CHAPTER – VII

NEEM WITH WATER DOMAIN

This chapter discusses the ecological sustainability and socio-economic well-being of the people of Plachimada and Attappady within the ecological economics frame work. It places the ecosystem services as the key source of socio-economic development. It observes water as a key attribute of eco-economic well-being and the NEEM analysis reinforces the role of water in rural economic sustainability. The multidimensional approach of NEEM (first part of this chapter is an extension of the New Ecological Economic Model discussed in Chapter 4) presents water as an economic development device; examines gender and livelihood issues related to water commercialisation; discusses the socio-cultural behavioural pattern of rural life; probes governance and sovereignty issues on water; and places water as an indicator of human development while delving into the issue of making water a 'public good' with rural water management techniques and practices. The pattern of discussion is linked and designed under NEEM constructs. Moreover, the study propagates NEEM as a tool for agrarian ecological economic analysis.

7.1 NEEM: A RURAL-AGRARIAN-ECOLOGICAL WORKING MODEL

The study recognises water as an important element in socio-economic development of rural life. Agrarian ecology completely depends on water; it creates employment, generates income and maintains ecological balance. Therefore, diverting rural water to any other purpose over agriculture and allied activities is considered as 'commercialization of water'; even though the agrarian ecology itself is a part of market. However, the study recognises the "subsistence" and "self-sustainability" nature of agrarian ecology beyond its commercial use argument; where water is an analytical tool rather than a problem. Moreover, water is an 'ecological good' with ecological functions and a 'development device'

with socio-economic functions. The NEEM constructs, thus, focuses on ethical, social, economic, ecological and institutional nature of water as a tool as well as an element, making the NEEM as a Rural-Agrarian-Ecological Working Model.

7.1.1 Philosophical Construct

What is water? What are its functions? What is its significance in ecology? How to manage and govern water sources? How to distribute water among human and ecological rights? Which would be the supreme concern in water related issues - human demand or ecological demand? such vital questions shape the philosophical/ethical rules in an agrarian ecology. As a supreme entity, the social ecology has the sole authority to answer these questions. The 'social-ecology individual' should be an 'ecologically-vigil rational-civic person' rather than a 'rational economic person'; one who can ethically govern the ecological resources, especially water. The contemporary socio-economic-ecological arena requires an ethical and equitable distribution of water among competitive market demands so that the individual needs to be ecological-literate, well-informed and social-responsible. Such an individual will acknowledge the superiority of ecology and keep pace with the speed of ecological cycles. With an eco-ethical commonsense, water in perspective, the individual would be principled by the following canons:

- Without human-beings, ecology will sustain; but without ecology human-being will not survive.
- Water is an ecological good
- Water is for ecology, not for human-beings
- All biotic and abiotic elements have equal consumptive rights on water
- Water has important ecological functions and cycles
- Human-being are the subset of ecology
- Water is essential for human development
- Over-extraction of water is unethical

- Man, as a rational being, has the responsibility to keep water-tables safe and healthy.
- Man should obey the ecological laws and be aware about the consequences of his/her actions.
- Ecology is not an input to production but an abode for productive socio-economic actions.

7.1.2 Ecological Construct

The philosophical construct directs the 'ecologically-vigil rational-civic person' to the in-depth analysis of ecological cycles. It helps the human-beings to analyse the viability of the ongoing economic development practices and also helps to recheck and make necessary corrections. Here, water is recognised as a vital ecological good that has intergenerational impacts and ensures the ecological sustainability of the future. Hence, while 'ecological cycles of water' have guided the socio-economic life of the past (river basin civilizations), they also serve the present generation as well as the life of the future. Therefore, NEEM advices the 'individual' to acquire scientific knowledge on the nature and pattern of local ecology, its historical evolution and ecological succession, with water perspective. The 'ecological construct', thus, constitutes a manner of 'ecological literacy'. The following general awareness about local ecology is inevitable for NEEM analysis.

- Topography/geographical features of land
- Historical data on water-table of local ecology
- Present water potential and future water demands of the region
- Nature and properties of soil, and its fertility
- Pattern of agriculture practices till date
- Biodiversity accounts and speed of ecological cycles
- Water holding capacity of soil
- Season shifts and its impact on local ecology
- Direction of water flows

- Water and soil management techniques
- Need-based and soil-concerned agriculture

7.1.3 Social Construct

NEEM seeks an equitable distribution of ecosystem services among social needs and ecological needs. Society, as an apex rational organism, is accountable to do the same. Thus, the 'social construct' is framed within two lines, social and ecological, which are parallel as well as complementary to each other. Rational (NEEM angle) distribution of ecosystem services among social (individual) needs avoids social conflicts and develops a social harmony. It develops a 'social civic sense', which promotes ecosystem management techniques and governance rules. Here, the 'social construct' deals with water-related issues over a wider spectrum rather than over its narrow economic point of view. Under NEEM, water is not only an ecological good, but has social-good nature also. The aim of the 'social construct' is the assessment of water consumption with the help of the 'philosophical construct' and the 'ecological construct'. Thus, the 'social construct' for water comprises of the following elements.

- Human rights on water
- Ecological rights on water
- Gender equality in water use and collection
- Accessibility, availability and affordability of water in quantity and quality
- Protection and management of water sources
- Social checks on water consumption
- Water distribution among productive sectors viz. domestic uses, irrigation, environmental sanitation and ecological needs.
- Prevention of water commercialization practices
- Political communication about resource scarcity
- Marking the ecological limits of human activities

7.1.4 Economic Construct

NEEM seeks to develop the local ecology as a self-sufficient economy with the above discussed constructs. It examines the well-being of the society rather than individual income, savings and capital assets. It is assumed that the sustainable local ecology ensures sustainable economic well-being among people. 'Social construct' expresses the behavioural pattern of society; whereas 'economic construct' is the execution of the 'social construct', indicating the progress/development of society. 'Economic construct' assumes that there is a limit to economic growth; but society can develop with the pace of ecological cycles. Here, NEEM considers the changing scenario of water (disturbed water cycles) and accordingly frames the economic construct. Therefore, the 'economic construct' observes the following socio-economic elements that focus on water.

- Accessibility, affordability and availability of water
- Quality of drinking water
- Water related health issues
- Occupational pattern of the society
- Educational profile of the society
- Income of the household
- Living conditions of people
- Agriculture productivity of farm
- Agricultural pattern of region
- Detailed study on major irrigation sources of region
- Water Commercialization practices
- Environmental degradation of the region through water pollution and chemical fertilizers

7.1.5 Institutional Construct

NEEM believes that ecology itself is an institution, that every being – organic and inorganic, micro and macro organisms - are symbiotically related. In a sense, eco-

logically, man is the single identity disturbing this symbiotic relationship of nature. But, an 'ecologically-vigil rational-civic person' is accountable to maintain, manage and govern the symbiotic nature of ecology by putting a check on the illogical human actions. So, the man-house needs self-controlled correction tools, which have to be implemented institutionally. The above constructs viz. philosophical, ecological, social and economic constructs direct the man-house to such an institutional framework. The NEEM-promoted institutional construct, thus, would have the following features.

- Good political communication
- Well-visionary, uncorrupted local democratic political structure
- Women's representation in local political structure
- Peoples participation in political decision-making
- Participation of scientists, experts and academicians in decision-making
- Peoples participation in development projects
- Prioritisation of development projects
- Eco-logical economic activities
- Rules for equitable distribution of ecological resources
- Strong laws for checking the illogical human actions
- Ecologically viable and sustainable, socially beneficial economic policies

7.2 ECO-LOGICAL DESIGN OF NEEM ANALYSIS

Apart from water related questions, for general-purpose ecological economic analysis, the Rural-Agrarian-Ecological-working model can be illustrated in Figure 7.1. It is an eco-logical design of NEEM, which helps to analyse the present economic system on the basis of ontological constructs initiated from the limitations or scratches of conventional economic models (refer Chapter 4). Thus, the components seen in the sketch are comparatively the same as the conventional economic models, but contain a wide-ranging meaning absorbed from the new constructs of NEEM.

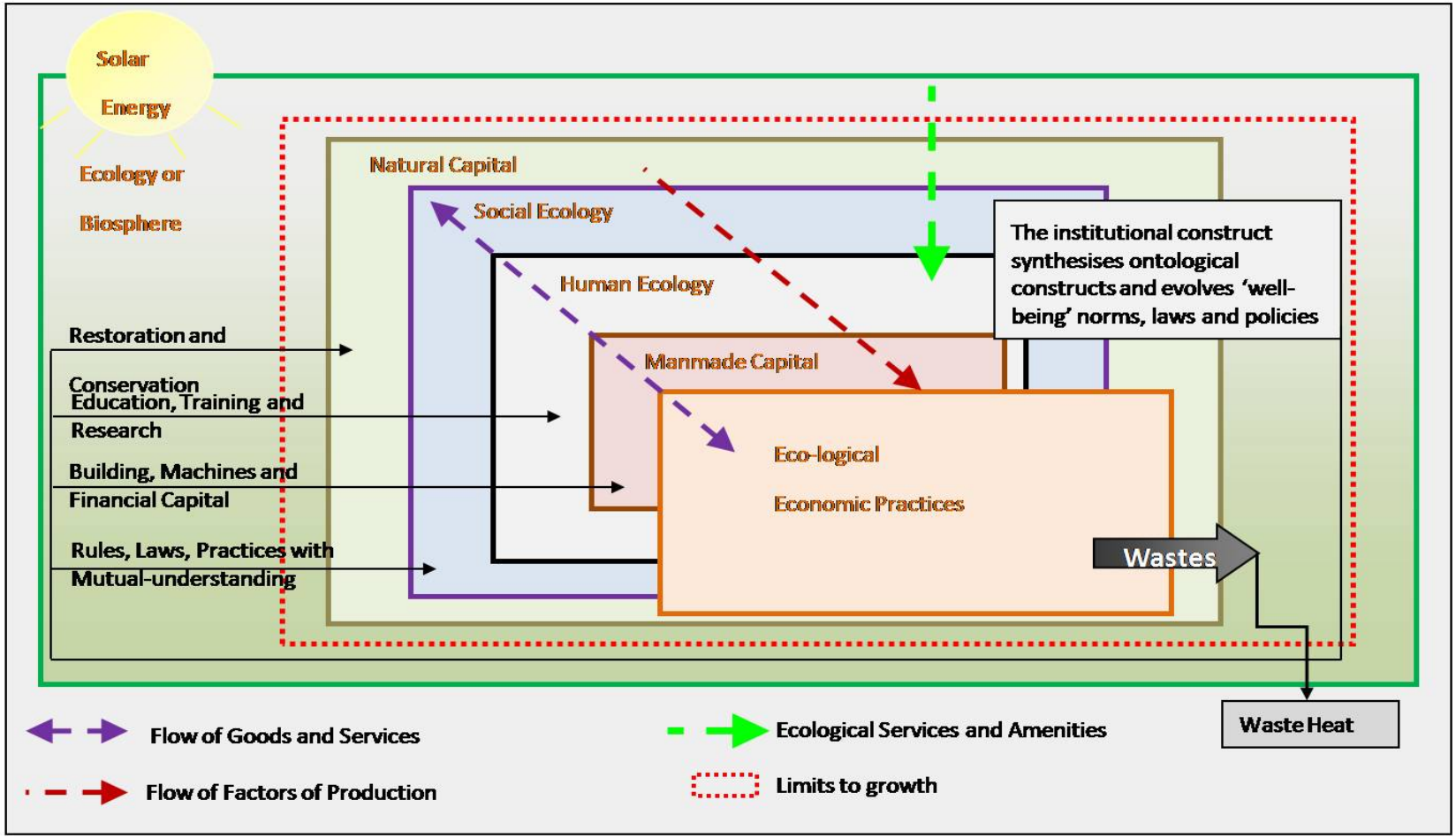


Fig. 7.1 Eco-logical Design of NEEM Analysis

The model has six frames viz. ecology or biosphere, natural capital, social ecology, human ecology, manmade capital and eco-logical economic action frames. The eco-logical design of NEEM begins with the differentiation of ecology and natural capital, which conventional models have used interchangeably. While the term 'capital' symbolizes the tangibility of resources, some ecological services and amenities cannot be quantified tangibly. Every frame of this model operates through an ecological consciousness that generates from the ontological construct of synthesis focusing on right well-being and right eco-logical economic actions. There is one dotted line (red) indicating the limits of growth, lying between the ecology frame and natural capital frame. Here, the whole economic system lying within the natural capital frame enjoys unpaid ecological services and amenities supplied by abiotic ecological domains originating from the ecological frame. The model discusses the economic activities of man-house supported by the ecosystem in general. It is an integrated eco-logical analysis, which is designed on the philosophical construct, ecological construct and social construct that take into consideration all other beings and abiotic ecological domains in the system analysis. Therefore, the New Ecological Economic Model (NEEM) is inevitable in such an ecological-economic system analysis due to its eco-logic.

7.3 CASE STUDIES: NEEM ANALYSIS

The present study undertakes two case studies to analyse the impact of water commercialization practices on socio-economic life and ecological balances of rural-agrarian ecology. The studies intend to check the viability of NEEM as a rural-agrarian-ecological working model. The basic socio-economic-ecological features of the case study areas viz. Plachimada and Attappady have already been discussed in Chapter 6. Here, the pattern of analysis is based on NEEM constructs. The study has collected primary data through a three-pronged research approach viz. case study methods, explorative research methods and descriptive methods.

The study uses secondary data from reports and articles and adopts a historical analysis that is used in Chapter 6. This NEEM analysis is the continuation of Chapter 6 and mainly based on primary data, obtained through participatory research techniques, semi-structured interviews, focused group discussions, observations and conversation with people and interviews with selected experts.

7.3.1 Case Study I: Coca-Colanization at Plachimada

As discussed in Chapter 6, Plachimada is an abode of predominantly landless agricultural labourers; the Coca-cola plant site is surrounded by such SC/ST settlements viz. Plachimada, Vijayanagaram, Veloor, Rajeev Nagar, Thodichipathy and Madhavan Nair Colonies of Perumatty and Pattencherry panchayats. To analyse the water scarcity and the consequent socio-economic-ecological issues of Plachimada due to the operations of HCBPL (water commercialization), the study has undertaken a detailed survey at Plachimada through a questionnaire. It is observed that the socio-economic-demographic features of households are stereotypic in nature. Therefore, 10 samples from each settlement are collected, comprising a total of 60 samples of working class households with a ratio of 5:1 (see Table 7.1).

Regular visits to Plachimada since the year 2003 helped to understand the cultural pattern and value system of the study area and also helped to undertake casual interviews with local people for key issue-based data collection. Water pollution and soil related data are collected through interviews with scientists and experts. For convenience of the study, the water scarcity issue of Plachimada is divided and analysed over three phases viz. Phase I, Phase II and Phase III.

Phase I: It is the period before 2000. At the end of Phase I, HCBPL established at Plachimada and launched its soft-drink production. Before that there were no such big industrial production units and life of Plachimada was normal and dependent purely on agriculture based activities.

Phase II: It is the period between 2000 and 2006. The people of Plachimada were pushed to a situation of acute water scarcity due to HCBPL operations. Agriculture sector also faced a setback during the period. Giving in to local resistance HCBPL stopped its production.

Phase III: This is the period since 2006. People of Plachimada are continuing their struggle for compensation to cope with the physical, ecological and agriculture loss they faced under the operation of HCBPL.

Table 7.1 Details of the Data Collection

Data- Period	**1998 -2008**
Approximate Number of Agriculture Labour Households around HCBPL	300
Number of Settlements	6
Number of Samples Surveyed	60
Number of STs Households Surveyed	30
Number of SCs Households Surveyed	18
Number of OC Households Surveyed	12
Observed and studied area Around HCBPL	5 km^2
Approximate Number of Agriculture Households around HCBPL (2.5 km radius)	80-100
Number of Samples Surveyed in Detail	15
Source: *Author's Primary Survey*	

The Study has collected the data under five strict criteria:

1. The sample households should have at least 10 years experience with the Plachimada geography, climate and ecology.
2. The households must have a dug well with 10 years historical background.
3. The labour households should not have a positional change of their housing.

4. The agriculture households should have a 12-year experience in agriculture.
5. The agriculture land owned by the farmer should be the same in size, quality and use of fertilizers and pattern of agriculture, from 1997 to 2002.

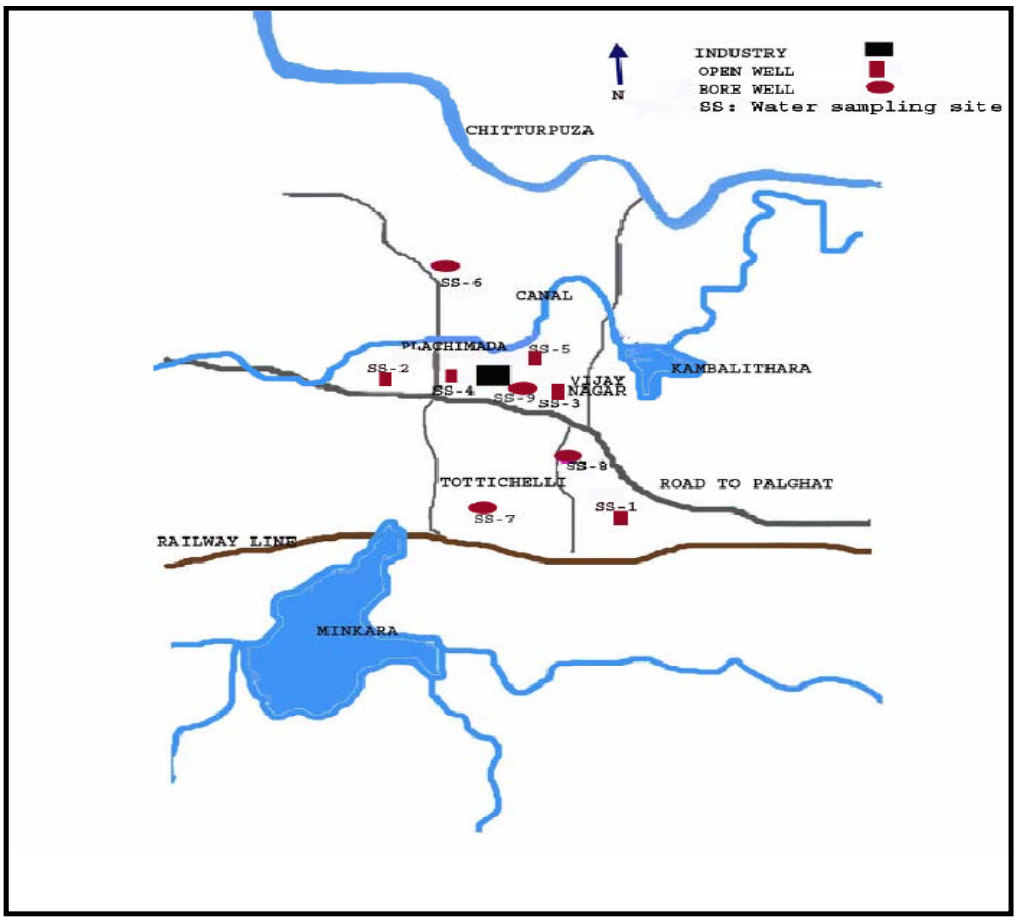


Fig. 7.2 The Study Area

7.3.1.1 Demographic features of Plachimada

Socio-economic-demographic features show the miserable living conditions of the people of Plachimada. The occupational structure, land holding pattern, education and housing conditions are extremely appalling in SCs/STs settlements of Plachimada (see Table 7.2). The general picture of the Socio-economic situation of Plachimada area has discussed in Chapter 6 (see Table 6.13). Average land size is 5 to 8 cents (1 cent = 40.46825 m^2)[1] occupying 4 to 6 members of a family (see Figure 7.3). Since the year 2000 there has been a remarkable shift in labour force from

agriculture sector to other sectors (occasional, temporary or petty jobs) due to the scarcity of water. Previously, 95 percent of labour force was engaged in agriculture whereas now it has dropped to 70 percent. Generally, the shift from agrarian sector to other sectors is considered to be a progress of the economy; but here in Plachimada, it is not an optimistic sign that people are forced to seek new opportunities for their little earnings due to the setback of local agriculture.

Table 7.2 Basic Profile of the Agriculture Labour Households-Plachimada (pp. 314-16)

Sl. No.			Demography				Occupation				Living Condition			Education		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
P1	SC	5	4		1	3	3				SP	2	Y		3	1
P2	SC	5	6		2	4	3			1	SP	3		1	3	2
P3	ST	4	4	2		2	2				P	2			2	
P4	OC	5	4	1		3	2			1	SP	2			4	
P5	ST	4	7		3	4	4				SP	3			4	3
P6	SC	8	5		1	4	4				SP	2	Y		4	1
P7	ST	7	5	1	1	3	2			1	SP	3	Y		3	1
P8	ST	4	5		1	4	2	1		1	SP	3			4	1
P9	SC	8	4	1	1	2	2				P	2			3	1
P10	OC	7	4		2	2	2				SP	2			2	2
V1	ST	6	4			4	4				SP	3	Y	2	2	
V2	ST	4	5	1		4	3			1	SP	2			3	
V3	ST	5	4			4	3			1	SP	3	Y		3	1
V4	SC	5	5	2		3	3				P	2			3	
V5	ST	6	5			5	3		1	1	P	3			4	1
V6	ST	5	5	2		3	3				SP	2			3	
V7	ST	4	5		2	3	3				P	2		1	3	1
V8	ST	7	4		2	2	2				SP	2	Y	1	1	2
V9	OC	8	4	1	1	2	2				P	3		1	2	1
V10	ST	4	3	1		2	2				SP	2	Y		2	
M1	ST	5	3	1		2	2				SP	2			2	

M2	ST	6	4			4	4				P	3		1	3	
M3	ST	6	4	2		2	2				SP	3			2	
M4	ST	8	4			4	4				P	2	Y	1	3	
M5	OC	5	5	2		3	2			1	SP	2	Y		3	
M6	SC	5	6	1	1	4	2			2	P	3	Y		4	1
M7	OC	6	7	1		6	2	1	1	2	SP	3			5	1
M8	SC	5	5		2	3	3				SP	2			3	2
M9	OC	10	5	1	2	2	2				P	2	Y		2	2
M10	SC	8	5	2	1	2	2				SP	2	Y		2	1
T 1	SC	5	4		1	3	3				SP	2	Y		3	1
T 2	OC	5	5		2	3	3				P	2			3	
T 3	SC	12	4			4	4				SP	3	Y	2	2	
T 4	ST	4	4	2		2	2				P	2			2	
T 5	SC	10	5	1	1	3	3				SP	2			3	
T 6	OC	5	5	1	1	3	2			1	SP	2	Y		3	
T 7	ST	6	7	1		6	2	1	1	2	SP	3			5	1
T 8	SC	10	5		1	4	2	1		1	SP	3			4	1
T 9	OC	6	5			5	3		1	1	P	3			4	1
T 10	SC	8	4	1	1	2	2				P	2			3	1
R1	ST	7	4		2	2	2				SP	2	Y	1	1	2
R2	ST	12	4		2	2	2				P	2			2	
R3	SC	5	5		2	3	3				P	2			3	
R4	OC	5	4			4	3			1	SP	3	Y		3	1
R5	SC	15	5	2		3	3				P	2			3	
R6	OC	6	5			5	3		1	1	P	3			4	1
R7	ST	5	5	1	1	3	3				SP	2			3	
R8	ST	4	5		2	3	3				P	2		1	3	1
R9	ST	4	3	1		2	2				SP	2	Y		2	
R10	ST	5	3	1		2	2				SP	2			2	
Vi1	ST	6	4			4	4				P	3		1	3	
Vi2	ST	8	4			3	4				P	2	Y	1	3	
Vi3	OC	5	5		2	3	2			1	SP	2	Y		3	
Vi4	SC	8	5	1	2	2	2				SP	2	Y		2	1
Vi5	SC	5	4		1	3	3				SP	2	Y		3	1

Vi6	ST	5	5		2	3	3				P	2			3	
Vi7	ST	6	4			4	4				SP	3	Y	2	2	
Vi8	ST	4	4	1	1	2	2				P	2			2	
Vi9	SC	8	4	1	1	2	2				P	2			3	1
Vi10	ST	7	4		2	2	2				SP	2			2	2

Source: Author's Primary Survey

A. Social Category
B. Land Size in Cents
C. Family Size in Number
D. Children <10
E. Children 10-15
F. Labour Force in Number
G. Agriculture Labourers in Number
H. Private Sector Labourers in Number
I. Self Employed
J. Other Works
K. Condition of the House.
P- Pukka
SP- Semi-Pukka
L. Number of Rooms
M. Toilet Facility (Y- yes)
N. Illiterate
O. Primary Schooling
P. Upper Primary Schooling

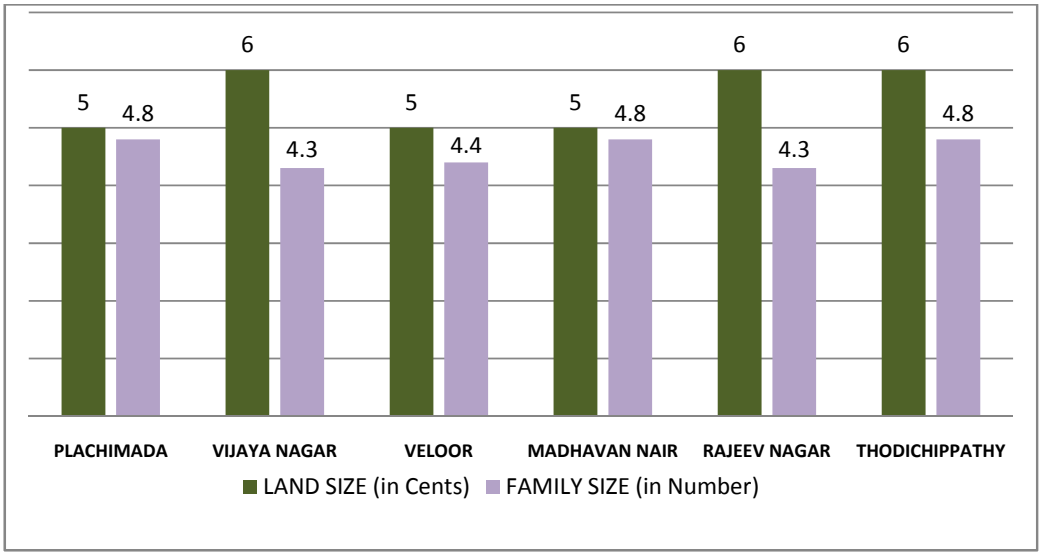
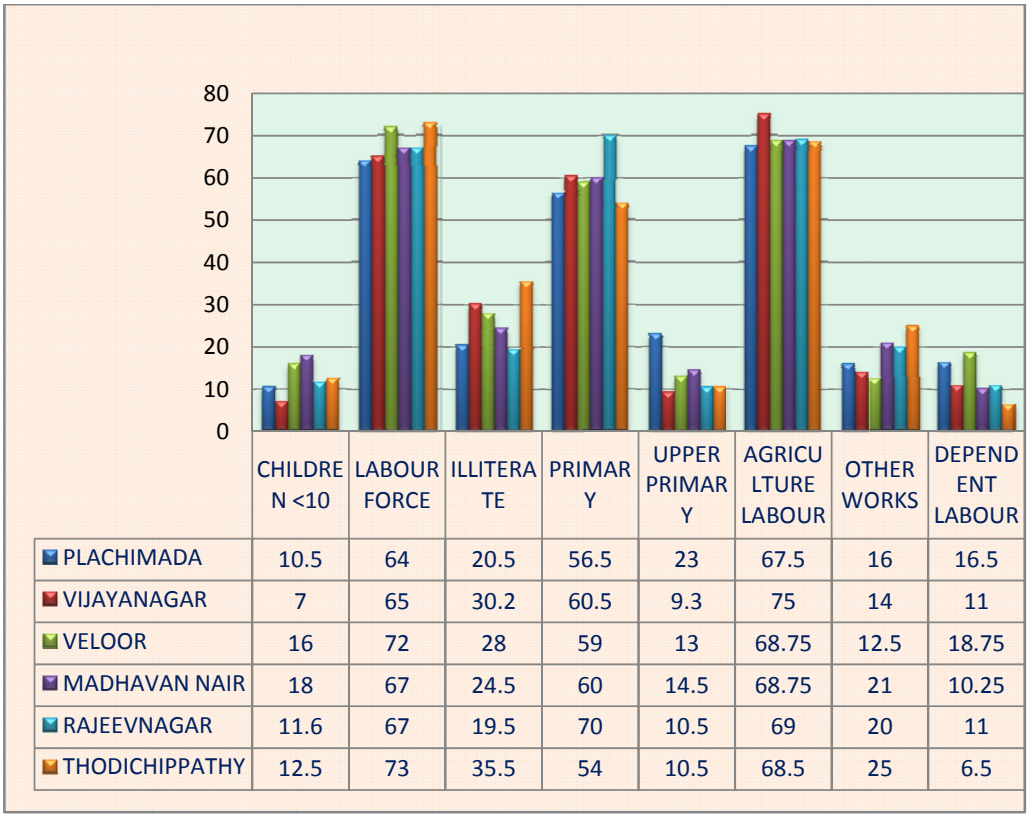


Fig. 7.3 Average Land and Family Size Plachimada Labour Households

Plachimada has a good potential of labour force which constitutes approximately 65 to 70 percent of the population. Nonetheless, the unemployed, old aged and ill-weakened are remarkably higher in the SCs/STs settlements that comprise an

average 10 to 15 percent of the labour force (the dependent Labour) (see Figure 7.4).



	CHILDREN <10	LABOUR FORCE	ILLITERATE	PRIMARY	UPPER PRIMARY	AGRICULTURE LABOUR	OTHER WORKS	DEPENDENT LABOUR
PLACHIMADA	10.5	64	20.5	56.5	23	67.5	16	16.5
VIJAYANAGAR	7	65	30.2	60.5	9.3	75	14	11
VELOOR	16	72	28	59	13	68.75	12.5	18.75
MADHAVAN NAIR	18	67	24.5	60	14.5	68.75	21	10.25
RAJEEVNAGAR	11.6	67	19.5	70	10.5	69	20	11
THODICHIPPATHY	12.5	73	35.5	54	10.5	68.5	25	6.5

Fig. 7.4 Demographic Features of Plachimada Labour Households

The houses in the SCs/STs settlements are marked as semi-pukka (see Table 7.2). However, it is observed that 38% of households have no toilet facilities or are in unusable condition. 20 percent households have no electricity connections. Income of the people is very low; a male agriculture labourer is paid Rs 85 to 100 in recent years. 25 percent of people in these SCs/STs settlements are illiterate. Literally, the area is an uneducated labour hub with Upper Primary schooling as the highest education. When these matters are compared with the state average, one observes that the people of Plachimada live in acute poverty.

7.3.1.2 Drinking Water Scenario

Plachimada is a water rich region of Palakkad district due to its naturally gifted topography and peculiar soils and rocks pattern (see Chapter 6 for further

reference). Since the production of soft drinks by HCBPL, the Plachimada area began to dry and the nearby villagers faced drinking water shortage. Till the end of 2001, the phenomenon was not much visible, but since the beginning of summer-2002 the smell and odour of water of nearby wells turned bad and the consumers of that water faced unusual health problems (see Table 6.15). The water quality test by various agencies has shown that the water of Plachimada area is not potable, and contains high level of hard metals and hazardous chemicals (see Table 6.14). The circumstances forced people to avoid their easily accessible and bulky drinking water source hitherto available in their backyard. Thus people of Plachimada began their long journeys for drinking water and livelihoods (see Figure 7.5).

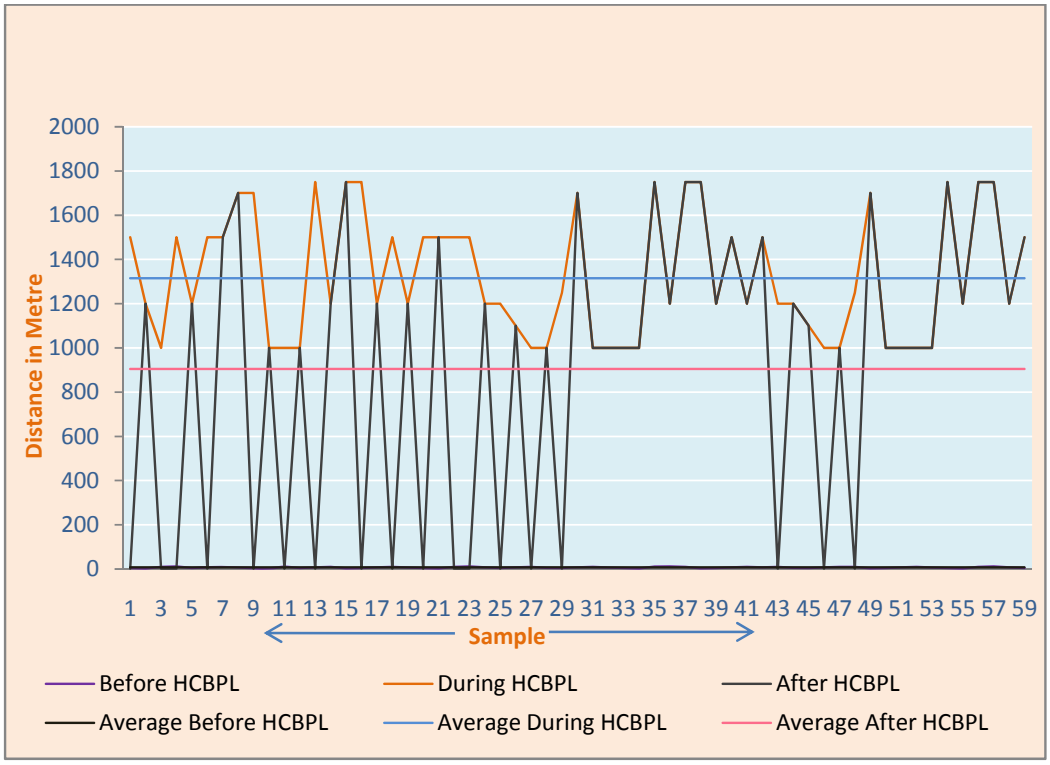


Fig. 7.5 Travelling Distance to the Drinking Water Source: Plachimada Labour Households

Figure shows the households distance to their drinking water sources; the average distance to the major drinking water source reduced the post-HCBPL era that does

not mean the community is progressing their water accessibility and availability in quantum and quality. The line "average after HCBPL" is remarkably lying down the "average during HCBPL" period due to the water harvesting programmes of NGOs in the area that reduced the travelling for drinking water; however, those who served with such arrangements are also depended on faraway water-bodies for other purposes and for drinking water in summer. The monsoon of the year 2009 was marked quite positive changes and it is expecting that the coming monsoons will wash out the polluted water from the area.

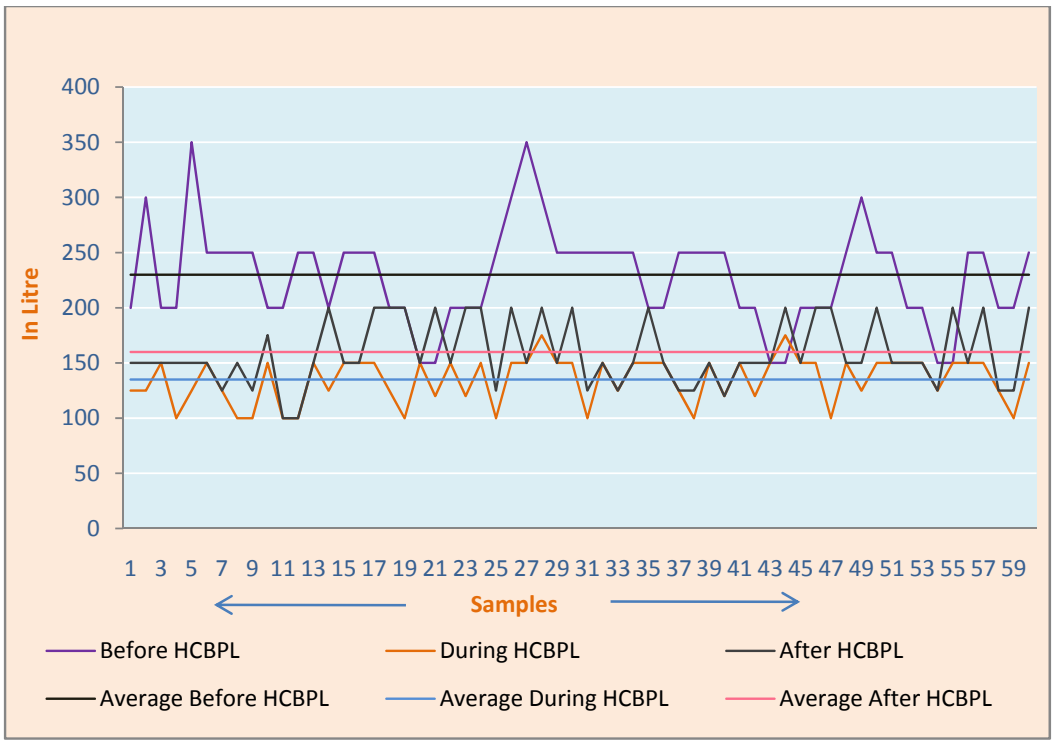


Fig. 7.6 Water Use of Labour Households at Plachimada

Table 7.3 illustrates the drinking water scenario of Plachimada over different phases and Figure 7.6 shows the general picture of water scarcity. Pre- post- and during HCBPL scenario illustrate in the figure show the remarkable changes in the water consumption of the labour households. The summer average use of water is highly pathetic with an average of 50-75 litres of water per day per household observed in 2002 and 2003. While, according to WHO norms a person required 40 litres of water per day for a healthy life.

Table 7.3 Drinking Water Scenario – Plachimada

	Before HCBPL	During HCBPL	After HCBPL
Own Dig well using Households (in percentage)	100	5	30
Open well or others dig wells using Households (in percentage)	Nil	80	40
Rain water Using House holds	No	No	30
Bore well (as an alternative)using Households (in percentage)	Nil	25	10
Water from Alternative Sources (Average in litre/household/day)	NA	35	35
Acute water shortage facing Households (in percentage)	Nil	100	Nil
Households with plenty of water in summer (in percentage)	100	Nil	Nil
Average volume of water by Households (in litre per day)	230	140	160
Average distance to major water source (in meter)	8	1300	900
Normal time for water collection (in minutes)	Nil	80-105	60
Households using water with risk (in percentage)	Nil	100	65
Households with potable water (in percentage)	100	NA	35
Households using good water with confidence (in percentage)	100	NA	NA
Normal level of water in wells (in feet)	4	12	6
Loss of working Days due to lack of water quality and quantity (in percentage)	Nil	25-30	20
Loss of working Days (Normal Yearly Sick Days)	10	15-25	18
Medical expenses per head (Yearly)	300	750	650
Source: *Author's Primary Survey*			

Some specimen cases are reported in Plachimada since 2002 that confirm the gravity of the issue. In 2002, due to the consumption of this contaminated water, two agriculture labourers - (husband (55 year old) and wife (51year old)) - died within a week. This forced the villagers to protest against HCBPL. In the course of field visits, some abortion cases were also noted in Plachimada. Thus, beyond its travel cost estimation, the water of Plachimada demands a number of qualitative investigations such as estimation of sick days, loss of working days, loss of income and the expenditure on health care in pre- and post-Coca-Cola era. Quality and availability of water reduced 25 to 30 percentage of their normal working days and 50 percent of income (see Figure 7.7). This also increased their per capita health care expenses to Rs 750 from Rs 300 yearly.

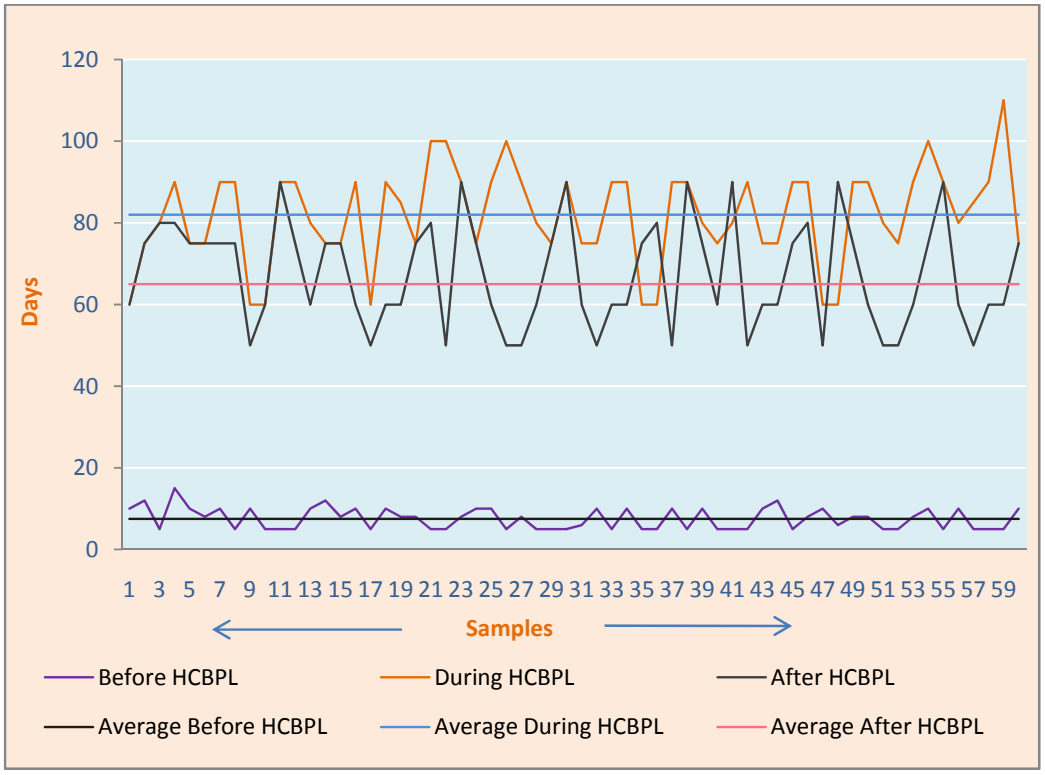


Fig. 7.7 Loss of Working Days by Ill Health and Drinking Water Scarcity: Plachimada Labour Households

Figure 7.8 shows the time cost for water by the women Plachimada. An average 90 to 120 minutes they spend for drinking water during the HCBPL period. The pre-

HCBPL scenario accounted a no-time cost for water due to its availability at their backyard and the men also were helped them in water collection. The scarcity of water compels the women to search for drinking water and washing clothes and utensils that expelled them from the agriculture activities (as a wage labourer). That reduced their income, leisure time and productive and responsible activities like child care and old age care. The women participation in the Plachimada struggle is a self-evident in terms of what they have actually forgone for drinking water and livelihood.

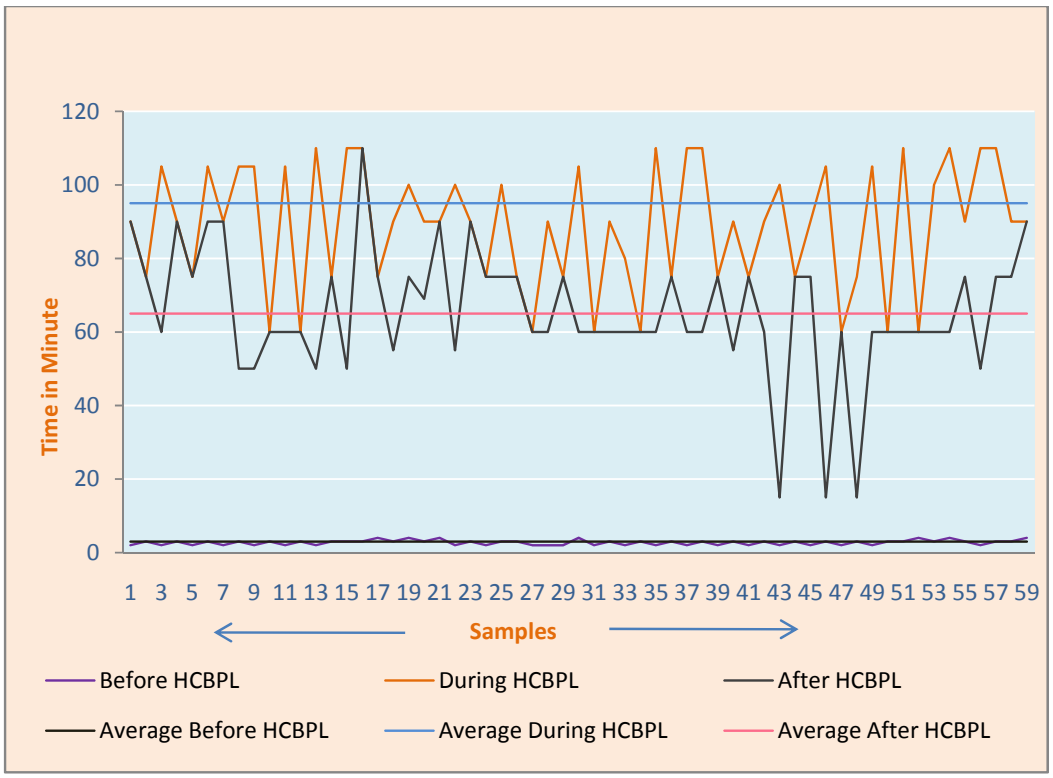


Fig. 7.8 Time Taken for Drinking Water Collection by the Plachimada Women

At Plachimada, health of the children is in an alarming condition. The collected data shows the ill health of mothers at pregnancy and low birth weights of children due to lack of sufficient nutrients and bad quality of drinking water. Table 7.4 and 7.5 illustrates the scenario. From the table, it is clear that the low birth weight (<2.5) is higher in the period of 2001 and 2005, when the operations of HCBPL were high.

Table 7.4 Under 10 Age Chidren and Their Mothers: Plachimada Labour Settlement Area (pp. 323-24)

Sample No.	I	II	III	IV	VI	VII	VIII	IX	X
P3	2	1998	< 2.5	N	-	Y	satisfactory	50	150
		2004	< 2.5	N	After three abortions	Y	weak		
P4	1	2006	2.5	N	-	Y	weak	50	60
P7	1	2005	< 2.5	N	after abortion	N	satisfactory	50	75
P9	1	1999	2.5	N	-	Y	satisfactory	50	90
V2	1	2002	< 2.5	N	Nutrient deficiency and abortion	N	weak	50	100
V4	2	2001	< 2.5	y	Nutrient deficiency and weak health of mother	N	weak	200	200
		2006	2.5	N	-	Y	weak		
V6	2	2004	2.5	N	after abortion	N	satisfactory	100	200
		2008	< 2.5	N	-	Y	satisfactory		
V9	1	1999	2.5	N	after abortion	Y	satisfactory	50	50
V10	1	2000	2.5	N	Nutrient deficiency and weak health of mother	Y	satisfactory	50	75
M1	1	2003	<2.5	N	Nutrient deficiency and weak health of mother	N	weak	75	100
M3	2	2004	2.5	N	-	Y	satisfactory	75	150
		2008	< 2.5	N	Nutrient deficiency and weak health of mother	Y	satisfactory		
	2	1998	2.5	N	after abortion	N	weak	100	150
M5		2003	< 2.5	N	-	Y	weak		
M6	1	2005	2.5	N	-	N	satisfactory	50	125
M7	1	2006	2.5	N	-	Y	weak	50	75
M9	1	2005	2.5	N	-	N	satisfactory	50	75
M10	2	2000	< 2.5	N	Nutrient deficiency and weak health of mother	Y	satisfactory	50	50
		2004	2.5	N	-	N	satisfactory	50	75

T 4	2	2003	< 2.5	N	Nutrient deficiency and two abortion	Y	weak	75	150
		2007	2.5	N	after abortion	N	weak		
T 5	1	1999	2.5	N	-	Y	satisfactory	50	50
T 6	1	2000	2.5	N	Nutrient deficiency , abortion and weak health of mother	N	weak	50	50
T 7	1	2004	< 2.5	N	Nutrient deficiency and two abortion	Y	satisfactory	25	75
T 10	1	2006	2.5	N	After abortion	N	satisfactory	50	100
R5	2	1999	2.5	N	-	Y	weak	50	150
		2007	2.5	N	weak health of mother	Y	satisfactory		
R7	1	2001	< 2.5	Y	-	Y	weak	200	100
R9	1	2004	2.5	N	-	N	satisfactory	50	80
R10	1	2005	2.5	N	-	Y	weak	50	75
Vi4	1	1999	2.5	N	-	N	weak	75	50
Vi8	1	2004	2.5	N	Nutrient deficiency and weak health of mother	Y	weak	50	80
Vi9	1	2006	< 2.5	N	-	Y	weak	25	100

I. Number of Children born during 1997-2008
II. Year of Birth
III. Birth Weight
IV. Severe/abnormal/disabled-ness/ Health problems since birth
N- No; Y- Yes
V. Health problems of Mothers at Pregnancy
VI. Regular Health problems- fever, cold, omitting, stomach ache etc.
VII. Health of the child in author's perspective
VIII. Weekly Health Expenditure for Child and Mother
IX. Weekly special food expenditure for child

Source: *Author's Primary Survey*

Table 7.5 Birth Weights of Children - Under Age 10

Year of Birth	No. Of Children	Weight <2.5	Weight > 2.5	Pregnancy Issues	
				Abortion	Other Problems
1998-2000	9	2	7	2	3
2001-2005	16	9	7	5	2
2006-2008	9	3	6	2	1
Source: *Author's Primary Survey*					

Table 7.4 evidently shows that the period was crucial to the mothers also, that out of 16, 5 mothers faced abortions and ill health during the period. The situation increased the child care and reproductive expenses in Plachimada. Each household of infants spends Rs 75 to 150 every week to maintain the health condition of the child.

7.3.1.3 Agricultural Labour Scenario

Agriculture is the main avocation of Plachimada, and the SC/ST settlements are the main source of labour force to the sector. Thus, the polluted water and consequent ill health directly affected the efficiency of labour-force and production of agriculture. Subsequently, the lack of irrigation due to water scarcity worsened the employment conditions in agriculture sector pushing the labour to other occasional and temporary jobs in nearby cities.

Figure 7.9, 7.10 and Table 7.6 show the major trends of the labour sector. Water scarcity reduced the normal working days from 250 to 110 during the phase of HCBPL operation and increased the travelling distance of a labourer from 1 km to 3.5 km (see Figure 7.9), that indicates the complete failure of agriculture sector in areas surrounding HCBPL. After the closedown of HCBPL, there has been a positive shift in travelling distance and income of labourers and an increase in working days also (see Figure 7.10).

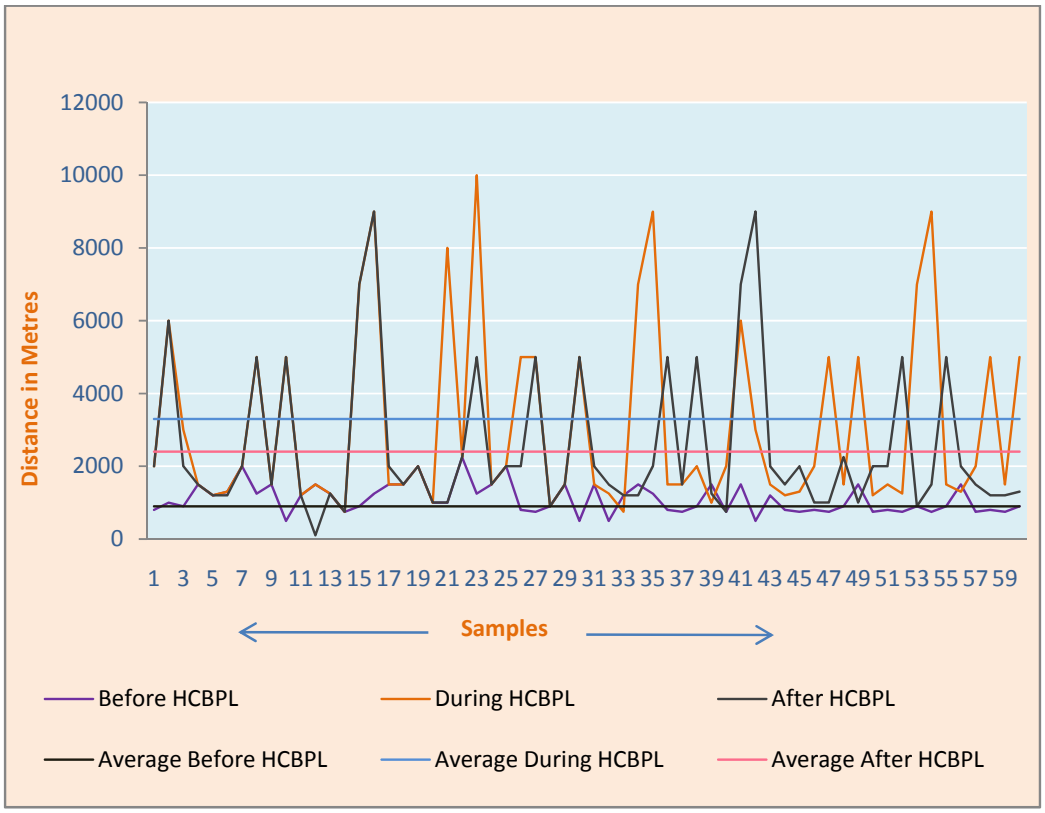


Fig.7.9 Travelling Distance to Working Place by the Plachimada Labour Force

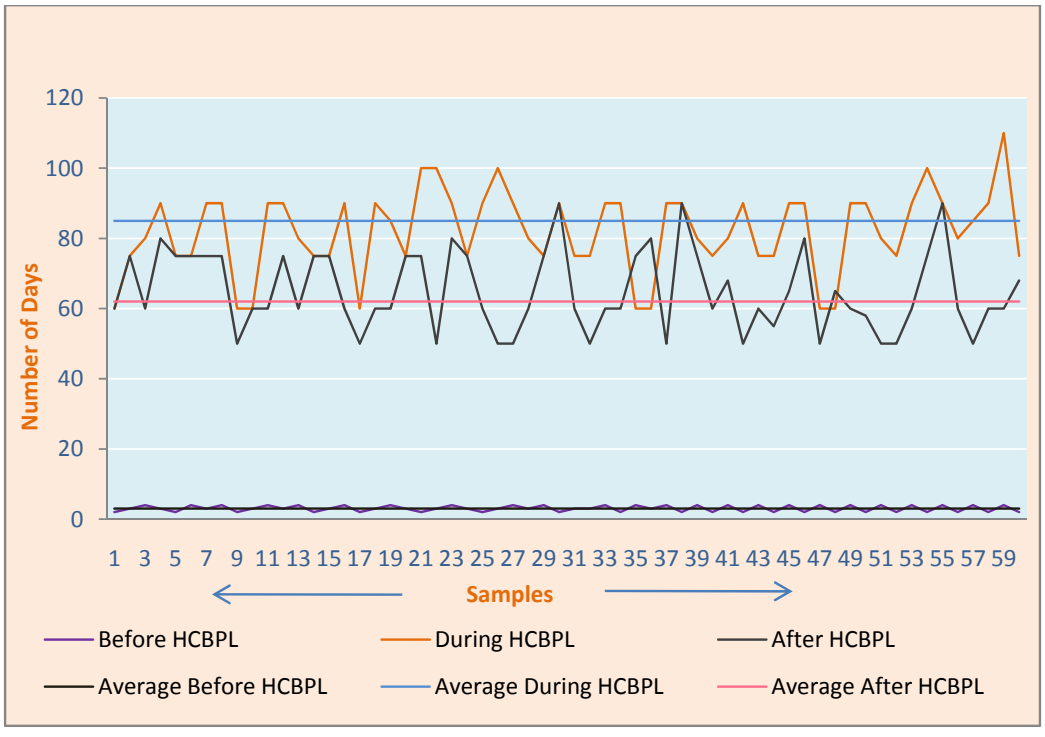


Fig. 7.10 Loss of Agricultural Working Days by Irrigation Water Scarcity at Plachimada

Table 7.6 Agricultural Labour Scenario

	Phase I	Phase II	Phase III
Average labour force from each households (in Number)	3 – 4	3	2 – 3
Labour force to total population (in percentage)	72	68	68
Average Travel cost per head per day (in rupees)	nil	10	10
Average distance of travelling for work (in kilo meters)	1	3.4	2.5
Average labour days per year (in number)	250	110	180
Average travel cost per year (in rupees)	nil	1000	1500
Normal wage for male labourers (in rupees)	75	80	90
Normal wages for female labourers (in rupees)	45	50	70
Loss of working days due to water shortage	No	85	50-60
Normal Weekly income in season by labour supply (in rupees)	900	250	650
Normal Weekly income in off season by labour supply (in rupees)	500	150	200
Income from other Sources (percentage of households)	10	40	60
Source: *Author's Primary Survey*			

However, it observed that the working class has lost faith in agricultural activities (see Figure 7.4 for the present occupational pattern) and 60 percent of households, thus, have turned to other income sources like construction works, some petty works like hotel waiter, grocery shop salesman, loading and unloading works and factory works at Coimbatore. It is also observed that the low wage rate of Plachimada is compelling the younger generation to shift away from agricultural activities.

Income of the labour households declined from an average of Rs 900 per week in pre-HCBPL period to Rs. 250 in the time of HCBPL operation. Many reasons can be forwarded to substantiate the income pattern change (see Figure 7.11) as follows and are linked to HCBPL.

1. Water scarcity excluded the female labours from the agriculture works, the only known skill of the working class.
2. People were forced to struggle against HCBPL for their livelihood which reduced their labour days.
3. The political and judicial interventions in the struggle demanded more days to settle the local issues, police and court cases that again reduced their working days.
4. The ill-health reduced their labour days and increased the medical expenditures.
5. Water shortage in the area again reduced their seasonal agriculture activities.

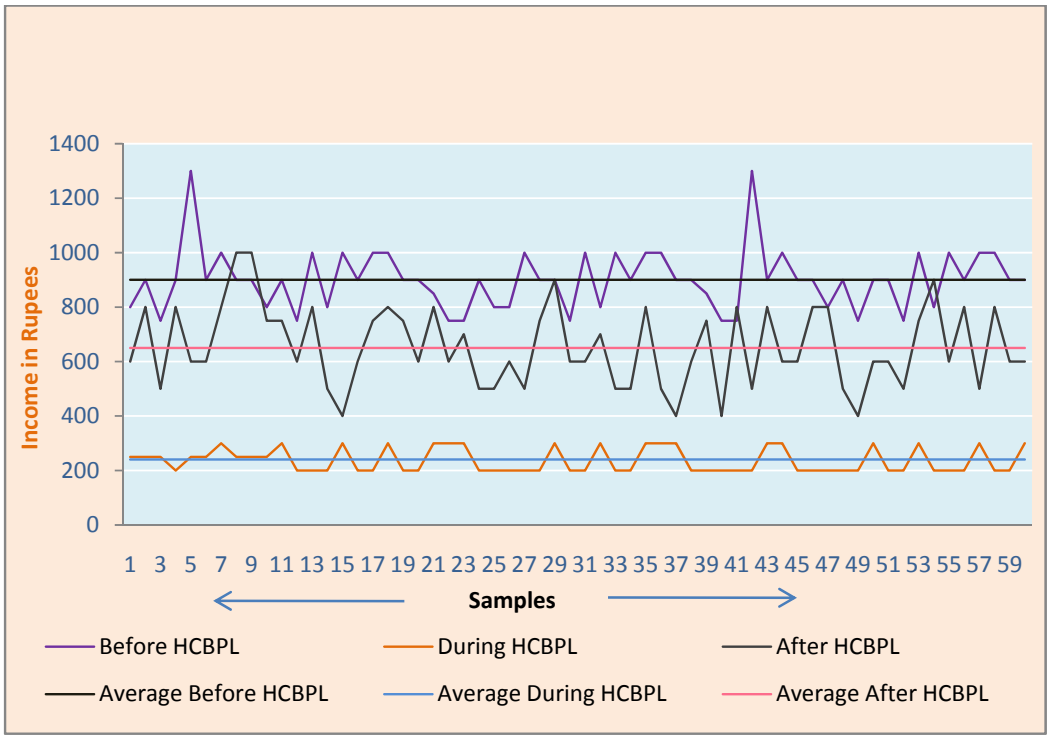


Fig. 7.11 Weekly Income of the Plachimada Labour Households during Agriculture Season

All these factors gravitated the income issue to its apex since 2002; however, the figure shows an increasing trend in income the post-HCBPL period. The progressing income pattern is substantially lower than any period of the life of Plachimada due to the following reasons:

1. There is a hike in wage rate from Rs. 75 to 100 and more for male worker and Rs. 50 to 80 above for female labour.

2. The inflationary pressure does not cope with this wage rise and income progress.

3. The collapse of agriculture compels the people to purchase all food items from the market. Prior to HCBPL, the workers could buy the food grains from their workplace at a lower price and sometimes even free of cost.

4. The increased health cost and increased diseases again worsened the life of the people.

5. While considering the plight of the people of Plachimada over the last 10 years, Rs. 650 as an average weekly income in the post-HCBPL era is not substantial to overcome the scenario and manage the increasing needs of life in the inflationary market economy.

7.3.1.4 Irrigation and Agriculture Scenario

The study has conducted a detailed investigation among farmers of Plachimada. Since majority of farmers were reluctant to share their experience in detail, the focus of data collection narrowed to 15 farmers, who have been found genuine in their line of discussion. This sample spreads over a 2.5 km radius from the HCBPL location. It is observed that the farmers who were reluctant to the survey were bitterly treated by the Coca-Cola HCBPL, which distributed its factory effluents (sludge) to the farmers as fertilizer for coconut and vegetables. Effectively, it was

hazardous waste from the factory (Report of Greenpeace India; refer Chapter 6) that completely ruined their crop as well as the land. Some of their land became useless for a long time. Acres of coconut plantations were affected by this illogical and unethical action of HCBPL. Thus, the Plachimada case study brings out multidimensional aspects of the water commercialization practice – over-exploitation of water on the one hand and environmental pollution on the other.

The data sample of 15 farmers illustrates the cynical situation of the agrarian economy of Plachimada since the arrival of HCBPL (Table 7.7 and 7.8). Apart from the crop loss by the sludge use, water scarcity has slowed down the agrarian pace of Plachimada. The locality once had a major share in the agriculture production of Palakkad district. Among various crops, coconut and paddy constitute the major chunk of production, occupying a large area of land - 34,569 hectare and 15640 hectare (paddy crop I) respectively. These are relatively more water consuming crops than other crops of Plachimada such as groundnut, maize, vegetables, mango, tapioca and fodder grass.

The data shows the remarkable change in water availability for irrigation (Table 7.7). 10 out of 15 farmers are served by canal system; however they are keeping well-maintained open wells and bore wells for irrigation purpose. Before the arrival of the Cola plant, farmers experienced 14 to 18 hours of continuous irrigation in summer days every year which decreased to 15 to 30 minutes since the year 2002 due to the dry-out conditions of under currents. Therefore, after the arrival of HCBPL these farmers were forced to dig new bore wells or deepen the existing wells (see Figure 7.12 and 7.13) for meeting their irrigation needs. Interestingly, the HCBPL is located on the side of the canal and the local people complain that the plant is often illegally drawing water from the canal. Besides, it is observed that apart from the bad condition of the canal, recharging the open wells and tanks within the HCBPL premises has directly affected the canal dependent farmers.

Table 7.7.a Water Sources and Availability of Water for Irrigation Before 2000

Sl. No.	Number and Size of Open Wells			Year of Digging	Bore Wells	Depth (in feet)	Other Sources	Year of Digging	Cost of Digging (in Rs.)	Type of Lift: Electric Motor Pump	Capacity of Motor: 5 hp Each source	Irrigated Area in Acres	Water Level*	Cost of fuel and Maintenance
F1	2	water availability: Sufficient	40x20x10	1965	1	150	canal	1992	4000			5	20	100/month/ pump
F2	2		25x25x15	1975	1	175	canal	1989	4000			4	25	100/month/ pump
F3	1		35x20x15	1977	1	160	canal	1994	6000			4	25	100/month/ pump
F4	2		40x30x12	1980	2	150		1985	3000			6	15	100/month/ pump
F5	2		40x20x14	1987	1	145	canal	1990	4000			7	15	100/month/ pump
F6	1		30x20x15	1978	2	150		1993	4000			5	25	100/month/ pump
F7	2		42x15x12	1990	1	160	canal	1997	5000			5	20	100/month/ pump
F8	1		50x30x15	1985	2	150		1987	3000			5	20	100/month/ pump
F9	2		60x35x12	1986	1	160	canal	1995	4500			5	25	100/month/ pump
F10	1		75x40x10	1990	1	175	canal	1998	10000			4	25	100/month/ pump
F11	1		42x40x10	1982	2	160		1991	4500			6	20	100/month/ pump
F12	2		35x35x15	1986	2	160	canal	1990	4500			5	15	100/month/ pump
F13	1		60x35x12	1982	1	175	canal	1998	9000			7	25	100/month/ pump
F14	2		25x20x10	1978	1	175	canal	1987	3000			5	15	100/month/ pump
F15	2		35x20x12	1968	2	145		1995	3000			5	15	100/month/ pump

Source: *Author's Primary Survey*

* in feet from the surface level

Table 7.7.b Water Sources and Availability of Water for Irrigation 2000-2006

Sl. No.	Number and Size of Open Wells		Year of Digging	No. of Bore Wells	Depth (in feet)	Other Sources	Year of Digging	Cost of Digging (in Rs.)	Cost of Deepening (in Rs.)	Type of Lift: Electric Motor Pump	Capacity of Motor: 5 hp Each source	Irrigated Area in Acres	Water Level*	Cost of fuel and Maintenance (Rs/Month/ Pump)
F1	2	water availability: Acute Shortage	40x20x15	2001	1	275	canal	1992		4000		5	150	200
F2	2		30x30x15	1999	2	275	canal	2003	15000			4	160	200
F3	1		35x20x15	1996	1	160	canal	1994				4	150	200
F4	2		40x30x12	2000	1	300		2003		7000		6	175	200
F5	2		4ox20x15	2002	2	245	canal	2002	17000			7	160	200
F6	1		30x20x15	2004	1	275		1993		5000		5	150	200
F7	2		42x15x15	2002	2	250	canal	2002	16000			5	160	200
F8	1		50x30x15	2001	2	250		2003	16000			5	175	200
F9	2		60x35x15	1999	2	300	canal	2003	18000			5	175	200
F10	1		75x40x12	2003	1	300	canal	1998		3000		4	160	200
F11	1		42x40x14	2002	2	250		1991		6000		6	170	200
F12	2		35x35x15	2001	2	325	canal	1990		5000		5	170	200
F13	1		60x35x12	2000	1	175	canal	1998				7	150	200
F14	2		25x20x10	1978	2	350	canal	2002	15000			5	150	200
F15	2		35x20x15	2001	2	275		1995		8000		5	170	200

Source: *Author's Primary Survey*

* in feet from the surface level

Table 7.7.c Water Sources and Availability of Water for Irrigation After 2006

Sl. No.	Number and Size of Open Wells and Water Availability				Year of Digging	No. of Bore Wells	Depth (in feet)	Other Sources	Year of Digging	Bore well digging and deepening are not reported	Type of Lift	capacity of motor: 5 hp	Irrigated Area	Water Level*	Cost of fuel and Maintenance (Rs/Month/ Pump)
F1	Number of open wells	2	sufficient	40x20x15	2001	1	275	canal	1992		Pump		5	50	200
F2		2	shortage	30x30x15	1999	2	275	canal	2003		Pump		4	60	200
F3		1	shortage	35x20x15	1996	1	160	canal	1994		Pump		4	50	200
F4		2	shortage	40x30x12	2000	1	300		2003		Pump		6	75	200
F5		2	shortage	4ox20x15	2002	2	245	canal	2002		Pump		7	60	200
F6		1	shortage	30x20x15	2004	1	275	canal	1993		Pump		5	50	200
F7		2	shortage	42x15x15	2002	2	250	canal	2002		Pump		5	60	200
F8		1	shortage	50x30x15	2001	2	250		2003		Pump		5	75	200
F9		2	sufficient	60x35x15	1999	2	300	canal	2003		Pump		5	75	200
F10		1	shortage	75x40x12	2003	1	300	canal	1998		Pump		4	60	200
F11		1	sufficient	42x40x14	2002	2	250		1991		Pump		6	70	200
F12		2	shortage	35x35x15	2001	2	325	canal	1990		Pump		5	70	200
F13		1	shortage	60x35x12	2000	1	175	canal	1998		Pump		7	50	200
F14		2	shortage	25x20x10	2006	2	350	canal	2002		Pump		5	50	200
F15		2	sufficient	35x20x15	2001	2	275		1995		Pump		5	70	200

Source: *Author's Primary Survey*

* in feet from the surface level

Table 7.8.a Agriculture Scenario Before HCBPL

sample No.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		(in Acre)								(in Rupees	(in Acre)	
F1	2500	3	3	2			1	6	5	2	10	9
F2	2000	1	4	3			1	5	4	1.75	5	9
F3	1750	2		2	6		0.5	4.5	4	1.5		10.5
F4	1000	2		4	3		0.5	6.5	6	2.25		9.5
F5	500	4	3	3			0.75	7.75	7	2.5	5	10.75
F6	250	2	2	3			0.5	5.5	5	2		7.5
F7	1000	3	5	2			1	6	5	2.25		11
F8	1000	2		3	5		1	6	5	2.5		11
F9	500	3	4	2	4		0.5	5.5	5	2		13.5
F10	750	2	2	2			1	5	4	1.75	25	7
F11	500	3	1	3	2		1	7	6	2.75		10
F12	1000	2	1.5	3			0.5	5.5	5	2.5	20	7
F13	750	3		4	4		0.5	7.5	7	3	12	11.5
F14	250	3		2	5		0.75	5.75	5	2.5		10.75
F15	500	3	2	2			1	6	5	2.5	15	8

I. Distance from HCBPL
II. Paddy Owned
III. Paddy Leased in
IV. Wet Garden
V. Wet Garden Leased in
VI. Wet Garden Leased out
VII. Dry Land owned
VIII. Total Land
IX. Irrigated Land
X. Normal income
XI. Land outside Plachimada
XII. Cultivated Area in Plachimada

Source: *Author's Primary Survey*

Table 7.8.b Agriculture Scenario During HCBPL

Sample No.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		(in Acre)								(in Rupees	(in Acre)	
F1	2500	3	1	2		2	1	6	5	0.6	10	5
F2	2000	1	2	3		3	1	5	4	0.65	5	4
F3	1750	2		2	4		0.5	4.5	4	0.6		8.5
F4	1000	2		4	3		0.5	6.5	6	0.7		9.5
F5	500	4		3		3	0.75	7.75	7	0.5	5	4.75
F6	250	2	1	3			0.5	5.5	5	0.3		6.5
F7	1000	3	2	2			1	6	5	0.5		8
F8	1000	2		3	5		1	6	5	0.4		11
F9	500	3		2			0.5	5.5	5	0.6		5.5
F10	750	2	2	2		2	1	5	4	0.5	25	5
F11	500	3		3	2		1	7	6	0.85		9
F12	1000	2		3			0.5	5.5	5	0.4	20	5.5
F13	750	3		4	4		0.5	7.5	7	0.9	12	11.5
F14	250	3		2	5		0.75	5.75	5	0.3		10.75
F15	500	3	2	2			1	6	5	0.4	15	8

I. Distance from HCBPL
II. Paddy Owned
III. Paddy Leased in
IV. Wet Garden
V. Wet Garden Leased in
VI. Wet Garden Leased out
VII. Dry Land owned
VIII. Total Land
IX. Irrigated Land
X. Normal income
XI. Land outside Plachimada
XII. Total Cultivated Area in Plachimada

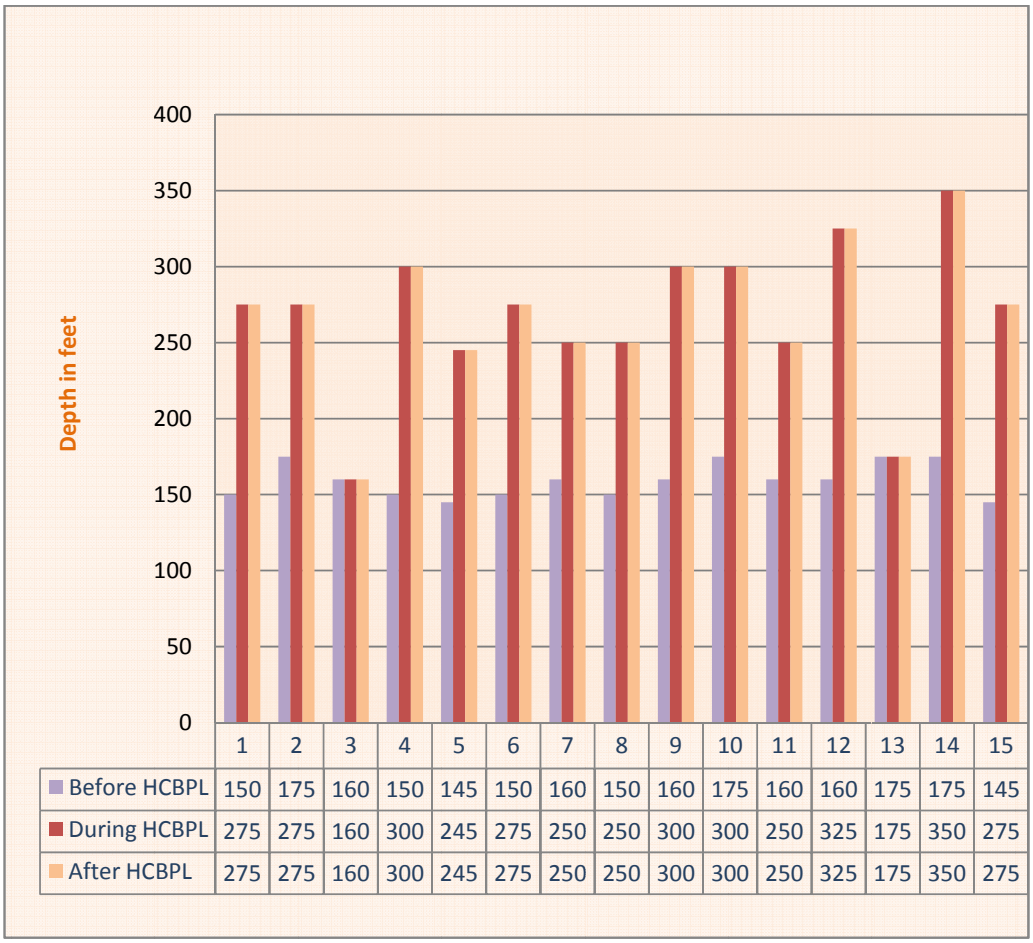
Source: *Author's Primary Survey*

Table 7.8.c Agriculture Scenario After HCBPL

Sample No.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		(in Acre)								(in Rupees	(in Acre)	
F1	2500	3	3	2			1	6	5	0.8	10	9
F2	2000	1	4	3			1	5	4	0.75	5	9
F3	1750	2		2	6		0.5	4.5	4	0.7		10.5
F4	1000	2		4	3		0.5	6.5	6	0.9		9.5
F5	500	4	2	3			0.75	7.75	7	1	5	9.75
F6	250	2	2	3			0.5	5.5	5	0.85		7.5
F7	1000	3	5	2			1	6	5	0.85		11
F8	1000	2		3	5		1	6	5	0.4		11
F9	500	3	2	2	4		0.5	5.5	5	0.9		11.5
F10	750	2	2	2			1	5	4	0.6	25	7
F11	500	3	1	3	2		1	7	6	0.85		10
F12	1000	2		3			0.5	5.5	5	0.5	20	5.5
F13	750	3		4	4		0.5	7.5	7	1	12	11.5
F14	250	3		2	5		0.75	5.75	5	0.5		10.75
F15	500	3	2	2			1	6	5	0.6	15	8

I. Distance from HCBPL
II. Paddy Owned
III. Paddy Leased in
IV. Wet Garden
V. Wet Garden Leased in
VI. Wet Garden Leased out
VII. Dry Land owned
VIII. Total Land
IX. Irrigated Land
X. Normal income
XI. Land outside Plachimada
XII. Total Cultivated Area in Plachimada

Source: *Author's Primary Survey*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Before HCBPL	150	175	160	150	145	150	160	150	160	175	160	160	175	175	145
During HCBPL	275	275	160	300	245	275	250	250	300	300	250	325	175	350	275
After HCBPL	275	275	160	300	245	275	250	250	300	300	250	325	175	350	275

Fig.7.12 Depth of the Bore Wells of Plachimada Farmers

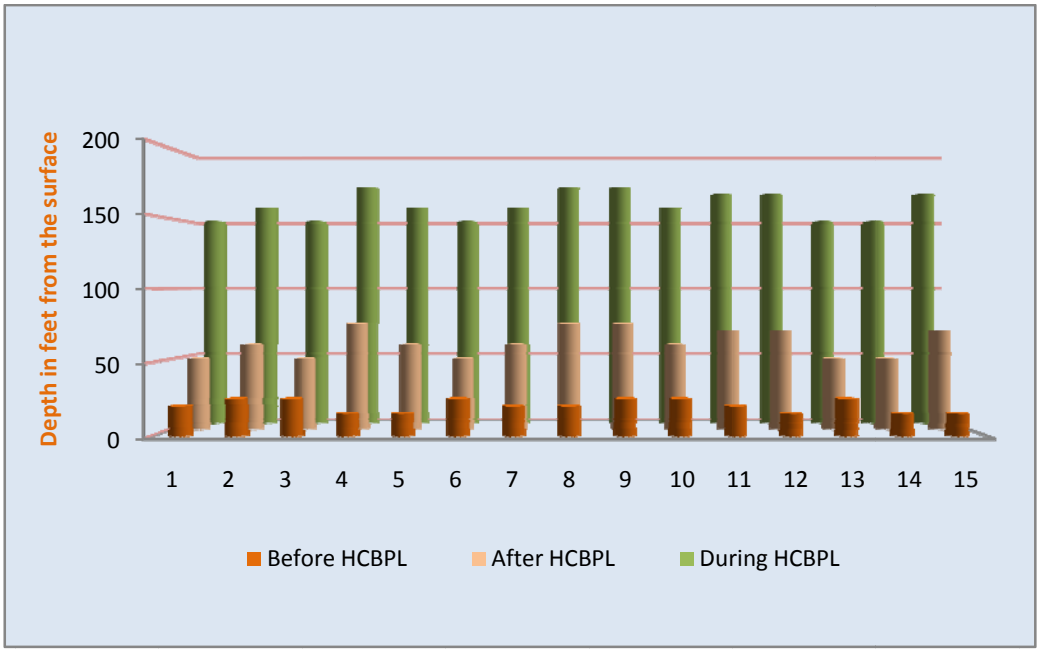
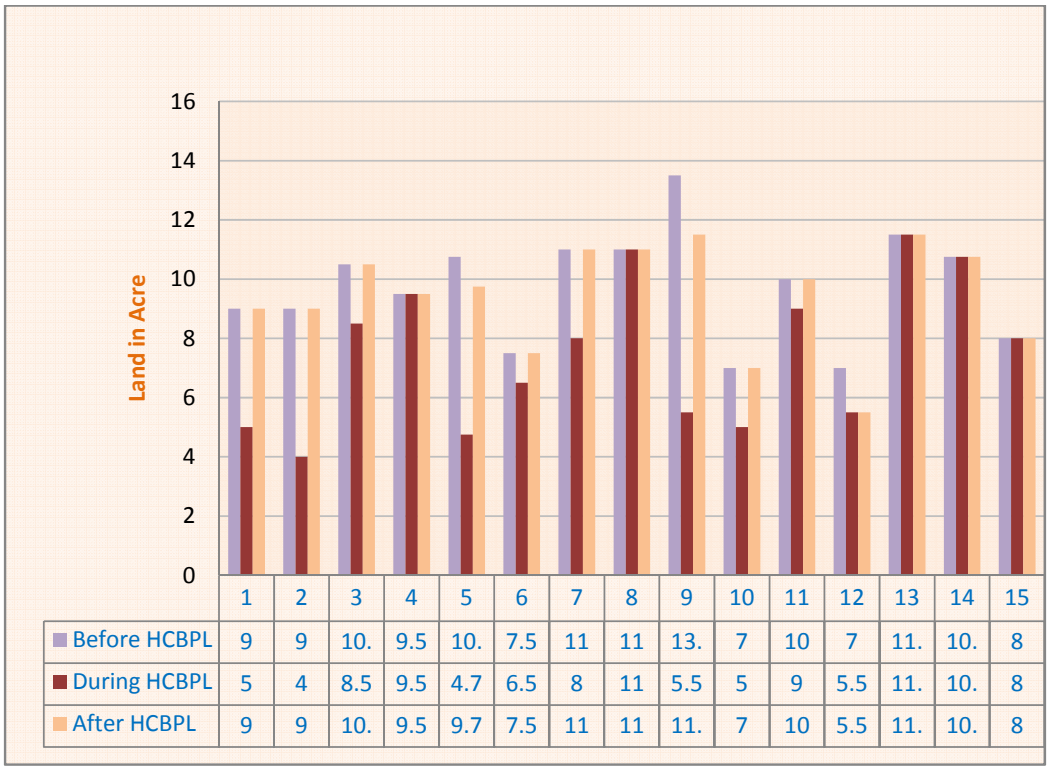


Fig. 7.13 Water Level of the Bore Wells at Plachimada

The soft drink production of HCBPL has reduced irrigation time and availability of water in Plachimada watershed. Lowest depth from the surface shows a highest water table, according to the figure, that the farmers of Plachimada benefited by the water ecology before the pre-HCBPL scenario. During the operations of HCBPL the water table highly exhausted and showed long depth from the surface. Post-HCBPL era shows an increasing trend in water table; however it will take a long period to regain its pre-HCBPL level.

These farmers have average 5 acre irrigated land, providing an average annual income of Rs. 1.5 lakhs to 2.25 lakhs. During the period of acute water scarcity, from 2002 to 2005, the income from agriculture reduced to Rs. 50000 and also reduced job opportunities. Pre-HCBPL, post-HCBPL and during HCBPL periods has not witnessed any change in the size of owned cultivable land (see Figure 7.14) of farmers, and quality and quantity of fertilizer used for the crops were same over the periods since 1997.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Before HCBPL	9	9	10.	9.5	10.	7.5	11	11	13.	7	10	7	11.	10.	8
During HCBPL	5	4	8.5	9.5	4.7	6.5	8	11	5.5	5	9	5.5	11.	10.	8
After HCBPL	9	9	10.	9.5	9.7	7.5	11	11	11.	7	10	5.5	11.	10.	8

Fig. 7.14 Acres of Land under Cultivation

The changing pattern of irrigation that depended on the ground water availability reduced the income of farmers during the operation period of HCBPL. In post-HCBPL era the income has not been regained to the pre-HCBPL levels. While comparing with the during-HCBPL scenario, there is an increasing trend in the level of income from agriculture in the post-HCBPL period. However, it still remains substantially lower than the before-HCBPL levels (see Figure 7.15).

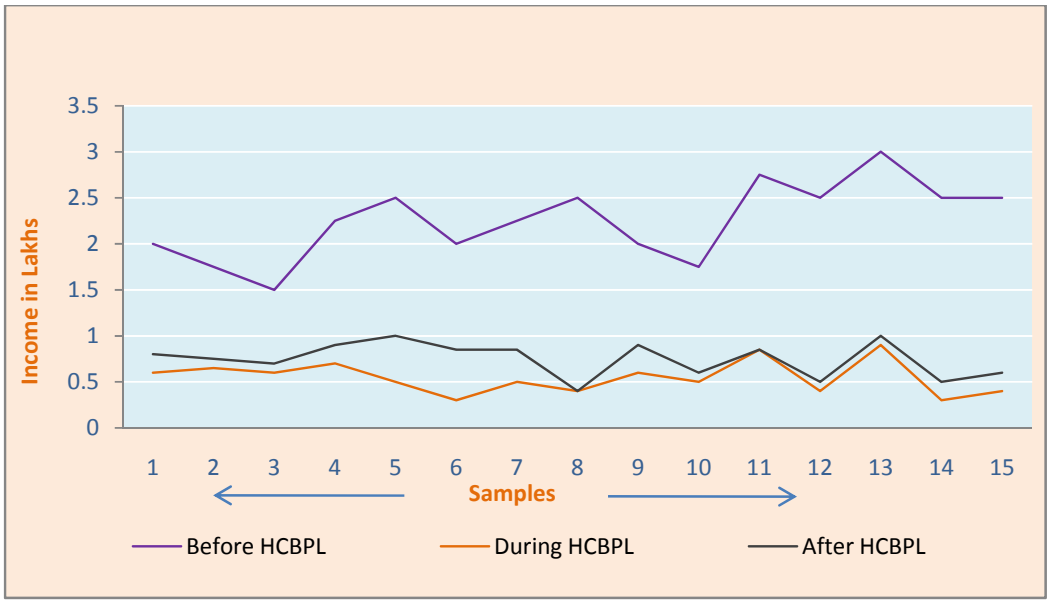


Fig. 7.15 Annual Income of the Agriculture Based Households at Plachimada

These farmers managed such financial crisis with income from other land, lying outside Plachimada. Plachimada land-dependent farmers were thrown into bankruptcy or other financial liabilities. The real estate sector collapsed in Plachimada; nobody was ready to buy such barren land. Thus the price of land decreased; within the village itself no land deal has yet been reported. Land is an asset anywhere in the world, but for the farmers of Plachimada it turned into a curse.

7.3.1.5 Soil Fertility and Water Requirements

Rational use of soil resources, based on its potential, is essential for an economically viable and ecologically sound agriculture. The study collected the

sample soil data of 300 farms around HCBPL to understand the quality of soil, the pattern of agriculture and usage of chemical fertilizers. The fertility assessment of soil done by Kerala Agricultural University and duly give a soil fertility card to the farmers (Appendix VI). The study has collected these cards and focused on two Panchayats viz. Perumatty (where the plant is located) and Pattancherry (the closest panchayat to the HCBPL location, is lying just 5 meters away from the HCBPL wall). The major samples of soil of Plachimada region show an acidic nature with 4.6 to 7.2 pH value range. As per the scientific guidelines (see Table 7.9), It is also evident that the Plachimada soil has been exploited to its maximal level and the fertility card advises the farmers to utilize more chemical fertilizers to maintain the productivity of land (see Table 7.10). The soil fertility data of Plachimada watershed shows that the soil of Plachimada is infertile (see Table 7.11) and the average quantity of nutrient presence in soil is very less. The study observes that the chemical fertilizer does not maintain sustainable agriculture and that it requires a large quantity of water to maintain the productivity of crops (see Table 7.12).

Table 7.9 pH Value of Soil and Interpretations

7.0	Neutral
more than 7.0	Alkaline
less than 7.0	Acidic
6.5 to 7.5	Neutral for Practical purposes, maximum availability of all the essential plant nutrients
7.5 to 8.2	Normal of calcareous or saline soils.
8.50 and above	Alkali or Sodic soils.
3.5 to 6.5	Acid Soils of warm to humid and high rain fall areas. (Laterite soils)
less than 3.5	Acid Sulphate soils (Kerala costal belt)
Source: *Primary source; discussion with Agronomists*	

Table 7.10 Recommendations for the Use of Chemical Fertilizers for Plachimada Agro-system

Division	Nutrient Recommendations for Rice (kg/hectare)			Required Quantities of Fertilizers for Rice (kg /acre)			Nutrient Recommendations for Coconut (g/palm)			Required Quantities of Fertilizers for Coconut (g/palm)		
	N	p	K	Urea	Factomphos	Potash	N	p	K	Urea	Ammonium	Potash
42	80.7	35.8	47.8	47.6	72.2	32.4	304.8	135.4	703.14	491.8	675.17	1200.65
43	85.12	36.15	49.45	53.17	72.85	33.5	321.75	136.375	743.35	471.5	683.25	1239.12
44	92.36	26.7	41.63	76.63	44.13	28.13	349.7	100.96	627.26	712.1	504.5	1045.66
45	89.85	24.97	45.15	75.22	50.72	30.45	340.17	94.45	680.575	564.95	475.25	1133.25
46	89.6	35.5	45.3	59	71	30.5	339.5	134.12	674.4	469.7	671.8	1137.9
47	92.1	33.41	53.28	65.08	67.44	36.35	348.3	126.1	800	610.12	632	1335.1
48	85.8	36.8	54	52.9	74.1	36.8	324.7	138.8	810.8	577.5	695	1352.4
49	89.02	34.05	48.7	60.02	68.7	33.2	337.07	128.57	712.34	622.2	646.85	1222.4

Source: *Kerala Agricultural University 2009*

Table 7.11 Soil Fertility Data of Plachimada Area

Division	Sample size	pH	O C (in %)	Phosphorus (kg/hectare)	Potassium (kg/hectare)	Iron (ppm)	Copper (ppm)	Manganeese (ppm)	Zinc
42	35	6.21	0.96	20.87	90.48	100.09	2.41	39.41	1.86
43	40	6.43	0.78	28.27	84.28	32.93	1.82	17.28	1.12
44	30	6.35	0.537	60.047	150.62	29.27	1.75	17.89	1.35
45	40	6.68	0.60	33.63	116.14	19.10	1.51	19.45	1.16
46	35	6.54	0.59	38.21	110.11	33.46	1.68	28.82	1.44
47	50	6.4	0.54	36.97	51.91	29.81	2.15	16.79	0.87
48	35	6.23	0.738	22.68	50.68	96.00	4.44	18.98	1.76
49	35	5.98	0.61	30.62	89.92	99.64	2.41	34.40	1.80

Source: *Data Collected and Compiled from Soil Fertility Cards (K A U-2009)*

Table 7.12 Area and Water Requirement

Major Crops	Area Under Cultivation	Water Requirement (Litre per Kg)
Coconut	34569	1000
Rice	25828 (1st & 2nd Crop)	1900
Groundnut	15130	3500
Maize	5050	900
Vegetables	2295	259
Mango	1330	400
Tapioca	780	600
Fodder Grass	558	264
Floriculture	520	532
Plantains and Areca nut	858	1146
Source: *Compiled from various Sources and discussions with experts*		

According to CWRDM (2005) "the rainfall data recorded at this rain gauge station shows the monsoon season (June to November) rainfall in both 2002 and 2003 has been much less than the mean value with the deviation from the mean as a percentage from the mean being lower than even 30 percent. This deficiency in the rainfall, and that too in two successive years can be considered to be the most significant factor that has contributed to the acute scarcity of water experienced in Chittur Block....The annual ground water draft required by the Coca-Cola factory can be estimated as 0.1825 MCM (at the average rate of 500,000 litres per day) which forms a little less than 5 per cent of 4.2 MCM. Hence, it can be very safely concluded that under normal rainfall conditions the planned groundwater withdrawal of 500,000 litres per day by Coca-Cola will not adversely affect the availability of groundwater in and around the factory complex."

While the present study observes that the lack of rainfall is quite manageable for local agriculture activities at Plachimada without HCBPL till the year 2000 (see Table 7.13).

Table 7.13 District-wise Rainfall Data of Kerala – From 1997 to 2008

District	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average*	Phase I*	Phase II*	Phase III*
Thiruvananthapuram	1860	2080	1882	1530	2102	1505	1567	1911	2133	2322	2051	1932	1906	1838	1771	2110
Kollam	2671	2523	2851	2288	2432	2104	2025	2447	2428	2859	2751	2207	2465	2583	2252	2561
Pathanamthitta	3136	3128	3296	2667	2907	2400	2575	2932	3349	3043	3251	2658	2945	3057	2704	3075
Alappuzha	3189	3108	3104	2634	2748	2478	2324	2797	2599	3021	3107	2585	2807	3009	2587	2828
Kottayam	3122	3371	2957	2423	3078	2574	2780	2913	3386	3755	3468	2534	3030	2968	2836	3286
Idukki	3885	4247	3823	3302	3685	3361	3152	3834	5707	4015	4453	3031	3874	3814	3508	4302
Eranakulam	3490	3317	3053	2858	3587	3018	2593	3204	3402	3858	4046	2874	3275	3180	3101	3545
Thrissur	3082	3315	2748	2199	2761	2569	2248	2928	2857	3577	3954	2310	2879	2836	2627	3175
Palakkad	2405	2407	2173	1862	1970	1833	1728	2225	2648	2659	3270	1884	2255	2212	1939	2615
Malappuram	3453	3019	2852	2109	2508	2200	2206	2626	2632	3408	3544	2145	2725	2858	2385	2932
Kozhikkodu	4062	3392	2795	2623	2646	2845	2274	3348	2347	3659	4701	3328	3168	3218	2778	3509
Wynadu	2921	2438	2219	2350	1980	2098	1915	2633	3212	2586	3093	2142	2466	2482	2157	2758
Kannur	3961	3484	3037	3033	2944	3087	2865	3423	2643	3426	4092	2823	3235	3379	3080	3246
Kasaragod	3744	3778	3233	3332	3854	3174	3064	3047	2521	3445	3856	3320	3364	3522	3285	3286
State	**3213**	**3115**	**2859**	**2515**	**2800**	**2518**	**2380**	**2876**	**2990**	**3260**	**3546**	**2555**	**2886**	**2926**	**2644**	**3088**

Source: *The Indian Meteorological Department (IMD)*

* Author's Calculation for the Study

If lack of rainfall is the only one factor, it is notable that the year 2003 onwards there is a remarkable positive change in monsoon availability at Plachimada. However the ground water level of the bore wells are not regained its former position. Thus it is evident that HCBPL over-extracted water from the Plachimada watershed beyond aquifers' water withdrawal capacity. Factually, Plachimada micro-watershed is spread over 14.89 sq.km areas of the Perumatty and the Pattencherry Panchayats of Palakkad have 3.67 MCM ground water capacities. It is observed from the resource map of Perumatty panchayat that the average areas of one ward (division) is 4 sq. km. As per the accounts, the groundwater potential of Plachimada ward is 0.9 MCM where the HCBPL started its water extraction. But the data of CGWB shows that the annual draft of ground water from the Plachimada ward is 1.89 MCM against 0.9 MCM. According to CGWB report 2003, the average water consumption of the factory was 5 lakhs litre per day. Subsequently it is observed from various scientific studies that the rainfall infiltration is 5 to 8 percentage in Plachimada and the locality requires 0.81 MCM water for domestic uses and 2.61 MCM water for irrigation purpose; the remaining 0.25 MCM goes to other uses. The Coca-Cola factory extracts 73 percent (0.1825 MCM) of that water, as per their claims. The investigative studies on Plachimada water issue till date have ignored the water demands of ecology and other-beings.

The present study examines this issue in detail and finds that many farmers, besides almost 50% of households at Plachimada watershed, have cows and goats for their domestic needs and income. The Panchayat-wise survey of 2001 by the Kerala State Economics and Statistics Department accounts 67,146 of domestic animals in Chittoor Block (Plachimada Watershed). An average 80 litres of water is needed for these animals that constitute 1.95 MCM water demand. Thus, it is very clear that the extraction of 0.1825 MCM (the minimum demand) water by HCBPL has caused an adverse effect on the ecology and well-being of the people of Plachimada watershed. The documents and spokesperson of the Department of Industry, Kerala State revealed that, in its request letter for licence for the

production unit at Plachimada, HCBPL claimed having a production capacity of 5.67 lakhs litre soft drinks per day. The other quality assurance documents, market promotion discussions and advertisements of HCBPL provide evidence that, for 1 litre of cola product they use 4 litre of water that comprises 23 lakhs litre water per day. Thus, the annual water need of HCBPL is almost 0.7300 MCM. Thus the accounts and data on water in Plachimada show that there is no justification for such industrial practices.

Moreover, the study observes a large scale virtual water trade from Plachimada to Central Travancore of Kerala in the form of Toddy, which is a traditional alcoholic beverage in Kerala tapped from coconut trees. The yield from each tree depends directly on the intensity of irrigation, leading farmers to intensify irrigation. *A standard estimate shows that a minimum requirement of water per tree is 1000 to 1500 litres at an interval of 9 to 12 days* (Mansoor 2004 c.f. Nair et.al.2008). This virtual water in the form of toddy puts a high water stress on the region.

As a concluding remark, it is observed that the ethical base, institutional harmony and ecological quotient of people of Plachimada is relatively poor. The protest against HCBPL emerged as an insurgence rather than a civic consciousness. Later, hired by academicians, environmentalists and voluntary organizations, it transformed the struggle into an international stage of water discourse. This extensive strike against HCBPL lasted more than 1200 days in its full strength and succeeded in closing down the factory. The strike for subsequent demands is still ongoing. Nonetheless, the HCBPL issue developed an environmental awareness among the people of Plachimada.

7.3.2 Case Study-II AWCECOP at DU4 Pudur

The study has conducted a detailed survey at Development Unit of Pudur (DU4) Attappady (see Figure 7.16) to analyse the ecosystem management and consequent changes in availability of water and quality of life. The socio-economic and

ecological features and selection criteria of this particular watershed has explained in Chapter 6. In this section, the discussion focuses on analysing the role of water in this particular tribal belt of Attappady. DU4-Pudur consists of 10 UAs micro watersheds, 3 dedicated forest watersheds and 1 plantation watershed. The UAs are the key players of ecological restoration programmes of AHADS. Therefore the study focuses on UAs to understand the socio-economic and ecological development of DU4-Pudur. Other than the ecological restoration programmes since the year 2000, DU4-Pudur has been pursuing the same socio-economic and cultural characteristics since 1980s. AWCECOP is the only one programme in the life of Attappady Block at DU-4 in recent times. A total of 44.5 sq.km land in the study area is continuously under ecological restoration programmes. Of these, 44.5 sq.km land 36.5sq.km area, is considered as waste land in the initial stages of AWCECOP. Table 7.14 shows the land use pattern in Pudur macro watershed (see Figure 7.16).

Table 7.14 Pudur Macro Watershed Land Use Pattern

Name of Micro watershed	Agri. land (sq.km)	Forest land (sq.km)	Forest/Agri. Plantations (sq.km)	Total (sq.km)	Waste land (sq.km)
Mele Moolakombu	0.143	4.347	1.953	6.470	4.517
Pudur	2.546	0.490	0.912	3.949	3.036
Ummathampady	1.510	4.356	0.208	6.073	5.866
Pattanakkal	1.034	1.135	0.727	2.896	2.169
Thoppukadu	0.690	0.146	0.220	1.056	0.836
Olavankara	0.308	1.647	0.439	2.395	1.956
Swarnagadhaa	0.470	1.415	0.366	2.251	1.884
Aralikkonam	0.142	4.213	0.356	4.711	4.355
Bhoothayar	2.411	1.852	0.708	4.971	4.263
Idavani	0.228	7.398	2.114	9.739	7.625
Total	**9.482**	**26.999**	**8.003**	**44.5**	**36.507**
Adapted: *Concise Report on AWCECOP by AHADS 2002 November 8*					

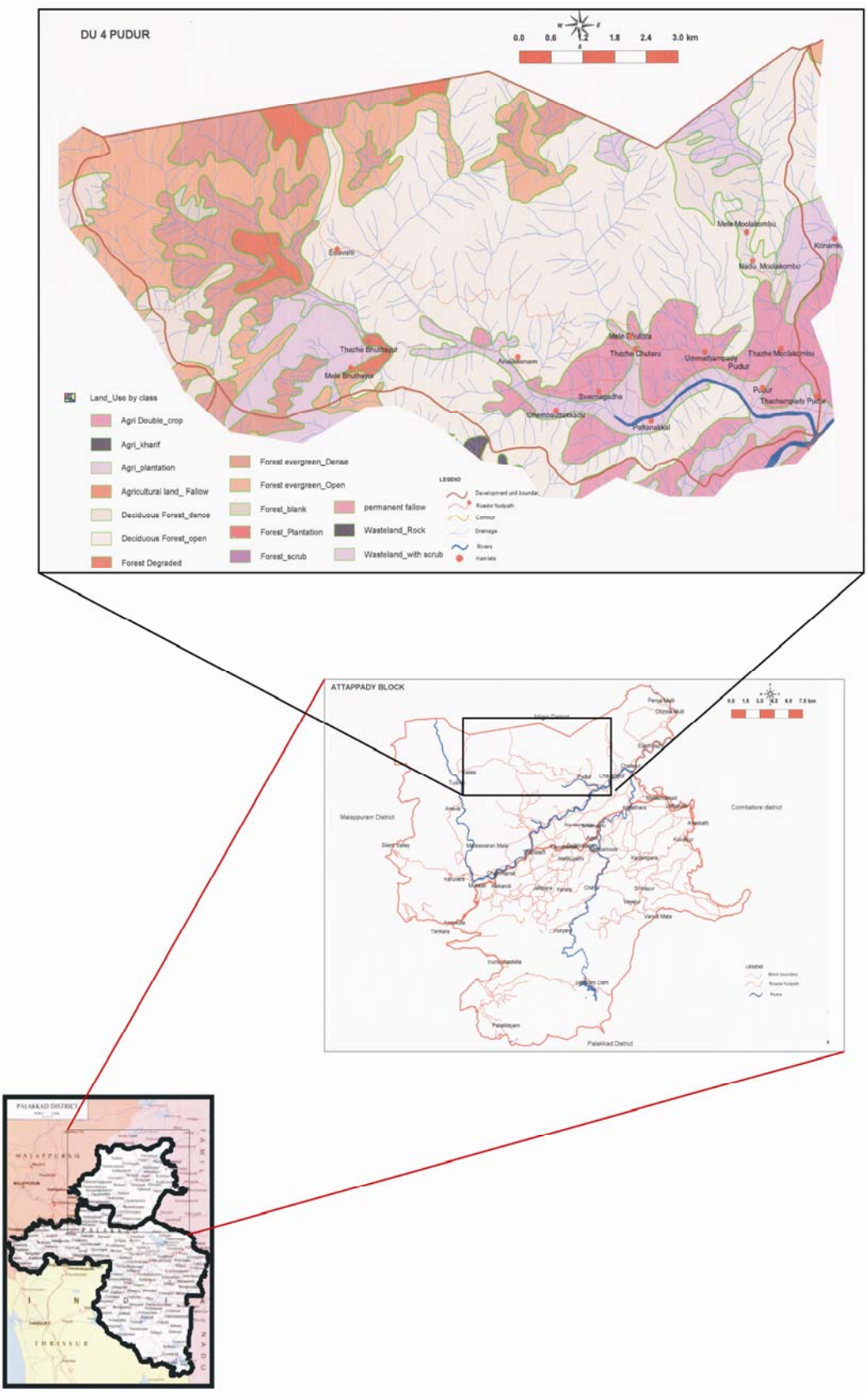


Fig. 7.16 Land Use and Location Map of Pudur Macro Watershed: The Study Area

The present research identifies water as the prime ecological domain arguing that the availability of water directly affects the ecological sustainability and economic well-being of the society. Therefore, the case study on DU4 is more specific on water availability and its consequences rather than other economic linkages like markets, investments, savings and entrepreneurships. For convenience of the study, the time span of ecological restoration experiment of DU4 is divided into three phases viz. Phase I, Phase II and Phase III.

Phase I: It is the period from 1998 to 2002. In Phase I, AHADS proposed for AWCECOP and the fund was sanctioned from JBIC. The project was formally inaugurated on 22nd April 2000 which began various eco-restoration activities.

Phase II: It is the period between 2002 and 2006. The AWCECOP was at its peak during this period and completed many eco-restoration projects. Benefits from the project have started trickling in.

Phase III: This is the period since 2006. People of Attappady have begun to enjoy considerable real sustainable benefits of AWCECOP and are working towards ecological and economic sustainability.

7.3.2.1 Nature of AWCECOP

The conservation activities like afforestation, biomass development, soil and water conservation, water resources development and promotion of income generating activities are attempted through community-based organizations, ensuring micro watershed-based governance of resources. The participatory micro-plans are prepared for each micro watershed that reflects the needs of the people and ecosystem as well.

7.3.2.2 Drinking water Scenario

Availability, accessibility and quality of water are the essential determinants of quality of life. Therefore, according to Tribal culture, the valleys and banks of

small streams and rivers are the normal habitat for tribes. Since the modernization programmes and policies (forest conservation policies) compelled the Tribes to settle somewhere in hilly places, they failed to bargain for fertile land and accessible water sources with civil society. Attappady hills have also not been free from such development projects and 'humanization practices'.

Culturally, the Tribes have been very reluctant to use well water at least till 1998-99. In Phase II and III, the scenario slowly transformed to well water due to the awareness programmes carried out by AWCECOP; meanwhile they experienced its ease of use through cultural interactions. Nowadays, the Tribes are very conscious about the quality of water and only 46 percent of them depend on stream water. AWCECOP programmes have improved the quality, availability and accessibility of water across the region. In Phase III it is observed that the Tribes and Non Tribes are enjoying water, sufficient in volume and good in quality and are collecting water with comparatively less effort.

It was very difficult to get good potable water in rainy season at Attappady, because of heavy soil erosion from the hilltops caused by large scale deforestation activities and the use of chemical fertilizers by the new settlers. AWCECOP makes the water to walk instead of run through trenches, check dams, contour bunds and earthen dams etc. have greatly enhanced surface water availability. This has positively affected the quality and quantity of water as well as longevity of water sources. Furthermore, waste lands have remarkably improved since the year 2000 and productivity of land has also increased.

The drinking water scenario of DU4-Pudur shows (see Figure 7.17) a progressive shift:

1. STs have shifted to dig well from their traditional stream water consumption.

2. There is a slight increase in surface water availability in open wells; however it is more significant, compared to the scenario of increasing number of dig wells.
3. Quantum of water use increased over the years after AHADS programmes.
4. Most of the rivulets are in the process of rejuvenation reducing the travelling distance to the water sources.
5. Time for water collection is considerably reduced among STs and Non-STs
6. However, it can be observed that there is an inequality among water use, accessibility and time of water collection among STs and Non-STs, with the latter enjoying better water conditions.

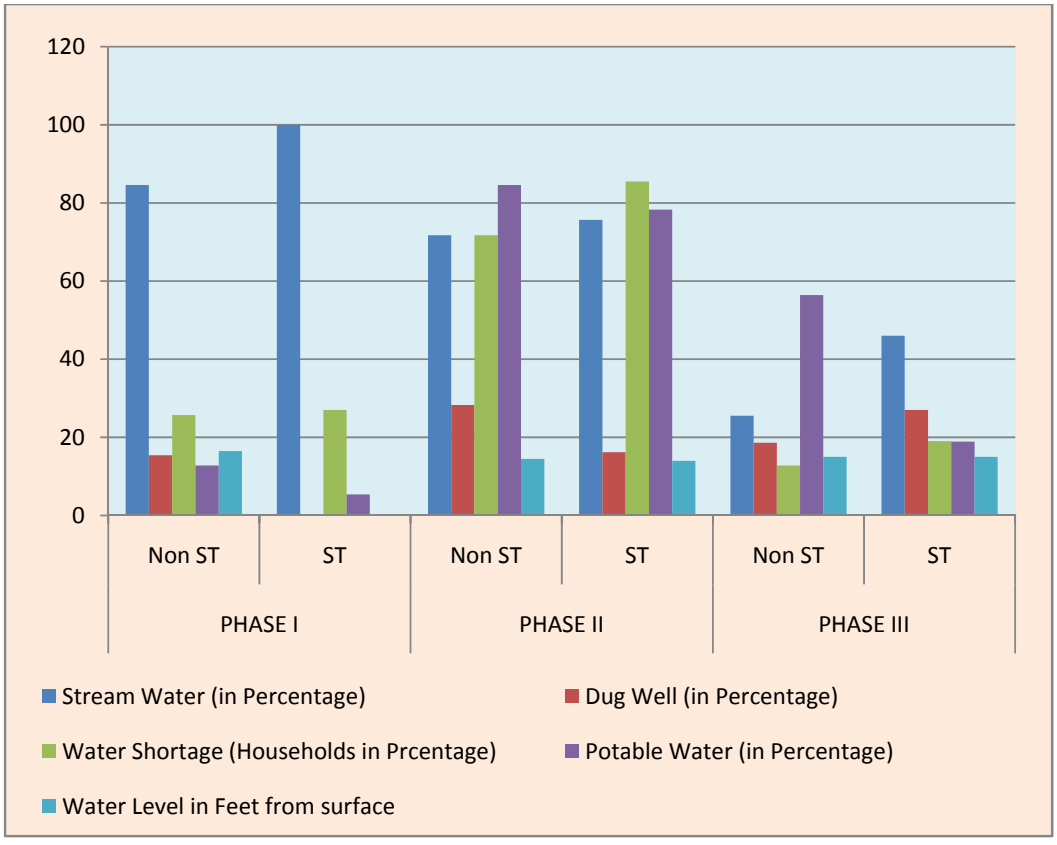


Fig. 7.17 Drinking Water Scenario: Attappady DU-4 Pudur

The following self-explanatory figures (7.18, 7.19, 7.20, 7.21, 7.22 and 7.23) show the pattern of above mentioned water-features of DU4-Pudur over Phase I (before 2000), Phase II (2000-2005) and Phase III (after 2005).

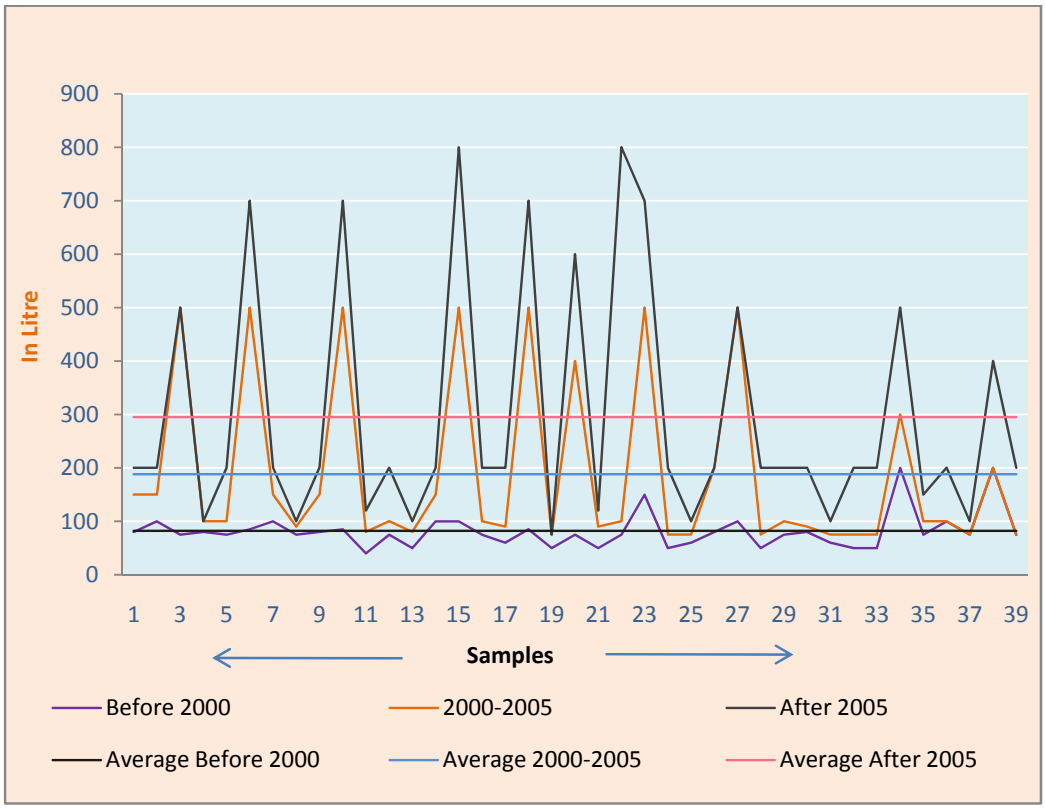


Fig. 7.18 Water Use of Non-Scheduled Tribes at DU-4 Pudur

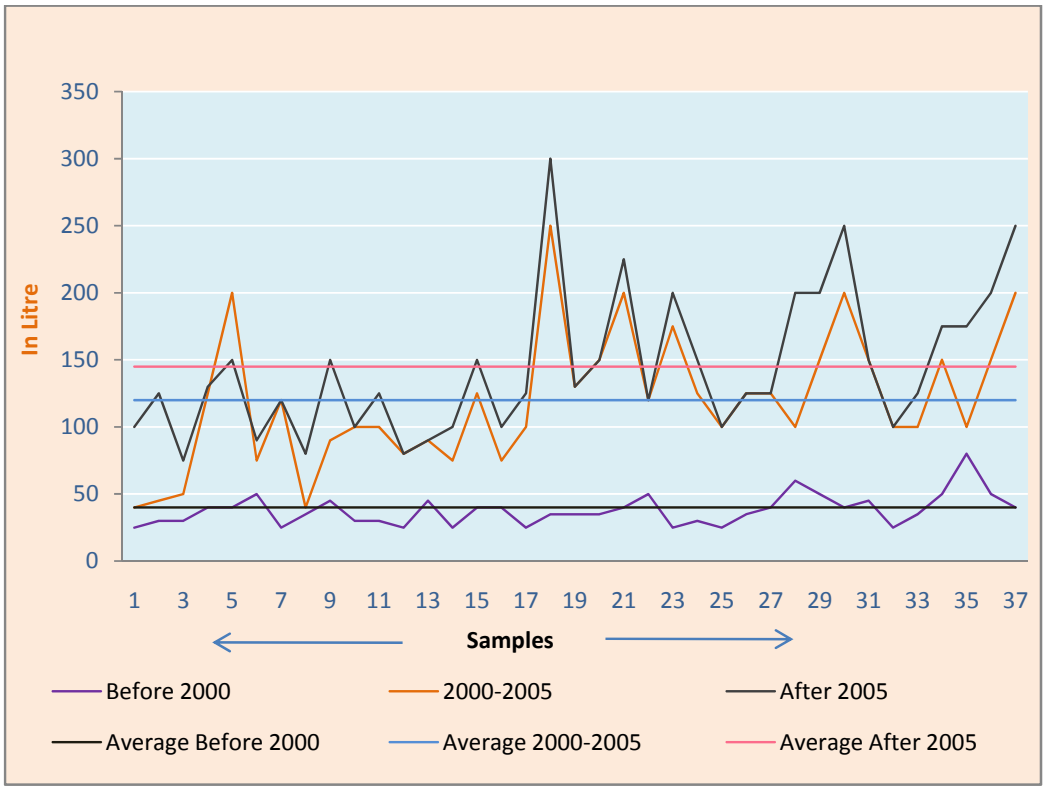


Fig. 7.19 Water Use of Scheduled Tribes at DU-4 Pudur

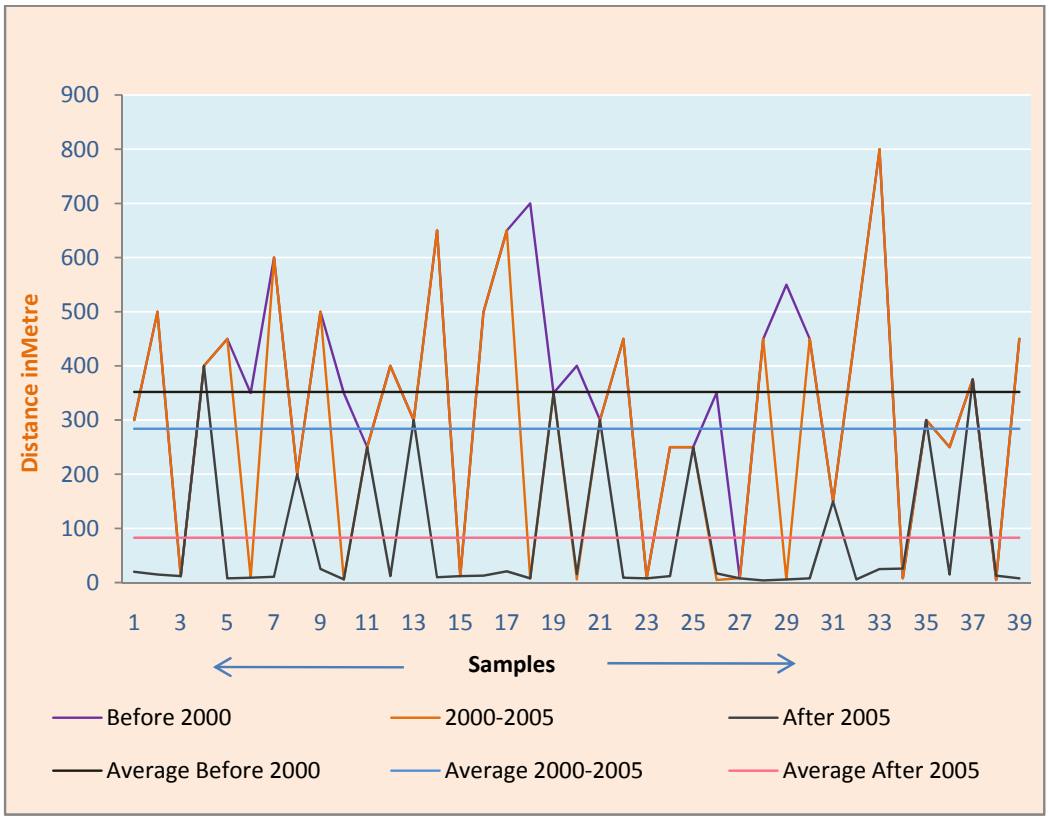


Fig.7. 20 Distances to the Drinking Water Source: Non-STs DU-4 Pudur

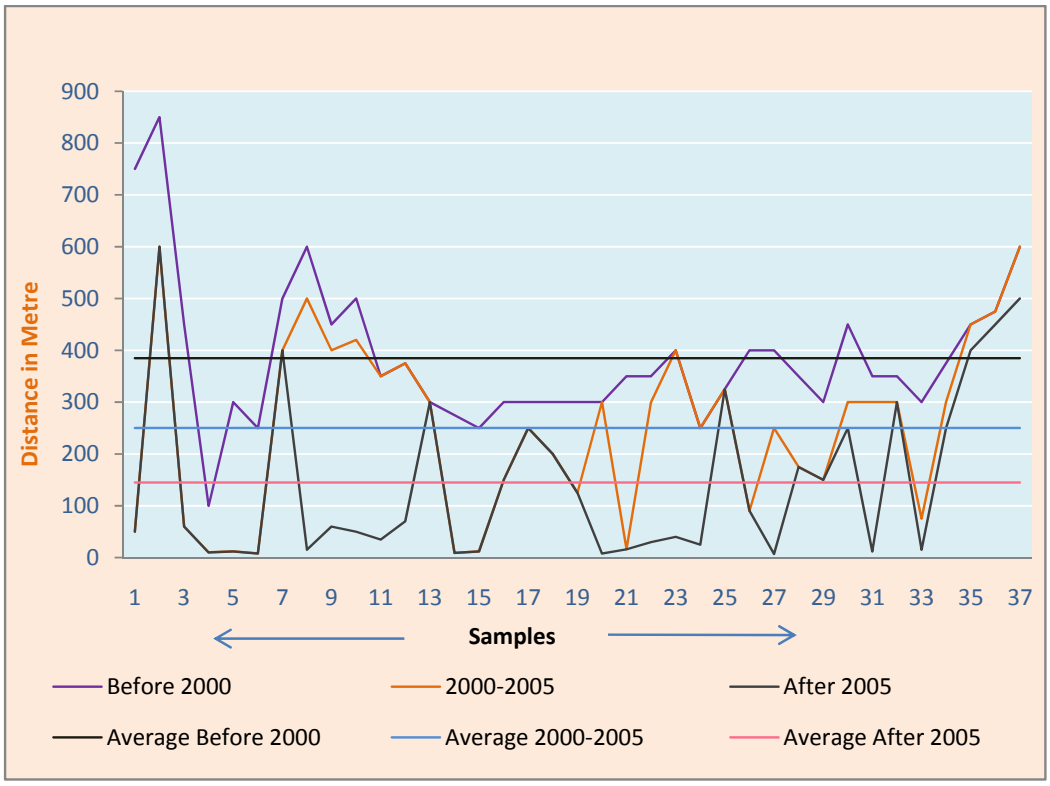


Fig.7.21 Distance to the Drinking Water source: STs of DU-4 Pudur

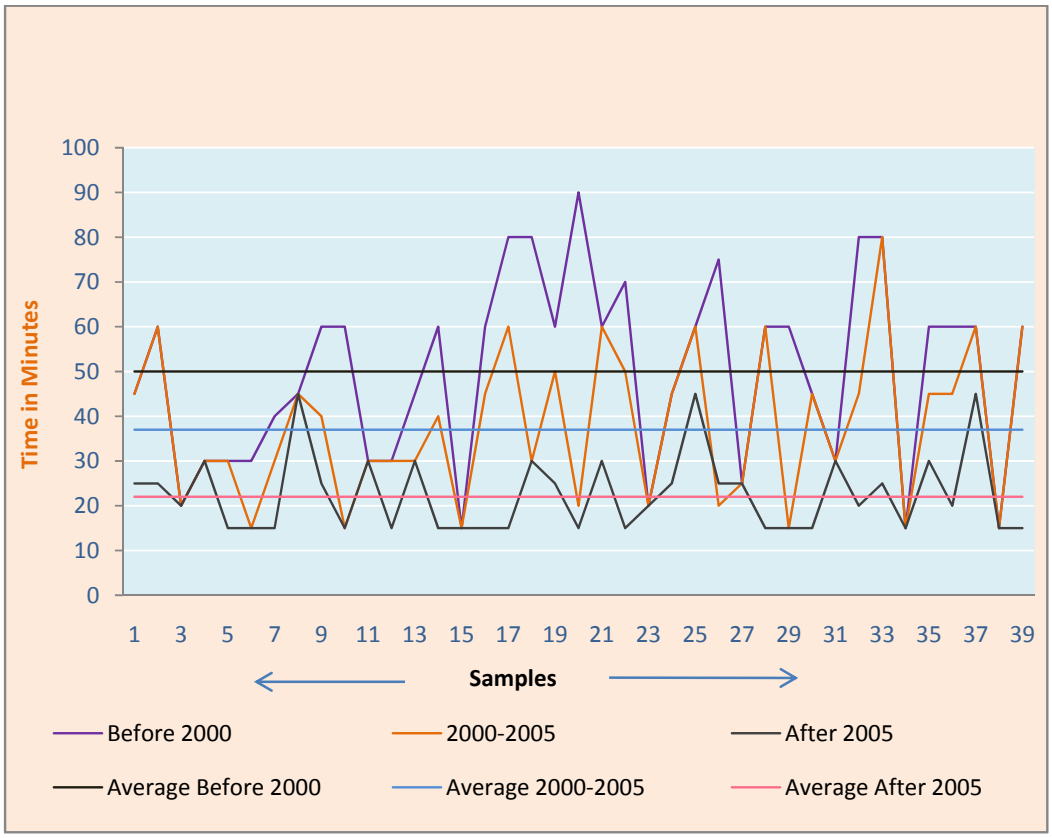


Fig. 7.22 Time Taken for Water Collection by Non-ST Households at DU-4 Pudur

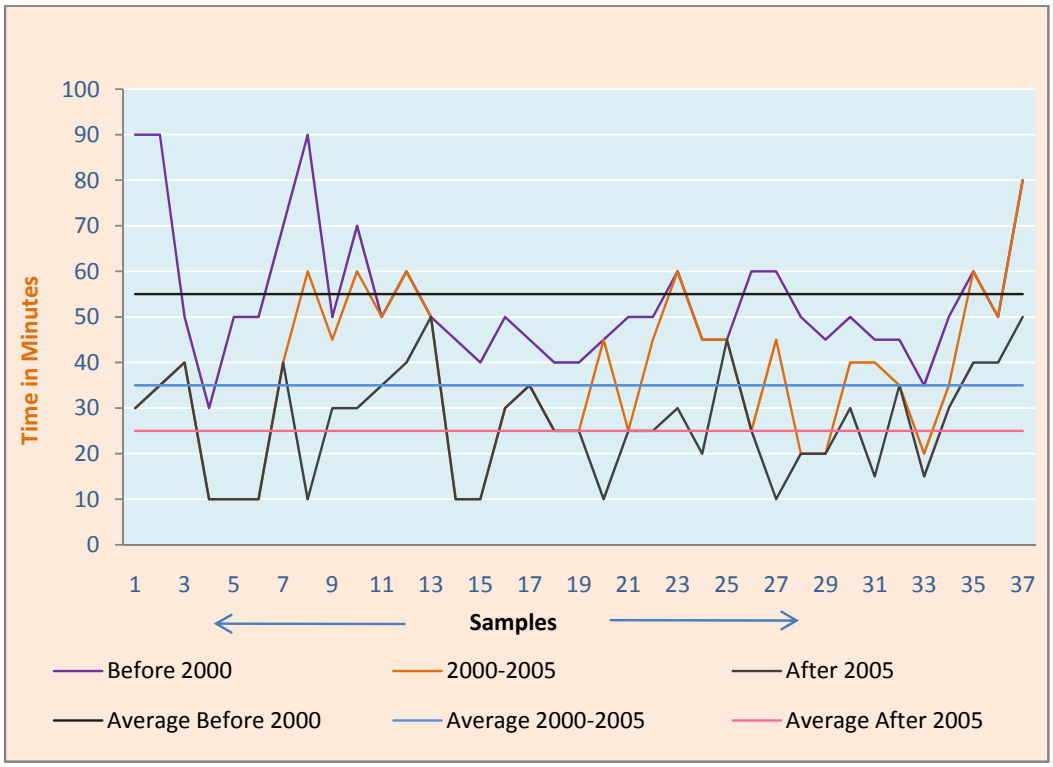


Fig. 7.23 Time Taken for Water Collection by STs at DU-4 Pudur

7.3.2.3 Streams and Irrigation

Afforestation and soil and water conservation activities, both in forests and private wastelands have resulted in rejuvenation of streams which were completely dried away decades ago. The Varagar river (tributary of river Bhavani) that used to flow only during the rainy days with full of muddy water, has been flowing throughout the year 2007 with clean potable water even in summer. Small canals like Pattanakkal, Ummathampady, Olavankara, Pudur, Mele choottara and Thazhe Choottara are showing high discharge of water in to the streams since AWCECOP attempts. Thousands of trenches, pits, water retention and harvesting structures constructed by AHADS have improved ground water availability which has reduced the momentum and intensity of soil erosion. The dry wells of eastern Attappady have increased their water levels by 5 to 40 feet with 7 to 37.8 cubic metres per day (AHADS Status Report 2008).

Agriculture practices of Attappady mainly depend on monsoon, and the Tribes are ignorant of modern irrigation techniques. Even after a decade's experience of AHADS and 8 years of practices with AWCECOP, people of DU-4 are very reluctant towards modern irrigational methods. It is observed that 50 percent area of agriculture land is vacant in summer and the Tribes are highly dependent on stream water for small scale irrigation. The Tribes are focus on seasonal agriculture. Moreover they collect water from the streams for small scale horticulture in the summer season simply for subsistence use. Even though motorised irrigation practices are rare in this area, traditional canal system[2] has covered a remarkable share of agriculture land that is owned by the Non-STs. Pipe irrigation[3] has been applied over 10 percent of agriculture land that mainly serves Banana cultivation, a major crop of Attappady followed by coconut, areca nut and rice (see Table 7.15). Remarkably, the seasonal irrigation has increased the income as well as working days of the people of Attappady in general. As per Kerala's agriculture calendar, one labourer gets maximum 220 working days per

year; therefore it is remarkable that in Phase III AWCECOP has enhanced the working days to 225 against 110 days in Phase-I.

Table 7.15 Development of Irrigation Water at DU-4 Pudur Since 1996

	Phase III		
Average land Area	4.6 acre per household		
Average pumping hours	55 minutes		
Nearest water source (stream)	455 meter		
Normal power of the motor	5hp		
motor irrigated	23.3 percentage		
Pipe irrigated	10.2 percentage		
Canal irrigated	26.5 percentage		
Total irrigated	2.5 acre per household		
Major crops by irrigation	1st position	Banana	
	2nd Position	Rice and Coconut	
	3rd Position	Vegetables	
	Phase I	Phase II	Phase III
Normal working days (in number)	110	160	220
Claim on creation of labour days (in number)	-	30-60	40-50
Source: *Author's Primary Survey*			

7.3.2.4 Water as an Economic Device

The changing scenario of resource economics is transforming water as an economic and commercial good; and often its economic significance is overlooked in development experiments. The study conducted in DU-4 Pudur retains the role

of water as an economic device for eco-restoration and human well-being. The enhanced water availability by AWCECOP at DU-4 has increased the productivity, extent of farming and income of the people over their socio-cultural disparities. As a labour stratum of Attappady, Tribes are highly benefited with the increase of labour days and the farmers have considerably extended the area of farming and have experienced expertise in diversified crops which has improved their level of income.

Since 1996 it is observed that the number of labour days (175 to 220 days), distance (4.5 km to 1.5 km) and cost of travel to work place (Rs 1100 to 400 per year) have shown positive changes (see Figure 7.24 and 7.25) and the income of the labour households has also increased from Rs. 675 per month to Rs.2000 per month per season in Phase III of AWCECOP (see Table 7.16).

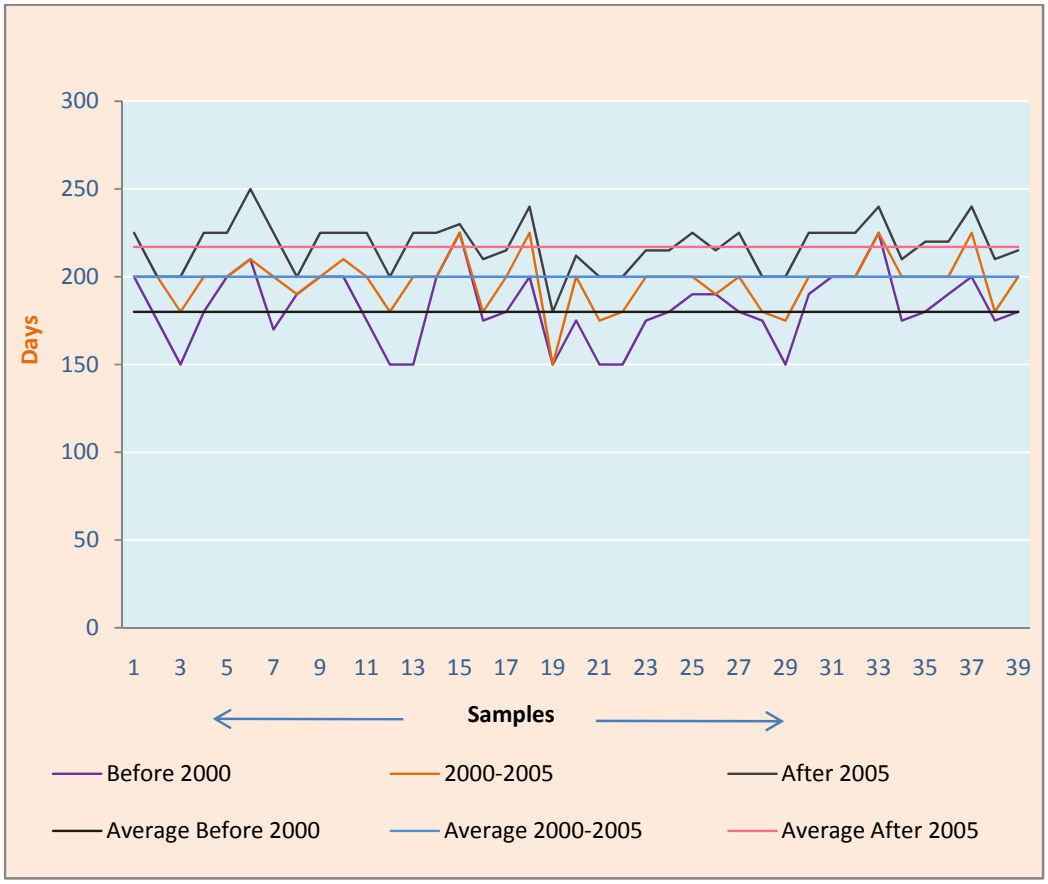


Fig. 7.24 Agriculture Labour and Farming Days at DU-4 Pudur

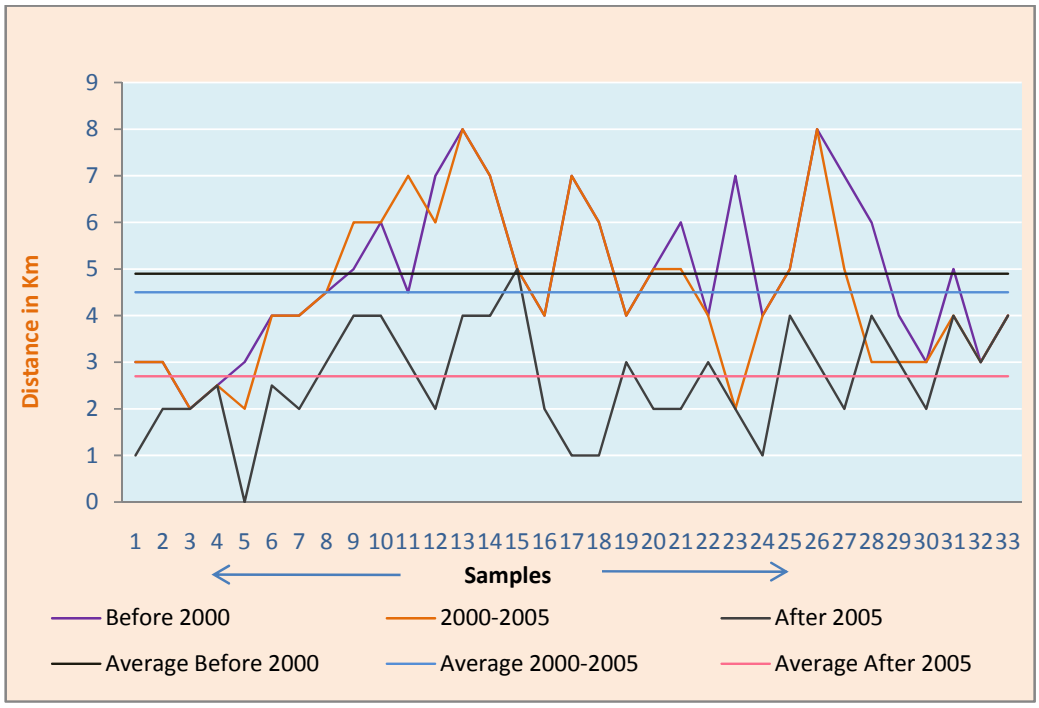


Fig. 7.25 Distance to the Work Place: DU-4 Pudur Labour Class

Table 7.16 Agri. Labour Scenario of DU4-Pudur Since 1996 to 2009

	Phase I	Phase II	Phase III
Average labour force from each households (in Number)	3 –4	3	2 – 3
Labour force to total population (in percentage)	63	60	59.5
Average Travel cost per head per day (in rupees)	10	10	2
Average distance to work site (in kilo meters)	4.5	4	1.5
Average labour days per year (in number)	110	160	200
Average travel cost per year (in rupees)	1100	1600	400
Normal wage for male labourers (in rupees)	75	95	120
Normal wages for female labourers (in rupees)	55	70	110
Normal monthly income in season by labour supply (in rupees)	675	1250	2000
Normal monthly income in off season by labour supply (in rupees)	500	850	1400
Source: *Author's Primary Survey*			

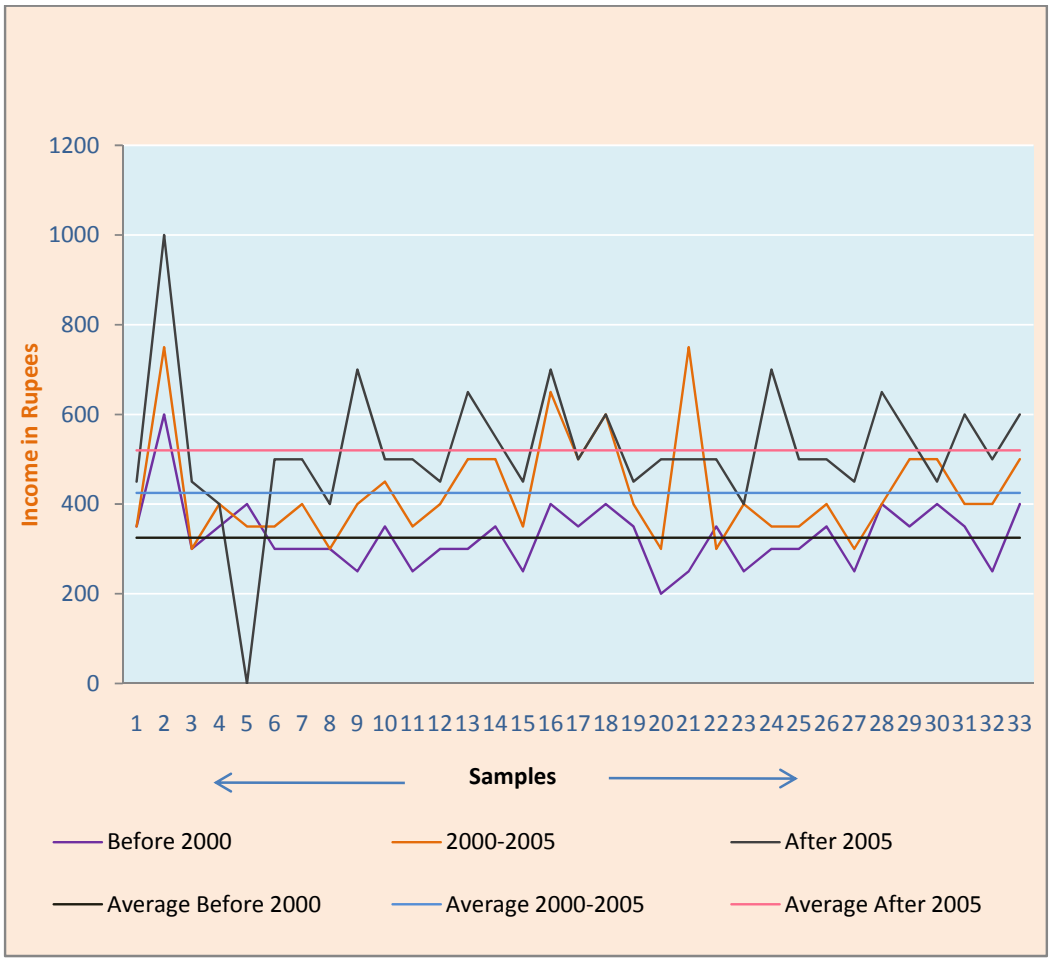


Fig.7.26 Weekly Income of the labour Households by Labour Supply: Du-4 Pudur

The lands near valleys and irrigation sources have passed on to the ownership of the Non-Tribes, leaving mostly the infertile, barren and rocky lands on the slopes of hillocks with the Tribes. Since 2002 the Tribes have returned to small-scale agriculture experiments (from the figure 7.26, it is clear that one ST labour household completely returned to agriculture and their income from labour supply is zero now) the help of AHADS and in Phase III they have been getting an average net benefit of Rs 500 per month from horticulture and other agriculture related activities (see Table 7.17 and Figure 7.27). Also, there is a positive change in other income sources since 1996. By the year 2007, approximately 70 percent of added labour was observed to have been engaged in agriculture and other sub-sectors viz. skilled technical labour, self employment and private sector labour etc.

Table 7.17 Other Income Sources of Labour Supply Households of DU4-Pudur Since 1996

	Phase I	Phase II	Phase III
Petty shops owned Households (in percentage)	1	1.5	3
Households with Self employed persons (in percentage)	1.5	3	8
Households with Skilled labourers (in percentage)	-	5.5	8.6
Households with Private sector labourers (in percentage)		3.5	7.5
Households engaged in Small scale horticulture (in percentage)	13	48	64
Households earning income from Live stocks (in percentage)	-	2	3
Average monthly Income of Households from agriculture and allied sectors (in rupees)	150	250	500
Average monthly income of a Household (in rupees)	**650**	**1300**	**2200**

Source: *Author's Primary Survey*

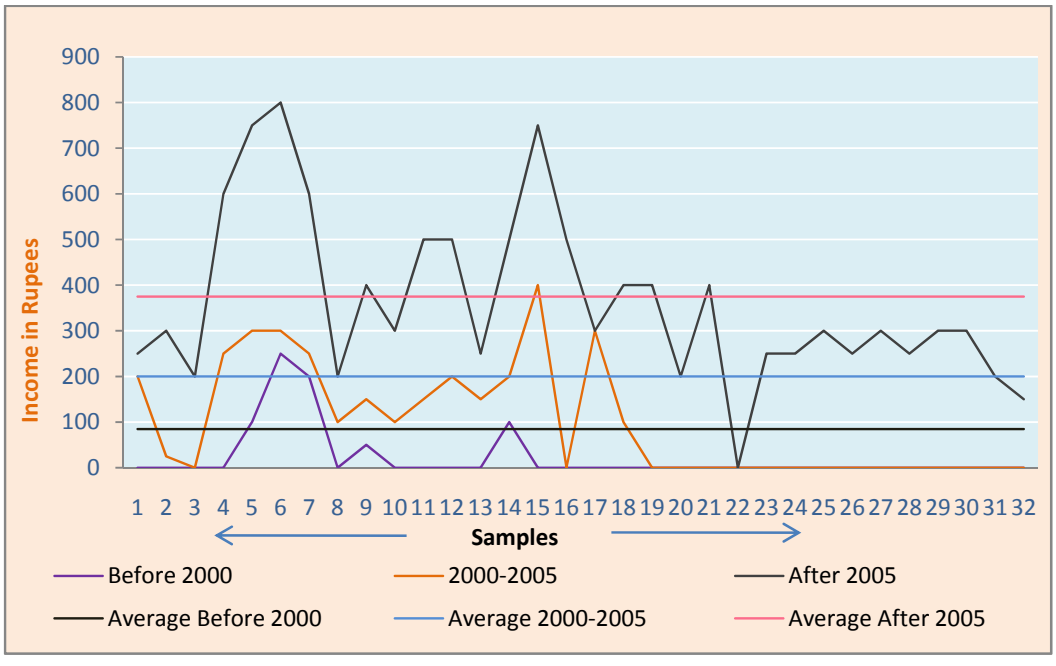


Fig. 7.27 Weekly Income of the Labour Households from Other Sources: DU-4 Pudur

Farming culture has radically changed (see Table 7.18) in this region since 2000; farmers have turned towards eco-friendly farming methods that have improved the fertility of land and the water holding capacity of the soil has resulted in higher yield. Land mortgage out practices are remarkably reduced in the 3rd Phase, and leased in practices are increased in this area. The reason behind this change is: a) the awareness programmes of AHADS and b) the increase in water availability in the region.

Table 7.18 Development of Agriculture at DU-4 Pudur Since 1996

	Phase I	**Phase II**	**Phase III**
Average owned cultivable land in DU-4Pudur (acre)	4.1	4.4	4.6
Households have land outside DU-4 (%)	8	7	5
Households have leased in land (%)	2	4	10
Households have mortgage in land (%)	9	5	2
Normal agricultural expenses per acre for major crops(rupees)	4000	5500	7000
Average yearly income from major crops (rupees)	32000	40000	48000
Source: *Author's Primary Survey*			

Non-ST participation has increased in agricultural activities, extending the average cultivation from 4.1 acre to 4.6 acre, a minimal change (see Figure 7.28) and there is no remarkable change in owned land size also.

While, the income from agriculture shows remarkable change, as well as noticeable that Non-Tribes grow more of cash crops like coconut, coffee, ginger, banana etc. AWCECOP has helped the cultivators to increase their average annual income to Rs 48000 in favourable climate conditions.

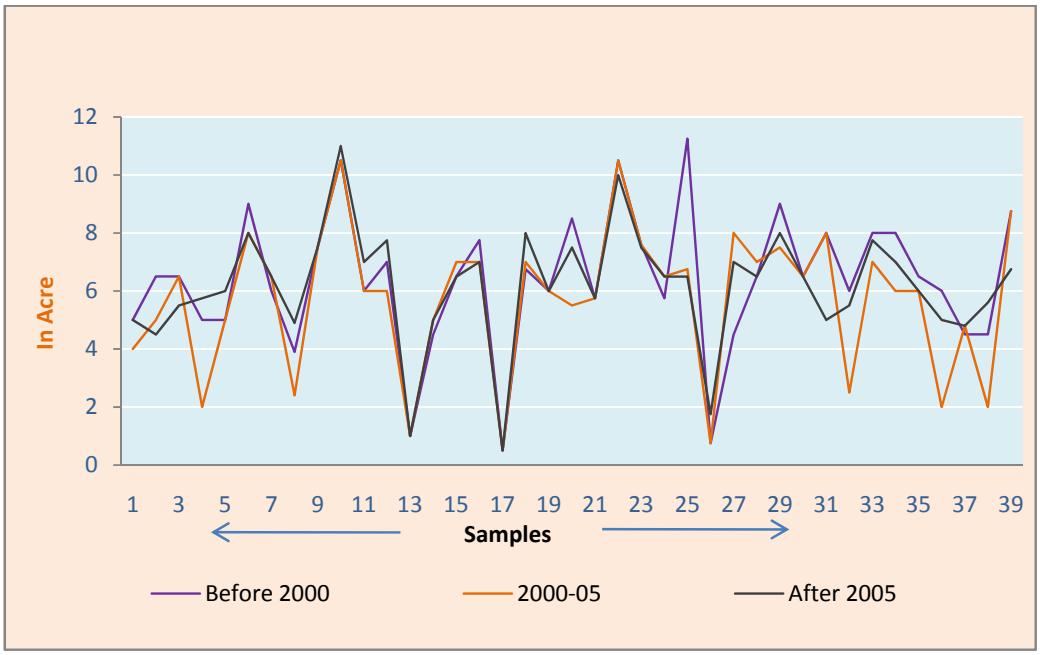


Fig. 7.28 Total Areas of Cultivation by Agrarian Household Samples at DU-4 Pudur

Other than major crops, 40 percentages of households are engaged in horticulture, floriculture, sericulture and arboriculture and earn substantial income from the same (see Table 7.19 and Figure 7.29).

Table 7.19 Other Income Sources Agrarian Households of DU4-Pudur Since 1996

	Phase I	Phase II	Phase III
Petty shops owned Households (%)	2.1	3.5	5.3
Households with Self employed persons (%)	4.4	5.4	8.1
Households with Skilled labourers (%)	7.2	10.5	14.3
Households with Private sector labourers (%)	2.3	3.1	8.2
Households engaged in Small scale horticulture (%)	75	98	100
Households earning income from Live stocks (%)	8	27.4	35.5
Average monthly Income of Households from other income sources (rupees)	250	800	1200
Average monthly income of the Households (rupees)	3000	4200	5200
Source: *Author's Primary Survey*			

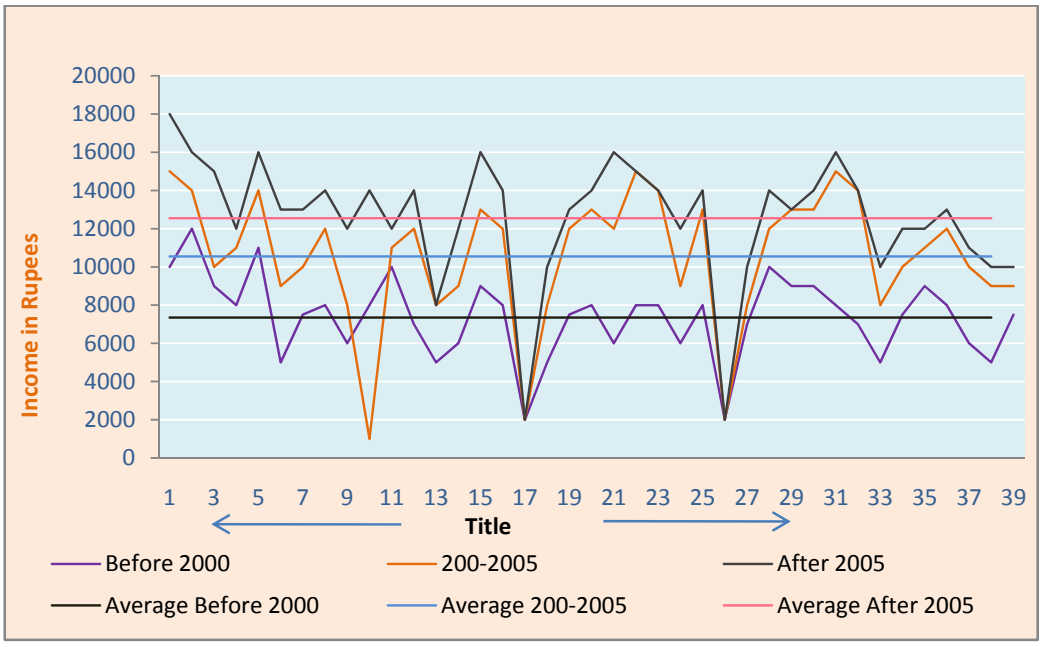


Fig. 7.29 Annual Income from Subsidiary Crops : DU-4 Pdur

7.3.3. A Comparative Study with Ethical and Institutional Constructs

The present study embraces radical-socio centrism as its analytical ideology and considers ecology as an abode of human beings, it believes that protection, conservation, management and governance of ecosystem for a sustainable future of the present and future generation is the ethical responsibility of the contemporary society. Such a society must be a group of ecologically-vigil rational-civic persons. With this focus, the study undertakes a sample survey – an 'ecological quotient' (Ec. Q) survey - among selected 25 relatively educated people to understand the philosophical and ecological perception of the people of Plachimada and Attappady.

The survey focused on 10 themes viz. ecology, water, development, quality of life, local ecology, agriculture, institutions or organizations, social life, ecological rights and self esteem; those synchronising a rural-agrarian individual to his/her ecology, society and polity for a sustained socio-economic-ecological future. At the same time, the basic environmental school of thoughts viz. money-centrism, ego-centrism, socio-centrism, eco-centrism and the proposed radical socio-centrism

are employed as the measuring scale of Ec. Q of an individual. Open-ended questions and casual talks and interviews are used to collect the data and each parameter is rated on a 5 point scale. 5 indicates the individual's radical socio-centric view on the concerned parameter or theme; points 4, 3, 2 and 1 indicate respectively the eco-centric, socio-centric, ego-centric and money-centric ways of thinking and practice of the individual (Tables 7.20 and 7.21). The compound of these 10 themes is valued on band points enumerated below:

1. Band I- < 20 indicate the individual's selfishness and irresponsibility to nature.
2. Band II- 20 to 24 - individual is money-centric.
3. Band III- 25 to 29- individual is ego-centric.
4. Band IV- 30 to 34- individual is socio-centric.
5. Band V- 35 to 39- individual is eco-centric and
6. Band VI >40 indicates the radical socio-centric behviour of the individual.

The objectives of this survey were (i) to understand the socio-economic and ecological pattern, trends, problems and prospects of the local ecology and (ii) to measure the ecological quotient of the community as well as the individual.

7.3.3.1. Plachimada

The following ecological pattern, trends, problems and prospects have been observed from the Plachimada watershed.

1. Agriculture is purely an economic activity.
2. The people of Plachimada are least concerned about their soil and biodiversity.
3. Whenever a problem (most of them water related) arises the people are divided under different political flags (except the Coca-cola issue).
4. Beyond pure political party affiliations, the people have no other social organization.

5. The struggle against Coca-cola has raised their ecological awareness and strengthened their institutional and social affiliations.
6. The virtual water trade has intensified in the locality through the shifting of agriculture pattern towards horticulture and Toddy taping.
7. Mangoes plantations have proliferated as against paddy and other food grains, accentuating the water stress (see Table 7.10 for water requirement a mango tree).
8. Use of chemical fertilizers has turned the soil more dry and infertile, losing its bulk density and water holding capacity.
9. A huge amount of money, technical knowhow, expertise and man power is required to restore the ecosystem at Plachimada.
10. The institutional coordination failure has been visible in case of Coca-Cola struggle. The Pattancherry panchayat has been very passive on this issue, in spite of sharing a common boundary with HCBPL plant.
11. The Local Government's careless actions and ignorance of its ecological health worsened the water conditions of Plachimada.
12. Illegal as well as illogical bore-well digging has spread in the locality; there is no execution of prevailing government laws and rules on such practices.
13. The strike against HCBPL and the subsequent environment consciousness has been the prospect of the locality; however there are no governmental or voluntary constructive institutions or organizations to co-ordinate and mobilize the existing unity of the people.
14. People's participation in the development projects and decision- making in Plachimada is very less due to the reluctant behaviour of the State and Central Governments in the 'Cola issue'.
15. The following table (7.20) illustrates the ecological quotient of the region, where radical socio-centrism works as a community's ecological quotient scale. It shows the community score of Plachimada a 28.4 which lies in the

third band indicating that the Plachimada society follows an 'ego-centric consumerist behaviour'.

Table 7.20 Plachimada Ecological Concerns

Theme	Community average on 5point scale	Band VI	Band V	Band IV	Band III	Band II	Band I
Ecology	3.08	4%	28%	40%	28%	-	
Water	2.96	4%	8%	68%	20%	-	
Development	3.04	-	20%	64%	16%	-	
Quality of life	2.36	-	4%	40%	44%	12%	
Local ecology	3.00	-	28%	48%	20%	4%	
Agriculture	2.36	-	4%	40%	44%	12%	
Institution/ organization	2.88	-	24%	40%	36%		
Social Life	2.88	-	20%	48%	32%		
Ecological Rights	3.08	-	20%	68%	12%		
Self-Esteem	2.76	-	12%	52%	36%		
Community's overall performance at band value						**28.4**	
Source: *Author's Primary Survey*							

7.3.3.2. DU4 Pudur at Attappady

DU4-Pudur gets all sorts of assistance from a government-supported well-administered NGO-AHADS, which keenly monitors the region and trains the people of Attappady with their 'nurturing-the-nature' tools and techniques. Since

the very first visit to Attappady in 1996, the researcher has keenly observed the region; and subsequently the present study was conducted over wide ranging academic explorations since 2006. Over the last 10 years, the people of Attappady have experienced a lot of moral, ecological, social and economic shifts - from subsistence hunter-agrarian-nomadic tribal culture to open-developing-settled modern life styles. During this process it has faced a variety of ecosystem quality issues. Besides, the following ecological pattern, trends, problems and prospects have been observed from the DU4-Pudur micro-watershed.

1. Attappady is declared a tribal development block of the State of Kerala due to its peculiar tribal habitations that constitute major tribal clans viz. Irulas, Mudugas and Kurumbas.

2. Large scale in-migration of poor Central Travancore farmers and Tamil farmers to this ecologically rich region, adjacent to the ecological hotspot The Silent Valley (continued till the end of 1980s).

3. The in-immigration threatened the ecosystem quality and tribal culture of Attappady. Large scale hooch production and consumption spread over Attappady collapsing the rich tribal cultural harmony, laws and value systems. The alcohol addiction forced the tribes to surrender their government allotted land to the immigrants for a token price, thereby increasing their dependence on forest land.

4. Labour exploitations, women and girls trafficking, drug addiction and other type of social unrests have broken out over the entire region. The number of unmarried mothers has increased. The ethnic value education as well as modern education systems have became unproductive in the region, thus throwing the tribal hamlets dip into social and cultural value crisis and financial crisis.

5. Till the end of 1990s, the ecology of Attappady faced unethical resource exploitation. Forest wood trade and encroachment of forest land for agriculture particularly increased in Attappady, which consequently affected the ecological balance and water cycles. Thus the entire region faced a wave of desertification that threatened the very survival of the tribes.

6. While a number of government development projects and financial assistance worked towards reviving the tribal culture as well as to pave out poverty from the region, they were failed due to the people-negating-administration and their lack of understanding about local ecology, tribal culture and value systems. Mean while, the immigrants hijacked all development projects and the ethnic people were consistently marginalised from the path of development.

7. At this juncture AHADS came into existence which studied the region thoroughly, adopted participatory community development methods, initiated eco-restoration practices, restored the traditional values and know how, revived the tribal culture as well as language and educated them with modern scientific knowledge. Thus, this amalgamation of Government, NGO and local people with the help of the available potential of ecology marked a new life towards prosperity.

8. The changes are visible now; the barren hilly areas turned to green, major rivers and streams rejuvenated and even in peak summer these streams are flowing.

9. The area under dense forest has increased, witnessing the presence of wild animals in number and variety. The wildlife has extended beyond the silent valley reserved forest.

10. Stream supported life, especially the agriculture activities and dairy farms, have revived in the Attappady hills, thereby increasing their income, employment opportunities and social harmony.

11. Hooch business, drug consumption and women and girls trafficking, bonded labour practices etc. have been completely eradicated from the region with the support of tribal people.

12. People of Attappady are now very conscious about their role as protectors and managers of the local wild life, forest and other ecosystem services. The forest fire incidents have sharply declined since the operations of AHADS in turn increasing the expansion of quality forest.

13. The subsistence agrarian life has shifted towards a sustainable agrarian economy; people are more active on their cultivable land under the constant supervision and advice from AHADS.

14. The area has shifted to bio-fertilizers and organic farming techniques setting a new momentum in Attappady hills that maintains and enriches the bulk density and water-holding capacity of the soil. Consequently, soil erosion from the Attappady hills has almost stopped.

15. As an institution, AHADS maintains its links with government and funding agencies, whereby people are highly dependent on AHADS projects and funding.

16. The co-ordination, peoples participation and women representation in the region is encouraging, especially in decision making.

17. The study observes that people are viewing all the development projects in relation to the watershed base rather than the parliamentary or constitutional boundary.

18. In a way, AHADS is working as a parallel Local Government to the people's needs. The awareness programmes and its grass-root level voluntary intervention in the social, economic and ecological issues gets AHADS the support of the local people.

19. AHADS has also not been free from criticisms. The politicians are reluctant to the project and the greedy NGOs question its fund utilization methods by criticising that the accounts of AHADS show only 41% of total budget outlay having been utilized till date since 1996, even though the project period has been revised to 2010 March from the closure date on 26th March 2005. AHADS has again filed a request to extend the project, and not ready to throw away the money among people without constructive programmes and a sustainable future.

20. The second criticism is that AWCECOP is a large project with a huge amount of Rs. 219.31 crore, but there has been no such significant improvement in the region. The AHADS office claims that the project is developing in accordance with the pace of ecological restoration which takes a long gestation period. Therefore AHADS intends to extend the project period and make necessary legal and diplomatic representation to the funding agency to stay with the people of Attappady hills.

21. Whatever may be the legal and political criticism, the people of Attappady have become relatively more ethical, eco-friendly, socially responsible and economically genuine; as is clear from the following table (7.21). On the community Ec. Q on radical-socio centric scale, the Attappady community is lying in the 4th band with a score of 34.08, showing the community having good eco-centric sense of life with notable socio-economic-institutional co-ordination.

Table 7.21 Attappady DU4 Pudur Ecological Concerns

Theme	Community average on 5point scale	Band VI	Band V	Band IV	Band III	Band II	Band I
Ecology	4.08	44%	20%	36%	-	-	-
Water	3.96	44%	20%	24%	12%	-	-
Development	3.52	20%	20%	42%	8%	-	-
Quality of life	3.28	16%	20%	40%	24%	-	-
Local ecology	3.68	16%	40%	40%	4%	-	-
Agriculture	2.84	-	24%	36%	40%	-	-
Institution/ organization	3.16	-	44%	28%	28%	-	-
Social Life	3.2	-	36%	48%	16%	-	-
Ecological Rights	3.32	-	36%	60%	4%	-	-
Self Esteem	3.04	-	28%	48%	24%	-	-
Community Overall at 50 point Scale					34.08		
Source: *Author's Primary Survey*							

The ethical, ecological and institutional behaviours of the people of both the case study areas can be summarised below (Table 7.22). The summary table shows the percentage of people lying among various lines of ideology in relation to their understanding of the afore-mentioned 10 life-dependent themes.

Table 7.22 Percentage of People Lying Among Various Lines of Ideology

	Irrational	Money-Centric	Ego-Centric	Socio-Centric	Eco-Centric	Radical Socio-Centric
Plachimada	Nil	25%	28%	36%	16%	Nil
Attappady	Nil	8%	12%	32%	20%	28%
Source: *Author's Primary Survey*						

The present study observes the Attappady community is more concerned about ecology and ecological well-being rather than Plachimada. 28% of people of Attappady express a radical socio-centric behaviour, while there is no one at Plachimada. It is hope that 28% is a remarkable chunk of the community; they can lead the region towards a sustainable future.

END NOTES

[1] 1 hectare = 10000 m^2 = 2.471044 acres

1Acre = 4046.825 m^2 = 100 cents

1cent = 40.46825 m^2

[2] Directing the water from the upper streams to lower level agriculture land.

[3] Directing water from the upper streams through plastic or rubber pipes without loss of water.

REFERENCES

AHADS (2002). *AHADS-AWCECOP Status Report and briefing of the Project*. Published by AHADS . Agali. Palakkad.

AHADS (2008). *Attappady Wasteland Comprehensive Environmental Conservation Project (AWCECOP) Status Report 2008*. Published by AHADS. Agali. Palakkad.

KAU (2009). *Soil Fertility Card.* Kerala Agricultural University. Recommendation by RARS Pattambi, KAU, NBSS & LUP, Bangalore, KSSO Thiruvananthapuram.

Nair, K.N., Antonyto Paul and Vineetha Menon (2008). *Water Insecurity Institutions and Livelihood Dynamics*. Daanish Books. Delhi.