6. INTER RELATIONSHIPS BETWEEN RAINFALL, SURFACE & GROUNDWATER POTENTIAL

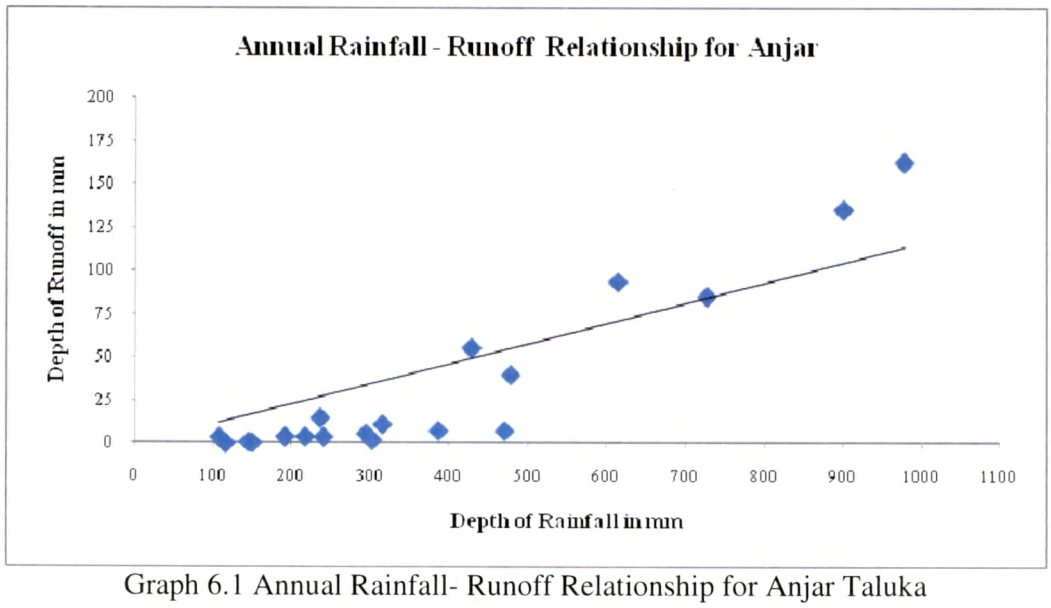
The relationship between rainfall and runoff has been worked out for annual as well as monthly values for all the talukas. The relationship between rainfall and groundwater recharge has been worked out for annual values for all the talukas.

6.1 RAINFALL-RUNOFF RELATIONS

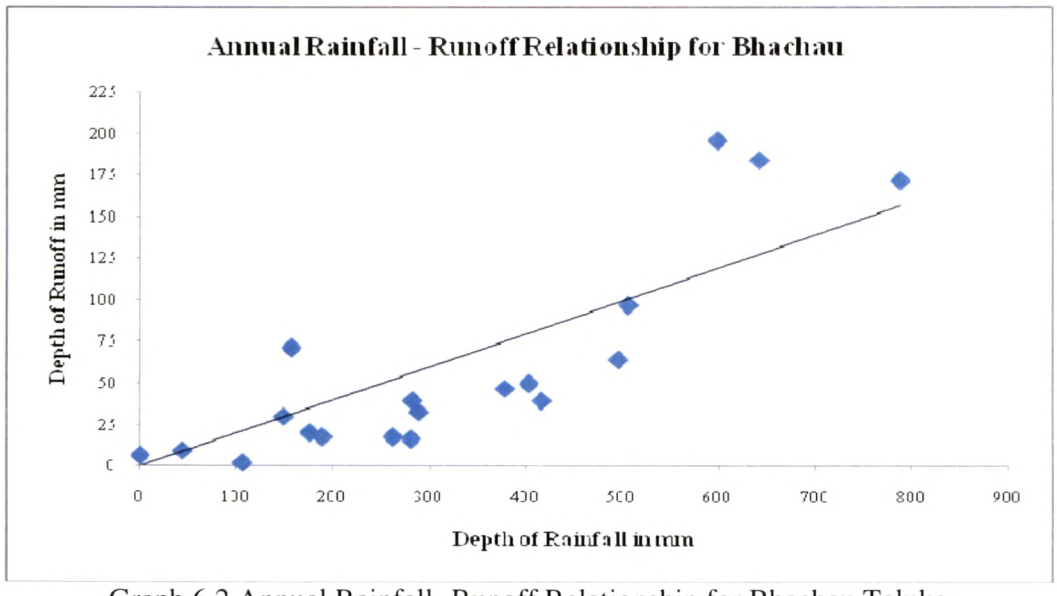
The relationship for rainfall and runoff for annual values as well as the monthly values was found out using regression analysis with the help of software Statistica. Scatter plots have been prepared with the help of software Microsoft Excel. The results obtained by use of Statistica have been tabulated in Table 6.1.

6.1.1 Annual Relations between Rainfall and Runoff

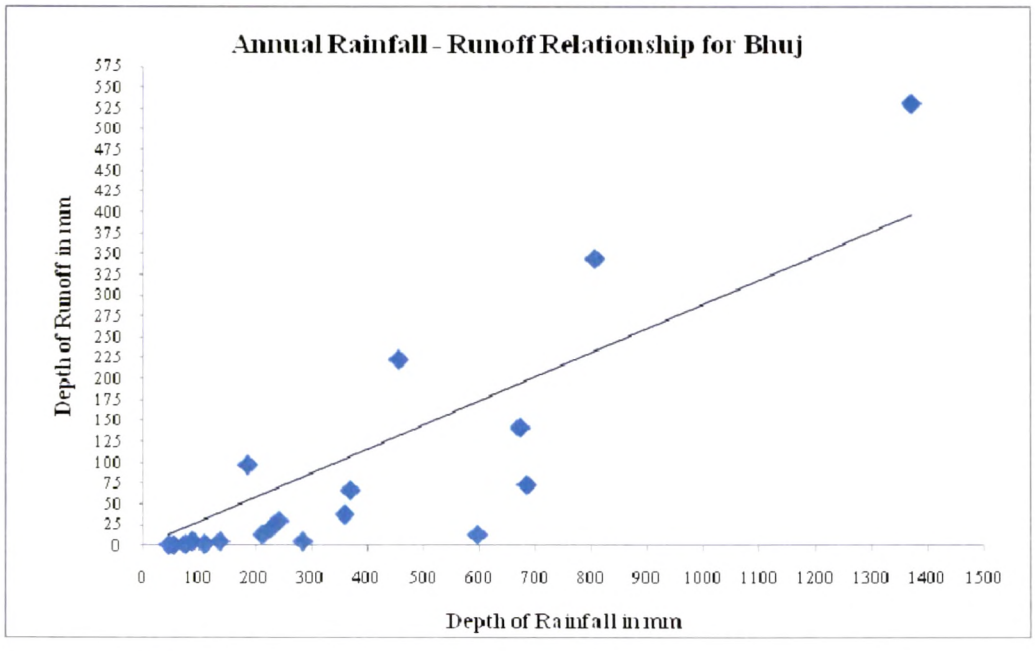
Graphs 6.1 to 6.9 show the scatter plots for the annual values of rainfall and runoff for all the talukas.



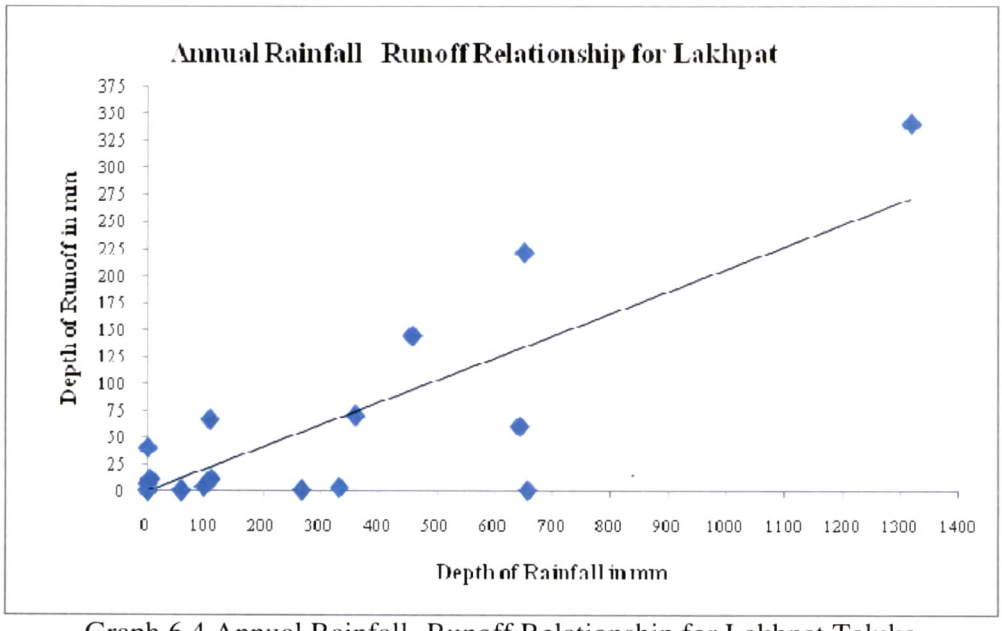
Graph 6.1 Annual Rainfall- Runoff Relationship for Anjar Taluka



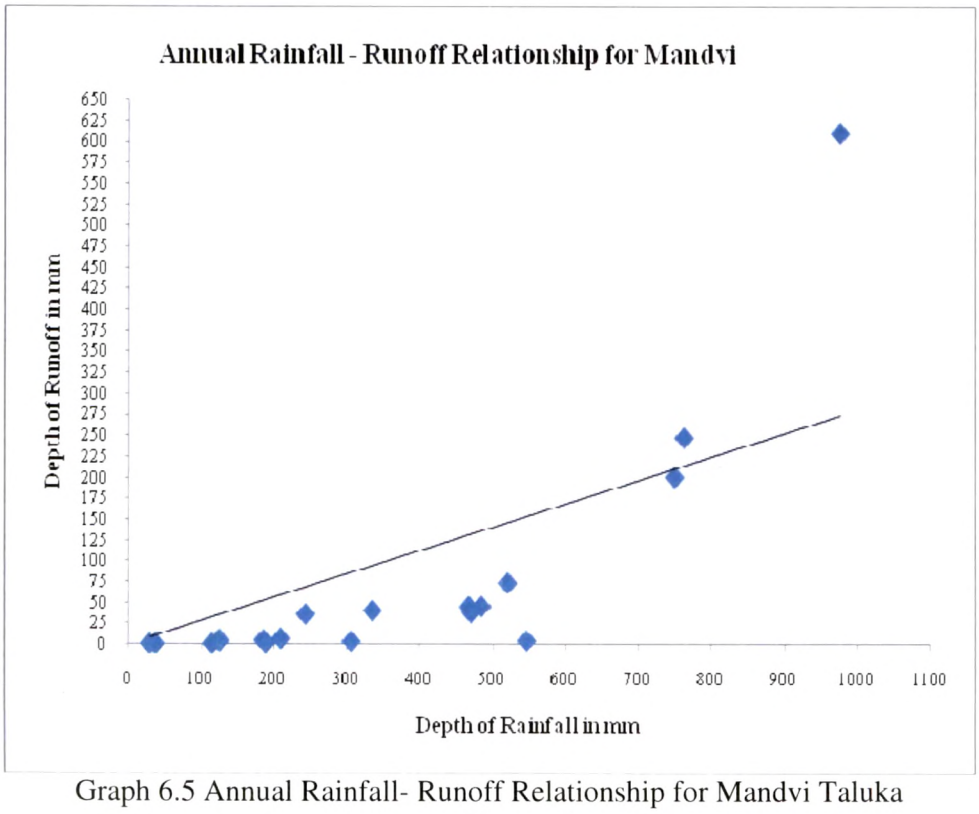
Graph 6.2 Annual Rainfall- Runoff Relationship for Bhachau Taluka



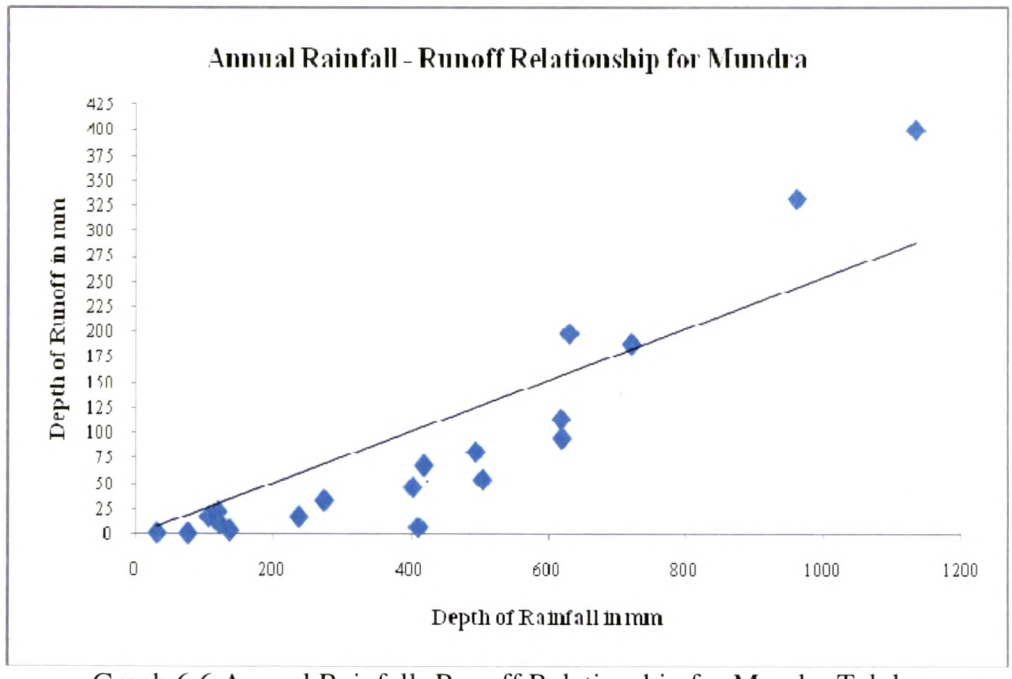
Graph 6.3 Annual Rainfall- Runoff Relationship for Bhuj Taluka



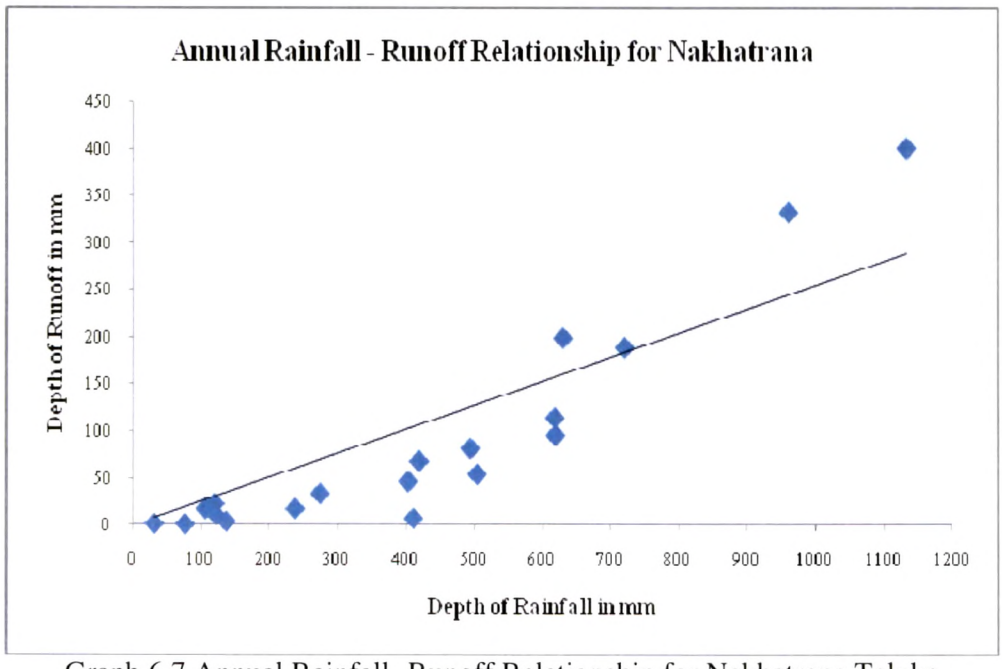
Graph 6.4 Annual Rainfall- Runoff Relationship for Lakhpat Taluka



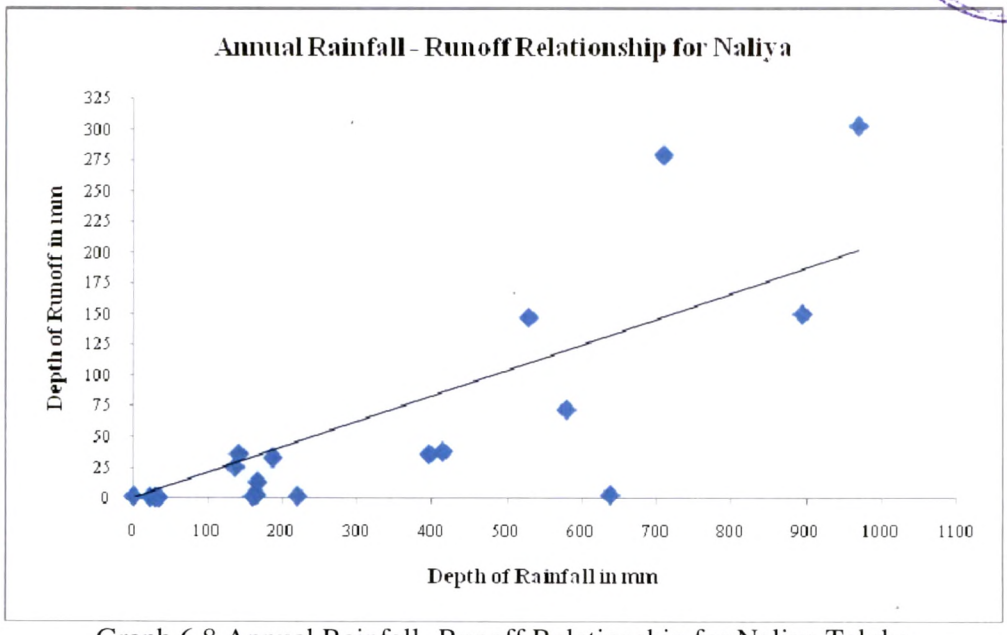
Graph 6.5 Annual Rainfall- Runoff Relationship for Mandvi Taluka



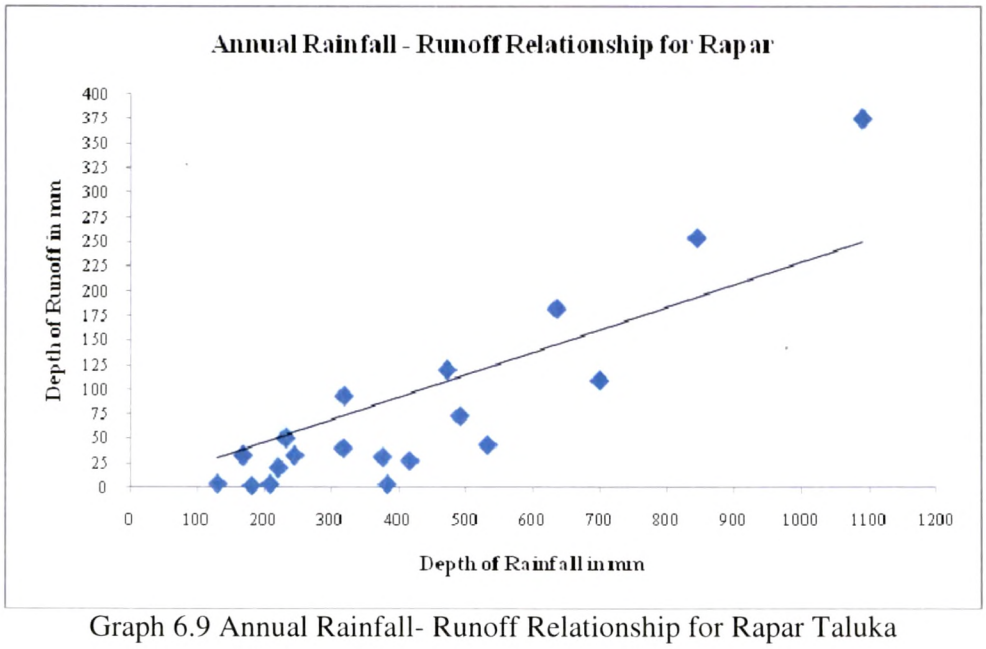
Graph 6.6 Annual Rainfall- Runoff Relationship for Mundra Taluka



Graph 6.7 Annual Rainfall- Runoff Relationship for Nakhatrana Taluka



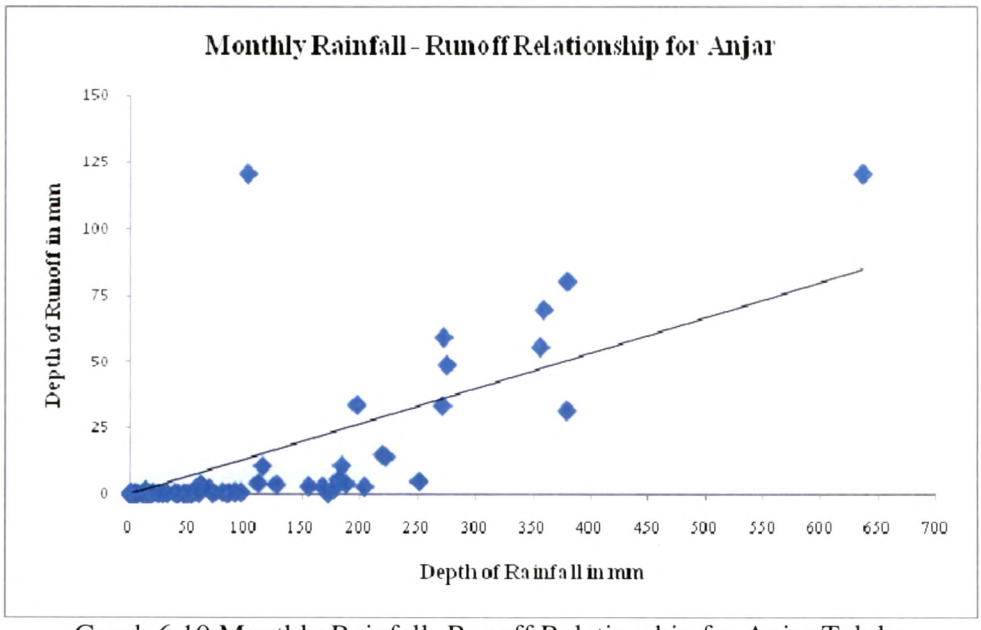
Graph 6.8 Annual Rainfall- Runoff Relationship for Naliya Taluka



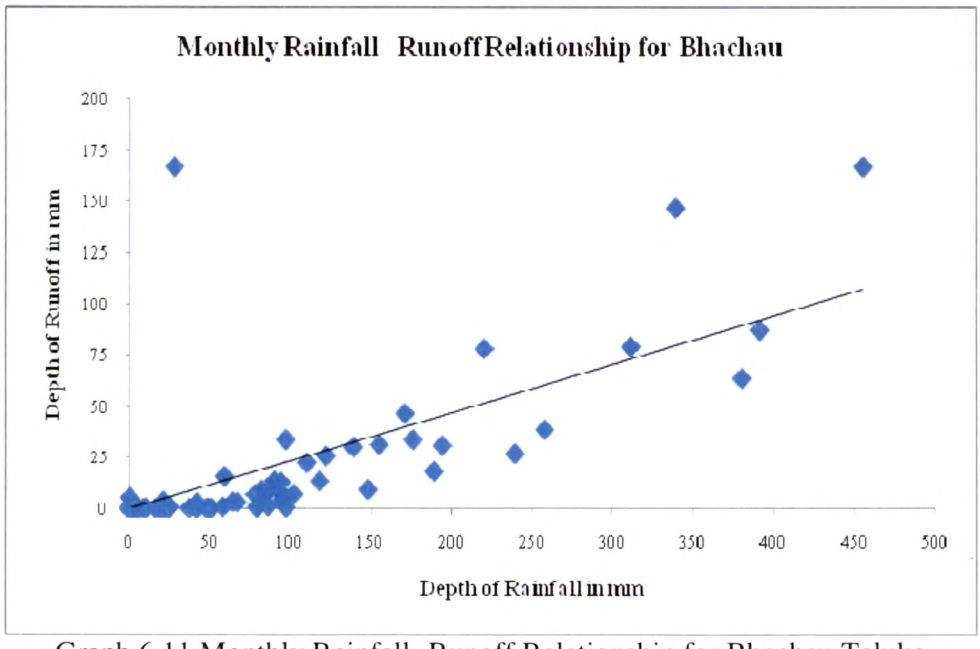
Graph 6.9 Annual Rainfall- Runoff Relationship for Rapar Taluka

6.1.2 Monthly Relations between Rainfall and Runoff

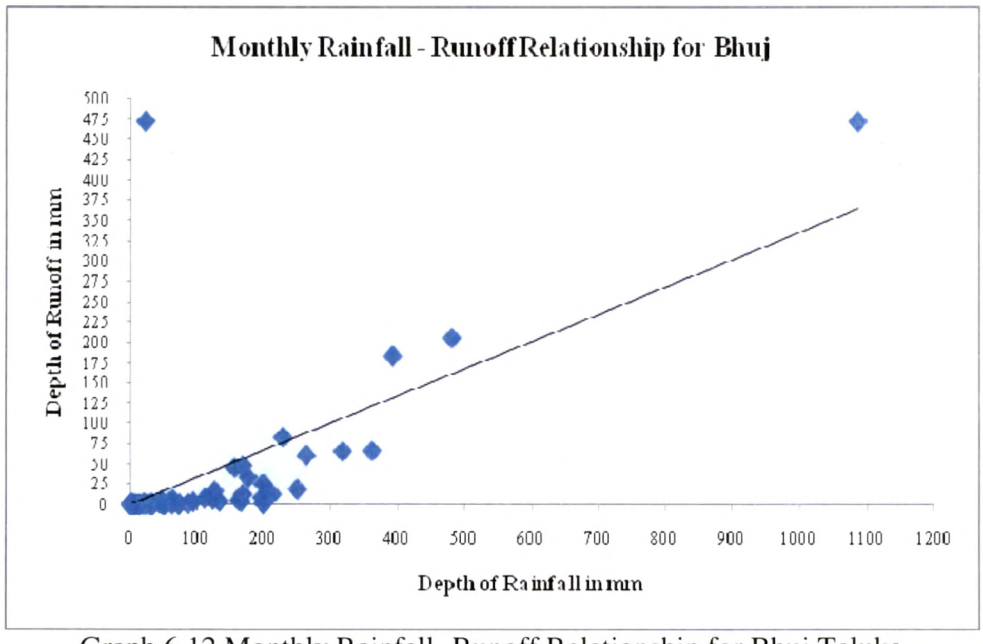
Graphs 6.10 to 6.18 show the scatter plots for the monthly values of depth of rainfall and depth of runoff for all the talukas.



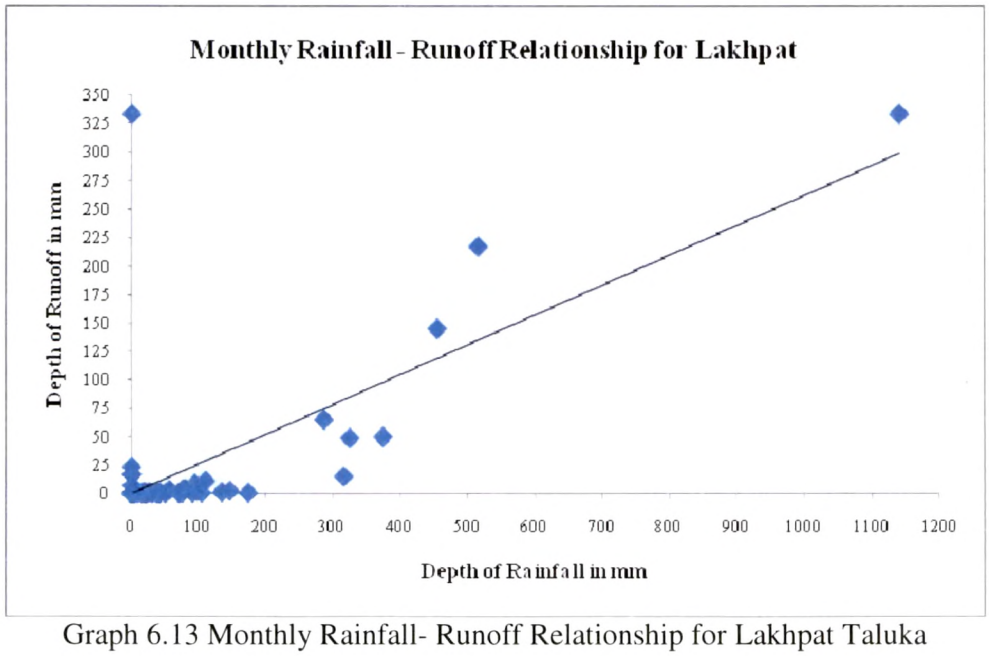
Graph 6.10 Monthly Rainfall- Runoff Relationship for Anjar Taluka



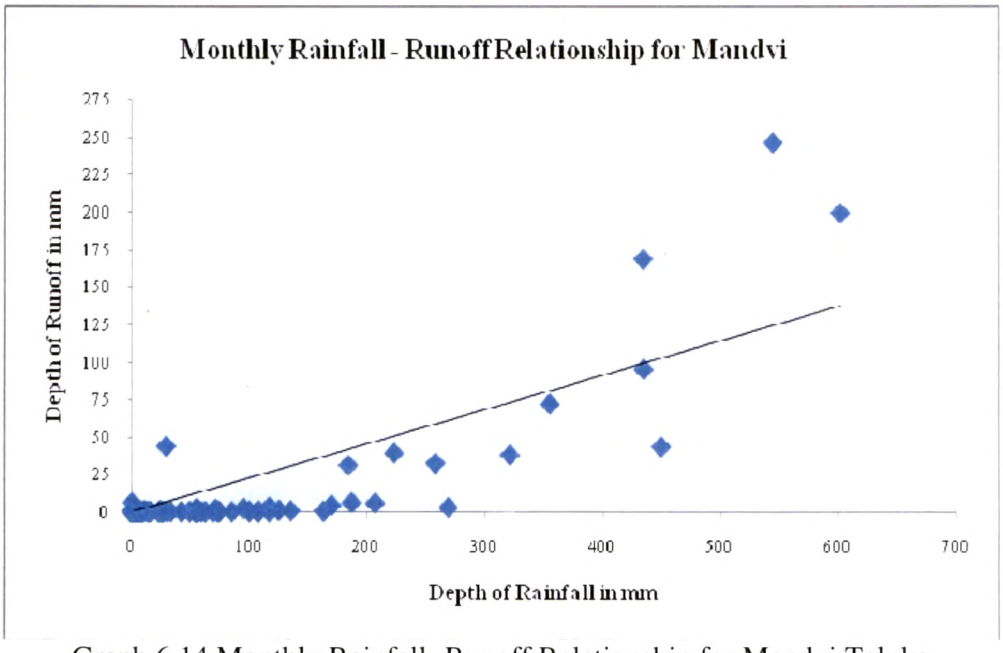
Graph 6.11 Monthly Rainfall- Runoff Relationship for Bhachau Taluka



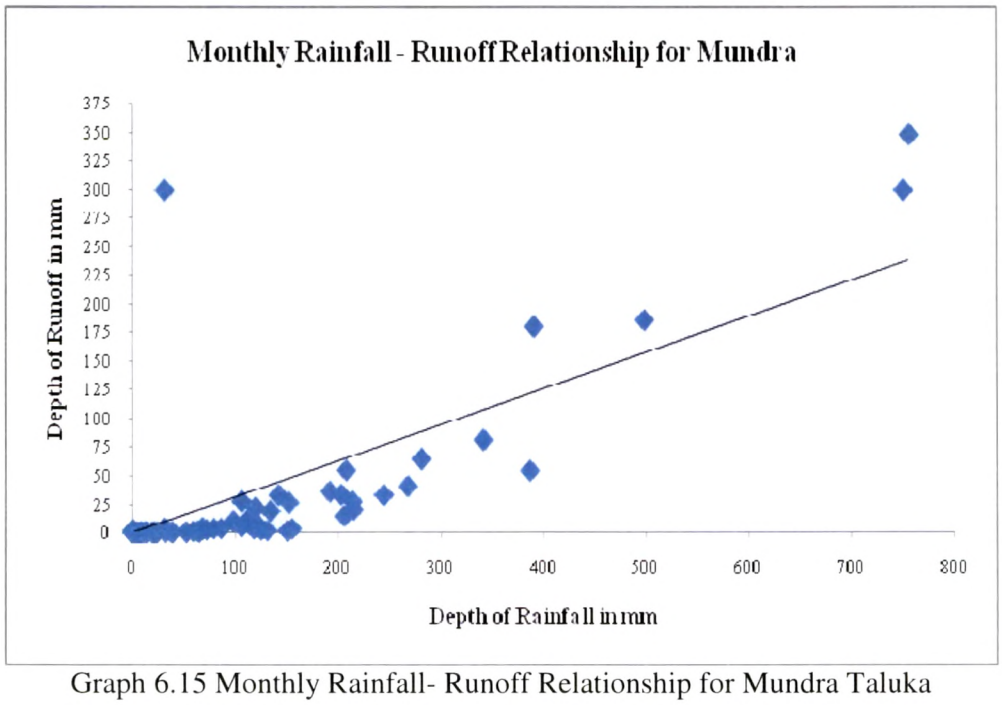
Graph 6.12 Monthly Rainfall- Runoff Relationship for Bhuj Taluka



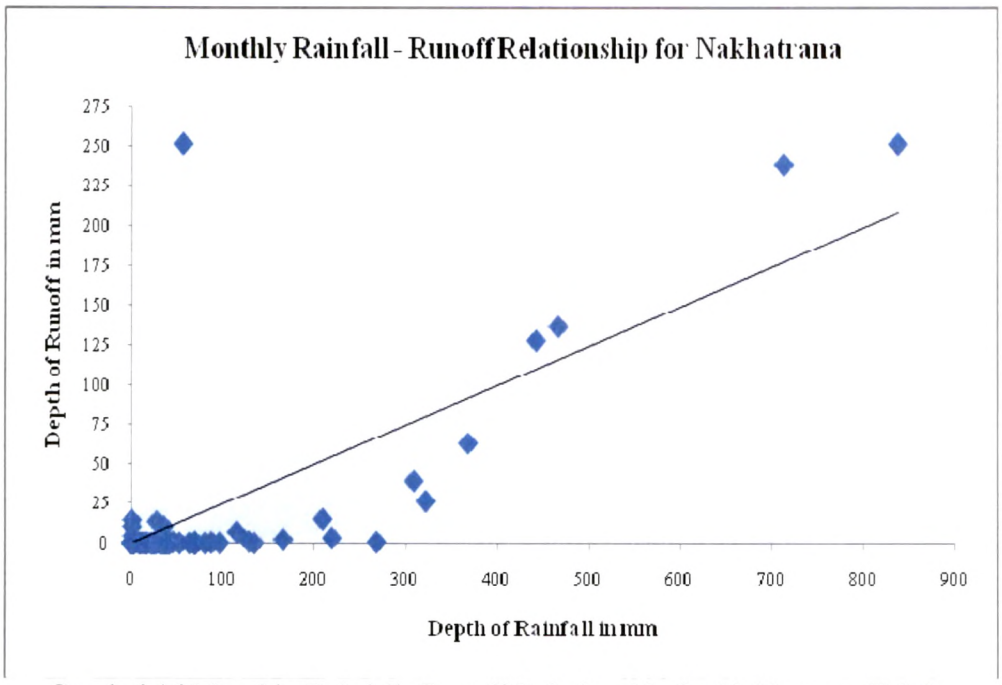
Graph 6.13 Monthly Rainfall- Runoff Relationship for Lakhpat Taluka



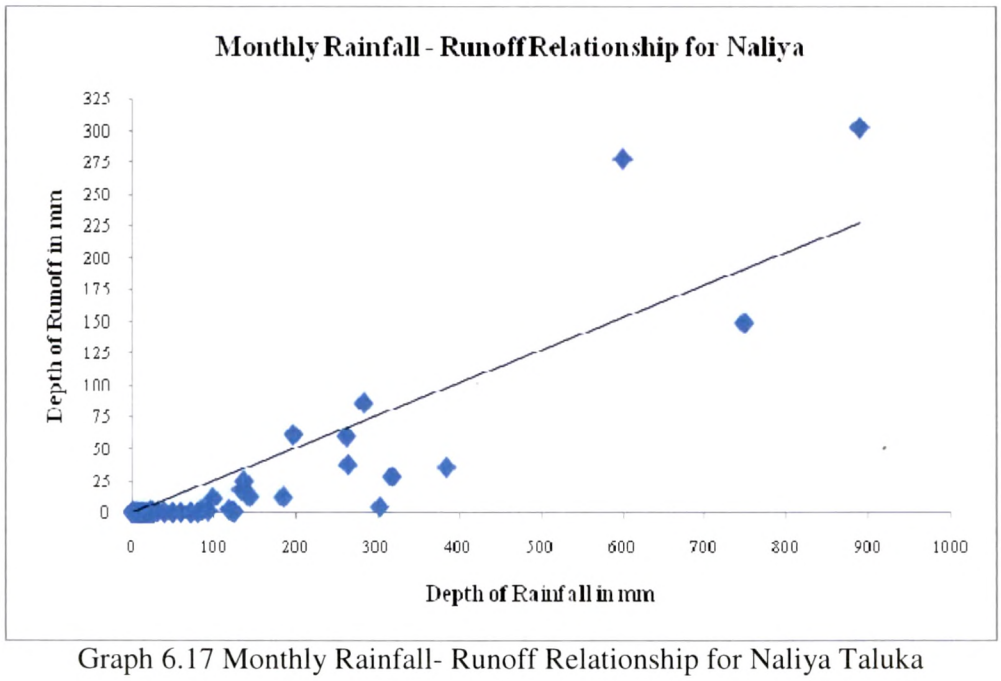
Graph 6.14 Monthly Rainfall- Runoff Relationship for Mandvi Taluka



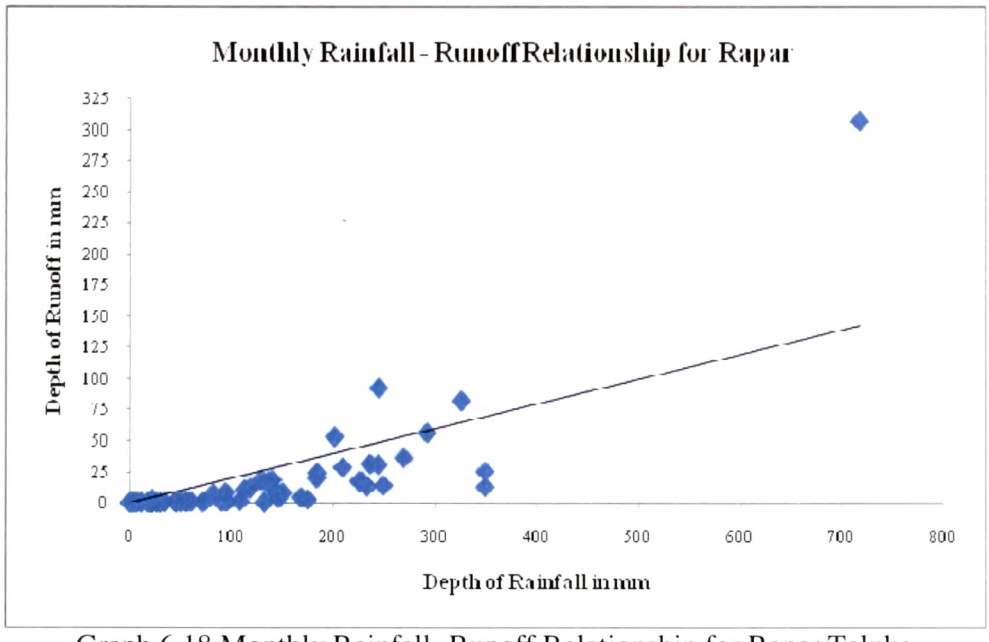
Graph 6.15 Monthly Rainfall- Runoff Relationship for Mundra Taluka



Graph 6.16 Monthly Rainfall- Runoff Relationship for Nakhatrana Taluka



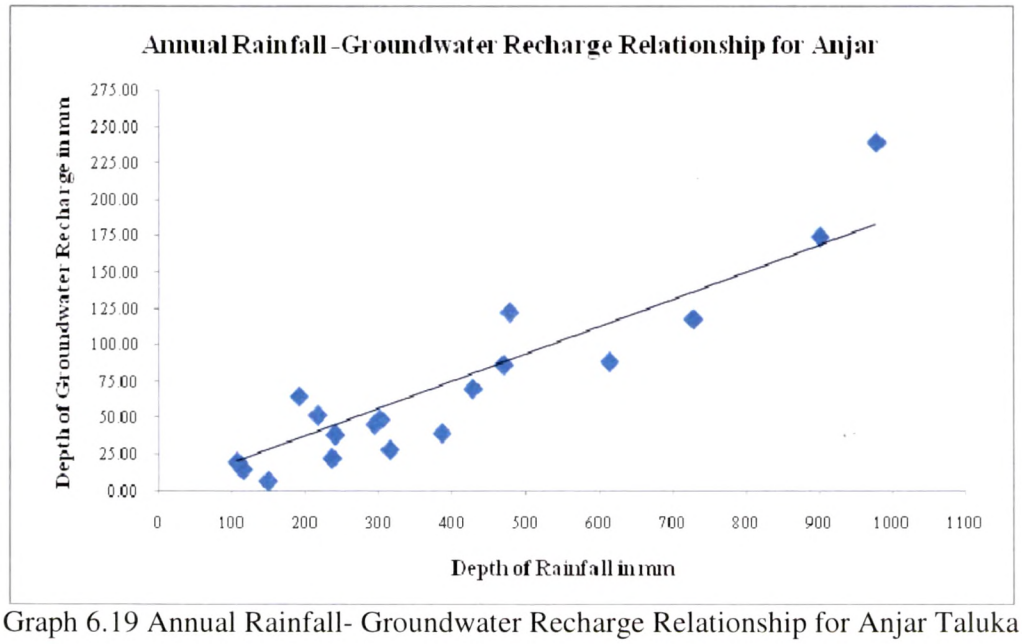
Graph 6.17 Monthly Rainfall- Runoff Relationship for Naliya Taluka



Graph 6.18 Monthly Rainfall- Runoff Relationship for Rapar Taluka

6.2 RAINFALL-GROUNDWATER RECHARGE RELATIONS

Graphs 6.19 to 6.27 show the scatter plots for the annual values of depth of rainfall and depth of total groundwater recharge for all the talukas.



Graph 6.19 Annual Rainfall- Groundwater Recharge Relationship for Anjar Taluka

6.3 SUMMARY

The summary for the linear regression analysis for the relationship between annual rainfall and runoff, monthly rainfall and runoff and rainfall and groundwater recharge is given as follows.

6.3.1 Annual Rainfall - Runoff Relations

The summary for inter relationship obtained by linear regression between annual rainfall and runoff values has been found in the form of the following equation.

$Q = aP + b$
Where, P = depth of rainfall in mm
Q= depth of runoff in mm
a=constant
b=constant
The values for "a" and "b" and the R^2 values for the regression for all the talukas have been tabulated as shown in Table 6.1.

Table 6.1 Results for Annual Rainfall – Runoff Relations

Taluka	Value for "a"	Value for "b"	Equation	R^2
Anjar	0.182	-36.177	Q = 0.182P-36.177	0.877
Bhachau	0.245	-20.714	Q = 0.245P-20.714	0.729
Bhuj	0.364	-49.371	Q = 0.364P-49.371	0.761
Lakhpat	0.215	-6.295	Q = 0.215P-6.295	0.671
Mandvi	0.445	-89.991	Q = 0.445P-89.991	0.649
Mundra	0.344	-56.392	Q = 0.344P-56.392	0.854
Nakhatrana	0.352	-30.369	Q = 0.352P-30.369	0.768
Naliya	0.249	-24.030	Q = 0.249P-24.030	0.655
Rapar	0.348	-67.236	Q = 0.348P-67.236	0.818

6.3.2 Monthly Rainfall – Runoff Relations

The summary for inter relationship obtained by linear regression between monthly rainfall and runoff values has been found in the form of the following equation.

$Q_m = aP + b$
Where, P =depth of monthly rainfall in mm
Q_m=depth of monthly runoff in mm
a=constant
b=constant
The values for "a" and "b" and the R^2 values for the regression for all the talukas have been tabulated as shown in Table 6.2.

Table 6.2 Results for Monthly Rainfall – Runoff Relations

Taluka	Value for "a"	Value for "b"	Equation	R^2
Anjar	0.139	-1.163	$Q_m = 0.139P - 1.163$	0.581
Bhachau	0.240	-0.946	$Q_m = 0.240P - 0.946$	0.598
Bhuj	0.342	-2.212	$Q_m = 0.342P - 2.212$	0.488
Lakhpat	0.262	-0.172	$Q_m = 0.262P - 0.172$	0.529
Mandvi	0.239	-2.725	$Q_m = 0.239P - 2.725$	0.684
Mundra	0.324	-2.792	$Q_m = 0.324P - 2.792$	0.633
Nakhatrana	0.253	-1.476	$Q_m = 0.253P - 1.476$	0.614
Naliya	0.262	-2.390	$Q_m = 0.262P - 2.390$	0.786
Rapar	0.212	-2.986	$Q_m = 0.212P - 2.986$	0.612

6.3.3 Rainfall – Groundwater Recharge Relations

The summary for inter relationship obtained by linear regression between annual rainfall and groundwater recharge values has been found in the form of the following equation.

$R = aP + b$

Where, P = rainfall in mm

R= total groundwater recharge in mm

a=constant

b=constant

The values for "a" and "b" and the R^2 values for the regression for all the talukas have been tabulated as shown in Table 6.3.

Table 6.3 Results for Annual Rainfall – Groundwater Recharge Relations

Taluka	Value for "a"	Value for "b"	Equation	R^2
Anjar	0.231	-24.277	R=0.231P-24.277	0.84
Bhachau	0.136	-16.843	R=0.136P-16.843	0.51
Bhuj	0.216	-12.204	R=0.216P-12.204	0.59
Lakhpat	0.079	2.946	R=0.079P+2.946	0.79
Mandvi	0.524	-82.558	R=0.524P-82.558	0.71
Mundra	0.294	-54.043	R=0.294P-54.043	0.86
Nakhatrana	0.205	-11.025	R=0.205P-11.025	0.71
Naliya	0.163	-12.857	R=0.163P-12.857	0.69
Rapar	0.157	-22.514	R=0.157P-22.514	0.54