

I. Overview of the project

Name of the Project Area	Sriramapuram-Malvarpatty Watershed
Hamlets	1. Sriramapuram 2. Malvarpatty 3. Otthaiyur 4. Sikkirampatty 5. Mariyamangalapuram 6. Mandapampudur 7. Arasamarathupatty
Block	Vedasandur
Taluk	Vedasandur
District	Dindigul
Location	Located between 10°05' and 10°09' north latitude and between 77°30' and 78°20' east longitude
Households	280 families
Total population	1045
Live stocks	cattle, sheep, and goat
Literacy rate	54%
Cultivators	58%
Agricultural labors	20%
Average maximum temperature	34° C
Average minimum temperature	22° C
Normal rainfall during North East Monsoon (NEM)	375 mm
Normal rainfall during South West Monsoon (SWM)	220 mm
Average rainfall	726 mm/ year
Soil type	Red sandy soil, red loamy soil and laterite soil
Major crops	Maize, millets and other cereals, pulses, groundnut, gingelly, and cotton
Main water source for crops	bore wells and open wells, besides rainfall



Sriramapuram - Malvarpatty Watershed Climate Proofing AFB Project

Implementing Agency : NABARD

Project Execution : VWC- SriramapuramMalvarpatty

Project Facilitated : CIRHEP

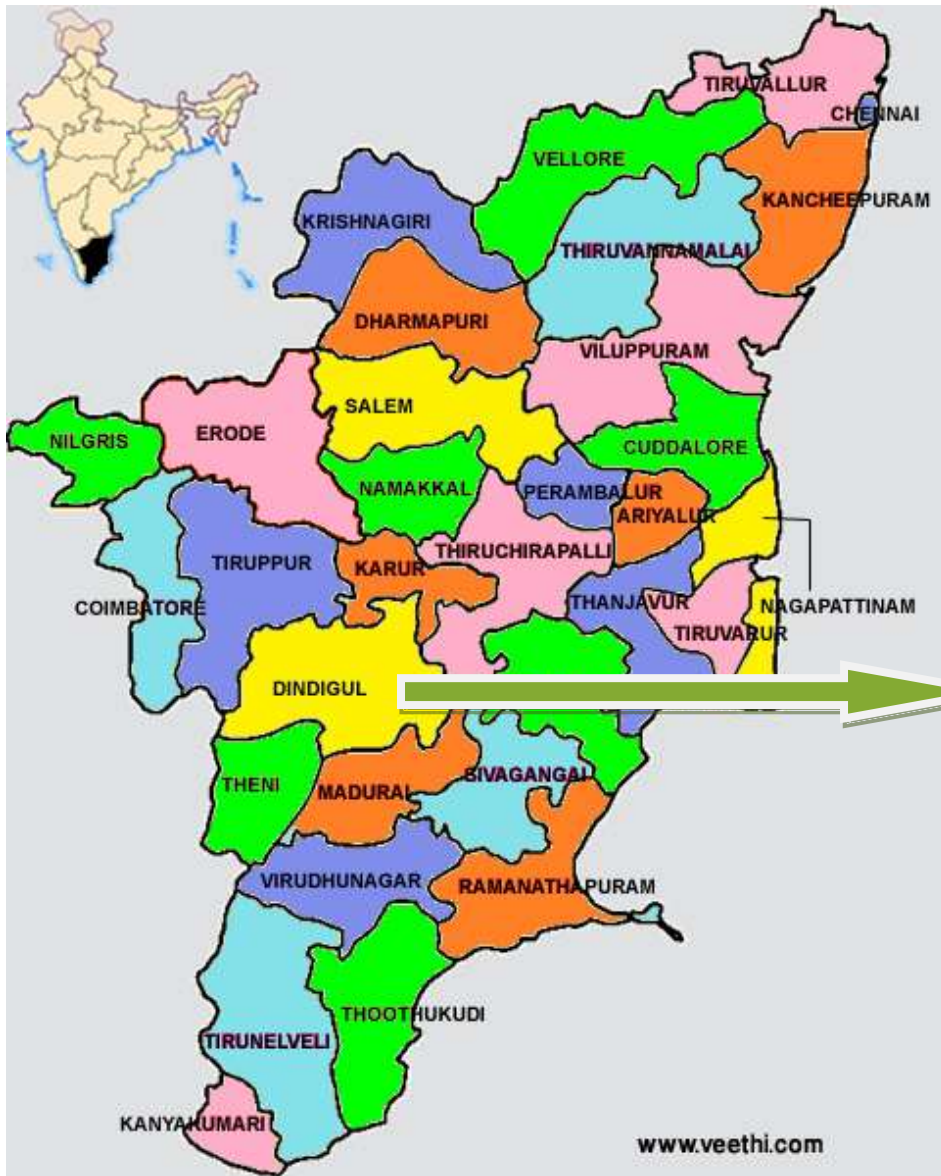
Sanctioned Amount : Rs.37,80,975/-

Utilized Amount : Rs. 37,80,975/-

Project Period : Feb 2016 – July 2021

Location Map :





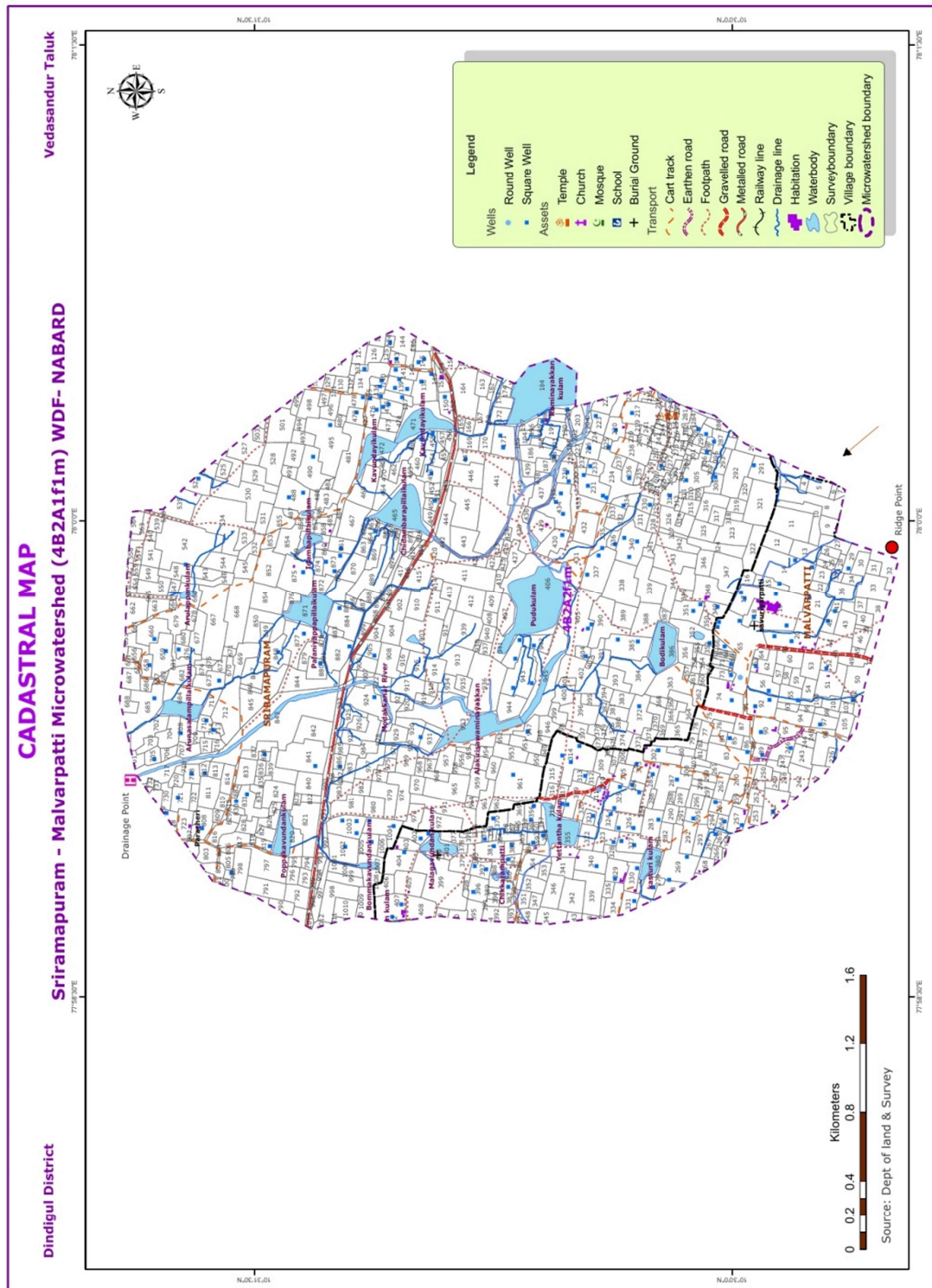
Dindigul District

Dindigul District



Vedasandur Taluk

Sriramapuram - Malvarpatty Watershed Cadastral



PROJECT SUMMERY

Introduction

Watershed development has proved to enhance the water tables in the project area and increases agriculture outputs. It has also brought about many changes within families and the village – politically, socially, and culturally. Watershed management is an adaptive, comprehensive, integrated multi-resource management planning process that seeks to balance healthy ecological, economical and cultural / social conditions, within a watershed. It serves to integrate the planning of land , water and community participation. It has been established that watershed management has (i) recharged ground water table (ii) restored soil fertility and helps in soil conservation (iii) restores water for drinking and other human purpose (iv) helps light climate change and promote sustainable agriculture (v) protected biodiversity of a the project area

Location

Location of the Project area

Sriramapuram watersheds is located in Vedasandur block of vedasandur Taluk in Dindigul District, Tamil Nadu. It is situated between 10°05' and 10°09' north latitude and between 77°30' and 78°20' east longitude. Average maximum temperature of this watershed is 34°C and minimum temperature is 22.5°C. Highest maximum temperature of 34.1°C is recorded in the month of April and the lowest minimum temperature of 17.3°C is recorded in the month of January. Annual average rainfall received in the region is 728.9 mm of which 350.7 mm is received during the Northeast monsoon that contributes to 48.1 % annual average rainfall and during SWM it received 31 % of annual total rainfall.

Total area covered under this watershed is 1195 ha. which supports for a population of 1169 persons as per 2011 census. Literacy level is 54 %. Out of total population cultivators constitute 58 % and the agricultural labourers constitute another 20 %.

Major soil types present are Red sandy soil, red loamy soil and late rite soil. Major crops grown are Maize, millets and other cereals, pulses, groundnut, Gingelly, cotton and onion. Main source of water for crop production is from open wells and bore wells besides rainfall. Livestock population in this area includes, Work animals (2) , Buffaloes (22) , Cows (65), Bullock (17), Sheep (358) and Goat(259),Total - 722

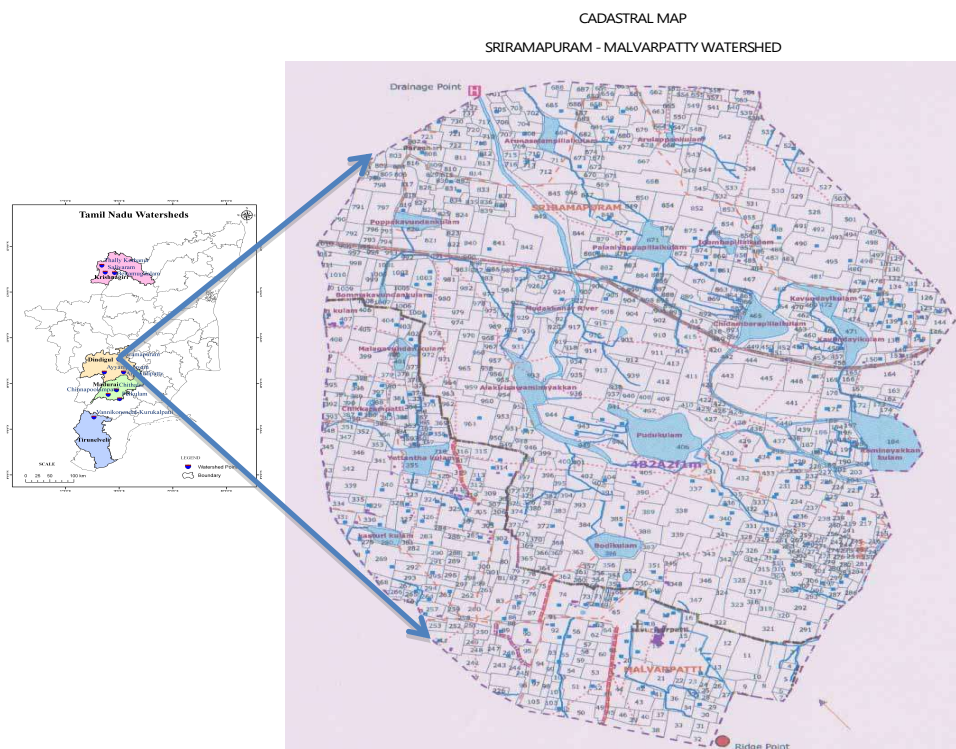


Figure 1. Location of the Project area

Climate related risks in the Case Study Watersheds

It is widely recognized that Climate related risks and their impacts are not just a future threat. Past and current experiences in dealing with climate variability and extreme events irrespective of attribution to climate change hold valuable lessons for reducing vulnerability and enhancing resilience for future climate related adverse impacts. Climate resilient watershed planning requires extensive high quality data and information on climate, and on agriculture, environmental and social systems affected by climate, with a view to carrying out realistic vulnerability assessment and looking towards the near future.

Analysis of historical weather data of the study region in relation to frequency of occurrence of extreme weather events such as drought, excess rainfall, extremes in temperature and wind speed and its impact on agricultural productivity helped in ranking the climate related risks and the results are presented in Table 1.

Table 1. Climate related Risks

Risk event	Consequence	Likelihood probability / frequency of occurrence	Risk	Rank
Droughts	Trees died , Food shortage Reduction in crop yields	Almost every year	High	1
Delayed on set of monsoon	Scarcity of fodder, negative effect in crop yield	Once in 3 – 4 years	High	2
Intermittent dry spell	Reduced crop yields	Frequent – almost every alternate year	Medium	2
Temperature extremes	Increased evapo-transpiration	Once in 5 yaers	Medium	3
Heavy wind	Physical damage to crops	Rare (Last 2 years high wind)	Medium	3
Cold wave	High mortality of animals	Noticed every year in the last 4 years	Medium	4
Flood	Heavy Soil erosion, Houses Broken, Cattles died	Rare	Low	5

Among the risk events, drought ranked first, as the frequency of occurrence is almost every year and impacted crop yield. Among the risk event Delayed on set of monsoon ranked second once in 3 & 4 years high risk, Because of delayed monsoon scarcity of fodder and negative effect in crop yield. Among the risk events intermittent dry spell ranked second because of that the crop yield reduced in every alternate year in medium risk. Because of temperature extremes ranked third in once in 5 years. So, increase evapo-transpiration. Due to heavy wind ranked third so physically the crops damaged. Due to cold wave ranked fourth so the animals mortality high. Among the flood ranked fifth so the heavy soil erosion ,houses broken and cattles are affected

II. Analysis of Current Climate

1. Characterization of current climate

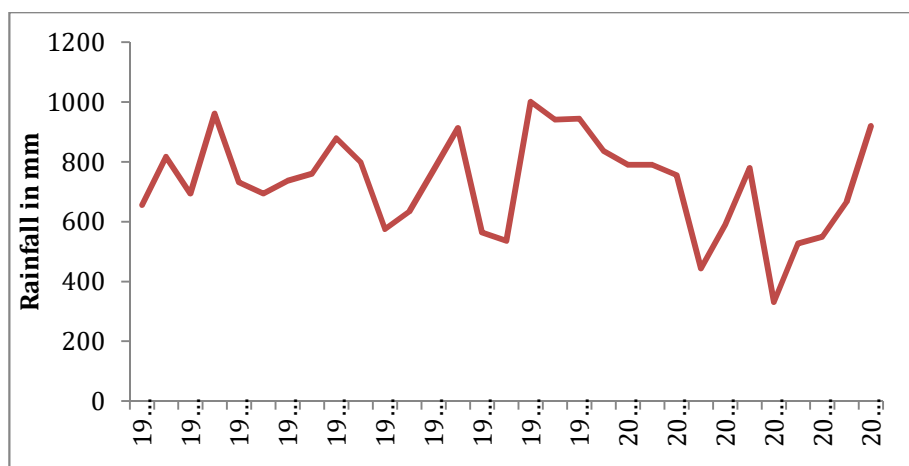
For understanding the current climate, daily rainfall, maximum and minimum temperatures data were obtained from Regional Meteorological Centre, Chennai for the period from 1969-2005. The geographical position of the data point is 10°5' Latitude and 77 ° 5' Longitude.

A. Rainfall

a. Annual rainfall

The study region receives an annual average rainfall of 728.9 mm. Annual rainfall recorded from 1980 – 2011 is presented in the figure 2 that shows high inter annual variability over a period of 32 years. The annual rainfall ranged from 331.4 mm to 1001.5 mm with a standard deviation of 162.5 mm and CV of 22.3 %. This indicates that receiving annual average rainfall of 728.9 mm is certain and in most of the years, annual rainfall oscillated between 566.3 to 891.3 mm (-1 SD to +1 SD). In the recent past, most of the years had lesser than average rainfall.

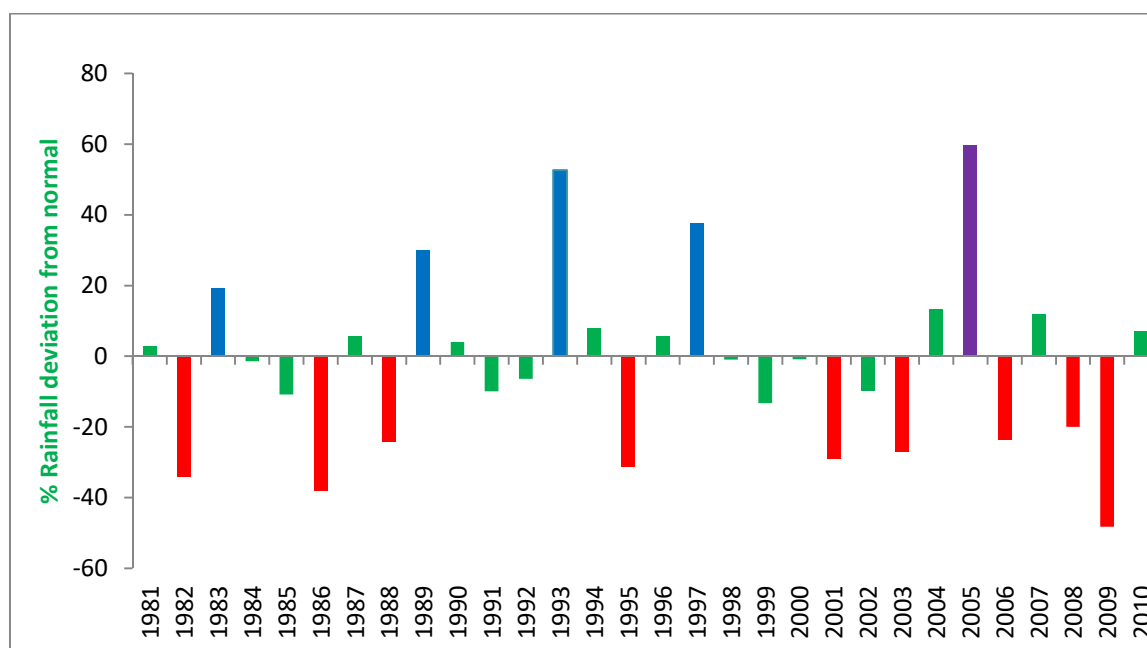
Figure 2. Annual Rainfall (1980 - 2011)



Annual Rainfall deviation from the long period average (LPA) of 728.9 mm is presented in the figure 3. Based on the India Meteorological Department (IMD) classification, if the rainfall received in that particular year is within $\pm 19\%$ of the LPA, that year is called as a normal rainfall year, $<-19\%$ to -59% of the LPA is deficit rainfall year, $<-59\%$ of LPA is grouped under scanty rainfall year. On the other hand, if the rainfall is $>+19\%$ to $+59\%$ of LPA, it is excess rain fall year and $>+59\%$ LPA is termed as wet year.

Out of 32 years of rainfall considered for the analysis, 18 years had normal rainfall, 4 years had excess rainfall, 1 year was wet and 9 years had deficit rainfall (Figure 3). There is no definite periodicity of normal / excess / deficit rainfall years. However, there are raising and falling epochs observed. Drought years are also quite common which would impact not only agriculture but also the water availability in the region (both agriculture and non agriculture including domestic purposes). Worst drought hit in the area during 1982, 1986, 1988, 1995 , 2001, 2003, 2006, 2008 and then again during 2009.

Figure 3. Annual Rainfall deviation from Normal

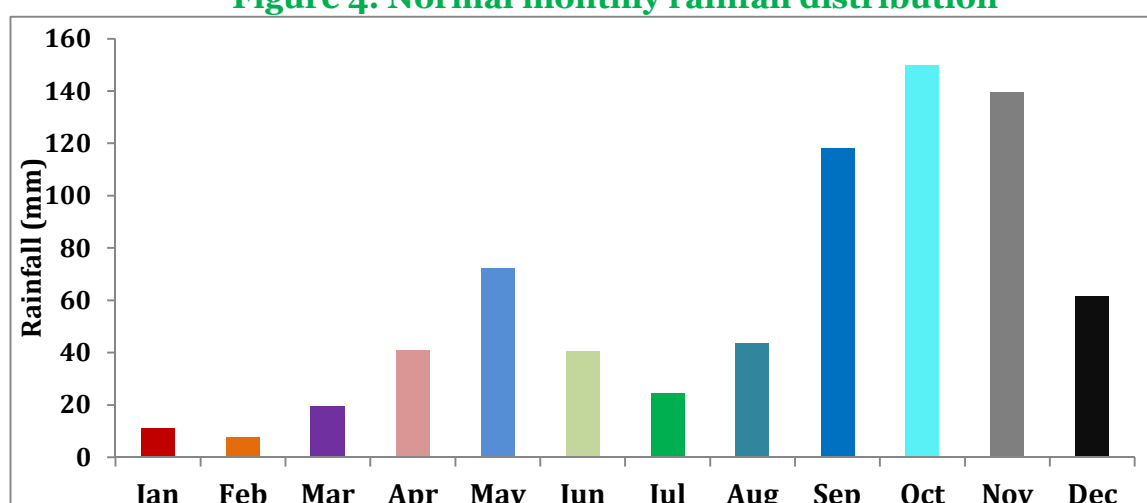


Wet years	Excess Years	Normal years	Deficit years

b. Monthly and Seasonal rainfall

Distribution of mean rainfall during different months of a year is presented in Figure 4. The region receives uni-modal rainfall with its major peak during NEM. There is also considerable amount of rainfall during SWM and pre-monsoon (Summer) seasons. Major rainfed crop season falls between September to December. Peak rainfall is received in the month of October followed by November.

Figure 4. Normal monthly rainfall distribution

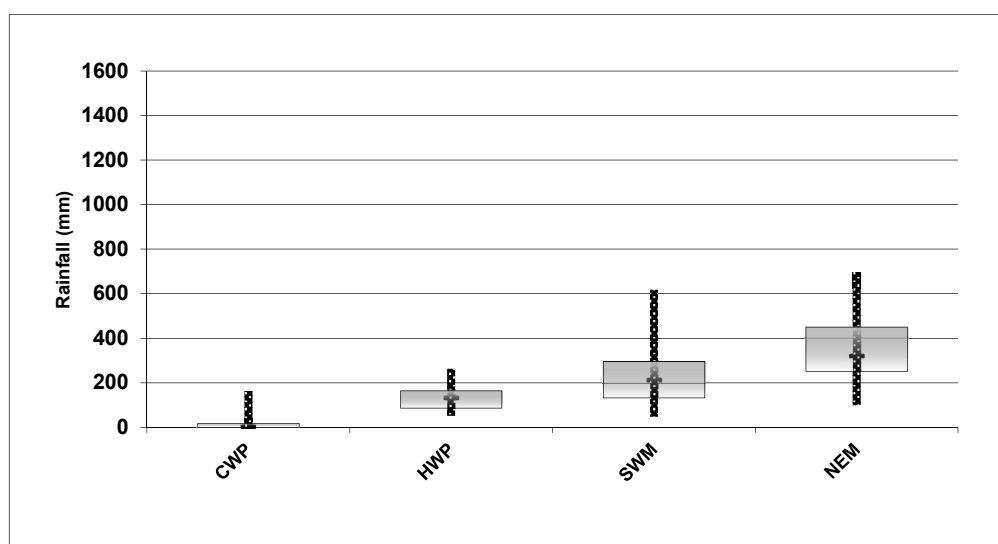


The entire year has been divided into following 4 major seasons:

- i. Cold Weather Period (CWP) / Winter: January – February
- ii. Hot Weather Period (HWP) / Summer: March – May
- iii. South West Monsoon (SWM): June – September
- iv. North East Monsoon (NEM): October – December

The amount of rainfall received in the study region during the above four seasons over a period of 32 years from 1980 – 2011 is presented in Figure 5. Among the four different seasons, maximum amount of rainfall with high dependability is received in NEM season. NEM and SWM seasons have a mean rainfall of 374 and 222 mm respectively. From the above graph, it is clear that even with high probability (80%), the quantum of rainfall expected in NEM season is close to 300 mm which indicates that rainfed cropping with less climatic risk is possible only during NEM in the selected watershed.

Figure 5. Rainfall distribution in different seasons (1969-2005)



c. Rainfall analysis during monsoon season

Rainfall received during the SWM and NEM are presented as a bar chart. To takeout the year to year variability and to study the trend, a five year moving average line was drawn (figure 6). Rainfall deviation from the normal during SWM and NEM is presented in Figure 7. Moving average of SWM and NEM clearly shows the epochs of increasing and decreasing trends are noticed.

Figure 6. Five years moving average of Rainfall in SWM & NEM (1980-2011)

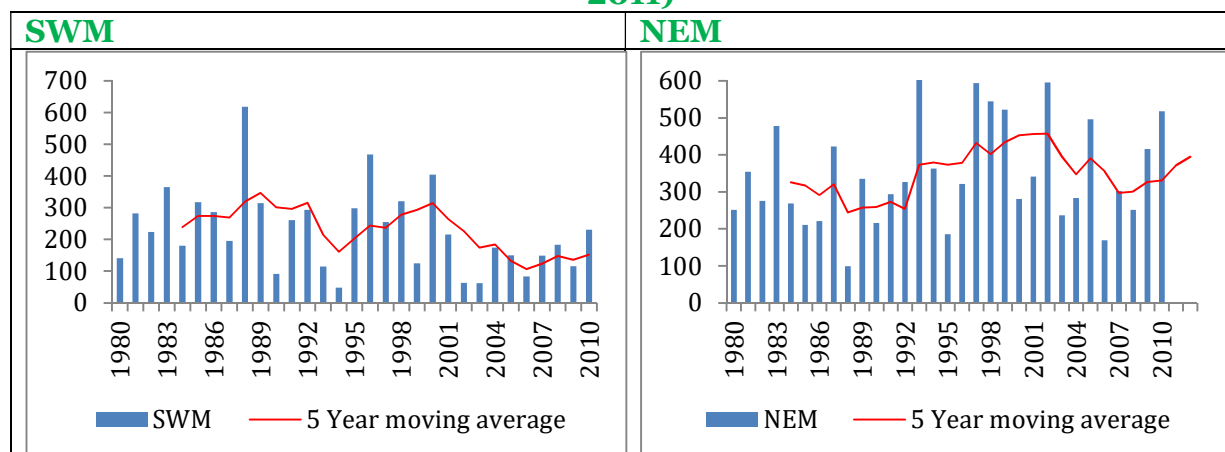
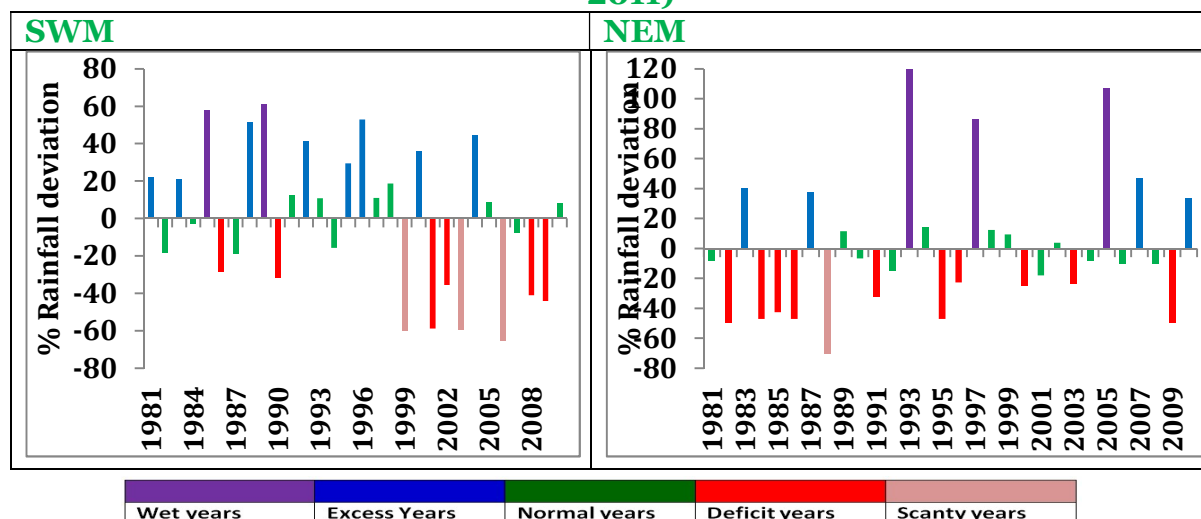


Figure 7. Rainfall Deviation (% from the Normal) in SWM & NEM (1981 – 2011)



Among the 31 years, 22 years received either normal / above normal / excess rainfall during the southwest monsoon. Six years recorded deficit rainfall and 3 years had scanty rainfall. In the absolute terms, only during 10 years, the SWM received more than average rainfall. This indicates that cropping during SWM is highly risky and hence the amount of rainfall received may be properly stored in the soil for utilizing it in the NEM season crop. In contrast, during NEM, among the 31 years, 13 years had normal rainfall and 4 years had excess rainfall with 3 years being wet and 11 years received either deficit (10 years) or scanty rainfall (1 year). From 1981 -1987, the study region experienced heavy drought. Water conservation measures and protective irrigation are essential to ensure good yields during NEM.

Table 2. SWM Rainfall diagnostics of Sriramapuram watershed in Tamil Nadu

Year	Date of Monsoon onset	Date of withdrawal of Monsoon	LGP	Rainfall during SWM	No.of rainy days	Wet spell weeks	Dry spell weeks
1980	1-Jun	30-Sep	122	140.5	10	0	13
1981	1-Jun	17-Sep	109	282.6	14	1	11
1982	8-Jun	22-Sep	107	223.4	9	2	13
1983	7-Jun	18-Sep	104	365.2	20	1	8
1984	1-Jun	28-Sep	120	180.4	21	0	12
1985	1-Jun	28-Sep	120	317	16	1	13
1986	1-Jun	29-Sep	121	286	19	1	14
1987	1-Jun	29-Sep	121	195.4	14	1	16
1988	2-Jun	27-Sep	118	618.4	20	5	9
1989	1-Jun	28-Sep	120	314.8	15	1	11
1990	27-Aug	25-Sep	30	91.5	6	0	2
1991	1-Jun	30-Sep	122	261.3	16	1	12
1992	5-Jun	30-Sep	118	292.8	11	2	13
1993	4-Jun	29-Sep	118	114.4	8	1	15
1994	27-Sep	30-Sep	4	47.7	2	0	0
1995	24-Jun	30-Sep	99	298.8	16	1	10
1996	9-Jun	29-Sep	113	467.7	22	3	11
1997	15-Jun	30-Sep	118	255.2	10	3	13
1998	2-Jun	28-Sep	119	320.3	20	2	11
1999	3-Jun	27-Sep	117	125	11	0	13
2000	3-Jun	30-Sep	120	404.2	25	3	13
2001	3-Jun	25-Sep	115	215.9	10	2	13
2002	9-Jun	21-Sep	105	63	5	0	14
2003	11-Jun	1-Sep	83	61.7	4	0	10
2004	1-Jun	29-Sep	121	174.6	18	1	15
2005	6-Jun	16-Sep	103	150.2	13	1	12
2006	21-Aug	25-Sep	36	82.9	7	0	5
2007	6-Jun	28-Sep	115	148.8	11	1	14
2008	2-Jun	9-Sep	100	183	13	1	13
2009	15-Aug	21-Sep	38	115.7	6	0	4
2010	2-Jun	29-Sep	120	230.0	14	0	14

Table 2. NEM Rainfall diagnostics of Srirampur watershed in Tamil Nadu

Year	Date of Monsoon onset	Date of withdrawal of Monsoon	LGP	Rainfall during NEM	No.of rainy days	Wet spell weeks	Dry spell weeks
1980	1-Oct	18-Dec	80	251.6	19	1	7
1981	1-Oct	22-Dec	83	354.2	25	2	5
1982	2-Oct	13-Dec	73	275.8	14	2	7
1983	11-Oct	26-Dec	77	477.9	25	2	4
1984	1-Oct	2-Dec	63	269	15	1	5
1985	1-Oct	4-Dec	65	210.6	11	1	8
1986	3-Oct	28-Dec	88	221.5	18	0	8
1987	6-Oct	24-Dec	81	423	26	1	2
1988	10-Oct	4-Dec	56	99.1	8	0	5
1989	9-Oct	4-Dec	57	335	18	3	4
1990	18-Oct	5-Dec	49	215.7	18	1	2
1991	1-Oct	23-Dec	84	293.8	19	1	5
1992	3-Oct	20-Dec	80	326.8	24	2	7
1993	5-Oct	23-Dec	81	697.1	35	4	3
1994	3-Oct	20-Dec	80	362.8	20	1	7
1995	3-Oct	12-Nov	42	185.4	14	1	2
1996	8-Oct	18-Dec	72	321.6	24	2	6
1997	8-Oct	20-Dec	74	594.1	36	3	1
1998	8-Oct	13-Dec	67	544.4	21	3	3
1999	1-Oct	24-Dec	85	522.5	28	5	6
2000	3-Oct	29-Dec	89	280.5	11	2	9
2001	11-Oct	23-Dec	75	341.4	23	1	3
2002	6-Oct	11-Dec	67	596	26	4	4
2003	3-Oct	13-Nov	59	236.6	19	0	4
2004	1-Oct	15-Dec	76	283.4	26	1	5
2005	4-Oct	14-Dec	73	496.1	27	2	4
2006	8-Oct	28-Nov	52	169	16	0	4
2007	14-Oct	21-Dec	69	302.1	16	1	5
2008	4-Oct	16-Dec	74	251.1	22	1	6
2009	11-Oct	23-Dec	74	415.7	21	3	5
2010	3-Oct	21-Dec	90	517.6	32	3	4

Table 2. NEM Rainfall diagnostics of Sriramapuram watershed in Tamil Nadu

Year	Date of Monsoon onset	Date of withdrawal of Monsoon	LGP	Rainfall during NEM	No.of rainy days	Wet spell weeks	Dry spell weeks
1980	21-Sep	18-Dec	90	251.6	25	0	5
1981	2-Sep	22-Dec	112	354.2	36	4	5
1982	16-Sep	13-Dec	89	275.8	20	2	6
1983	3-Sep	26-Dec	115	477.9	32	3	6
1984	19-Sep	2-Dec	104	269	24	1	9
1985	2-Sep	4-Dec	94	210.6	20	2	9
1986	1-Sep	28-Dec	119	221.5	27	2	8
1987	14-Sep	24-Dec	102	423	31	2	4
1988	5-Sep	4-Dec	92	99.1	17	1	8
1989	3-Sep	4-Dec	93	335	26	4	6
1990	8-Sep	5-Dec	89	215.7	23	1	5
1991	2-Sep	23-Dec	113	293.8	27	2	9
1992	15-Sep	20-Dec	97	326.8	33	4	6
1993	13-Sep	23-Dec	102	697.1	39	5	5
1994	27-Sep	20-Dec	87	362.8	22	2	7
1995	10-Sep	12-Nov	64	185.4	17	2	5
1996	1-Sep	18-Dec	109	321.6	37	4	8
1997	5-Sep	20-Dec	107	594.1	43	6	4
1998	1-Sep	13-Dec	104	544.4	28	4	8
1999	20-Sep	24-Dec	97	522.5	32	4	5
2000	9-Sep	29-Dec	112	280.5	25	4	8
2001	9-Sep	23-Dec	106	341.4	30	6	7
2002	15-Sep	11-Dec	88	596	29	4	6
2003	1-Sep	13-Nov	91	236.6	20	0	8
2004	3-Sep	15-Dec	104	283.4	39	1	5
2005	2-Sep	14-Dec	104	496.1	32	3	6
2006	3-Sep	28-Nov	101	169	20	0	11
2007	28-Sep	21-Dec	85	302.1	17	1	8
2008	1-Sep	16-Dec	107	251.1	25	1	10
2009	16-Sep	23-Dec	98	415.7	24	2	5
2010	10-Sep	21-Dec	102	517.6	36	4	5

Onset of monsoon: When two or more rainy days consecutively occur after June 1st with minimum of 25 mm of rainfall in the first rain spell was considered as onset of monsoon.

Figure 7. Frequency of SWM onset

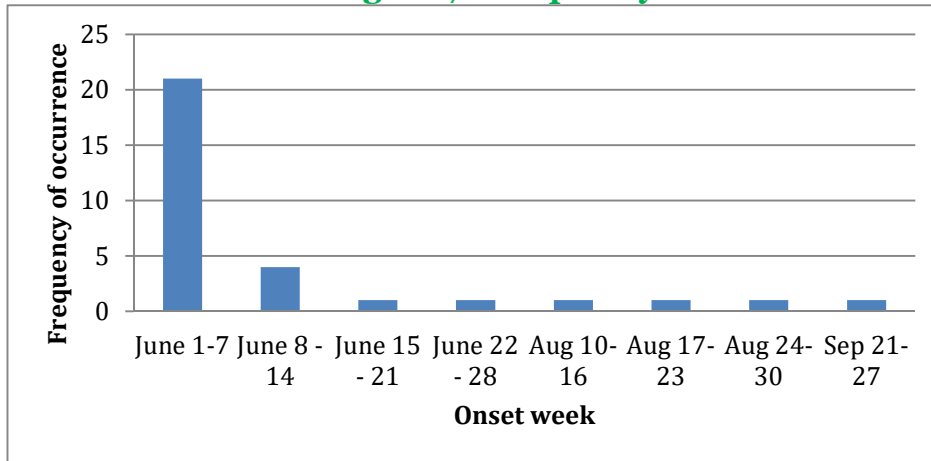


Figure 7. Frequency of NEM onset

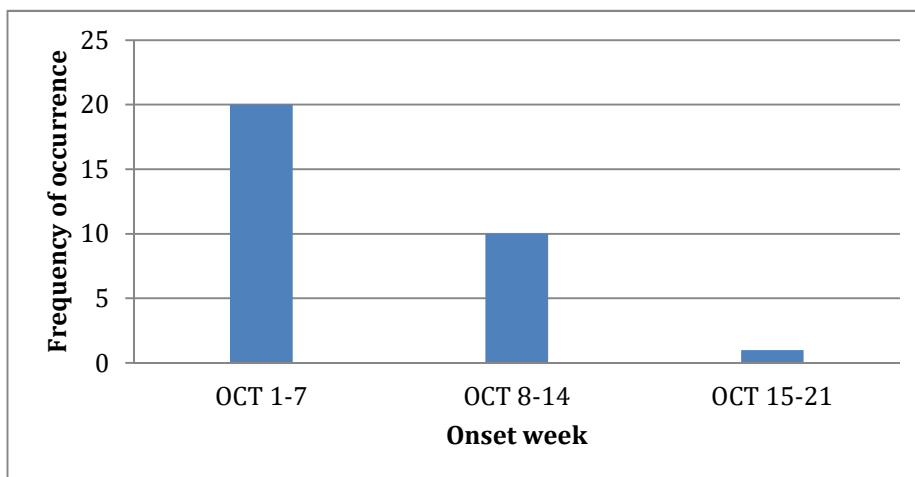


Figure 7. Frequency of NEM onset

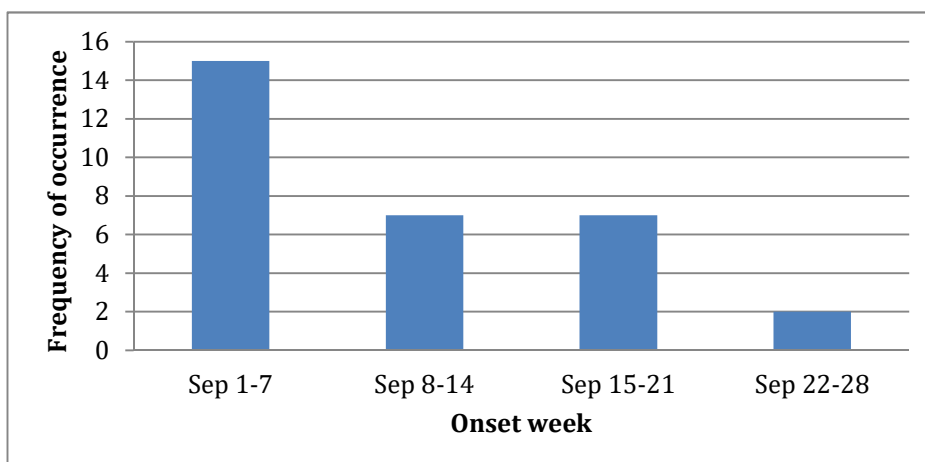


Table 3.SWM Rainfall behaviour based on onset week

Monsoon Onset weeks	Frequency of onset (No.)	Rainfall (mm)	Rainy days (No.)	LGP (days)	LGP (Weeks)	Wet spell (Weeks)	Dry spell (Weeks)	Normal (Weeks)
June 1-7	21	253.4	15.2	116.3	16.6	1.2	12.6	2.8
June 8 – 14	4	253.4	15.2	116.3	16.6	1.25	12	3.4
June 15 – 21	1	255.2	10	118	16.9	3	13	0.9
June 22 – 28	1	298.8	16	99	14.1	1	10	3.1
Aug 10-16	1	115.7	6	38	5.4	0	4	1.4
Aug 17-23	1	82.9	7	36	5.1	0	5	0.1
Aug 24-30	1	91.5	6	30	4.3	0	2	2.3
Sep 21-27	1	47.7	2	4	0.6	0	0	0.6

Out of 30 years, the frequency of onset of SWM was maximum (70 %) during first week of June (June 1-7) followed by June second week (13 % - June 8-14). According to the analysis during 70 per cent of the times the average SWM rainfall is around 253 mm in 15 rainy days with a LGP of 116 days (16.6 weeks). Out of which around 12.6 weeks dry spell could occur resulting in reduced crop productivity depending upon the stage of the crop in which it is exposed to water stress. There is also possibility for wet spell of around 1.2 weeks which may be advantageous to crop growth, however, if it coincides with critical crop growth stage such as flowering then it would affect the productivity. In general, when the onset is delayed beyond 2nd week of June the LGP gets reduced with reduction in number of rainy days.

Table 3.NEM Rainfall behaviour based on onset week

Monsoon Onset weeks	Frequency of onset (No.)	Rainfall (mm)	Rainy days (No.)	LGP (days)	LGP (Weeks)	Wet spell (Weeks)	Dry spell (Weeks)	Normal (Weeks)
OCT 1-7	20	352.7	21.6	75.6	10.8	1.8	5.4	3.7
OCT 8-14	10	360.0	20.8	67.3	9.6	1.8	4	3.8
OCT 15-21	1	215.7	18	49	7	1	2	4

Out of 30 years, the frequency of onset of NEM was maximum (66 %) during first week of October (Oct 1-7) followed by October second week (33 % - Oct 8-14). According to the analysis during 66 per cent of the times the average NEM rainfall is around 352 mm in 21 rainy days with a LGP of 75 days (10.8 weeks). Out of which around 5.4 weeks dry spell could occur resulting in reduced crop productivity depending upon the stage of the crop in which it is exposed to water stress. There is also possibility for wet spell of around 1.8 weeks, which may be advantageous to crop growth, however, if it coincides with critical crop growth stage such as flowering then it would affect the productivity.

Table 3. Rainfall behaviour based on onset week for the 2nd season crop (Sep – January)

Monsoon Onset weeks	Frequency of onset (No.)	Rainfall (mm)	Rainy days (No.)	LGP (days)	LGP (Weeks)	Wet spell (Weeks)	Dry spell (Weeks)	Normal (Weeks)
Sep 1-7	15	325.9	28.6	104.3	14.9	2.5	7.4	5.0
Sep 8-14	7	380.1	28.7	96.7	13.8	3.4	5.6	4.8
Sep 15-21	7	379.6	26.7	94.7	13.5	2.4	6.0	5.1
Sep 22-28	2	332.5	19.5	86.0	12.3	1.5	7.5	3.3

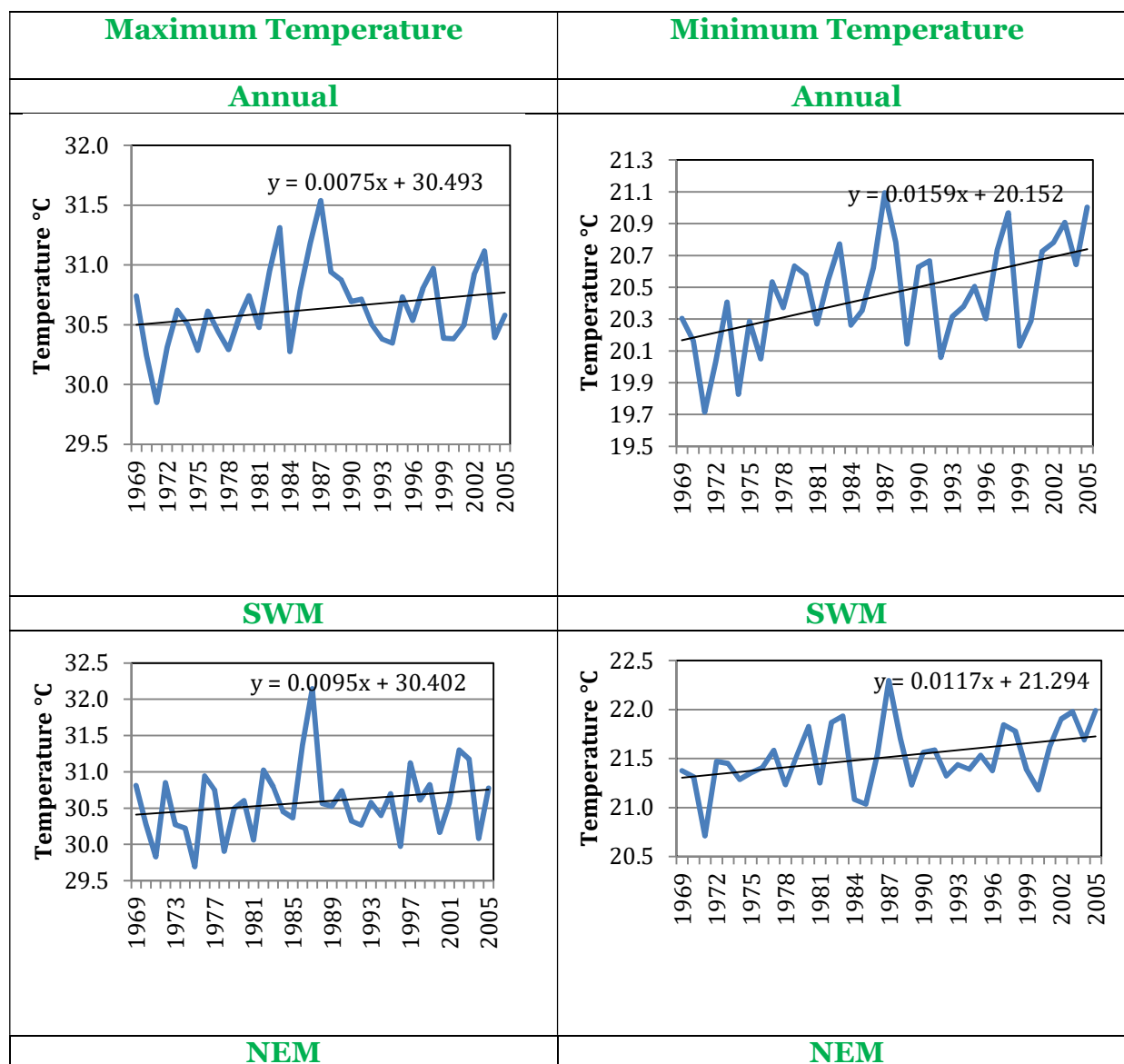
Out of 30 years, the frequency of onset of NEM was maximum (50 %) during first week of September (Sep 1-7) followed by September second and third week (23 % - Sep 8-14; Sep 15-21). According to the analysis during 50 per cent of the times the average NEM rainfall is around 325 mm in 28 rainy days with a LGP of 104 days (15 weeks). Out of which around 7.4 weeks dry spell could occur resulting in reduced crop productivity depending upon the stage of the crop in which it is exposed to water stress. There is also possibility for wet spell of around 2.5 weeks, which may be advantageous to crop growth, however, if it coincides with critical crop growth stage such as flowering then it would affect the productivity.

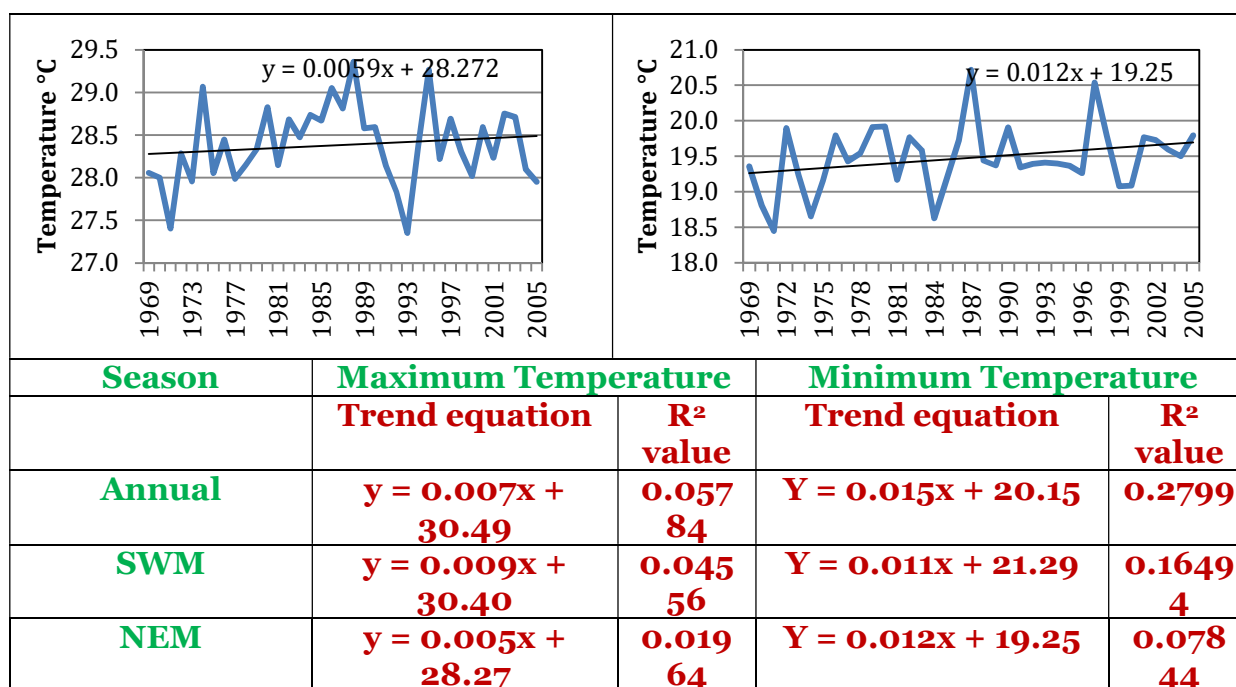
B. Temperature

Temperatures play a major role in determining the growth, productivity and duration of the crop growth. Increase in mean temperature would reduce the crop duration and thereby decrease the time available for the plants to photosynthesis and accumulate the food material into the sink (grain). Increase in daytime temperature will have greater influence on rate of photosynthesis / respiration related gas exchanges. Moreover, it would also increase the crop water requirement by increasing the rate of evapotranspiration. If the day temperatures exceed 32 - 35 °C during the flowering phase, it will have impact on pollination and grain setting. Increase in night time temperature will have larger impact on yield of the crops as the photosynthates accumulated during the day time hours will

be wasted during night hours as a result of increased respiration rate. Production of annual crops will be affected by the increase in mean temperature of 2 – 4 °C expected towards the end of the century. In future warmer climate, time of planting has to be adjusted in such a way that the flowering phase do not coincide with the hot days, to ensure better yields. Mean maximum and minimum temperatures prevailed during SWM and NEM in addition to annual mean temperature in the study region were analyzed for its trend considering 37 years data set and the results are presented in Figure 8.

Figure 8. Trend Line for Maximum & minimum Temperature





Trend analysis results clearly state that minimum temperatures are increasing at a faster rate compared to maximum temperature. Mean maximum/minimum temperatures recorded during annual, SWM and NEM are 30.49/20.15, 30.40/21.29 and 28.27/19.25°C respectively. Increase in maximum temperature is more during SWM period and the observed rate of increase is 0.9 °C over a period of 100 years while it was only 0.5 °C during NEM. In the case of minimum temperature, the rate of increase in NEM is observed to be higher (1.2 °C) compared to SWM season (1.1 °C) during the past century. As the major crop growing season is falling in NEM, if the trend of higher rate of increase in night time temperature continues, it would definitely decline the productivity of many annual crops.

Table 4. Extreme events (Droughts, floods, cyclones, storms and other)

Year	Event	Implication on Livelihood	Implications on Social Life
1960-65, 1980	Heavy rain	Crops and trees affected	Houses affected
1974-75	Famine	Crops affected, Foods shortage	Migration
1977, 2004	Flood	Crops affected	Sale of domestic animals, Migration
2011, 2012, 2013	Drought	Food shortage	Sale of domestic animals, Migration
2014	Heavy wind	Trees damaged	

III. Future Climate projections

Development of Future climate Projections: The future climate change scenario was developed using Regional Climate Models (RCM) viz., PRECIS which was developed by Hadley centre, UK met office that can be used over any part of the globe. Special Report on Emission Scenario (SRES)- A1B scenario was selected which is likely to happen in Indian sub continent. From the large number of generated output from the models, only maximum temperature, minimum temperature and rainfall were retrieved. Models were run for 129 years from 1971 to 2099. Decadal means of maximum and minimum temperatures were generated to understand the variation more clearly. Decadal mean for the maximum and minimum temperatures along with its deviation from the base line data (Referred as year 2010) along with expected change in rainfall is presented in

Table 5. Expected decadal variations in Temperature, Rainfall and CO₂

Timeline	Expected Maximum Temp	Deviation	Expected minimum Temp	Deviation	Expected changes in Rainfall	Expected CO ₂ level
2010	34.0	0	22.5	0	0	370
2020	34.48	0.48	23.02	0.52	1.3	385
2030	34.57	0.57	23.19	0.69	3.5	420
2040	34.74	0.74	23.58	1.08	5.1	470
2050	34.99	0.99	24.11	1.61	5.3	500
2060	35.45	1.45	24.58	2.08	7.9	520
2070	35.87	1.87	25.05	2.55	8.0	535
2080	36.25	2.25	25.46	2.96	8.5	550
2090	36.87	2.87	26.1	3.60	10.8	565
2100	37.69	3.69	26.65	4.15	11.6	588

The results of the projected climate change over the study region for A1B scenario using PRECIS regional climate models showed a gradual increasing trend for maximum and minimum temperatures. The increase of maximum and minimum temperatures were 3.6°C and 4.06°C respectively towards the end of the century. As far as rainfall is concerned, the predictions indicate a slight decline (-5%) in near future (2020). During 2030, the rainfall predictions indicate no change from the current condition. Thereafter, rainfall is expected to increase gradually and towards the end of the century, 15 % increase in rainfall is expected.

Survey results

Assets and Action

Sl.No	Livelihood - Assets	Risk	Actions	Actors
1	Agriculture	Water scarcity Crop failure	Irrigation facilities, well digging, bore well,	Self, project and panchayat, Farmes club
			Field Bunding, check dam, Insurance, Compensation	Project, Farmers, Panchayat , Government
2	Cattle rearing	Diseases (Sore mouth, Diarrhea, water discharge from eyes,	Vaccination, Take care, Treatment, poundage	Self, Veterinary Hospital
3	Temperature rise	Crop failure	Planting trees	NABARD
4	Wind	Soil erosion	Tree planting	Department of Horticulture
4	Fodder	Shortage of fodder	Sale of cattle, using natural resources, soil and water conservation	Self
5	Labour	Low wages ,money not given in time, lack of labour work	Migration, enhance the working days, generate new employment scheme, increase wages.	Panchayat, Government
		Viral fever, Malaria, Dengu, Chikengunia	Primary health centre	

Seasonal Calendar

S.No	Climate Change	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Rainy Season		*		*	*	*	**	**	***	***	***	
2	Non Rainy Season	*		***									***
3	Floods										***	**	
4	Winter Season	***	**										***
5	Land Erosion												
6	Cattle and Crop Disease			***	**						**	**	**
7	Food Shortage									**	**		
8	Water Scarcity				**	***	***						
9	Human Diseases				***	***							
10	Wind				***			** *	*				

Livelihood Calendar

S. No	Crops	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	White Sorghum		SO	W		H/M							
2	Maize	H/M								SO	W	P	
3	Groundnut	W	W	H	M			SO	W				SO
4	Paddy	H								SO	W	W	
5	Pearl Millet				SO	W		H/M					
6	SunFlower		SO	W	H/M								
7	Fire woods	C	C	C	C	C	C	C	C	C	C	C	
8	Horticulture Trees					M				Pl	Pl		
9	Milk Production	Mx									Mx	Mx	Mx
10	Onion					SO	W	W	H/M	SO	SO	W	H/M

Hazard Mapping developed with the community

Effects	Years	Impacts;
Heavy rain	1960 -65, 1980	Crops, houses affected and trees also
Drought	2011,2012,2013	Food shortage
Famine	1974,1975	Migrated to towns for employment
Floods	1977,2004	Migrated to towns for employment , sold cattle, (Lesser milk production)
Heavy Wind	2014	Trees damaged

Geological features

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The geomorphologic feature indicates that the area is situated in hard rock terrain that has clear ridge line. The area can be classified into three Categories, the top catchment is covered by patches of garden land with red soil area, secondly the tank and Aayacut region and thirdly the rainfed cultivation area. Water harvesting structures are the traditional tanks which are from the irrigation infrastructure for the ayacut regions under each tank and also received irrigation from PWD channel at Vaigai dam on heavy rainy season. There are 4 such tanks and 7 ponds in the project area. The tanks were established in such a way that the excess water from the top portion of the tank is let out through the spill way and made to reach the next adjoining tank at the lower gradient, which lie in the chain of tank systems.

The catchment area for the tanks are the dryland tracts on the upper portion and 60% of which is of fallow land. There are few garden lands with prosopis fencing and with thorny bushes. Common trees are agro forestry and horticulture plants. The top soil thickness varies from 0.5m to 1.2m with is followed by a thin layer of pebble and gravel. The ayacut region hold the irrigation fields and that forms the wetland tracts. Single crop of paddy is being cultivated in all the ayacut regions, when there is very good rainfall in the area. The top catchment area is almost flat where garden lands are existing which forms merely about 247.815 hectares of land. In ayacut region, paddy is being cultivated during rainy season which is about 140.80 hectares in all. The only source of irrigation is through tanks and also PWD channel during the heavy rainy season. Rainfed cropped area is about 404.40 hectares.

Climate change related

In the cropping season of July to November an increase in temperature of 2.7°C and during the cropping season of April to June 4.1°C has increased over the last 12 years. Moisture content of two major cropping seasons has decreased to 5.83% and 6.33%. During the SW Monsoon season an average rainfall of 240 mm is received and for the NE Monsoon season 415 mm is received. Summer season 170mm is received.

Climate change is universal and has programmatic and policy implications. It imbalances the livelihoods of communities and consequently increases their vulnerability. Men and women viewed the impact of climate change differently. While men are mostly talking about economic security, women are more bothered about food security as its consequence. Before the project, the

community was not much aware about sustainable strategies. The communities have very little scientific information about the causes of climate change. Communities were more aware of seasonal changes but not able to connect it to climate change. The livelihoods of rural poor are affected by such climate changes. Livelihoods are understood as ways and means of making a living. It comprises of capabilities, assets (both material and social resources) and activities as means of living. Livelihood constitutes all productive tasks. Livelihoods essentially revolve around resources such as land, crops, seed, labour, knowledge, cattle, money, social relationships etc. Livelihoods are also about creating and embracing new opportunities.

Climate Change has impacted natural and human systems and has altered the productivity, diversity and functions of many ecosystems and livelihoods in the project area. For poor, natural resource dependent communities, Climate Change had compound existing vulnerabilities. As the availability and quality of natural resources declined, so does the security of their livelihoods. With Climate Change impacts already being observed, there was an urgent need for adaptive response measures. The impacts of climate variability and Climate Change was addressed by interacting with and understanding the community's view points.

Risk events	Consequence	Livelihood	Risk	Rank
Drought	-Reduction in yield -Drinking water scarcity -Fodder shortage -Migration	Two out of 5 years affected	High	1
Delay in monsoon	-Scarcity of water -Yield reduction	Frequent	High	2
Excess rainfall	-Soil erosion -Reduction in yield -Disease attack on both people and animal	Rare	Medium	3
Extreme temperature	Increased evapo transpiration	Rare	Frequent	4
Storming	Physical damage to crop and houses	Rare	Rare	5
Cold Weather	Reduction in yield	Rare	Rare	6

Project Strategy undertaken

Strategies for sustaining agriculture to adapt climatic change

Adaptation to climatic change involves taking actions aimed at reducing the extent of global warming. This is in contrast to adaptation to global warming which involves taking action to minimize the effects of global warming. CIRHEP, based on its interventions with the communities in the Srirampuram-Malvarpatty watershed through

- Interactions

- Group discussions
- Village meetings
- Participatory Rural Appraisal
- Net planning
- Crop Survey
- Questionnaires for Climate change

Village Meeting



Seasonal Calendar



Hazard time line , Mapping & Assets and Actors



Hazard time line , Mapping & Assets and Actors



Crop Survey



Well Inventory



Questionnaires for Climate change with stake holders



Net planning



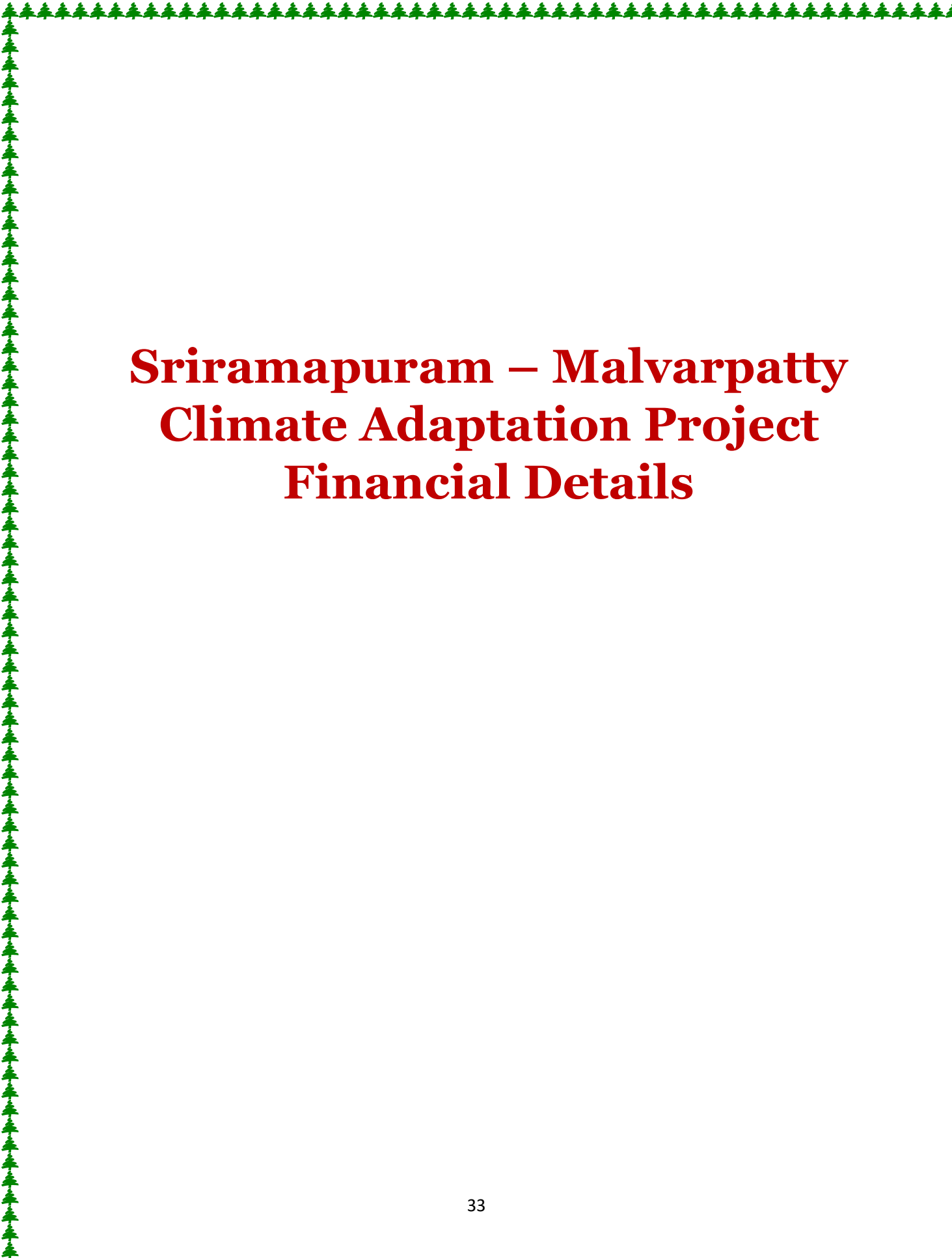
Monitoring System

- **Monthly and quarterly review meetings were conducted**
- **Monthly and quarterly reviews by NABARD and Adaptation Fund Board**
- **Minutes of the meeting and reporting were maintained**
- **Periodical monitoring system was followed by NABARD and PFA – AGM meeting and auditing was conducted**

Sriramapuram – Malvarpatty Village Watershed Committee members

S.n	Name of the Watershed committee members	Address	Occupation	Gender
1.	K.Karuppiah	S/o kanthasamy, Sriramapuram Post, Eriyodu via, Vedasandur Taluk, Dindigul.	Coolie	Male
2.	Chandra	S/o Alagar, D.no: 11-2-6, E.B.Colony 1st Street, Nilakottai, Dindigul.	Secretary representative of CIRHEP	Female
3.	Gandhimathi	Malvarpatty Sriramapuram Post, Vedasandur taluk, Dindigul	Farmer	Female
4.	Muthu lakshmi	Sriramapuram, Sriramapuram Post, Vedasandur Taluk, Dindigul	Coolie	Female
5.	Murugeaswari	Sriramapuram, Sriramapuram Post, Vedasandur Taluk, Dindigul	Coolie	Female
6.		S/o Savarimuthu, Mariamangalapuram		

	S.Jesu raj	, Sriramapuram, Vedasandur taluk, Dindigul District.	Coolie	Male
7	Dhomnic	Sriramapuram, Savariyarpatty, Vedasandur taluk, Dindigul District.	Farmer	Male
8	T.Mayilvaganam	S/o Duraisamy, Mandapampudur, Eriyodu via, Vedasandur taluk, Dindigul	Farmer	Male
9	M.Kannaiya	S/o Muthu servai, Othaiyur, Eriyodu via, Vedasandur Taluk, Dindigul District.	Farmer	Male



Sriramapuram – Malvarpatty Climate Adaptation Project Financial Details

Fund utilization

NABARD – Climate change Adaptation Projects (Adaptation Fund)

Financial Utilization in the project

Reporting Period : JULY – 2021

Location of the Project : Vendasandur Block, Dindigul District

Name of Project : Sriramapuram _ Malvarpatty Watershed AFB - Climate proofing Project

PFA : Centre for Improved Rural Health and Environmental Protection – CIRHEP

Amount Received from NABARD	Activities Cost		Management Cost		Total Received
	Date	Amount	Date	Amount	
1 st Instalment	08.10.2016	775750	08.10.2016	81600	857350
2nd Instalment	06.03.2018	434821	06.03.2018	33304	468130
3rd Instalment	02.11.2018	707304	02.11.2018	48596	755900
4th Instalment	09.06.2020	929000	09.06.2020	57600	986600
5 th Instalment	04.02.2021	611900	04.02.2021	101095	712995
Total Amount		3458775		322200	3780975

Climate Proofing AFB Project Physical and Financial Achievements

	Sanctioned			Completed		
Name of component and activity	Unit	Unit Cost	Total amount	Unit	Amount	% of Completed
Area Treatment						
Well Recharge Pit	104	4500	468000	104	468000	100
Summer ploughing	397	1750	694750	397	694750	100
Deep Tillage	115	175	20125	115	20125	100
Afforestation and pasture Land Development						
Azolla	20	1500	30000	20	30000	100
Fodder Development	142	4200	596400	142	596400	100
Korangad Development	7	2500	17500	7	17500	100
Other Climate Resilient Farming/ Livelihood support						
Integrated Farming System	7	28500	199500	7	199500	100
Kitchen Garden	20	1500	30000	20	30000	100
Vermi compost	20	3000	60000	20	60000	100
Drip Irrigation	5	18000	90000	5	90000	100
Micro Sprinkler	7	40000	280000	7	280000	100
Tank silt application	11	7500	82500	11	82500	100
Minor Millets	110	500	55000	110	55000	100
Energy efficient System						
Bio Gas	5	22000	110000	5	110000	100
Risk Mitigation						100
RML Subscription			150000		150000	100
Instrumentation, e.g. Runoff Measurement			80000		80000	100

Gio Hydrological Study			150000		150000	100
Knowledge Management						
Posters and Pamphlets on climate Adaptation			25000		25000	100
Educational Kit- Manual of climate change adaptation			100000		100000	100
Awareness and mobilization/ Capacity Building			50000		50000	100
Audio- visual tools- Short films			70000		70000	100
Exposure Visit, Peer Learning			100000		100000	100
Project Execution cost						
Field Coordinators			252000		252000	100
Travel (Local and for facilitation) for 3 years			43200		43200	100
Reporting and Data for 3years per year			3600		3600	100
Half Yearly Watershed level meeting			23400		23400	100
Total Amount in Rs			3780975		3780975	100

Programme wise Benefited Families

Climate Proofing AFB Project

S.NO	Programme Area	Benefited Families	S.C Families	Women Headed Families
1	Improved in the Soil and Water	214	22	13
2	Afforestation and Pasture Land Development	118	8	6
3	Other Climate Rsilient Farming	339	63	16
4	Risk mitigation	150	17	21
	TOTAL	821	110	56