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ANNEXURE 1: PRODUCT DESIGN MODELS

- 1) **Key Factor Index Product (D1):** Suppose there are ‘n’ weeks from sowing to maturity. Aggregate rainfall, weight and cap for the i^{th} week are R_i , W_i and C_i , respectively. Where $i=1,2,\dots,n$. Then index I is given by

$$I = \sum_{i=1}^n W_i * \text{Max}(C_i, R_i)$$

Say, T is Trigger. Shortfall (%) $\Delta(I,T)$ is given by,

$$\Delta(I,T) = 100 * (\text{Max}(0, T - I)/T)$$

And payout function F is given by:

$$F(\Delta(I,T)) = S * g(\Delta(I,T))$$

Where, S is maximum payout under this cover and function g is given by the following table:

$\Delta(I,T) \geq$	0	$\Delta 1$	$\Delta 2$	.....	Exit
Pay-out (%)	0	p1	P2	.....	100

So claim payable under design D1 is given by

$$P(D1) = F(\Delta(I,T))$$

- 2) **Aggregate Rainfall Product with Dry-spell (D2):** Suppose aggregate rainfall over risk period is R,

$$I1 = R$$

Say, T1 is Trigger. Shortfall (%) $\Delta(I,T)$ is given by,

$$\Delta(I1, T1) = 100 * [\text{Max}(0, T1 - I1)/T1]$$

And payout function F1 is given by:

$$F1(\Delta(I1, T1)) = S1 * g[\Delta(I1, T1)]$$

where, S1 is maximum payout under this cover and function g is given by the following table:

$\Delta(I,T) \geq$	0	$\Delta 1$	$\Delta 2$	.....	Exit
Pay-out (%)	0	p1	P2	.....	100

A day is called a dry day if recorded rainfall on that day is less than 2.5 mm. Incidence of consecutive dry days is called dry-spell and number of consecutive dry days is called length of dry-spell. Suppose there are 'n' dry spells of length D1, D2, ..., Dn, Then Index I2 is given by

$$I2 = (D1, D2, \dots, Dn)$$

Here trigger T2 is also a vector value of 1 * 5.

$$T2 = (t1, t2, t3, t4, t5)$$

Such that $t1 \leq t2 \leq t3 \leq t4 \leq t5$.

$$\Delta(I2, T2) = (\delta(D1, T2), \delta(D2, T2), \dots, \delta(Dn, T2))$$

$$\delta(Dn, T2) = \begin{cases} 0 & \text{if } Dn \in [0, t1) \\ t1 & \text{if } Dn \in [t1, t2) \\ t2 & \text{if } Dn \in [t2, t3) \\ t3 & \text{if } Dn \in [t3, t4) \\ t4 & \text{if } Dn \in [t4, t5) \\ t5 & \text{if } Dn \in [t5, \infty) \end{cases}$$

And payout function F2 is given by

$$F2(\Delta(I2, T2)) = \text{Min}(S2, \sum_{k=0}^n f(\delta(Dk, T2)))$$

where, 'f' is given by following table

Strike (=)	0	t1	t2	t3	t4	t5
Pay-out (Rs.)	0	p1	p2	p3	p4	S2

where, 'S2' is the Maximum pay-out under this cover

So, claim payable under design D2 is given by

$$P(D2) = \sum_{i=1}^2 Fi(\Delta i(Ii, Ti))$$

- 3) **Market- based Product with Crop Stage-wise Volume and Dry-spell (D3):** Suppose the total risk period is divided into 'm' crop phonological phases and aggregate rainfall during these phases are R1, R2, ..., Rm and S11, S12, ..., S1m is sum insured for phase 1 to m, respectively. So index I1 is given by

$$I1 = (R1 \ R2 \ \dots \ Rm)$$

Trigger T1 is given by matrix of 3xm

$$T1 = \begin{pmatrix} t11 & t21 & \dots & tm1 \\ t12 & t22 & \dots & tm2 \\ t13 & t23 & \dots & tm3 \end{pmatrix}$$

$$T1 = (T11 \quad T12 \quad \dots \quad T1m)$$

$$\Delta(I1, T1) = (\gamma(R1, T11) \quad \gamma(R2, T12) \quad \dots \quad \gamma(Rm, T1m))$$

$$\gamma(Rm, T1m) = \begin{pmatrix} \text{Max}(0, tm1 - \text{max}(Rm, tm2)) \\ \text{Max}(0, tm2 - Rm) \end{pmatrix}$$

Notional Rate Vector

It's given by

$$NR = \begin{pmatrix} \beta11 & \beta21 \\ \beta12 & \beta22 \\ \vdots & \vdots \\ \beta1m & \beta2m \end{pmatrix}$$

$$NR = \begin{pmatrix} \beta1 \\ \beta2 \\ \vdots \\ \beta3 \end{pmatrix}$$

So,

$$\beta k = (\beta1k \quad \beta2k)$$

Where, $\beta1k, \beta2k$ are notional rate for kth phase chosen such that it should indemnify farmer for yield loss due to shortfall in index and

$$S1k = (t1k - t2k) * \beta1k + (t2k - t3k) * \beta2k$$

Payout function F1 is given by

$$F1(\Delta(I1, T1)) = \text{Min}(S1, \sum_{k=1}^m h(\gamma(Rk, T1k)))$$

where,

$$h(\gamma(Rk, T1k)) = \beta k * \gamma(Rk, T1k)$$

$$\text{And } S1 = S11 + S12 + \dots + S1m$$

' Dry-spell' cover is designed on the same principle as an in design D2.

So claim payable under design D3 is given by

$$P(D3) = \sum_{i=1}^2 F_i(\Delta_i(I_i, T_i))$$

- 4) **INFOCROP based Crop Growth Simulation Model (D4):** Let the total risk period be divided into 'm' fortnights and aggregate rainfall during these fortnights are R_1, R_2, \dots, R_m and $S_{11}, S_{12}, \dots, S_{1m}$ are the sum insured for fortnight 1 to m, respectively. So index I1 is given by

$$I = (R_1 \ R_2 \ \dots \ R_m)$$

Trigger T is given by

$$T = (T_1 \ T_2 \ \dots \ T_m)$$

Shortfall (%) is given by

$$\Delta(I, T) = (\delta(R_1, T_1) \ \delta(R_2, T_2) \ \dots \ \delta(R_m, T_m))$$

where,

$$\delta(R_m, T_m) = 100 * (\text{Max}(0, T_m - R_m) / T_m)$$

and, pay-out function 'F' is given by:

$$F(\Delta(I, T)) = \sum_{k=1}^m S_k * l(\delta(R_k, T_k))$$

where, l is a function given by following table:

	→				
	↓				
100		p(1,100)	p(2,100)	.....	p(m,100)
90		P(1,90)	p(2,90)	.....	p(m,90)

$\begin{matrix} \vdots \\ \vdots \\ \vdots \end{matrix}$	$\begin{matrix} \vdots \\ \vdots \\ \vdots \end{matrix}$	$\begin{matrix} \vdots \\ \vdots \\ \vdots \end{matrix}$	$\begin{matrix} \vdots \\ \vdots \\ \vdots \end{matrix}$	$\begin{matrix} \vdots \\ \vdots \\ \vdots \end{matrix}$
10	p(1,10)	P(2,10)	.....	p(m,10)

where, the values p(r,q)'s (r=1,2,...,m ;q=10,20,...,100) are estimated yield loss (%) because of moisture stress of different levels and at different stages. These values are crop and location specific.

- 5) **CRIDA Model (D5)**: Suppose T_i ; $i=1 \dots n$ denotes the mean temperature for i^{th} day during phase and T is trigger temperature for phase. Trigger temperature is usually the long-term average of daily mean temperature over respective phase, i.e:

$$d_i = \begin{cases} 1, & \text{If } T_i > T \\ 0, & \text{Otherwise} \end{cases}$$

$$\partial T_i = \begin{cases} (T_i - T), & \text{If } T_i > T \\ 0, & \text{Otherwise} \end{cases}$$

$$\partial T = \frac{\sum_{i=1}^n \partial T_i}{\sum_{i=1}^n d_i}$$

$$D_i = \begin{cases} D_{i-1} + d_i, & \text{If } d_i > 1 \\ 0, & \text{Otherwise} \end{cases}$$

$$\tilde{D}_i = \begin{cases} D_i, & \text{If } D_i > 5 \text{ and } D_{i+1} = 0 \text{ or } i = n \\ 0, & \text{Otherwise} \end{cases}$$

$$I_i = \begin{cases} 1, & \text{If } \tilde{D}_i > 0 \\ 0, & \text{Otherwise} \end{cases}$$

$$D = \frac{\sum_{i=1}^n \tilde{D}_i}{\sum_{i=1}^n I_i}$$

The index I is defined as

$$I = \partial T \times D$$

$$\Delta(L,T) = I$$

And payout function F is given by:

$$F(\Delta(I,T)) = S \times R(\Delta(I,T))$$

where, S is sum insured under this cover and $R[(\Delta(I,T))]$ is response factor given by

$$R(\Delta(I,T)) = K \times \Delta(I,T) - 10^{-16}$$

where, K is a coefficient of adverse deviation, which depends on crop growth stage.

Suppose index for vegetative and reproductive phases is I_v and I_r respectively. The payout function for Vegetative and Reproductive Phase are given as

$$F_v(\Delta(I,T)) = S_v \times R_v(\Delta(I_v, T_v))$$

$$F_r(\Delta(I,T)) = S_r \times R_r(\Delta(I_r, T_r))$$

where, S_v and S_r are sum insured and R_v and R_r are response factor corresponding to vegetative and reproductive phases, respectively and are given by

$$R_v(\Delta(I_v, T_v)) = K_v \times \Delta(I_v, T_v) - 10^{-16}$$

$$R_r(\Delta(I_r, T_r)) = K_r \times \Delta(I_r, T_r) - 10^{-16}$$

where, K_v and K_r are Coefficients of adverse deviation corresponding to vegetative and reproductive phase, respectively.

So the payout from this product design is given by

$$P(D1) = \sum_{i=r,v} F_i(\Delta_i(I_i, T_i))$$

6) **INFOCROP based Crop Growth Simulation Model-Temperature Deviation (D6):**

Suppose the total risk period is divided into 'm' fortnights and average mean temperature during these fortnights are A_1, A_2, \dots, A_m and $S_{11}, S_{12}, \dots, S_{1m}$ have sum insured for fortnight 1 to m, respectively. So index I1 is given by

$$I = (A_1 \ A_2 \ \dots \ A_m)$$

Trigger T is given by

$$T = (T_1 \ T_2 \ \dots \ T_m)$$

$$\Delta(I, T) = (\delta(A_1, T_1) \ \delta(A_2, T_2) \ \dots \ \delta(A_m, T_m))$$

where,

$$\delta(A_m, T_m) = (\text{Max}(0, A_m - T_m))$$

And payout function F is given by:

$$F(\Delta(I, T)) = \text{Min}(S, S \times \sum_{k=1}^m l(\delta(A_k, T_k)))$$

where, l is a function given by following table:

	→				
	↓				
1		p(1,1)	p(2,1)	.....	p(m,1)
2		P(1,2)	p(2,2)	.....	p(m,2)
⋮		⋮	⋮	⋮	⋮
⋮		⋮	⋮	⋮	⋮
N		p(1,n)	P(2,n)	.....	p(m,n)

where, values $p(r,q)$'s ($r=1,2,\dots,m$; $q=1,2,\dots,n$) are estimated yield loss (%) because of adverse deviation of mean temperature of different levels and at different stages. These values are crop and location specific.

- 7) **Market-Product for Temperature (D7):** Suppose the total risk period is divided into 'm' fortnights and T_i ($i=1,2,\dots,m$) 's are fortnightly Trigger temperature, respectively.

Suppose $\text{Max } T_{ij}$ denotes maximum temperature for the jth day of the ith fortnight. Index I is given by

$$I = \sum_i \sum_j \text{Max}(0, \text{Max}T_{ij} - T_i)$$

Suppose T is strike:

$$\Delta(I, T) = \text{Max}(0, I - T)$$

And payout function 'F' is given by

$$F(\Delta(I, T)) = \sum_{k=1}^m \text{Min}(S, \Delta(I, T) \times r)$$

where, S is sum insured for this cover and r is rate per degree deviation.

ANNEXURE 2: Weights of Key Factor Index Model

LOCATION	AKOLA			ANANTPUR			BIJAPUR		
CROP	SOYBEAN			GROUNDNUT			SHORGUM		
PERIOD	18-Jun to 8-Oct			2-Jul to 15-Oct			4-Jun to 10-Sep		
PARTICULARS	MSW	Kc _i	C _i	MSW	Kc _i	C _i	MSW	Kc _i	C _i
	25	0.2	50	27	0.1	50	23	0.20	60
	26	0.2	50	28	0.2	50	24	0.20	60
	27	0.4	60	29	0.4	60	25	0.30	60
	28	0.6	60	30	0.4	60	26	0.30	75
	29	0.6	70	31	0.4	60	27	0.30	75
	30	0.8	80	32	0.6	60	28	0.45	75
	31	0.8	80	33	0.8	75	29	0.45	75
	32	0.8	90	34	0.8	75	30	0.45	75
	33	1	100	35	0.8	75	31	0.55	90
	34	1	100	36	0.8	60	32	0.55	90
	35	0.8	80	37	0.6	60	33	0.55	90
	36	0.6	80	38	0.6	60	34	0.45	60
	37	0.5	60	39	0.4	60	35	0.45	60
	38	0.4	50	40	0.4	50	36	0.45	60
	39	0.2	50	41	0.3	40	37	0.30	40
	40	0.1	50	42	0.2	30	38	0.20	30
41	0	40				39	0.10	30	
I=	$\sum_{i=0}^n Kc_i = \text{Max}(C_i, R_i)$, where R _i is aggregate rainfall of ith week								
T<	303			159			104		
S	16000			20000			20000		

Where, MSW is the Meteorological Standard Week, and C_i is the rainfall cap.

ANNEXURE 3: Product basis risk term sheets
WEATHER BASED CROP INSURANCE SCHEME

Term-sheet (KHARIF 2011)

STATE- Rajasthan
DISTRICT- Ajmer
TEHSIL- Ajmer, Bhinay, Kekari, Kishangarh, Sarwar

CROP -Bajra
UNIT: Hectare

Rainfall Volume Cover:

	PHASE I	PHASE II	PHASE III
PERIOD	01 July to 20 July	21 JUL TO 15 AUG	16 AUG TO 30 SEPT
INDEX	Aggregate of rainfall over respective Phases		
STRIKE I(<)	40	100	40
STRIKE II(<)	15	40	10
EXIT	5	0	0
RATE I (INR/mm)	10	10	15
RATE II (INR/mm)	50	22.50	30.00
MAXIMUM PAYOUT (INR)	750	1500	750

TOTAL PAYOUT (INR)	3000
--------------------	------

Rainfall Distribution Cover:

PERIOD	1 July to 31 Aug		
INDEX	Number of days in a spell of Consecutive dry days		
STRIKE (=>)	22	26	30
PAYOUT (INR)	250	750	2000

TOTAL PAYOUT (INR)	2000
--------------------	------

Note: A day with rainfall less than 2.5 mm will be considered as a dry day and multiple events will be considered for payouts under rainfall distribution cover.

Excess Rainfall Cover:

PERIOD	1 Sep to 30 Sep
INDEX	Maximum of 3 consecutive day's cumulative rainfall
STRIKE (>)	50
EXIT	150
RATE (INR/mm)	10.00
MAXIMUM PAYOUT (INR)	1000

TOTAL PAYOUT (INR)	1000.00
--------------------	---------

Premium Description:

SUM INSURED (INR)	6000
PREMIUM (INR)	600
PREMIUM (%)	10

WEATHER BASED CROP INSURANCE SCHEME

Term-sheet (*KHARIF* 2012)

STATE- Rajasthan
DISTRICT-Ajmer
TEHSIL-Ajmer, Bhinay, Kekari, Kishangarh, Sarwar

CROP -Bajra
UNIT: Hectare

Rainfall Volume Cover:

	PHASE I	PHASE II	PHASE III
PERIOD	01 July to 20 July	21 JUL TO 20 AUG	21 AUG TO 30 SEPT
INDEX	Aggregate of rainfall over respective phases		
STRIKE I(<)	50	90	40
STRIKE II(<)	25	45	20
EXIT	0	0	0
RATE I (INR/mm)	13.33	14.81	16.67
RATE II (INR/mm)	26.67	29.63	33.33
MAXIMUM PAYOUT (INR)	1000	2000	1000

TOTAL PAYOUT (INR)	4000
--------------------	------

Rainfall Distribution Cover:

PERIOD	01 JUL to 10 SEPT
INDEX	Longest spell of Consecutive dry-days.
STRIKE (=>)	24
EXIT	68
PAYOUT PER DAY(INR)	45.45
MAXIMUM PAYOUT (INR)	2000

TOTAL PAYOUT (INR)	2000
--------------------	------

Note: A day with rainfall less than 2.5 mm will be considered as a dry day and single event of maximum intensity will be considered for pay-outs under rainfall distribution cover.

Excess Rainfall Cover:

	PHASE I	PHASE II	PHASE III
PERIOD	01 July to 20 July	21 JUL to 20 AUG	21 AUG to 30 SEPT
INDEX	Maximum of 3 consecutive day's cumulative rainfall in respective phases		
STRIKE I(>)	90	120	80
STRIKE II(>)	113	150	100
EXIT	135	180	120
RATE I(INR/mm)	14.81	22.22	16.67
RATE II(INR/mm)	29.63	44.44	33.33
MAXIMUM PAYOUT (INR)	1000	2000	1000

TOTAL PAYOUT (INR)	4000
--------------------	------

Note: Pay-out of deficit volume and excess rainfall cover will be calculated on "either or basis" the cumulative pay-out of respective phases will be compared and whichever is more will be considered.

Premium Description:

SUM INSURED (INR)	6000
PREMIUM (INR)	600
PREMIUM (%)	10

ANNEXURE 4: Spatial basis risk term sheet
WEATHER BASED CROP INSURANCE SCHEME

Term-sheet (KHARIF 2011)

STATE- Rajasthan
DISTRICT- Jaipur
TEHSIL- Amber, Bairath, Bassi, Chaksu, Chomu, Dudu, J. Ramgarh, Kotpuli, Naraina, Paota, Phagi, Phulera, Sambhar, Sanganer

CROP -Bajra
UNIT: Hectare

Rainfall Volume Cover:

	PHASE I	PHASE II	PHASE III
PERIOD	01 July to 20 July	21 Jul to 20 Aug	21 Aug to 25 Sept
INDEX	Aggregate of rainfall over respective Phases		
STRIKE I(<)	40	70	30
STRIKE II(<)	10	15	5
EXIT	0	0	0
RATE I (INR/mm)	8	10	5
RATE II (INR/mm)	51	80	175
MAXIMUM PAYOUT (INR)	750	1750	1000.00

TOTAL PAYOUT (INR)	3500
--------------------	------

Rainfall Distribution Cover:

PERIOD	1 July to 31 Aug				
INDEX	Number of days in a spell of consecutive dry days				
STRIKE (=>)	23	28	30	38	43
PAYOUT (INR)	500	750	2000	1250	1500

TOTAL PAYOUT (INR)	1500
--------------------	------

Note: A day with rainfall less than 2.5 mm will be considered as a dry day and single event of maximum intensity will be considered for pay-outs under rainfall distribution cover.

Excess Rainfall Cover:

PHASE I	
PERIOD	01 Sep to 30 Sep
INDEX	Maximum of 3 consecutive day's cumulative rainfall in respective phases
STRIKE (>)	100
EXIT	150
RATE (INR/mm)	20
MAXIMUM	1000
PAYOUT (INR)	

TOTAL PAYOUT (INR)	1000
--------------------	------

Note: Pay-out of deficit volume and excess rainfall cover will be calculated on "either or basis" the cumulative pay-out of respective phases will be compared and whichever is more will be considered.

Premium Description:

SUM INSURED (INR)	6000
PREMIUM (INR)	600
PREMIUM (%)	10

ANNEXURE 5: State's Questionnaire

Various Crop Insurance Schemes – States Perspective

Name:

State:

1. Which is a better Scheme? Give rank in order of preference

From State Govt.'s perspective		From Farmer's perspective	
Scheme	Rank	Scheme	Rank
NAIS		NAIS	
WBCIS		WBCIS	
MNAIS		MNAIS	

2. In your view, which are the good and bad aspects of these Schemes (list 2 under both good and bad)

Scheme	Good		Scheme	Bad	
NAIS	i	ii	NAIS	i	ii
WBCIS	i	ii	WBCIS	i	ii
MNAIS	i	ii	MNAIS	i	ii

Select from the list (can select the same under more than one scheme)

- | | | |
|--|--|----------------------------------|
| A. Adequacy of payments relative to losses | E. Liked by farmers | I. Transparency of process |
| B. Time taken to make claim payments | F. Lapse of data gathering (CCEs, weather etc) | J. Choice of Insurance companies |
| C. Ease in implementation | G. Reliability of data to assess payouts | |
| D. Ease for farmers to understand | H. Correlation of claim amount with yield loss | |

3. **Priority areas for further improvements** (give order of importance by writing the rank against the parameter)

MNAIS:

- | | |
|--|--|
| a. Timely payouts and faster processing of claims | e. Product communication and ease in buying product by non-loanees |
| b. Improve communication and outreach to farmers | f. CCE quality issues |
| c. Better tools to help State Govt make informed decisions between different schemes and insurance companies | g. Manpower / infrastructure to conduct CCEs |
| d. Product development: more effective insurance products that payout when farmers need it. | h. Product design and correlation with farmer losses |
| i. Others | |

WBCIS:

- | | |
|--|--|
| a. Timely payouts and faster processing of claims | e. Product communication and ease in buying product by non-loanees |
| b. Improve communication and outreach to farmers | f. Weather data quality issues |
| c. Better tools to help State Govt make informed decisions between different schemes and insurance companies | g. Product design and correlation with farmer losses |
| d. Product development: more effective insurance products that payout when farmers need it. | h. Misuse of product by non-loanees |
| i. Others | |

4. **Do you think involvement of multiple insurance companies is a good way to go forward:**
Yes / No

Could you list three pre-requisites to determine the maximum benefit to farmers out of competition ?

- a
- b.
- c.

5. **What do you think the essential features of weather insurance product?** Rank the below given options in the order of priority:

- a) Product payout to correspond to actual losses (product basis risk)
- b) Prefer reasonably large payouts once in 4 to 5 years to regular small payouts
- c) Distribute sum insured on 1 or 2 key weather parameters rather than 3 to 4 weather parameters
- d) Payout calculations of insurance companies to be certified by an independent entity

- e) Insurance product to be based practical and research inputs
- f) Ensure misuse of subsidy by enrolling only genuine farmers
- g) No claim discount for payout free years
- h) Others.....

6) Do you think a combination (hybrid) of weather & yield index insurance products is better than a pure yield or weather index insurance product?

Yes / No

7) Can you indicate comfort level on use of private weather data providers (give a rate between 1 and 5 with 1 corresponding to lowest comfort and 5 corresponding to highest comfort):

8) Do you think the product bench-marking of insurance product is essential to involve multiple insurance companies?

Yes / No

a. In any case, do you think the State has required expertise to bench-mark the product so that all competing insurance companies be able to give transparent product when can be easily evaluated by the State ?

Yes / No

b. In any case do you think there is a need for creating a **‘technical support unit’** within Ministry of Agriculture (GoI) to guide the States and to monitor performance of insurance companies?

Yes / No

ANNEXURE 6: Farmer's Questionnaire

Climate Risks and Crop Insurance

Data Zone Code:

Respondent Code:

1. Please rank the following weather perils in decreasing order of importance to your farming.

Weather Perils	Rank (Frequency)	Rank (Severity)	Rank (Overall)	Score/Weight (Out of 100)
Deficient Rainfall				
Excess Rainfall				
Low Temperature				
High Temperature				
High Humidity				
Low Humidity				
High Winds				
Frost				
Hail-stones (hailstorm)				
Others (Specify)				

2. Please rate the influence of weather on the following decisions related to your farming

Decision	Zero	Low	Medium	High	Full
Selection of Crops for Sowing					
Time of Sowing					
Crop Cycle/Duration					
Timing and Frequency of Irrigation					
Sprays of Protection Chemicals					
Quality/Variety of Seeds					
Quantity of Fertilizers & Nutrients					
Usage of Modern Farm Equipment (Drip Irrigation, Combine Harvester etc.)					

3. Please share the following information about your agricultural system and your views regarding

If YES, weather parameters to be covered for crops (Tick All Applicable Parameters and Detail Specific Risk)	Rainfall	
	Temperature	
	Relative Humidity	
	Wind Speed	
	Other (Specify)	

4. Coping Mechanisms and Role of Weather Forecast and Advisories

What, according to you, can be some practical approaches to manage weather risks?	1.
	2.
	3.
Have you heard of weather forecast or advisories?	
(Explain what the weather advisory is in case the farmer doesn't know) In case timely weather advisories are made available, are you in a position to minimize / prevent crop losses by taking some preventive / timely action?	1.
	2.
	3.
Which type of weather advisories would you prefer: a) those based on historical weather data b) those based on satellite forecast? Why?	Preference:
	Reason:
Which of the following modes of weather advisory do you prefer to receive? : (i) Radio; (ii) DD; (iii) Newsletter; (iv) village head (opinion leader); (v) extension worker	Preference:
	Reason:
What role can Government Agencies play for reducing weather risks of farmers?	

5. Based on your experiences during the past 5-10 years, please share with us your views about the changes in the following weather parameters.

Weather Parameter						Effect on your Farming and Risk Mitigation Strategies
	Type of Change	No Change	Decrease	Increase	Degree of Change (H/M/L)*	
Rainfall	No. of Rainy Days					
	Seasonal Rainfall Volume					
	Length of Dry Spells					
	Incidence of Unseasonal Rains					
	No. of High Rainfall Days					
	Others (Specify)					
Temperature	Minimum Temperature					
	Maximum Temperature					
	Average Temperature					
	Extremity / Range of Temperature					
	Others (Specify)					

*(H/M/L) ~ High/Medium/Low

6. Awareness / Experience related to Crop Insurance

Are you aware of any Crop Insurance Scheme? YES / NO

Have you bought any crop insurance policy so far? YES / NO

If NO, what were the main reasons for not buying it?

A) _____

B) _____

C) _____

If YES, what were the premium and sum assured for the latest policy bought by you?

Premium Rs. _____ per Acre Sum Assured: Rs. _____ per Acre

Kindly share specific reasons for satisfaction and dissatisfaction with crop insurance policies so far.

Aspect	Reasons of Satisfaction	Reasons of Dissatisfaction
Premium Rates		
Communication & Awareness		
Coverage of Risks		
Availability & Distribution		
Basis for Settlement		
Settlement Process		
Grievance Redress		
Others		

Which of the following assets and facilities do you have at present? Tick the applicable ones

Mobile Phone		Cycle	
Motorcycle/Scooter		Four-Wheeler/Tractor	
TV		VCD/DVD Player	
Cooler		Refrigerator / Fridge	
Kisan Credit Card		Thresher	

Respondent Information

Name: _____ Father's Name: _____

Age: _____ years Caste: _____ Category: _____

Total Landholding: _____ Acres Education: _____

Village: _____ Tehsil / Block: _____

Contact No:

ANNEXURE 7: Rainfall, Temperature and Relative Humidity Trends during the Study Period

Figure A7.1: Rainfall distribution during Southwest monsoon corresponding to two locations.

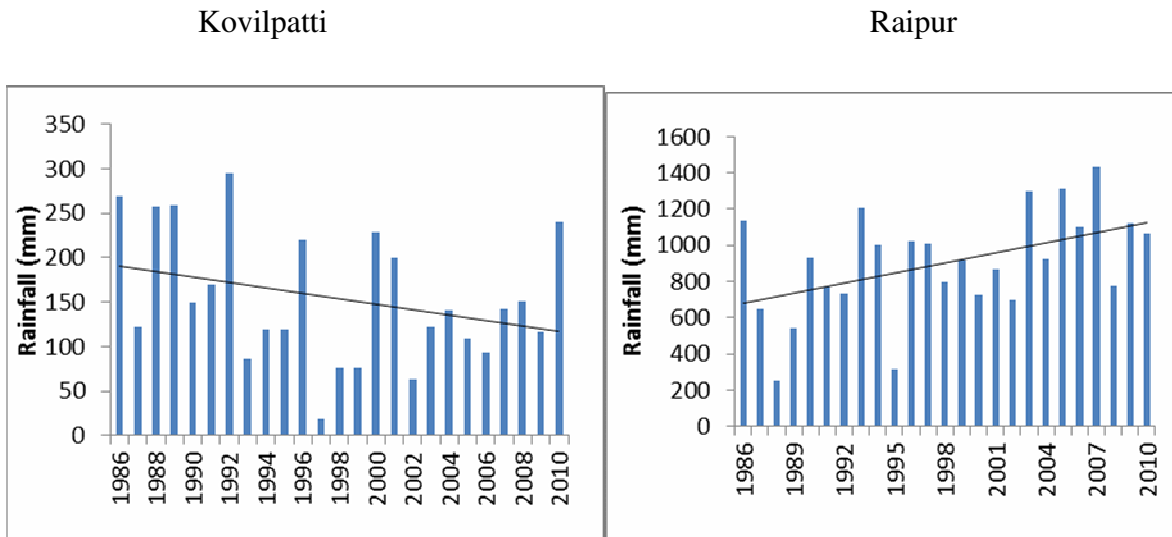


Figure A7.2: Single day maximum rainfall corresponding to two locations.

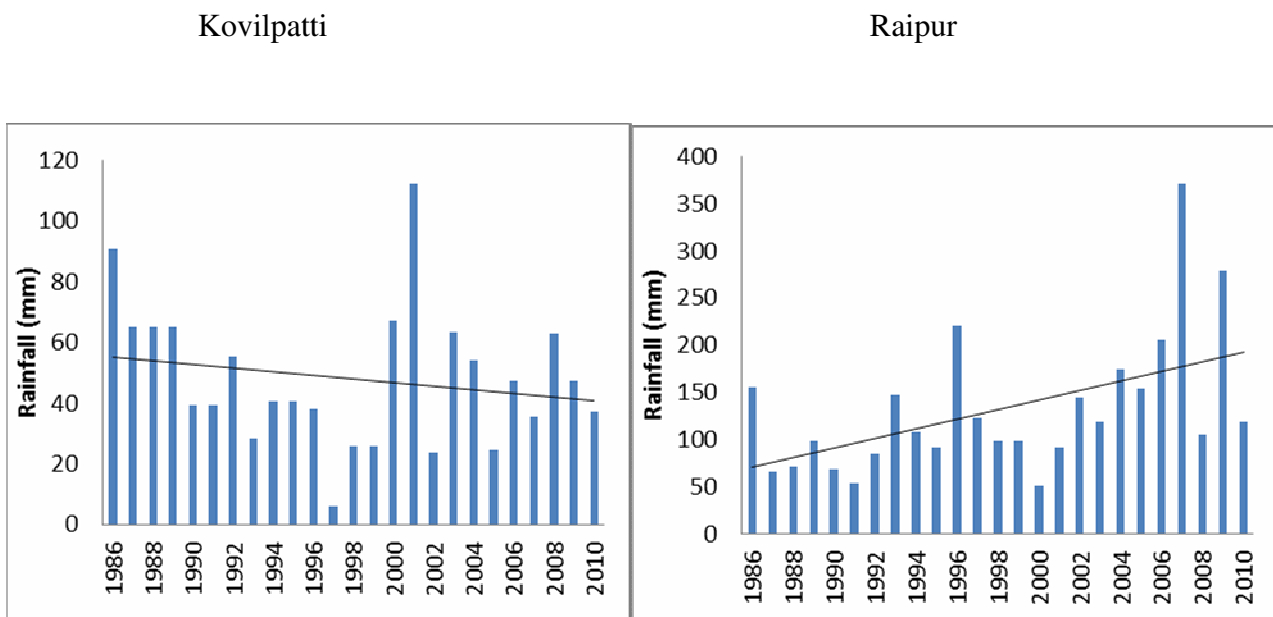


Figure A7.3: Two day maximum rainfall during June to September corresponding to two locations

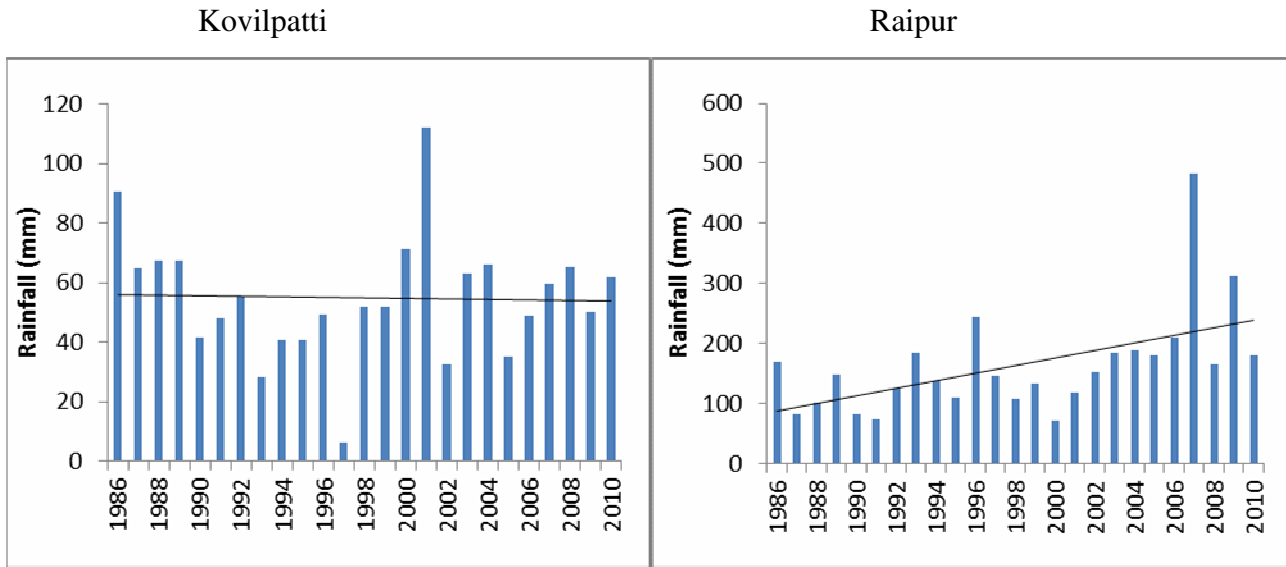


Figure A7.4: Duration of dry spell during June to September corresponding to two locations

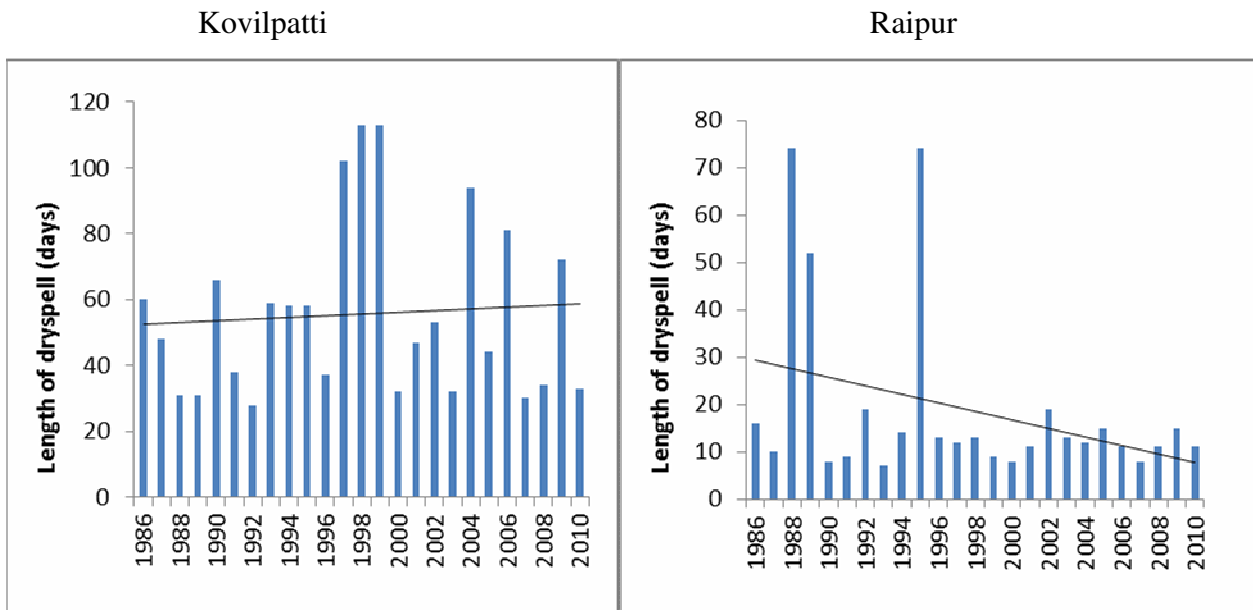


Figure A7.5: Duration of wet spell during June to September corresponding to two locations

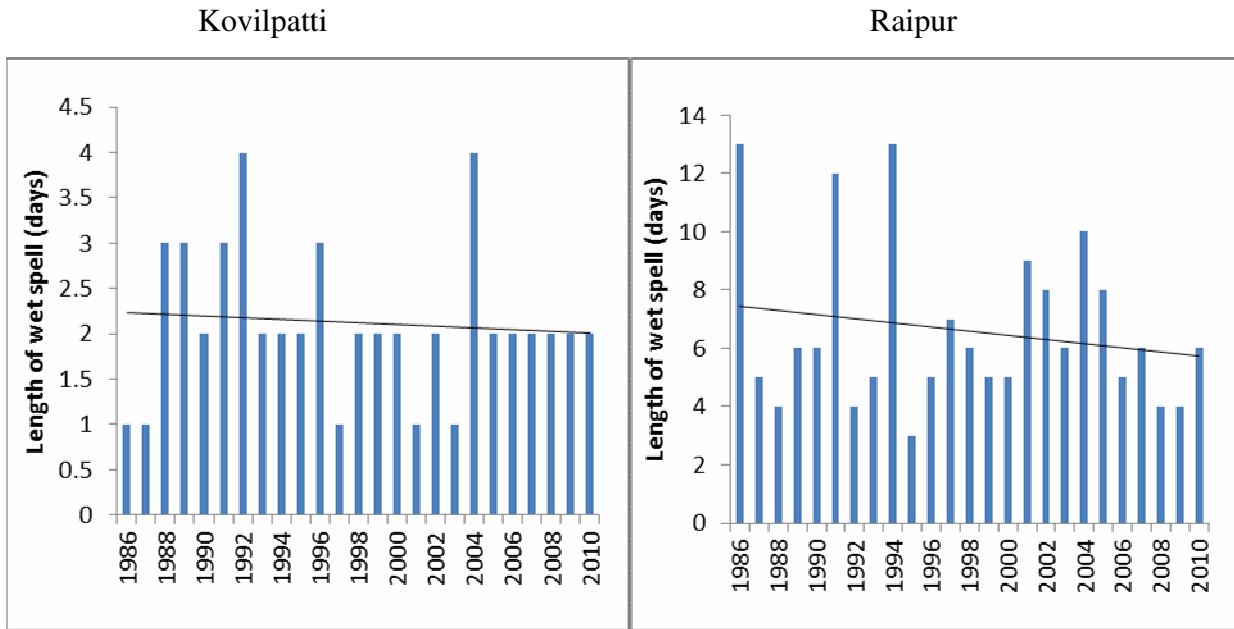


Figure A7.6: Minimum of daily minimum temperature during January to December corresponding to two locations

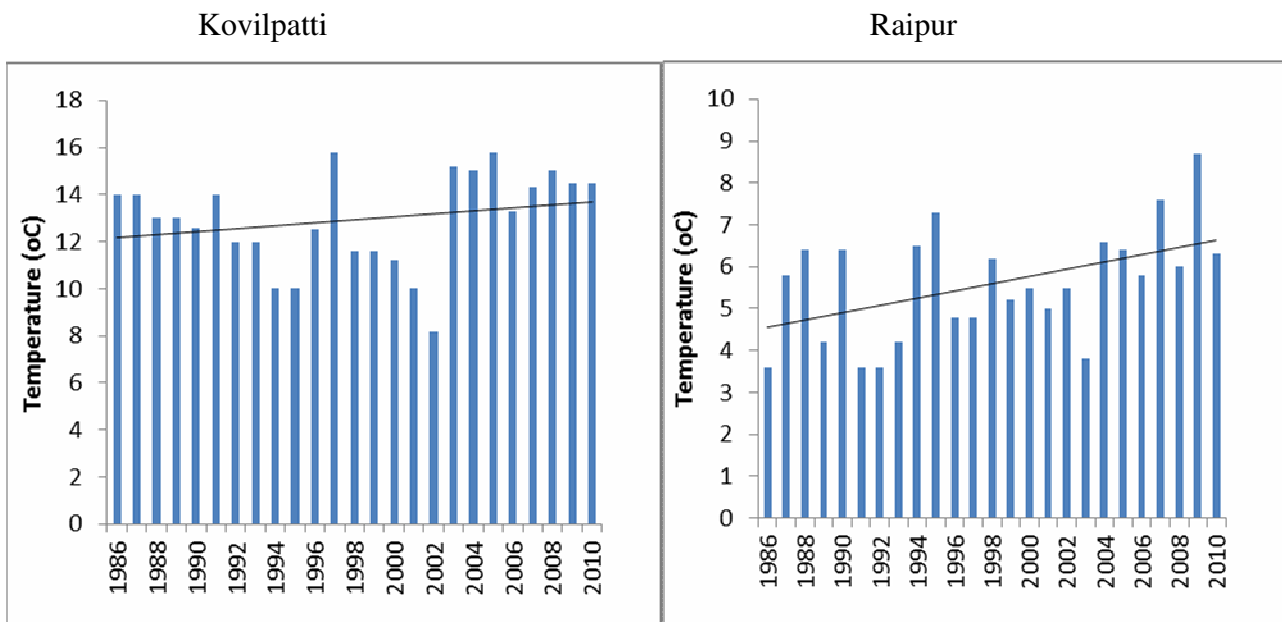


Figure A7.7: Maximum of daily maximum temperature during January to December corresponding to two locations

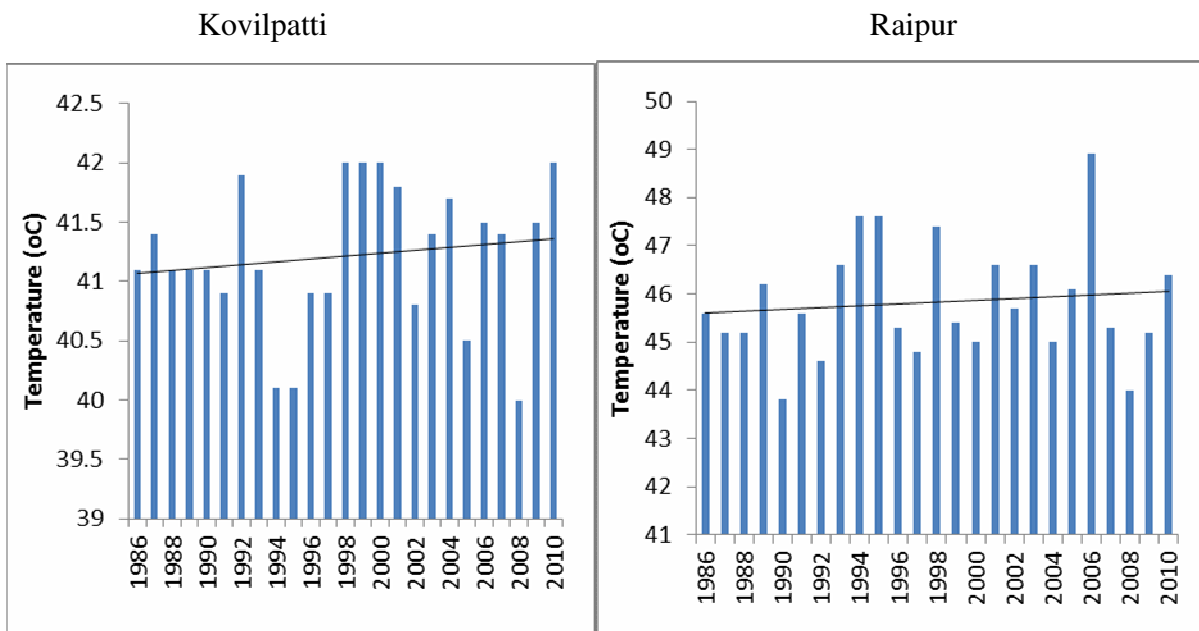
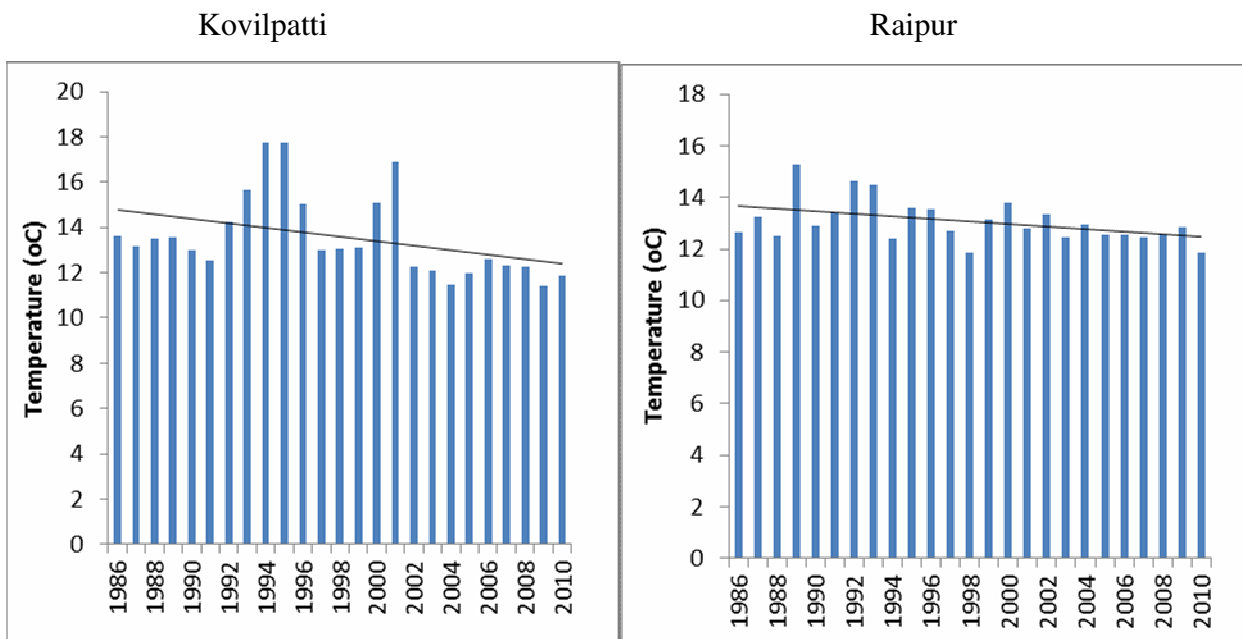


Figure A7.8: Average of daily temperature range during January to December corresponding to two locations



ANNEXURE 8: Product Basis Risk Results Tables

Table A8.1. Average claim payment conditional on total crop loss, expressed as percentage of average claim payment

Element/s of WBCIS cover	Expected claim payment in years with zero area average yield (percentage of average claim payment)	
	Products sold in 2011	Products sold in 2012
Volume deficit rainfall cover	186	181
Volume excess rainfall cover	52	197
Dry spell rainfall cover	188	53
Volume deficit and dry spell rainfall cover	193	153
All WBCIS cover	175	164

Table A8.2. Average claim payment conditional on area average yields equaling 50% of the historical average, expressed as percentage of average claim payment

Element/s of WBCIS cover	Expected claim payment in years with zero area average yield (percentage of average claim payment)	
	Products sold in 2011	Products sold in 2012
Volume deficit rainfall cover	141	139
Volume excess rainfall cover	79	147
Dry spell rainfall cover	142	77
Volume deficit and dry spell rainfall cover	144	126
All WBCIS cover	136	132

Table A8.3. Average claim payment conditional on area average yields equaling 70% of the historical average, expressed as percentage of average claim payment

Element/s of WBCIS cover	Expected claim payment in years with zero area average yield (% percentage of average claim payment)	
	Products sold in 2011	Products sold in 2012
Volume deficit rainfall cover	123	123
Volume excess rainfall cover	89	128
Dry spell rainfall cover	124	86
Volume deficit and dry spell rainfall cover	126	115
All WBCIS cover	120	119

Table A8.4. Average claim payment conditional on area average yields equaling 90% of the historical average, expressed as percentage of average claim payment

Element/s of WBCIS cover	Expected claim payment in years with zero area average yield (percentage of average claim payment)	
	Products sold in 2011	Products sold in 2012
Volume deficit rainfall cover	106	108
Volume excess rainfall cover	99	110
Dry spell rainfall cover	107	95
Volume deficit and dry spell rainfall cover	108	105
All WBCIS cover	105	107

ANNEXURE 9: Spatial Basis Risk Results Tables

Table A9.1: Distance between Weather Station Locations

Amber	0.00													
Bairath	60.61	0.00												
Bassi	24.79	70.21	0.00											
Chaksu	42.97	96.93	27.06	0.00										
Chomu	25.03	55.62	49.59	66.54	0.00									
Dudu	71.64	127.47	82.98	71.92	72.70	0.00								
J. Ramgarh	19.69	43.73	27.83	53.63	32.49	91.27	0.00							
Kotputli	86.35	28.01	98.04	124.56	76.03	148.65	71.02	0.00						
Naraina	68.53	120.99	83.32	76.26	65.47	12.58	87.69	140.71	0.00					
Paota	106.53	98.55	87.88	102.08	124.76	170.38	92.29	117.82	171.19	0.00				
Phagi	54.51	115.06	56.27	39.03	67.32	34.41	73.10	140.11	41.82	140.40	0.00			
Phulera	63.66	113.56	80.65	76.70	57.95	21.38	82.24	132.47	9.34	168.26	45.55	0.00		
Sambhar	67.47	115.22	85.42	82.35	59.75	25.50	85.60	133.14	12.92	172.79	51.45	5.92	0.00	
Sanganer	20.85	81.32	26.41	28.32	39.98	56.85	38.84	107.20	56.92	114.28	34.27	54.61	59.63	0.00
	Amber	Bairath	Bassi	Chaksu	Chomu	Dudu	J. Ramgarh	Kotputli	Naraina	Paota	Phagi	Phulera	Sambhar	Sanganer

Table A9.2: Conditional probability of occurrence of rainy day in year 2004 (%)

	Amber	Bairath	Bassi	Chaksu	Chomu	Dudu	J. Ramgarh	Kotputli	Naraina	Paota	Phagi	Phulera	Sambhar	Sanganer
Amber	100	78	63	60	84	75	70	74	70	59	75	78	77	87
Bairath	48	100	46	50	52	38	50	63	43	48	58	48	50	52
Bassi	52	61	100	60	60	46	57	53	65	44	58	61	68	57
Chaksu	41	56	50	100	52	50	50	53	43	41	54	57	50	57
Chomu	72	72	63	65	100	67	60	53	61	52	67	61	68	74
Dudu	62	50	46	60	64	100	50	58	65	56	67	74	68	65
J.Ramgarh	72	83	71	75	72	63	100	68	70	56	75	78	77	70
Kotputli	48	67	42	50	40	46	43	100	43	56	54	43	50	52
Naraina	55	56	63	50	56	63	53	53	100	48	71	70	86	57
Paota	55	72	50	55	56	63	50	79	57	100	58	57	59	61
Phagi	62	78	58	65	64	67	60	68	74	52	100	70	77	65
Phulera	62	61	58	65	56	71	60	53	70	48	67	100	77	61
Sambhar	59	61	63	55	60	63	57	58	83	48	71	74	100	57
Sanganer	69	67	54	65	68	63	53	63	57	52	63	61	59	100

Table A9.3: Conditional probability of occurrence of rather heavy rainfall in normal years (%)

	Amber	Bairath	Bassi	Chaksu	Chomu	Dudu	J.Ramgarh	Kotputli	Naraina	Paota	Phagi	Phulera	Sambhar	Sanganer
Amber	100	17	28	20	44	25	30	20	9	14	27	15	6	35
Bairath	22	100	33	27	67	17	23	45	0	21	36	15	13	22
Bassi	28	26	100	40	33	33	33	20	9	18	27	23	6	30
Chaksu	17	17	33	100	22	17	30	25	0	18	18	15	0	22
Chomu	22	26	17	13	100	8	20	10	0	4	9	8	0	9
Dudu	17	9	22	13	11	100	7	10	9	4	27	23	19	22
J. Ramgarh	50	30	56	60	67	17	100	30	0	36	27	31	13	35
Kotputli	22	39	22	33	22	17	20	100	0	25	36	8	13	26
Naraina	6	0	6	0	0	8	0	0	100	4	0	15	25	9
Paota	22	26	28	33	11	8	33	35	9	100	0	15	13	17
Phagi	17	17	17	13	11	25	10	20	0	0	100	8	6	30
Phulera	11	9	17	13	11	25	13	5	18	7	9	100	38	17
Sambhar	6	9	6	0	0	25	7	10	36	7	9	46	100	17
Sanganer	44	22	39	33	22	42	27	30	18	14	64	31	25	100

Table A9.4: Correlation of 3 day aggregate rainfall in year 2004 (%)

	Amber	Bairath	Bassi	Chaksu	Chomu	Dudu	J.Ramgarh	Kotputli	Naraina	Paota	Phagi	Phulera	Sambhar	Sanganer
Amber	100	49	48	40	72	63	74	82	57	51	66	62	62	61
Bairath	49	100	58	69	68	75	77	44	59	44	56	85	54	66
Bassi	48	58	100	59	63	37	58	61	35	28	25	50	34	55
Chaksu	40	69	59	100	46	61	67	32	54	39	39	72	58	69
Chomu	72	68	63	46	100	67	69	75	44	78	67	69	63	75
Dudu	63	75	37	61	67	100	69	43	75	60	64	84	54	71
J. Ramgarh	74	77	58	67	69	69	100	73	48	55	79	86	68	70
Kotputli	82	44	61	32	75	43	73	100	27	60	70	54	63	58
Naraina	57	59	35	54	44	75	48	27	100	28	42	66	25	50
Paota	51	44	28	39	78	60	55	60	28	100	64	59	74	77
Phagi	66	56	25	39	67	64	79	70	42	64	100	69	63	58
Phulera	62	85	50	72	69	84	86	54	66	59	69	100	55	72
Sambhar	62	54	34	58	63	54	68	63	25	74	63	55	100	77
Sanganer	61	66	55	69	75	71	70	58	50	77	58	72	77	100

Table A9.5: Standard deviation of absolute differences in payouts

	Amber	Bairath	Bassi	Chaksu	Chomu	Dudu	J. Ramgarh	Kotputli	Naraina	Paota	Phagi	Phulera	Sambhar	Sanganer
Amber	0.00	415.78	459.03	681.90	677.13	502.94	305.89	702.61	527.73	917.99	686.54	567.07	648.65	493.67
Bairath	415.78	0.00	435.41	480.80	533.70	368.68	327.52	505.91	272.44	579.69	480.83	349.79	413.55	323.72
Bassi	459.03	435.41	0.00	303.06	255.40	369.78	470.83	336.07	368.94	763.83	310.32	350.86	475.27	341.82
Chaksu	681.90	480.80	303.06	0.00	244.41	370.99	629.30	278.25	418.58	840.45	285.00	385.85	421.90	448.18
Chomu	677.13	533.70	255.40	244.41	0.00	461.11	619.31	313.43	468.48	678.29	94.95	363.84	496.38	435.83
Dudu	502.94	368.68	369.78	370.99	461.11	0.00	414.61	440.38	327.31	805.87	436.30	279.37	171.24	328.33
J. Ramgarh	305.89	327.52	470.83	629.30	619.31	414.61	0.00	630.36	417.53	614.84	600.30	406.58	510.59	302.87
Kotputli	702.61	505.91	336.07	278.25	313.43	440.38	630.36	0.00	448.31	840.44	351.40	387.67	485.72	454.87
Naraina	527.73	272.44	368.94	418.58	468.48	327.31	417.53	448.31	0.00	801.61	430.11	343.28	333.21	355.73
Paota	917.99	579.69	763.83	840.45	678.29	805.87	614.84	840.44	801.61	0.00	615.64	515.03	801.35	596.98
Phagi	686.54	480.83	310.32	285.00	94.95	436.30	600.30	351.40	430.11	615.64	0.00	310.77	459.79	365.91
Phulera	567.07	349.79	350.86	385.85	363.84	279.37	406.58	387.67	343.28	515.03	310.77	0.00	287.44	179.28
Sambhar	648.65	413.55	475.27	421.90	496.38	171.24	510.59	485.72	333.21	801.35	459.79	287.44	0.00	355.06
Sanganer	493.67	323.72	341.82	448.18	435.83	328.33	302.87	454.87	355.73	596.98	365.91	179.28	355.06	0.00