint Forest Management (JFM) based community afforestation plan. The JFM in Shyampura was historic in the sense that it was to be the first NGO supported JFM site in Rajasthan. A large effort was put in by SEVA MANDIR, the village community and the Forest Department into fleshing out the plans for the JFM. However during the process of implementation it was gleaned that 13 persons from the village had built houses and were undertaking agriculture on

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encroached areas inside the forest plot. (the actual number was 19 as in many cases more families were using the land while only 13 families were registered with the forest department.)

There was tremendous pressure on all three parties to ensure the removal of these “encroachments”. An agreement was arrived at wherein the said people who wanted to maintain ownership of the land agreed not to farm on these plots. They also agreed not to send animals to graze on these plots. The entire negotiation was long and arduous, and one of the clinching arguments in favor of the decision was that SEVA MANDIR agreed to invest on people's private lands so that they could be encouraged to change land use patterns- specifically abandon cultivation of infertile and sloppy forest areas in favor of irrigated low-lands. The entire 13 families reside in the Kala Fala of Shyampura, and belong to the Angari sub-caste, and are close relatives. Today Jhalam Chand and Nathu Lal are para-professionals with SEVA MANDIR, and Nana Lal is the President of the Van-Utthan-Sangh, a federation of JFM Committees. Nathu Lal was also the Sarpanch in the previous Panchayat. These three persons are an integral part of the JFM and the Lift Irrigation Committees, and are also the “mautbir” (leaders) in the village.

Figure 1. Key Stakeholder Sets



Around 50% of the total land area in Jhadol is under Forest Department ownership. In order to make a sustainable impact on people's livelihoods it becomes imperative to work towards a policy that would give the local community a right to work on and regenerate these degraded forest lands. Some form of tenural arrangement then is a critical issue. Hence JFM became an important focal point of Seva Mandir's intervention in the area. Since normally people's stakes in managing a forest are low, an organization can seek to work on such lands only if the conditions in the village suggest that there is a possibility of success. Further people's needs are diverse and people in areas like Shyampura will stay in the village and look after a protected patch only if some of their other basic needs are met- food security, cash-in-hand, and to some extent- education and health. Each additional intervention may consolidate/intensify/diffuse power centers in the village- thus if each intervention is by itself successful, it will make for a multiplier level of success; conversely if even one of the main programmes hits a rough patch, all activities are under threat.

Leadership plays a dominant role – they negotiate with their own community as well as the NGO, shoulder work responsibilities linked to each project as well as project the vision of the organization at the village level. This complex interplay of the organizational vision, economic and social realities at the village level defines the politics and substratum of any NGO intervention.

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While looking at the Agency, it is also important to note that the NGO '*karyakarta*' (worker) at the time had become very important in the whole politics. S/He steers the process given her/his own proclivity. In this case a key employee of Seva Mandir interfacing with the village was Lal Chand Garg, an engineer by profession, and was interested in the Natural Resources. He played a key role in defining the activity set that needed to be executed in the village.

Site Selection

Shyampura has 2 perennial streams running through the village. The jackwell that feeds the lift irrigation scheme is located on the banks of one of the streams. The command area of the scheme covers 81 bighas (app. 16 ha), owned by 27 families. The hill ridgelines define the natural boundaries.

People in the village said that the stream in question had not run dry for the past 30 years (infact upto the current 5 year drought). There is a natural indentation in the stream bed, and the local community used to build earthen weirs there annually to retain water for the summer. A checkdam was built in 2001 at the same location.

The other proposed site was on the other proposed stream of Shyampura, near the anicut built with Seva Mandir assistance in 1986-7. This would have used the recharge potential on the downstream of the anicut. The site was rejected as it was anticipated that the cost of bringing the electricity to this site would be very high, though more people would have benefited- specially people from the nearby Vada Fala.

The catchment of the stream comprises of a large forested hill (the Kakrol-Bavsi) with around 2000ha, from where the waters flow into the Nagmala dam. The runoff from the dam passes through Shyampura and goes on to join R.Wakal and eventually R. Sabarmati. The residual flow in the stream was estimated to be around 40lps²³ and it was assumed that around 20 lps flow could be extracted, leaving 20 lps for the downstream communities. As the State regulations do not permit direct extraction from the stream, a jackwell was constructed and a Hume-pipe (cement-concrete) was used to channel the flow into the jackwell. The area is highly undulating, and the net static head was estimated to be 48m (inclusive of friction losses). 9 distribution chambers were located to ensure that the eventual availability at the various discharge points, subsequent to a detailed contour survey. The net demand was estimated to be 32 lps.

The village is also at the tail end of the Nagmala dam canal network. About 8 ha of land in the particular patch gets irrigation from the canal, either directly or through seepage. The SEVA MANDIR engineers divided the command area of the lift irrigation into three parts based on water need- high, medium and low, based on the existing availability of water from the canal- and quantum of water of water required to be lifted from the jack-well was adjusted to 20lps, which matches the actual availability.

In the discussions between the SEVA MANDIR team and the potential 27 beneficiaries, it was agreed that

- Each beneficiary would irrigate app. 3 bighas (0.6 ha)- this corresponded to 6 hours of pump time;
- Not take water intensive crops like sugarcane (the discussions even included the norms for wheat cultivation).
- The total command was calculated to be 81 bighas (16 ha) i.e. 3 bighas X 27 families. It was also agreed that the persons not using their entire share of water (cultivating less land for instance) could sell the water right to others.
- Using the Rabi wheat as the defacto-standard crop, it was estimated that 3 irrigations would be required in the 4-month cropping season, and the system would need to irrigate app. 1 ha/day.

²³ Seva Mandir technical plan

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Hardware Design

The pipeline network consisted of 100m of HDPE-Hasti pipe (? 140mm), 700m of HDPE-Hasti pipe (? 140mm, and 110 mm), and 200m of distribution HDPE-Hasti pipes (? 90mm). The first distribution chamber was located at the end of the first 100m stretch from the jack well. The valve system was based on the assumption that only one valve would be opened at one time. The final distribution, from chamber to the fields was through gravity flow in field channels. A pump house was also constructed.

Subsequent to market survey, a 15 HP electric pump (Kriloskar brand, model KDS 1555) was purchased. The electric motor was preferred over the diesel engine, as it would have lower operating costs. It would also eliminate problems associated with adulterated fuel and associated pump damage.

Given the pump discharge rates and the area to be irrigated, it was assumed that the pump would be operated for around 6 hrs/day.

Table 11. Cost details (in Rs)

1	Construction of Jack well	60,000
2	Construction of the pump-house	15,000
3	Expenditure on pipes, pump and fittings	377,000
4	Construction of distribution chambers	14,000
5	Electric Connection	51,000
Total		517,000

Source: Seva Mandir Records

Of this cost the people contributed by deepening the well by 5 feet, and excavating and laying out the pipeline. The worth of their contribution amounted to Rs 42,000, of which Rs 30,000 was to be put in a "Lift Irrigation rakh-rakhav kosh" (repair and maintenance fund), and balance into the village Gram Vikas Kosh.²⁴

Of the Rs 51,000 that needed to be paid for the electricity connection, Rs 20,000 was contributed in various amounts by the beneficiaries, Rs 7000 was taken from the GVK, and Seva Mandir provided the balance Rs 24,000 as a loan. The loan is yet to be repaid by the beneficiaries.

The unit cost per area of the scheme is Rs 6500/bigha – app. Rs 30,000/ha.

One year after the scheme became operational, LI beneficiaries promised that an annual cess of Rs 100/beneficiary would be contributed to the GVK in order to pay to the larger community for the benefit that this small group had received. The amount was collected from 26 families in the first year, but not in subsequent years.

Two local youth were given pump maintenance training at Vidya Bhawan Rural Institute, and the larger group received several trainings and meetings regarding framing of the bylaws for the management of the scheme.

The hardware was put in place by 1991, the electricity connection was granted much later, on account of the DRDA's refusal to issue a NOC²⁵. **The first irrigation was taken in Kharif of 1994.**

The User Group

The user group consists of 27 families. They belong to two gotras (sub-castes)- the Angaris and the Vadheras. Of the 27 families, only 4 families are Vadhera, the rest are Angaris.

²⁴ GVK- The village Development Fund

²⁵ No Objection Certificate.

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In terms of land, 19 farmers own land between 3-5 bighas (0.6 to 1 Ha), 4 farmers have land below 3 bighas (0.6 ha), and 4 have land holdings larger than 5 bighas (1 Ha). In fact the last group has more than 10 bighas each in the command area of the LI.

Dubla Amara, who is one of the poorest (as ranked in a wealth ranking exercise) in the group, has 1 bigha of land inside the command area, 2 bighas outside it and owns 2 bullocks, Pira Lal, who is ranked as one of the wealthiest, owns 25 bighas in the command area, has 5 buffaloes, 3 cows, 10 goats, 2 bullocks, a pump-set and a boring-well. He is also a forest guard with the forest department.

Before the LI in Shyampura, barring the persons who had secure jobs (3 in number who had jobs either with the Government or local NGOs) or very large land-holdings and means to lift water to irrigate these (one family), all families migrated out for at least 10-15 days for 8 months in a year. This was necessary to secure the grain requirements as well as to create cash surpluses to meet non-food expense requirements- medicines, clothes, debt-servicing. The men normally migrated to Udaipur, Kelwa marble mines, Gujarat for construction and agriculture related work - specifically cotton picking. The women also migrated - normally to large construction sites like dams. Depending on the skill set, the person could earn Rs15 -80 per day.

3 farmers also had mortgaged their fields before the LI.

Impacts on the different sections

The following tables indicate impacts on the farm incomes of 3 farmers with 1, 2½ and 4 bighas of irrigated lands.

We find that Fatehlal, with 4 bighas of irrigated lands, after taking the risk of growing ginger (a highly capital intensive crop), manages to generate a +ive food surplus. He also has a cash surplus of Rs 12000 due to ginger sales alone. Fatehlal had also access to the irrigation from the Nagmala dam, one reason for his risk taking ability. On the other hand Dubla and Kana still continued to be food deficit- albeit to smaller levels, and thus had to migrate out, but for less time as compared to past.

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Farm Budgets

Table 12. Dubla – Farm Budget

Farm Budget No. 1

Dubla

Profile of a Small Adivasi Farm in Shyampura				Before Lift	After Lift		
1. Land resources at disposal							
Total land owned:							
- of which arable land (Class II/III)				ha 0.60	ha 0.60		
- and private wasteland (Class VI)				ha	ha		
Wasteland rented in and/or encroached				ha	ha		
Total land - operational holding				ha 0.60	ha 0.60		
- rainfed area				ha 0.60	ha 0.40		
- irrigated area				ha 0.00	ha 0.20		
2. Human resources							
Labour Units (LU) for farm work	Nos	LU					
Head of family	1	1	LU 1.00	LU 1.00			
Wife	1	0.4	LU 0.40	LU 0.40			
Youth	4	1	LU 4.00	LU 4.00			
School children	1	0	LU 0.00	LU 0.00			
Whole family	7		LU 5.40	LU 5.40			
Employment potential per year (290 calendar days):			1566 Labour Days	1566 Labour Days			
3. Livestock resources							
Non-descript animals:					added 2 Bullocks		
4. Invested capital on farm							
	ha						
Irrigated arable land	0.00	50000 /ha	Rs 0	Rs 0			
rainfed arable land	0.60	40000 /ha	Rs 24000	Rs 24000			
Private wasteland	0.00	15000 /ha	Rs 0	Rs 15000			
Farm implements and tools			Rs 4000	Rs 4000			
Value of livestock:							
Cow			Rs 0	Rs 0			
Bullock			Rs 0	Rs 10000			
Buffaloes			Rs 0	Rs 0			
Goats			Rs 1600	Rs 1600			
Irrigation systems			nil	nil			
Buildings (mud walls with improved roof)			Rs 40000	Rs 40000			
Total assets			Rs 69600	Rs 94600			
5. Estimated gross returns from crops and livestock							
	<i>kharif</i>	<i>Kg Yield</i>	<i>Rs</i>	<i>Amount</i>	<i>Kg Yield</i>	<i>Rs</i>	<i>Amount</i>
	Maize	300	5	Rs 1500	400	Rs 2000	
	Tuar	60	15	Rs 900	40	Rs 600	
	Paddy		10	Rs 0		Rs 0	
	Fodder	300	1	Rs 300	400	Rs 400	
	<i>rabi</i>			Rs 0		Rs 0	
	Wheat		8	Rs 0	250	Rs 2000	
	Mustard		15	Rs 0	10	Rs 150	
	Gram		15	Rs 0		Rs 0	
	Vegetables		15	Rs 0		Rs 0	
	Z. Pulses		15	Rs 0		Rs 0	
	Fodder	0	1	Rs 0	250	Rs 250	
Gross returns livestock:							Rs
Total gross return				2700	5400		

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(continued): Farm Budget No. 1

6. Estimated cost of production							
	ha	Rs / ha	Amount		ha	Rs / ha	
Maize	0.6	500	Rs 300		0.6	1000	600
Tuar	0.6	500	Rs 300		0.2	1000	200
Paddy		500	Rs 0			1000	0
Wheat		2000	Rs 0		0.2	2000	400
Mustard		500	Rs 0		0.2	500	100
Gram		500	Rs 0			500	0
Vegetables	0	20000	Rs 0			20000	0
Lift Irrigation Charges					0.2	468.75	205
Livestock maintenance cost		500			2	500	1000
Total production (recurrent cost)			Rs 600				Rs 2504.861111
7. Miscellaneous cost							
Depreciation:	%						
Implements and tools	10		Rs 400		10	Rs 400	
Maintenance of buildings	2		Rs 800		2	Rs 800	
Imputed family labour cost on farm	30	150	Rs 4500		200	Rs 6000	
	wage	days					
Total misc.cost			Rs 5700				Rs 7200
8. Farm Income Analysis							
Net farm income			Rs -3600				Rs -4305
Farm Income (without taking into account the misc costs)			Rs 2100				2895
Food Deficit			-789.75				-450
<i>food requirement given RDA of 450gm/person/day</i>		1149.75					
additional days of migration required for food security (@Rs 30/day)			130				70
9. Assessment							
Employment on farm for crop production is restricted to appx			150				200
labour days resulting in an employment rate of			10%				13%
Budget includes depreciation and maintenance costs except for livestock, for which depreciation is offset by births (value added).							
The small farm operates at a loss and does not have food security.							
The family cannot survive without additional income from wage labour. Additional income is earned from work in or near Udaipur and farm work in the village. Women also migrate and go for labour to large construction sites.							
No savings can be made.							
A huge gap exists to reach the anticipated minimum subsistence level.							
0.3 ha land is mortgaged.							
Men still go in non agriculture seasion Women do not go for labour 0.3 ha of mortgage land sold off. land/buyer in LI command							

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Table 13. Kana Vakta- Farm Budget

Farm Budget No. 2		Kana	Vakta				
Profile of a Small Adivasi Farm in Shyampura							
				Before Lift	After Lift		
1. Land resources at disposal							
Total land owned:							
- of which arable land (Class II/III)		ha		0.50	ha	0.50	
- and private wasteland (Class VI)		ha			ha		
Wasteland rented in and/or encroached		ha			ha		
Total land - operational holding		ha		0.50	ha	0.50	
- rainfed area		ha		0.50	ha	0.00	
- irrigated area		ha		0.00	ha	0.50	
2. Human resources							
Labour Units (LU) for farm work	Nos	LU					
Head of family	1	1	LU	1.00	LU	1.00	
Wife	1	0.4	LU	0.40	LU	0.40	
Youth	3	0.5	LU	1.50	LU	1.50	
School children	1	0	LU	0.00	LU	0.00	
Whole family	6		LU	2.90	LU	2.90	
Employment potential per year (290 calendar days):			841	Labour Days		841	
3. Livestock resources							
Non-descript animals:					added 2 Bullocks, 1 cow, 4 goats		
4. Invested capital on farm							
	ha						
Irrigated arable land	0.00	50000 /ha	Rs	0	Rs	0	
rainfed arable land	0.50	40000 /ha	Rs	20000	Rs	24000	
Private wasteland	0.00	15000 /ha	Rs	0	Rs	15000	
Farm implements and tools			Rs	4000	Rs	4000	
Value of livestock:			Rs	0	1	Rs	4000
Cow		4000 / head	Rs	0	2	Rs	10000
Bullock		5000 / head	Rs	0		Rs	0
Buffaloes		5000 / head	Rs	0		Rs	0
Goats	2	800 / head	Rs	1600	6	Rs	4800
Irrigation systems			Rs	40000		Rs	40000
Buildings (mud walls with improved roof)			Rs	40000		Rs	40000
Total assets			Rs	65600		Rs	101800
5. Estimated gross returns from crops and livestock							
	kharif	Kg Yield	Rs	Amount	Kg Yield	Rs	Amount
Maize		100	5	Rs 500	200	Rs	1000
Tuar			15	Rs 0		Rs	0
Paddy		50	10	Rs 500	60	Rs	600
Fodder		100	1	Rs 100	200	Rs	200
	rabi			Rs 0		Rs	0
Wheat			8	Rs 0	500	Rs	4000
Mustard			15	Rs 0	20	Rs	300
Gram			15	Rs 0		Rs	0
Vegetables			15	Rs 0		Rs	0
Z. Pulses			15	Rs 0		Rs	0
Fodder		0	1	Rs 0	500	Rs	500
Gross returns livestock:						Rs	
Total gross return				Rs 1100		Rs	6600

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(continued): Farm Budget No. 2

6. Estimated cost of production							
	ha	Rs / ha	Amount	ha	Rs / ha		
Maize	0.5	500	Rs 250	0.5	1000	500	
Tuar		500	Rs 0		1000	0	
Paddy	0.2	500	Rs 100	0.2	1000	200	
Wheat		2000	Rs 0	0.5	2000	1000	
Mustard		500	Rs 0	0.5	500	250	
Gram		500	Rs 0		500	0	
Vegetables	0	20000	Rs 0		20000	0	
Lift Irrigation Charges				0.5	469	345	
Livestock maintenance cost		500			500	0	
Total production (recurrent cost)			Rs 350			Rs 2295	
7. Miscellaneous cost							
Depreciation:	%						
Implements and tools	10		Rs 400	10	Rs 400		
Maintenance of buildings	2		Rs 800	2	Rs 800		
Imputed family labour cost on farm	30	150	Rs 4500	200	Rs 6000		
	wage	days					
Total misc.cost			Rs 5700			Rs 7200	
8. Farm Income Analysis							
Net farm income			Rs -4950			Rs -2895	
Farm Income (without taking into account the misc costs)			Rs 750			4305	
Food Deficit			-835.5			-206	
<i>food requirement given RDA of 450gm/person/day</i>		985.5					
additional days of migration required for food security (@Rs 30/day)			140			30	
9. Assessment							
Employment on farm for crop production is restricted to appx			150			200	
labour days resulting in an employment rate of			18%			24%	
Budget includes depreciation and maintenance costs except for livestock, for which depreciation is offset by births (value added).							
The small farm operates at a loss and does not have food security.				Food deficit greatly reduced			
The family cannot survive without additional income from wage labour. Entire family used to migrate for long periods				Women do not migrate Additional income is earned from wage labour in Bicchiwara filling Filling pots @Rs 2/pot			
No savings can be made.							
A huge gap exists to reach the anticipated minimum subsistence level.							

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Table 14. Fateh Lal-Farm Budget

Farm Budget No. 3

Fateh Lal

Profile of a Medium Adivasi Farm in Shyampura				Before Lift	After Lift
1. Land resources at disposal					
Total land owned:					
- of which arable land (Class II/III)				ha 0.80	ha 0.80
- and private wasteland (Class VI)				ha	ha
Wasteland rented in and/or encroached				ha	ha
Total land - operational holding				ha 0.80	ha 0.80
- rainfed area				ha 0.60	ha 0.00
- irrigated area				ha 0.20	ha 0.80
2. Human resources					
Labour Units (LU) for farm work					
Head of family				LU 1.00	LU 1.00
Wife				LU 0.40	LU 0.40
Youth				LU 2.00	LU 2.00
School children				LU 0.00	LU 0.00
Whole family				LU 3.40	LU 3.40
Employment potential per year (290 calendar days):				986 Labour Days	986 Labour Days
3. Livestock resources					
Non-descript animals:					added 3 buffaloes
4. Invested capital on farm					
				ha	
Irrigated arable land				0.20 50000 /ha Rs 10000	Rs 10000
rainfed arable land				0.60 40000 /ha Rs 24000	Rs 24000
Private wasteland				0.00 15000 /ha Rs 0	Rs 15000
Farm implements and tools				Rs 4000	Rs 4000
Value of livestock:					
Cow				4000 / head Rs 0	Rs 0
Bullock				2 5000 / head Rs 10000	2 Rs 10000
Buffaloes				5000 / head Rs 0	3 Rs 15000
Goats				7 800 / head Rs 5600	7 Rs 5600
Irrigation systems				nil	nil
Buildings (mud walls with improved roof)				Rs 40000	Rs 40000
Total assets				Rs 93600	Rs 123600
5. Estimated gross returns from crops and livestock					
				<i>kharif</i>	<i>rabi</i>
				Kg Yield	Rs Amount
Maize				200 5 Rs 1000	400 Rs 2000
Tuar				15 Rs 0	Rs 0
Paddy				100 10 Rs 1000	200 Rs 2000
Fodder				200 1 Rs 200	400 Rs 400
<i>rabi</i>				Rs 0	Rs 0
Wheat				200 8 Rs 1600	500 Rs 4000
Mustard				50 15 Rs 750	50 Rs 750
Gram				50 15 Rs 750	50 Rs 750
Vegetables				15 Rs 0	840 Rs 12600
Z. Pulses				50 15 Rs 750	50 Rs 750
Fodder				200 1 Rs 200	500 Rs 500
Gross returns livestock: milk				5	1890 Rs 9450
Total gross return				Rs 6250	Rs 33200

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(continued): Farm Budget No.3

6. Estimated cost of production							
	ha	Rs / ha	Amount	ha	Rs / ha		
Maize	0.6	500	Rs 300	0.6	1000	600	
Tuar		500	Rs 0		1000	0	
Paddy	0.2	500	Rs 100	0.2	1000	200	
Wheat	0.2	2000	Rs 400	0.4	2000	800	
Mustard	0.2	500	Rs 100	0.4	500	200	
Gram	0.2	500	Rs 100	0.2	500	100	
Pulses	0.2	2000	Rs 400	0.2	2000	400	
Vegetables	0	20000	Rs 0	0.2	20000	4000	
Lift Irrigation Charges				0.6	781.25	580	
Livestock maintenance cost		500		5	500	2500	
Total production (recurrent cost)			Rs 1400			Rs 9380	
7. Miscellaneous cost							
Depreciation:	%						
Implements and tools	10		Rs 400	10	Rs	400	
Maintenance of buildings	2		Rs 800	2	Rs	800	
Imputed family labour cost on farm	30	150	Rs 4500	250	Rs	7500	
	wage	days					
Total misc.cost			Rs 5700			Rs 8700	
8. Farm Income Analysis							
Net farm income			Rs -850			Rs 15120	
Farm Income (without taking into account the misc costs)			Rs 4850			23820	
Food Deficit			-221.25	surplus		379	
<i>food requirement given RDA of 450gm/person/day</i>		821.25					
additional days of migration required for food security (@Rs 30/day)			40			N Reqd	
9. Assessment							
Employment on farm for crop production is restricted to appx			150			250	
labour days resulting in an employment rate of			15%			25%	
Budget includes depreciation and maintenance costs except for livestock, for which depreciation is offset by births (value added).							
The farm operates at a loss and has no food security.				The farm operates at a profit and has food security.			
The family cannot survive without additional income from wage labour. Additional income is earned from work in or near Udaipur and farm work in the village				Men do not migrate Women do not go for labour			
No savings can be made.				Investments in assets made			

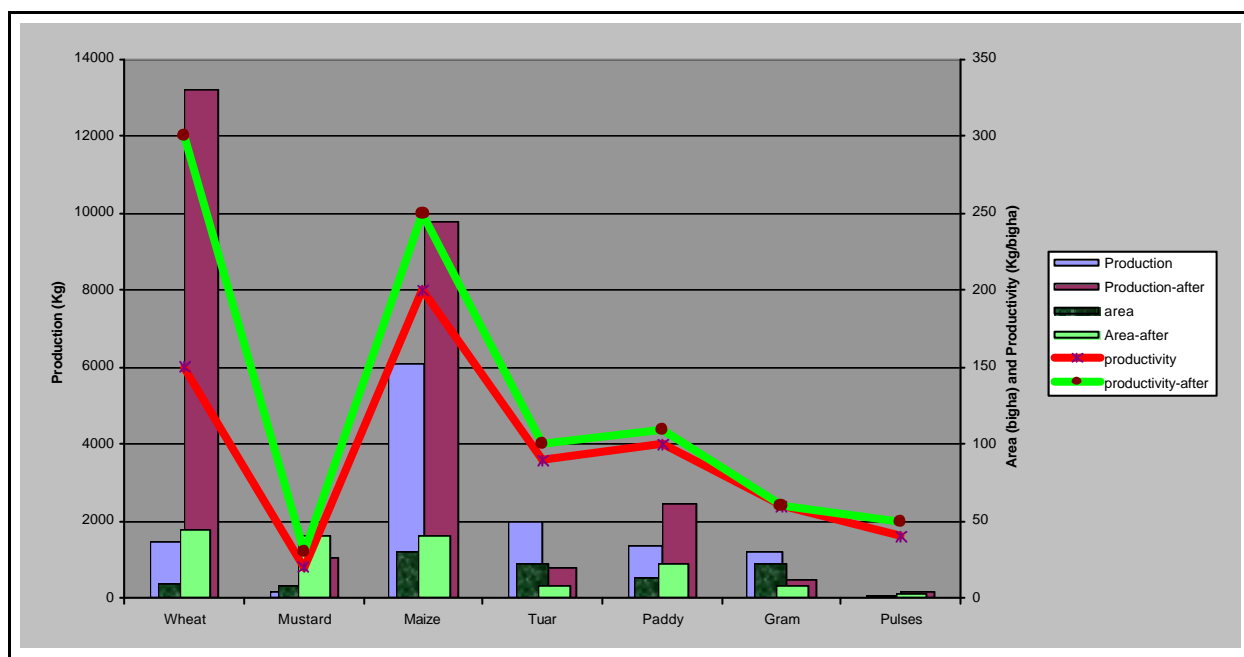
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Many farmers with 3 or more bighas of land did try out vegetable cultivation to generate cash surpluses. In an assessment²⁶ done in June 1999, of 16 farmers interviewed in 3 categories²⁷, only two families still migrated out of Shyampura post LI. 7 families reported that they were regularly growing and selling vegetables. 14 families reported that they were self sufficient in food-grains. The number of farmers growing wheat more than doubled, from 6 to 16.

Table 15. LI Impact- changes in area cropped and Yield

Crop	Production (kg)	Production-after (kg)	area (bigha)	Area-after (bigha)	productivity (kg/bigha)	productivity-after (kg/bigha)	Changes		
							Production	Area	Productivity
Wheat	1500	13200	10	44	150	300	780%	340%	100%
Mustard	170	1055	8	40	20	30	521%	400%	50%
Maize	6100	9800	30	40	200	250	61%	33%	25%
Tuar	2010	800	22	8	90	100	-60%	-64%	11%
Paddy	1370	2455	14	22.5	100	110	79%	61%	10%
Gram	1210	510	22	8.5	60	60	-58%	-61%	0%
Pulses	70	160	2	3.5	40	50	129%	75%	25%

Figure 2. Changes in area, Yield and Production



The above shows that

1. The area under almost all crops- wheat, mustard, maize paddy and pulses has increased.
2. There has been a significant increase in productivity of wheat and maize, with the wheat productivity levels moving towards district averages mentioned in Table 4, while maize productivity

²⁶ Socio-economic Impact of LI: Shyampura Village, Netaji Basumatary, Seva Mandir June 1999

²⁷ 7 farmers with holdings below 3 bighas, 8 with 3-5 bighas of land, and 1 with more than 5 bighas.

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- figures are way above the district averages on account of farmers being assured of supplementary irrigation- allowing them to use organic and inorganic manure .
3. There is a decisive replacement of tuar, a long duration crop, by Rabi crops.
 4. There is a clear preference for wheat-mustard intercrop, over gram in Rabi.
 5. Area under paddy has also increased, by a small amount.

Asset Creation

Most respondents reported that they had created assets during the period when the LI was operational. The assets included:

- Construction of new rooms/houses,
- Agricultural incomes,
- Livestock and cattle sheds,
- Field improvement.

Two clear assets that have been created are the two bore-wells. These belong to Jhalam Chand and Pira Lal. Jhalam Chand said that the bore-well he had dug was meant to irrigate fields of nearby farmers, and that he planned to sell water. His investment (with electrification costs) amounts to Rs 2 lacs.

Migration

In case of 4 farmers in the below 3 bighas category, all of them continued to migrate. However the kind of migration has changed- with women staying back at home, men migrating only in non-crop times and hence managing the burden of increased agriculture, and the duration of the migration has decreased by 23 months. Migration also depends on the family size- larger families mean more mouths to feed, as well as they have surplus labour that can be sent out to earn required cash.

In the second category of the persons who have a land holding of 3-5 bighas, some people continued to migrate for short durations to meet cash requirements for death rites, marriages etc. Of the 16 families surveyed in 1998-9, the number of persons migrating has reduced from 23 persons to 2, a decrease of more than 90%, with migration having reduced from a level of around 87% to 7% in post LI period.

Livestock

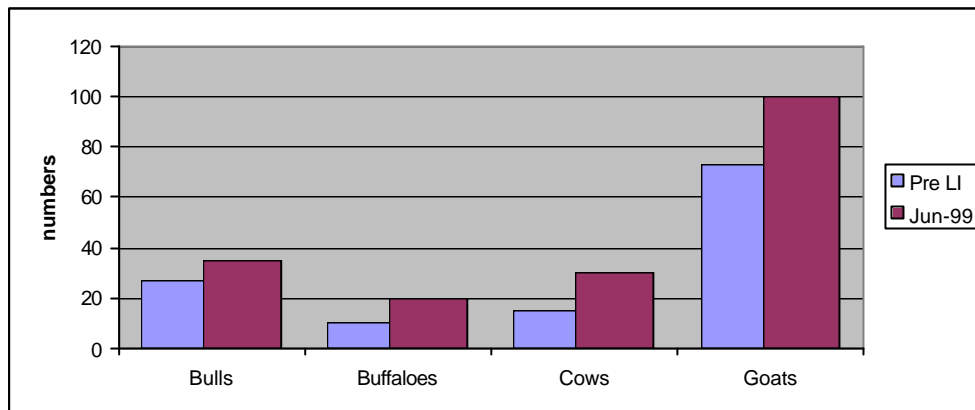
The changes in livestock population are as under

- The total number of livestock has gone up by around 48%.
- The number of cows and buffaloes has doubled.
- The number of bulls and goats has gone up by 30% and 37%.
- The buffaloes were purchased by persons who had at least 3-5 bighas of irrigated land. They are also people who planted Lucerne and fodder crops in small amounts.
- The bulls were purchased by those who had no bulls or had only one bull each. These were among the poorest families in the village.
- The people who bought buffaloes did so by reducing their goat holdings.

Table 16. Changes in Livestock

Type	Pre LI	Jun-99	Change
Bulls	27	35	30%
Buffaloes	10	20	100%
Cows	15	30	100%
Goats	73	100	37%

Figure 3. Changes in Livestock



The people offered the following reasons for the change in livestock composition:

- The JFM site and farm-forestry measures provided them with 100-200 *pullas* (bundles) of fodder per family.
- The farm-bunding work, undertaken in the fields through SEVA MANDIR support, and increased irrigation from the LI meant that abundant grass grew on the bunds.
- The increased crop production meant that the crop residues had more than doubled.

Vegetable Cultivation

People who had plots of lands close to the distribution chambers, mostly also took up vegetable cultivation. Around 25% of the HH started growing vegetables. The vegetables grown included brinjals, tomatoes, garlic, yams, onion, okra and coriander. Some people also grew ginger and turmeric. Chillies are grown as a regular part of the Kharif crop mix. Vegetables were sold in nearby *kasbas* and villages, earning each household around Rs 2000-3000.

Gender Analysis in Agriculture

Gender refers to the different roles played by men and women in society, which are shaped by ideological, historical, religious, ethnic and cultural determinants. Fieldstein and Poats (1989)²⁸ have developed a basic and easy to use framework for conducting gender analysis in agriculture. The framework is based on three sets of questions and analysis:

- Analysis of activities- who does what, when and where?
- Analysis of resources- who has access and control over resources of production?
- Analysis of benefits and incentives- who benefits from each enterprise?

The decision making status of women in the governance of the system in question has also been looked at to provide more insights.

²⁸ As quoted in "A well of Ones own", Eva Jorden and Margret Zwarteveen

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The context

Tribal societies, though more equal and egalitarian as compared to caste societies, are still patriarchal. Though women do enjoy some freedom in areas related to mobility, speech and choice of marriage partners, one finds that there are social and legal limits to women's access and control over productive resources, their own incomes and assets. Women's health and literacy figures also indicate that they lack control over their own bodies and choice of life options. One hears of increasing violence against women, often due to alcoholism.

As Udaipur has a large base of migrating communities, women often become prey to STD's and HIV. Another fallout of migration is that the women are carrying a huge burden of running a household single headedly. Poor women attempt to cope with poverty as far as possible in ways that will not threaten their kin-based networks and their families standing within the community. Poverty however has led to a gradual process of re-negotiation and re-interpretation of all aspects of gender relations, including the divisions of labour, rules about female mobility and family structure.

Analysis of Activities: who does what, when and where

An exercise was undertaken to understand the division of labour in wheat production. The work division and key issues are summarised below.

Table 17. Division of activities in wheat production

S No	Activity	Family Labour	
		Men	Women
1	Selecting Seed		v
2	Land Preparation -Ploughing	v	
	Land Preparation - de-stoning		v
3	Sowing		v
4	Fertilizer application- Organic		v
	Fertilizer application- in-Organic	v	
5	Irrigation- day		v
	Irrigation- Night	v	
6	Weeding		v
7	Harrowing		v
8	Threshing	v	
9	Winnowing		v
10	Marketing	v	
11	Storing		v

Source: Village PRA

The following features are of interest

- Women perform the larger part of work in agriculture.
- We also find that men, when they stay at home, help the women in other areas of household work like filling water, minding the children, grazing animals etc,
- There is a technological basis in the division of the labour between the men and women. The spreading of organic manure is a task entrusted to women; the spreading of in-organic manure (Urea, DAP etc) is done exclusively by men. Similarly introduction of tractors, threshers etc, leads to displacement of women by men. The main reasons cited are lack of knowledge and skill required to operate these machines among women, dress codes (*ghagharas*- the loose skirts apparently inhibit women from perching atop a thresher), modesty (women cannot be seen on top of a tractor or thresher when men are sitting down below). On a positive note these enable the women to be free of these tasks, traditionally performed by women.

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- Women play an important part in irrigation, specially in managing actual distribution - digging and repairing the field channels linking the field to the distribution point, channeling it to the required part of the field by making *kyaris* (smaller partitions), etc. In case the men are away from the house, the women will perform these tasks even at night (as the pump is operated whenever electricity is available). Some women have also mentioned that they might even plough the land in case the need arose.
- The tribals at Kala-Fala rarely hire labour for farm activities from outside the village. The men might marry twice to have a larger number of working hands. Children of both wives are given rights to land. However there often is infighting and discrimination between the wives.
- In case women labour is hired, they are paid Rs 30 and a meal, and do weeding and harvesting. Male labour will be hired at Rs 40 plus meal, and will perform tasks linked with land preparation.

Analysis of access to and control over resources

The main resources are water and land. With regard to these two we find that:

- Women have no legal titles on land, and hence possess no formal title to water. They also have no formal membership in the LI user group. The omission is critical when the woman in question is a widow or has been deserted by her husband.
- The women said that while the crop mix related decisions were taken jointly by both sexes, any new combination was normally proposed by the men.
- In Shyampura, there are no female-headed households. The women have attended the LI committee meetings, and aired their opinion. Men took most decisions regarding the pricing and distribution of water. No woman however complained that she did not get her share of water in absence of her husband.

Analysis of benefits and incentives

- The LI has resulted in a large increase in the number of livestock, and thus has also put a greater burden of work on women, as this work is exclusively in their domain. Conversely, the network of distribution points also means that water has reached close to the houses, reducing the workload related to bringing water to the house.
- The *medbandi* (farm-bunding) and the forestry (JFM, Farm-forestry) programmes have resulted in greater fodder generation, and the crop residues have also increased. Grazing time is thus reduced for larger animals, which are now stall fed (also necessary as most common lands are now under protection- thus grazing is regulated, and private fields are fallow only for one season). This results in manure generation in the home-stead, again reducing the work burden on women.
- Additional milk has become available, and if not sold, adds to the nutrition at home.
- The LI scheme resulted in increases in production of wheat and maize, both staple consumption crops. The increase in Rabi cultivation after LI resulted in greater food grain availability at home, benefiting the women.
- Currently women do not migrate out- men do so in case of grain and cash shortfall.
- Cash surpluses were generated by sale of ginger and other vegetables, as well as milk sales. Women said that they had no control over this cash. There was a big argument in the village the way the women would use the extra money. The men felt that they would put it into the bank or invest it into the farm, the women would normally prefer investing it as *rakam* (jewellery). On analyzing this difference the women pointed out that the *rakam* would belong to them in case of any mishap to the men folk, while the land would not. Further they are illiterate and it would be difficult to keep track of bank deposits and FD's.

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Role in Governance

The women were not involved in the planning, implementation or the operation of the scheme. They said that while informally they had a role in running the scheme, they were formally not a part of either pump operations, repairs and maintenance, pricing decision making or conflict resolution.

Impact on Schooling

One of the reasons cited for the spectacular increase in the girl child enrollment in Shyampura (91% of girls in 6-10, and 62% in 11-14 age groups are enrolled with formal or non-formal schools)²⁹ has been the LI scheme that has brought regular food and income into the household, reduced the migration as well as the work burden on account of grazing and meeting water requirement of the household and livestock. This has impacted the drudgery of the girl child

Operational and management Issues

At the time of commencement of the LI scheme, the LI beneficiary group decided upon the following norms.

- Allocation of water: All beneficiaries were allowed to irrigate three bighas (0.6 Ha) of land- this would have corresponded to app. 6 hours of pump time.
- In case the farmer had less land, s/he could sell water to other people in the user group. Hence there was a notion of 3times x 6hours of water rights.
- The LI committee could sell surplus water to non-beneficiaries by charging Rs 20/hour.
- Money thus earned was to be put into the LI maintenance fund, a fund specifically created to meet repair and maintenance needs, and pump replacement costs.
- The charges incurred on the watch-person/operator (Rs 450/month) and on repairs and maintenance were to be shared equally between all 27 beneficiaries and replaced into the maintenance fund. The watch-person/operator would run the motor, maintain records, and collect money from all beneficiaries and pay the electricity bill.
- The electricity charges were to be paid on a proportional basis on basis of hours of pump use.
- A cess of Rs 100/year will be contributed by all 27 families to the GVK, for equity purposes.

In order to ensure that all the norms are followed, as well as to undertake repairs and maintenance of the pump (when required), an eleven-member committee was constituted. They were also expected to play a key part in conflict resolution. Meetings of the committee were scheduled twice a month, and the committee was to have tenure of 4 years.

Problems arose in the management system essentially due to the costing of repair and maintenance bills. Due to erratic electricity supply, the pump was operated continuously, putting a great load on the machine (specially as the power supply is extremely fluctuation prone). The following specific reasons were cited:

- There was a great deal of disparity in the landholdings (the holdings range from 0.2 ha to 5 ha), and hence a disparity in pump hours used.
- Since a few farmers took Zaid (summer) mung (green-gram) and Lucerne, the electricity connection was maintained for the whole year. A flat charge of Rs 800/month meant that an annual bill of Rs 10,000 was received. Although the persons who took extra pump time

²⁹ Studying the Dropout rates of Girl Children and causal relationship between Non-school going girls and eco development, Jennifer and Sunita, Seva Mandir Aug 1998.

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paid up their share, the pump was used for a longer duration and had higher repair and maintenance costs.

- The larger farmers also cultivated water (and cash) intensive crops like ginger and Lucerne. This used more water and pump hours.
- Equal costing of repairs and maintenance was unacceptable to people with vastly lower land-holdings, and they refused to pay up. On an average Rs 3000 was spent annually on repairs and maintenance, roughly Rs 110/family. The people, specially the smaller farmers, felt that the richer farmers alone should pay the charge.
- The years between 1994-99 saw good rainfall in the catchment of the Nagmala dam, and hence the water in the stream on which LI is located was adequate. Some persons benefited from the canals from Nagmala dam directly also. In these years the group could irrigate upto 100 bighas (20 Ha), as 12 farmers from adjoining areas could also access water. On the negative side, the families who had not taken water in the rabi on account of having used the canal water, refused to pay the repair and maintenance costs, creating divides within the group.
- The entire load of organizing the repairs and maintenance was borne by the paraworkers of Seva Mandir.
- The concept of regular contributions in to the maintenance fund never worked, and Jhalam Chand collected cash on a need basis. The cess that was to be deposited into the GVK was also collected only once.

The above information was gleaned after discussions at the village and by looking at previous studies.

After 4 years of consecutive drought, and non-operation of the LI system, the formal documents of LI are not readily available. However the respondents were unanimous in stating that all got the required amount of water required in the good years. The other years were years with absolutely no water, so the local system was never put to test in a water scarce year.

Sustainability

The sustainability of the LI depends on the continued availability of water in the well. As regards the sustainability of irrigated agriculture, it seems that this would continue as Jhalam Chand is setting himself up as a local entrepreneur who would sell water to a large number of same beneficiaries. .

The agriculture engineer at Seva Mandir said that 8 farmers from the beneficiary group, have bought a diesel pump set and are using it to draw water from the well to irrigate their fields.

Caselet 1: Village Kada, Jhadol Tehsil

- The LI system at Kada was operationalised in 1992, and is still functional. About 35 families were beneficiaries in the initial years and the numbers have remained the same over the years.
- The system was based on a 8hp diesel pump set lifting water, through a pipeline network to a set of distribution chambers. The system was built using a grant from Seva Mandir to the village community. The investments also included construction of a well. Around 70 bighas (appx 18 ha) are irrigated.
- Farmers have used the irrigation water for Rabi crops as well as for cash crops like Lucerne, ginger, and other vegetables. The crop of mung is also taken. Supplementary irrigation is also provided to Kharif crops in drought years, and also irrigation to Rabi crops to prevent frost.
- Over time the farmers have realized that diesel was expensive, and as there was little monitoring of the fuel used, most farmers started using a mixture of diesel and kerosene in order to irrigate their lands. The group incurred huge costs in repairs and maintenance, and there was infighting regarding responsibility and sharing of the repair costs.
- Today the old diesel pumpset is nonfunctional. An entrepreneur, Andu, supplies his personal 10hp diesel pump to the farmers at Rs 25/hr, and the concerned farmer provides his own fuel (kerosene in most cases). Andu bears all costs for repairs and maintenance.
- The farmers say that they incur a cost of Rs 35 per hour of pumping. (Had they used pure diesel, the cost would be around Rs48/hr)
- The well, the water in the well, and the distribution network continue to be collectively owned and used, while the pumpset is privately owned. As most conflicts are related to pump maintenance, a private pumpset means that this source of conflict is eliminated.
- The group has filed an application for an electricity connection, The electric motor was given earlier by Seva Mandir, as it was envisaged that the system would be powered by an electric motor) with lower operating and maintenance costs. In case that happens, the whole system would revert to being collectively owned and operated.
- The stream on which LI is located has not run dry. The village has also successfully lobbied to have an anicut built on the upstream to check soil and water runoff.
- The productivity of wheat in the command area is astounding, with most farmers reporting yields of around 800kg/bigha (4000kg/ha).
- Apart from the fact that there is hardly any decrease in the number of beneficiaries over the years, there has been substantial increases in farm incomes. Most farmers have deepened wells and also bought personal diesel (5hp) pumps (for servicing fields outside this area. They have also built houses and also invested in livestock.
- Having private sources of irrigation, each farmer is able to take greater risks while deciding on crop-mix and also on investments in agriculture. This increases the chances of sustainability of the LI scheme.

Caselet 2: Village Amarpura, Kherwada Tehsil

- The LI system at Amarpura is still in the process of operationalisation. Structural constraints are impeding the progress of the scheme.
- The system is powered by two 14 hp machines. The command area is app. 50 bighas for each pump, and initially there were 50 beneficiaries in each user group. However the extent of fragmentation of land is greater than envisaged - e.g. a 1½ bigha patch is owned by 11 persons. Hence effectively around 125 persons need to sit down to take operational decisions. The very small landholdings also mean that there is limited interest in individuals to make the required investment of time and money.
- In the command area of the first 14hp pump, around 90% of the land is not fully owned by the potential beneficiaries, but has been mortgaged to others- specifically to a local teacher and a kalal shopkeeper. These persons have the final say in running of the system and individual farmers would need to take their approval regarding pricing of water, crop-mix etc.

Profile of a Medium Adivasi Farm in Shyampura				Before Lift	After Lift			
1. Land resources at disposal								
Total land owned:								
- of which arable land (Class II/III)		ha	0.80	ha	0.80			
- and private wasteland (Class VI)		ha		ha				
Wasteland rented in and/or encroached		ha		ha				
Total land - operational holding		ha	0.80	ha	0.80			
- rainfed area		ha	0.60	ha	0.00			
- irrigated area		ha	0.20	ha	0.80			
2. Human resources								
Labour Units (LU) for farm work	Nos	LU						
Head of family	1	1	LU	1.00	LU	1.00		
Wife	1	0.4	LU	0.40	LU	0.40		
Youth	2	1	LU	2.00	LU	2.00		
School children	1	0	LU	0.00	LU	0.00		
Whole family	5		LU	3.40	LU	3.40		
Employment potential per year (290 calendar days):			986	Labour Days	986	Labour Days		
3. Livestock resources								
Non-descript animals:					added 3 buffaloes			
4. Invested capital on farm								
	ha							
Irrigated arable land	0.20	50000 /ha	Rs	10000	Rs	10000		
rainfed arable land	0.60	40000 /ha	Rs	24000	Rs	24000		
Private wasteland	0.00	15000 /ha	Rs	0	Rs	15000		
Farm implements and tools			Rs	4000	Rs	4000		
Value of livestock:			Rs	0	Rs	0		
Cow		4000 / head	Rs	0	Rs	0		
Bullock	2	5000 / head	Rs	10000	2	Rs	10000	
Buffaloes		5000 / head	Rs	0	3	Rs	15000	
Goats	7	800 / head	Rs	5600	7	Rs	5600	
Irrigation systems			nil		nil			
Buildings (mud walls with improved roof)			Rs	40000	Rs	40000		
Total assets			Rs	93600	Rs	123600		
5. Estimated gross returns from crops and livestock								
		<i>Kg Yield</i>	<i>Rs</i>	<i>Amount</i>	<i>Kg Yield</i>	<i>Rs</i>	<i>Amount</i>	
<i>kharif</i>								
Maize		200	5	Rs	1000	400	Rs	2000
Tuar			15	Rs	0		Rs	0
Paddy		100	10	Rs	1000	200	Rs	2000
Fodder		200	1	Rs	200	400	Rs	400
				Rs	0		Rs	0
<i>rabi</i>								
Wheat		200	8	Rs	1600	500	Rs	4000
Mustard		50	15	Rs	750	50	Rs	750
Gram		50	15	Rs	750	50	Rs	750
Vegetables			15	Rs	0	840	Rs	12600
Z. Pulses		50	15	Rs	750	50	Rs	750
Fodder		200	1	Rs	200	500	Rs	500
Gross returns livestock:	milk		5			1890	Rs	9450
Total gross return				Rs	6250		Rs	33200

(continued): Farm Budget No.3

6. Estimated cost of production							
	ha	Rs / ha	Amount	ha	Rs / ha		
Maize	0.6	500	Rs 300	0.6	1000	600	
Tuar		500	Rs 0		1000	0	
Paddy	0.2	500	Rs 100	0.2	1000	200	
Wheat	0.2	2000	Rs 400	0.4	2000	800	
Mustard	0.2	500	Rs 100	0.4	500	200	
Gram	0.2	500	Rs 100	0.2	500	100	
Pulses	0.2	2000	Rs 400	0.2	2000	400	
Vegetables	0	20000	Rs 0	0.2	20000	4000	
Lift Irrigation Charges				0.6	781.25	580	
Livestock maintenance cost		500		5	500	2500	
Total production (recurrent cost)			Rs 1400		Rs 9380		
7. Miscellaneous cost							
Depreciation:	%						
Implements and tools	10		Rs 400	10	Rs 400	400	
Maintenance of buildings	2		Rs 800	2	Rs 800	800	
Imputed family labour cost on farm	30	150	Rs 4500	250	Rs 7500	7500	
	wage	days					
Total misc.cost			Rs 5700		Rs 8700		
8. Farm Income Analysis							
Net farm income			Rs -850			Rs 15120	
Farm Income (without taking into account the misc costs)			Rs 4850			23820	
Food Deficit			-221.25		surplus	379	
<i>food requirement given RDA of 450gm/person/day</i>		821.25					
additional days of migration required for food security (@Rs 30/day)			40			N Reqd	
9. Assessment							
Employment on farm for crop production is restricted to appx			150			250	
labour days resulting in an employment rate of			15%			25%	
Budget includes depreciation and maintenance costs except for livestock, for which depreciation is offset by births (value added).							
The farm operates at a loss and has no food security.				The farm operates at a profit and has food security.			
The family cannot survive without additional income from wage labour. Additional income is earned from work in or near Udaipur and farm work in the village				Men do not migrate Women do not go for labour			
No savings can be made.				Investments in assets made			

Profile of a Small Adivasi Farm in Shyampura				Before Lift	After Lift		
1. Land resources at disposal							
Total land owned:							
- of which arable land (Class II/III)	ha		0.50	ha	0.50		
- and private wasteland (Class VI)	ha			ha			
Wasteland rented in and/or encroached	ha			ha			
Total land - operational holding	ha		0.50	ha	0.50		
- rainfed area	ha		0.50	ha	0.00		
- irrigated area	ha		0.00	ha	0.50		
2. Human resources							
Labour Units (LU) for farm work							
Head of family	Nos	LU		LU			
	1	1	LU	1.00	1.00		
Wife	1	0.4	LU	0.40	0.40		
Youth	3	0.5	LU	1.50	1.50		
School children	1	0	LU	0.00	0.00		
Whole family	6		2.90	2.90	2.90		
Employment potential per year (290 calendar days):				841 Labour Days	841 Labour Days		
3. Livestock resources							
Non-descript animals:					added 2 Bullocks, 1 cow, 4 goats		
4. Invested capital on farm							
	ha						
Irrigated arable land	0.00	50000 /ha	Rs	0	Rs 0		
rainfed arable land	0.50	40000 /ha	Rs	20000	Rs 24000		
Private wasteland	0.00	15000 /ha	Rs	0	Rs 15000		
Farm implements and tools			Rs	4000	Rs 4000		
Value of livestock:			Rs	0	Rs 4000		
Cow		4000 / head	Rs	0	1 Rs 4000		
Bullock		5000 / head	Rs	0	2 Rs 10000		
Buffaloes		5000 / head	Rs	0	0		
Goats	2	800 / head	Rs	1600	6 Rs 4800		
Irrigation systems			Rs	nil	Rs nil		
Buildings (mud walls with improved roof)			Rs	40000	Rs 40000		
Total assets			Rs	65600	Rs 101800		
5. Estimated gross returns from crops and livestock							
	<i>kharif</i>	<i>Kg Yield</i>	<i>Rs</i>	<i>Amount</i>	<i>Kg Yield</i>	<i>Rs</i>	<i>Amount</i>
	Maize	100	5	Rs 500	200	Rs	1000
	Tuar		15	Rs 0		Rs	0
	Paddy	50	10	Rs 500	60	Rs	600
	Fodder	100	1	Rs 100	200	Rs	200
	<i>rabi</i>			Rs 0		Rs	0
	Wheat		8	Rs 0	500	Rs	4000
	Mustard		15	Rs 0	20	Rs	300
	Gram		15	Rs 0		Rs	0
	Vegetables		15	Rs 0		Rs	0
	Z. Pulses		15	Rs 0		Rs	0
	Fodder	0	1	Rs 0	500	Rs	500
Gross returns livestock:						Rs	
Total gross return				Rs	1100	Rs	6600

(continued): Farm Budget No. 2

6. Estimated cost of production							
	ha	Rs / ha	Amount	ha	Rs / ha		
Maize	0.5	500	Rs 250	0.5	1000	500	
Tuar		500	Rs 0		1000	0	
Paddy	0.2	500	Rs 100	0.2	1000	200	
Wheat		2000	Rs 0	0.5	2000	1000	
Mustard		500	Rs 0	0.5	500	250	
Gram		500	Rs 0		500	0	
Vegetables	0	20000	Rs 0		20000	0	
Lift Irrigation Charges				0.5	469	345	
Livestock maintenance cost		500			500	0	
Total production (recurrent cost)			Rs 350			Rs 2295	
7. Miscellaneous cost							
Depreciation:	%						
Implements and tools	10		Rs 400	10	Rs 400		
Maintenance of buildings	2		Rs 800	2	Rs 800		
Imputed family labour cost on farm	30	150	Rs 4500	200	Rs 6000		
	wage	days					
Total misc.cost			Rs 5700			Rs 7200	
8. Farm Income Analysis							
Net farm income			Rs -4950			Rs -2895	
Farm Income (without taking into account the misc costs)			Rs 750			4305	
Food Deficit			-835.5			-206	
<i>food requirement given RDA of 450gm/person/day</i>		985.5					
additional days of migration required for food security (@Rs 30/day)			140			30	
9. Assessment							
Employment on farm for crop production is restricted to appx			150			200	
labour days resulting in an employment rate of			18%			24%	
Budget includes depreciation and maintenance costs except for livestock, for which depreciation is offset by births (value added).							
The small farm operates at a loss and does not have food security.				Food deficit greatly reduced			
The family cannot survive without additional income from wage labour. Entire family used to migrate for long periods				Women do not migrate Additional income is earned from wage labour in Bicchiwara filling Filling pots @Rs 2/pot			
No savings can be made.							
A huge gap exists to reach the anticipated minimum subsistence level.							

Profile of a Small Adivasi Farm in Shyampura				Before Lift	After Lift
1. Land resources at disposal					
Total land owned:					
- of which arable land (Class II/III)				ha 0.60	ha 0.60
- and private wasteland (Class VI)				ha	ha
Wasteland rented in and/or encroached				ha	ha
Total land - operational holding				ha 0.60	ha 0.60
- rainfed area				ha 0.60	ha 0.40
- irrigated area				ha 0.00	ha 0.20
2. Human resources					
Labour Units (LU) for farm work					
Head of family				Nos 1 LU 1	LU 1.00
Wife				Nos 1 LU 0.4	LU 0.40
Youth				Nos 4 LU 1	LU 4.00
School children				Nos 1 LU 0	LU 0.00
Whole family				Nos 7 LU 5.40	LU 5.40
Employment potential per year (290 calendar days):				1566 Labour Days	1566 Labour Days
3. Livestock resources					
Non-descript animals:					added 2 Bullocks
4. Invested capital on farm					
Irrigated arable land				ha 0.00 50000 /ha Rs 0	Rs 0
rainfed arable land				ha 0.60 40000 /ha Rs 24000	Rs 24000
Private wasteland				ha 0.00 15000 /ha Rs 0	Rs 15000
Farm implements and tools				Rs 4000	Rs 4000
Value of livestock:					
Cow				4000 / head Rs 0	Rs 0
Bullock				5000 / head Rs 0	2 Rs 10000
Buffaloes				5000 / head Rs 0	Rs 0
Goats				2 800 / head Rs 1600	2 Rs 1600
Irrigation systems				nil	nil
Buildings (mud walls with improved roof)				Rs 40000	Rs 40000
Total assets				Rs 69600	Rs 94600
5. Estimated gross returns from crops and livestock					
kharif					
Maize				Kg Yield 300 Rs 5 Rs Amount 1500	Kg Yield 400 Rs Amount 2000
Tuar				60 15 Rs 900	40 Rs 600
Paddy				10 Rs 0	Rs 0
Fodder				300 1 Rs 300	400 Rs 400
rabi					
Wheat				8 Rs 0	250 Rs 2000
Mustard				15 Rs 0	10 Rs 150
Gram				15 Rs 0	Rs 0
Vegetables				15 Rs 0	Rs 0
Z. Pulses				15 Rs 0	Rs 0
Fodder				0 1 Rs 0	250 Rs 250
Gross returns livestock:					Rs
Total gross return				2700	5400

(continued): Farm Budget No. 1

6. Estimated cost of production							
	ha	Rs / ha	Amount	ha	Rs / ha		
Maize	0.6	500	Rs 300	0.6	1000		600
Tuar	0.6	500	Rs 300	0.2	1000		200
Paddy		500	Rs 0		1000		0
Wheat		2000	Rs 0	0.2	2000		400
Mustard		500	Rs 0	0.2	500		100
Gram		500	Rs 0		500		0
Vegetables	0	20000	Rs 0		20000		0
Lift Irrigation Charges				0.2	468.75		205
Livestock maintenance cost		500		2	500		1000
Total production (recurrent cost)			Rs 600			Rs	2504.861111
7. Miscellaneous cost							
Depreciation:	%						
Implements and tools	10		Rs 400	10	Rs		400
Maintenance of buildings	2		Rs 800	2	Rs		800
Imputed family labour cost on farm	30	150	Rs 4500	200	Rs		6000
	wage	days					
Total misc.cost			Rs 5700			Rs	7200
8. Farm Income Analysis							
Net farm income			Rs -3600			Rs	-4305
Farm Income (without taking into account the misc costs)			Rs 2100				2895
Food Deficit			-789.75				-450
<i>food requirement given RDA of 450gm/person/day</i>		1149.75					
additional days of migration required for food security (@Rs 30/day)			130				70
9. Assessment							
Employment on farm for crop production is restricted to appx			150				200
labour days resulting in an employment rate of			10%				13%
Budget includes depreciation and maintenance costs except for livestock, for which depreciation is offset by births (value added).							
The small farm operates at a loss and does not have food security.							
The family cannot survive without additional income from wage labour. Additional income is earned from work in or near Udaipur and farm work in the village. Women also migrate and go for labour to large construction sites.							
No savings can be made.				Men still go in non agriculture season Women do not go for labour			
A huge gap exists to reach the anticipated minimum subsistence level.							
0.3 ha land is mortgaged.				0.3 ha of mortgage land sold off. land/buyer in LI command			