Rainfall Analysis for Agriculture Planning

A Case Study

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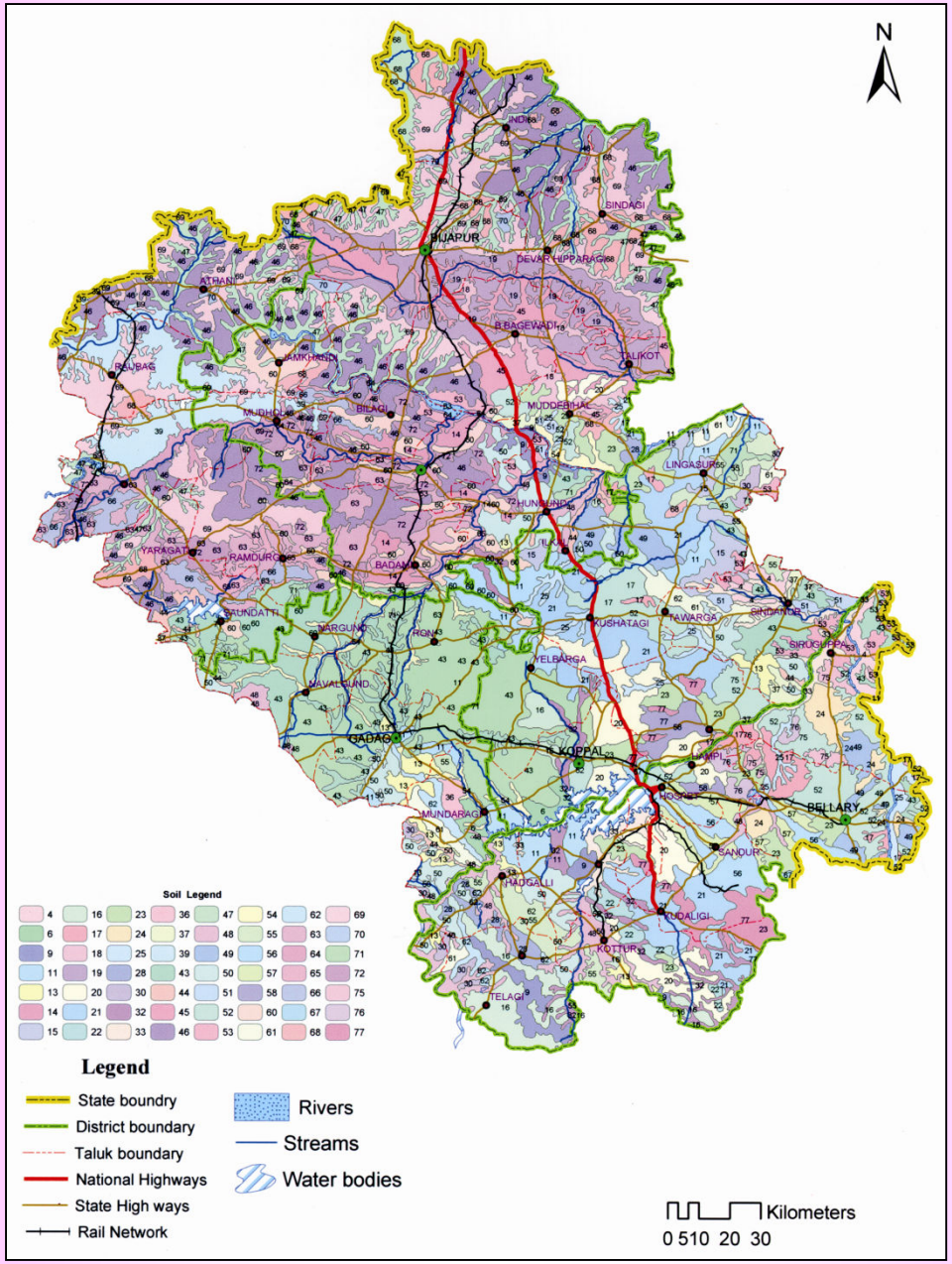
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KARNATAKA

Rainwater and soil are the two vital natural resources which influence food security in dryland agriculture

Soils of Northern Dry zone of Karnataka



Soil resource :

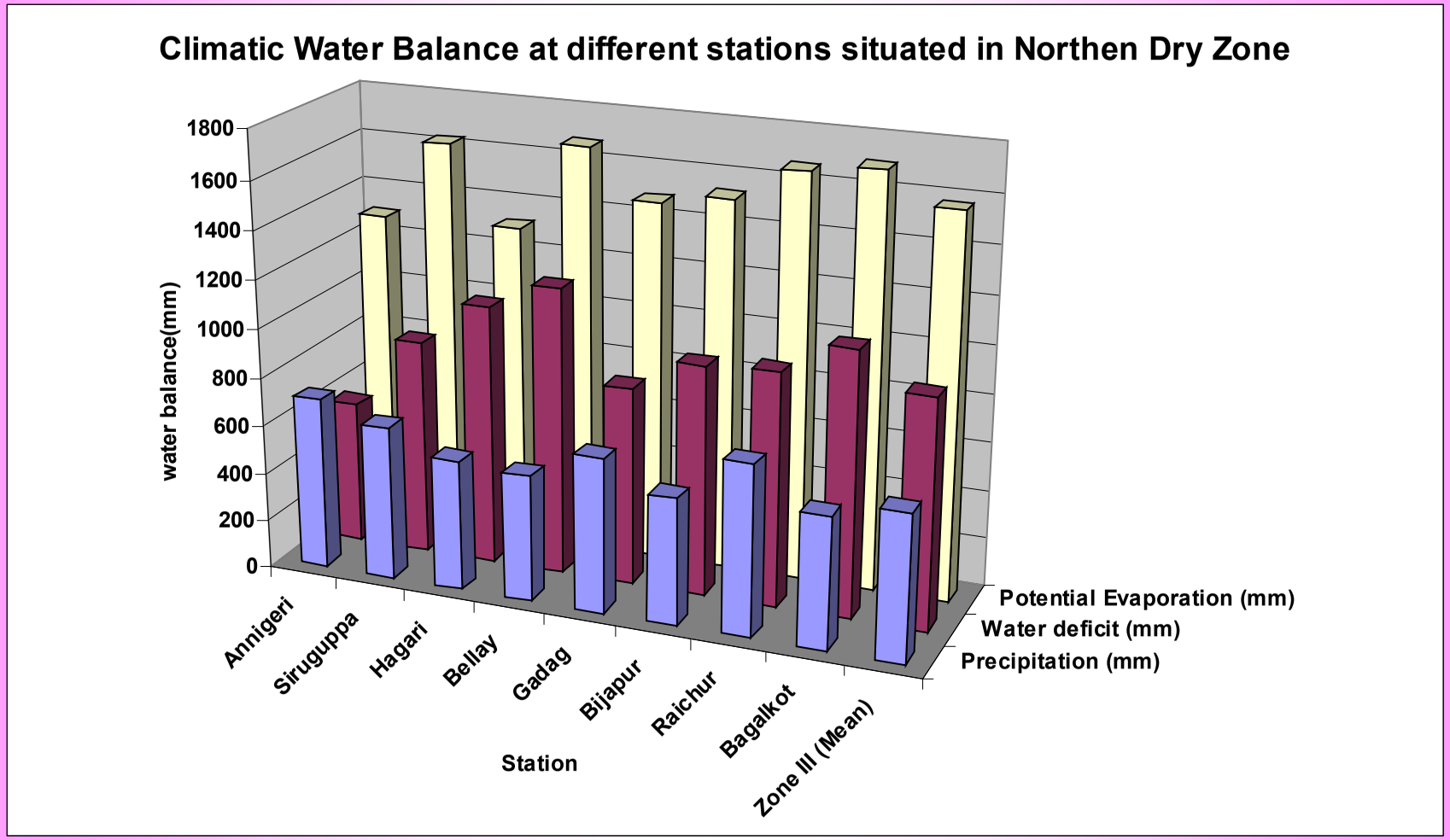
- **Northern Dry zone of Karnataka is endowed with 56 different soil map units in an area of 49.43 lakh hectares spread over 35 talukas of nine districts.**
- **Of this 56 per cent of the soils are shallow to very shallow and their AWC is low to very low and LGP is less than 90 days.**
- **Practically there is no vegetative cover on the soil surface for six months.**

- **The intense sunlight and the desiccating winds dry the top soil and disintegrate organic matter.**

- **Consequently, poor physical, chemical and biological properties are associated with the soil.**

- **Occurrence of high run-off (20 to 40% of annual rainfall), Soil loss (12 to 43 t / ha / year) and nutrient loss (48 kg N, 16 kg P_2O_5 and 27 kg K_2O per ha.) is a common feature.**

Climate


Climatic Water Balance at different stations situated in Northen Dry Zone
water balance(mm)
1800
1600
1400
1200
1000
800
600
400
200
0
Annigeri
Siruguppa
Hagari
Bellay
Gadag
Bijapur
Raichur
Bagalkot
Zone III (Mean)
Station
Potential Evaporation (mm)
Water deficit (mm)
Precipitation (mm)

Rainwater :

- The probability of occurrence of deficit rainfall is 76 per cent and its spatial and temporal variability ranges from 31 to 64 per cent.
- High insolation (18.9-21.0 $MJ/M^2/day$) and desiccating wind (20 km/hr) cause annual potential evaporation of 1574 mm that far exceeds rainfall by 988 mm. The eidity index is of 62 per cent.

- Drought generally occurs twice in every five years, while the severe droughts that persist for 3-4 years occur nearly once in 30 years.

- Since 16th century, drought has occurred 423 times. out of them severe drought has occurred for 73 times.

Case Study :

Rainwater and soil resources of both the districts were characterized.

Rainfall :

- The mean annual rainfall over the study area varied from 518 mm in the extreme Southern Taluka of Badami to 639 mm in the Central region
- The following rainfall characteristics were identified.

- Long period analysis of annual rainfall (from 1901 to 2000) indicated a jump in rainfall during the 1960s, resulting in higher rainfall in the last four decades.

- Two phases on either side of this shift *i.e*., Phase-I (1930 – 1970) and Phase-II (1970-2000) were segregated.

- Mean and Co-efficient of variation of seasonal and annual rainfall were determined and were found significant.

- The study area had the following rainfall characteristics like:

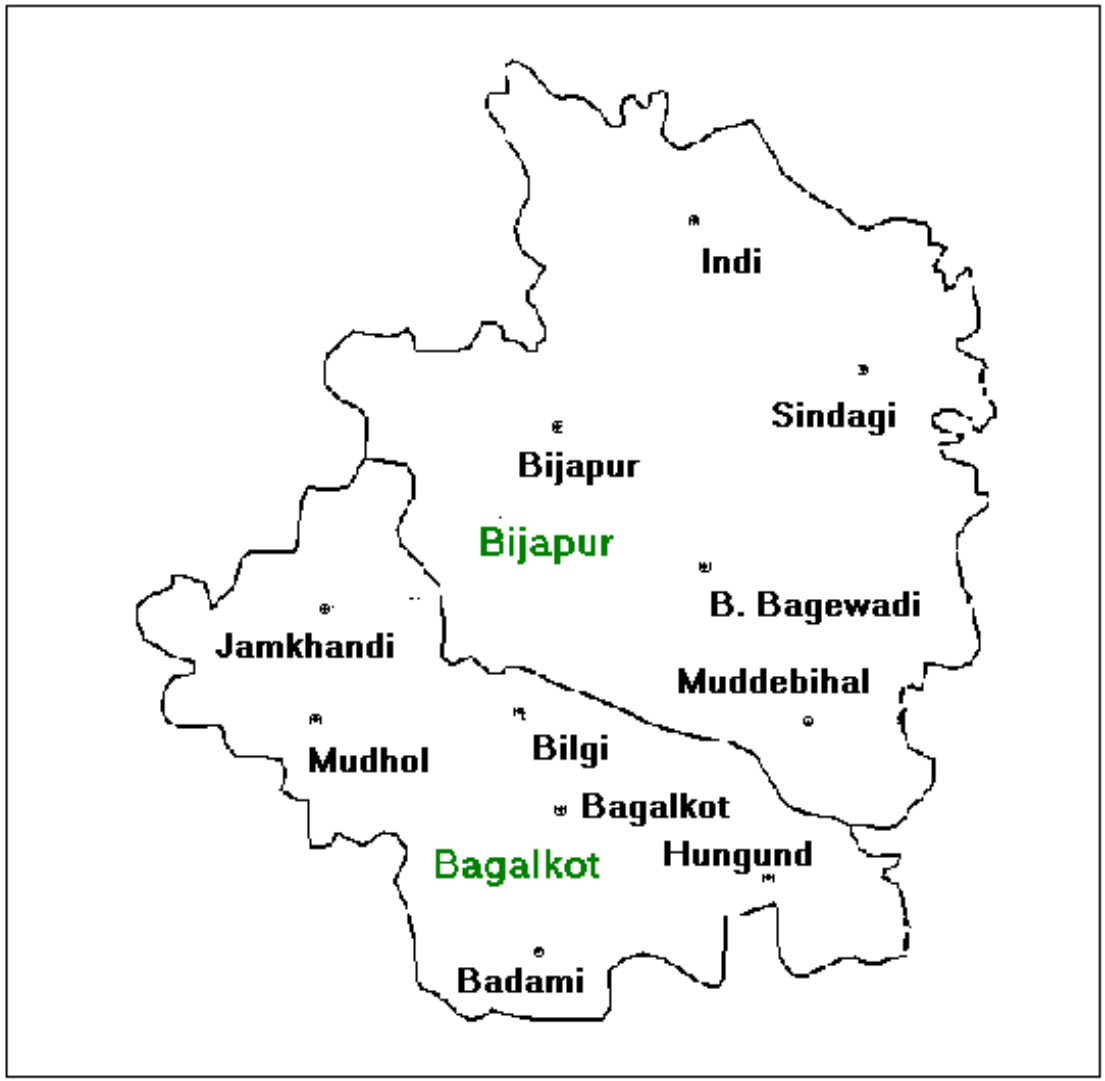
i. **Increased rainfall and low variability.**

ii. **Decreased rainfall and high variability and**

iii. **Increased rainfall and increased variability**

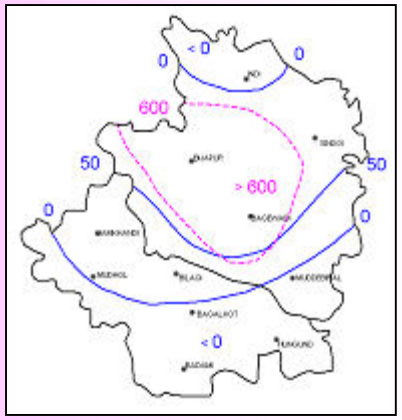
- In addition to the climatological variations, the spatial variations in intra-seasonal fluctuations for all the talukas of two districts have been identified.

- This information is important for effective micro-level planning and implementation

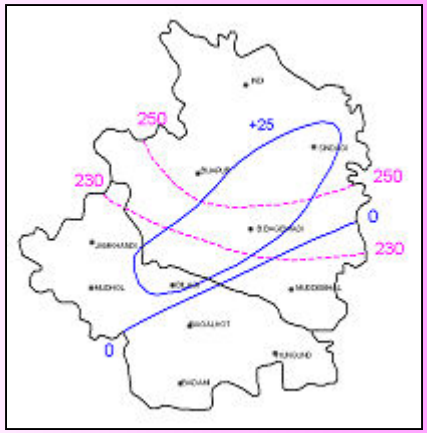

Indi
Sindagi
Bijapur
Bijapur
B. Bagewadi
Jamkhandi
Muddebihal
Mudhol
Bilgi
Bagalkot
Bagalkot
Hungund
Badami

Distribution of rainfall (1931 - 2000) and difference of rainfall between Phase I & Phase II (Phase II-I) over Bijapur district

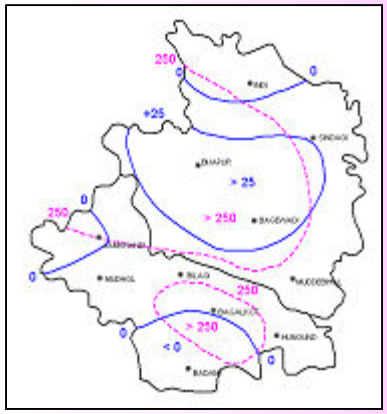
a) Annual



b) *Kharif* season



c) *Rabi* season

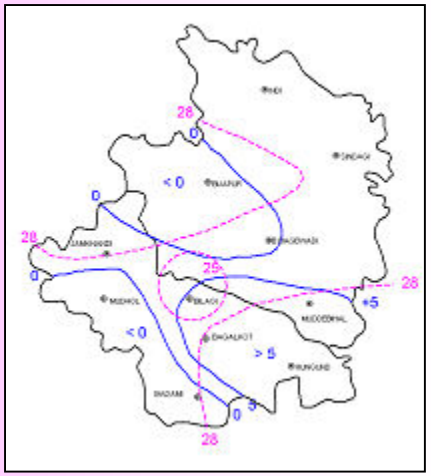


Long term rainfall (mm)

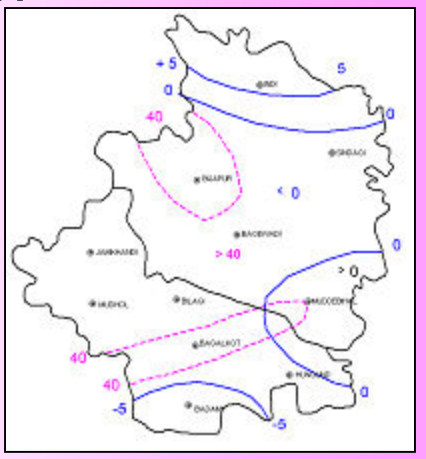
Phase II – I

Distribution of variability of rainfall (1931 - 2000) and difference of rainfall variability between Phase I & Phase II (Phase II-I)

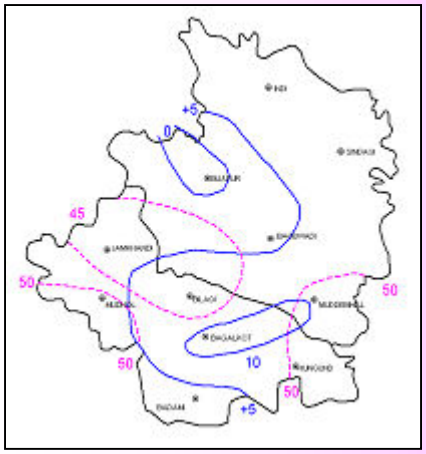
a) Annual



b) *Kharif* season



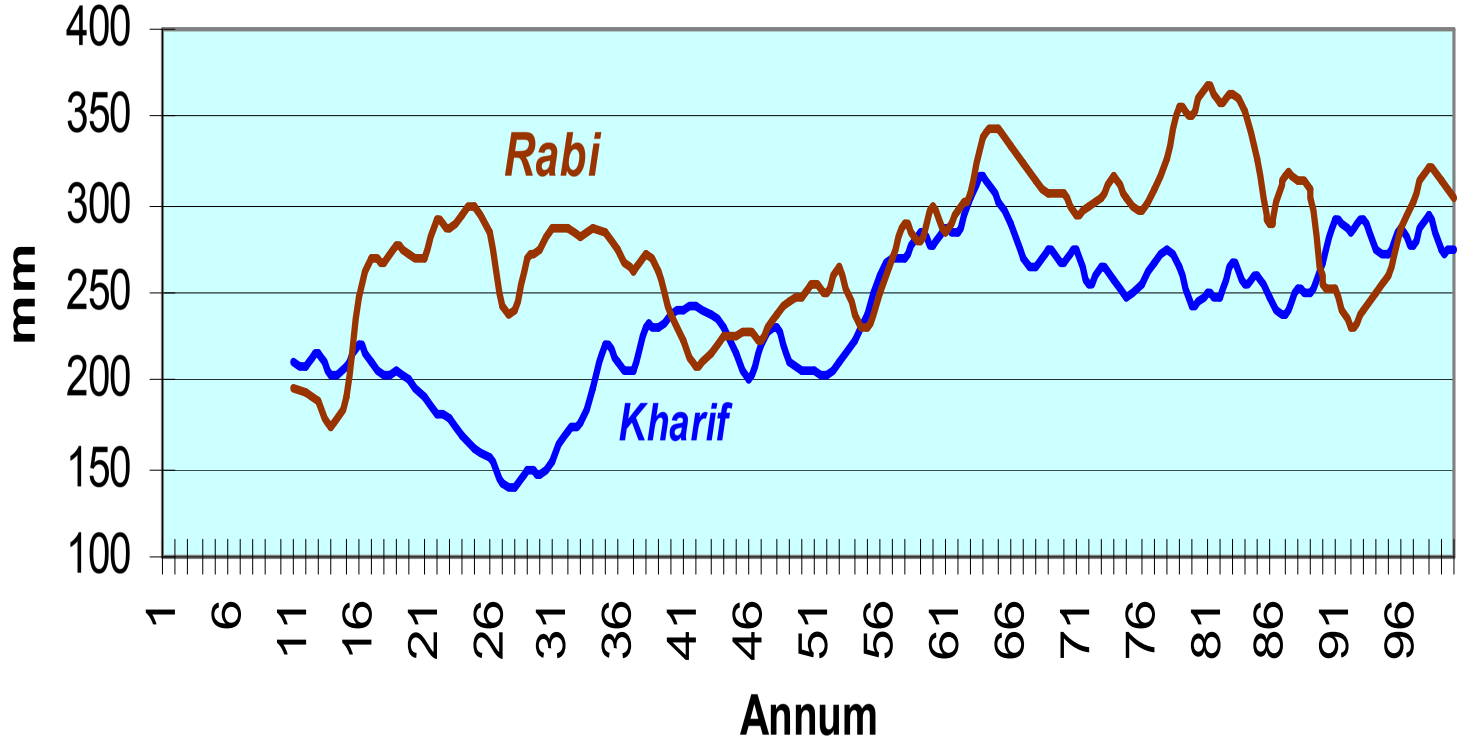
c) *Rabi* season

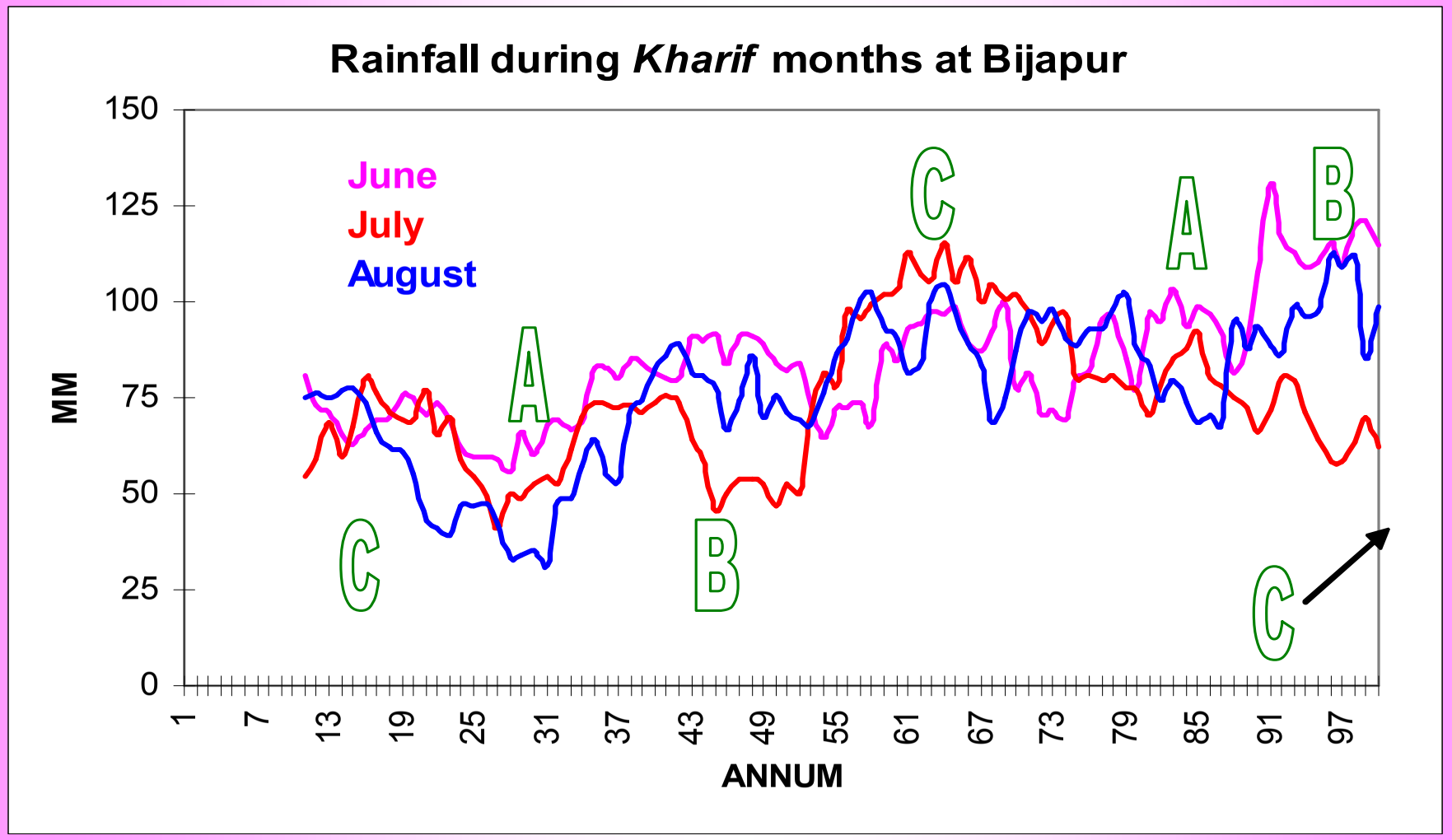


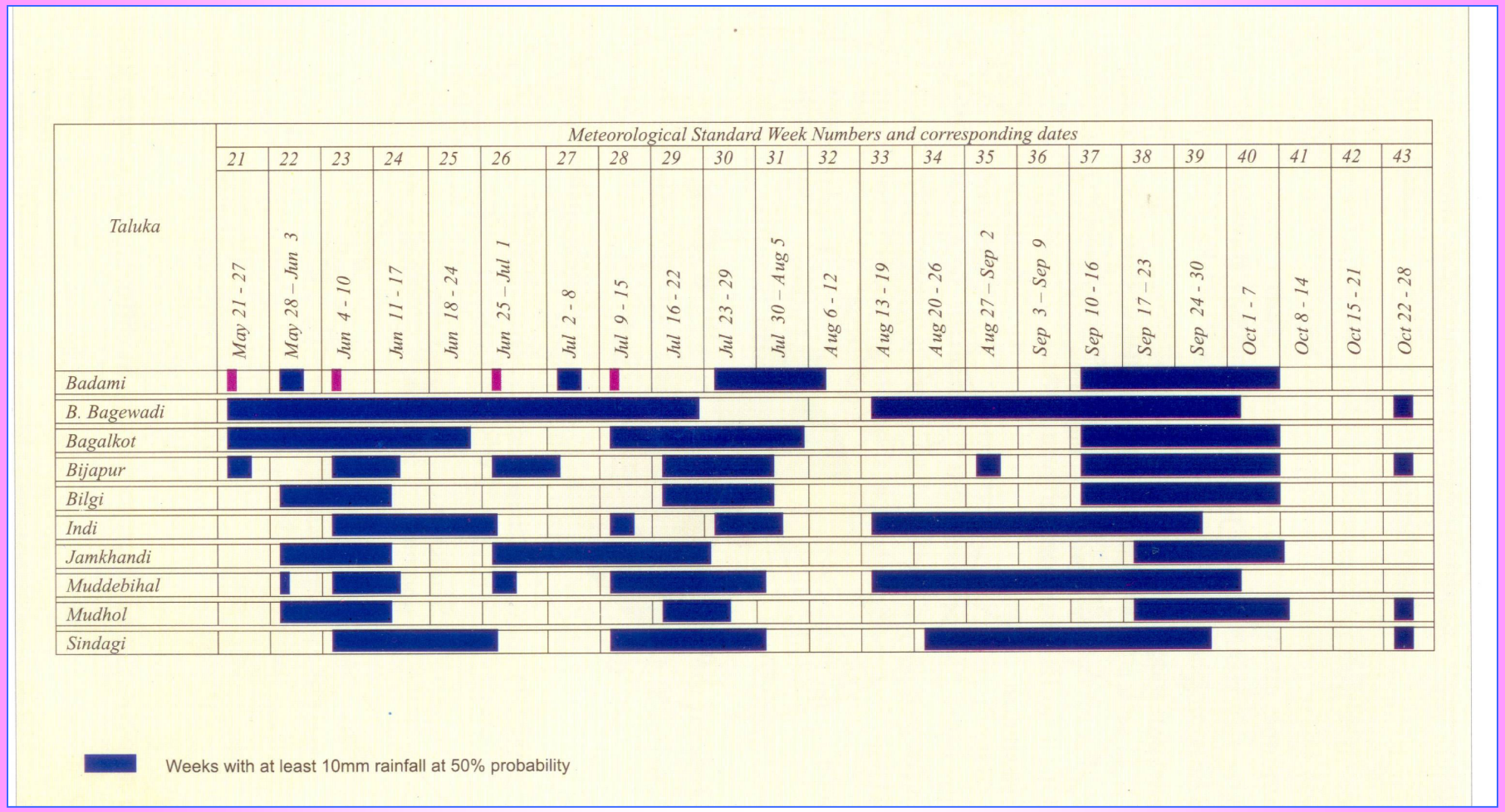
Long term rainfall variability (%)

Phase II – I

Secular changes in seasonal rainfall at Bijapur

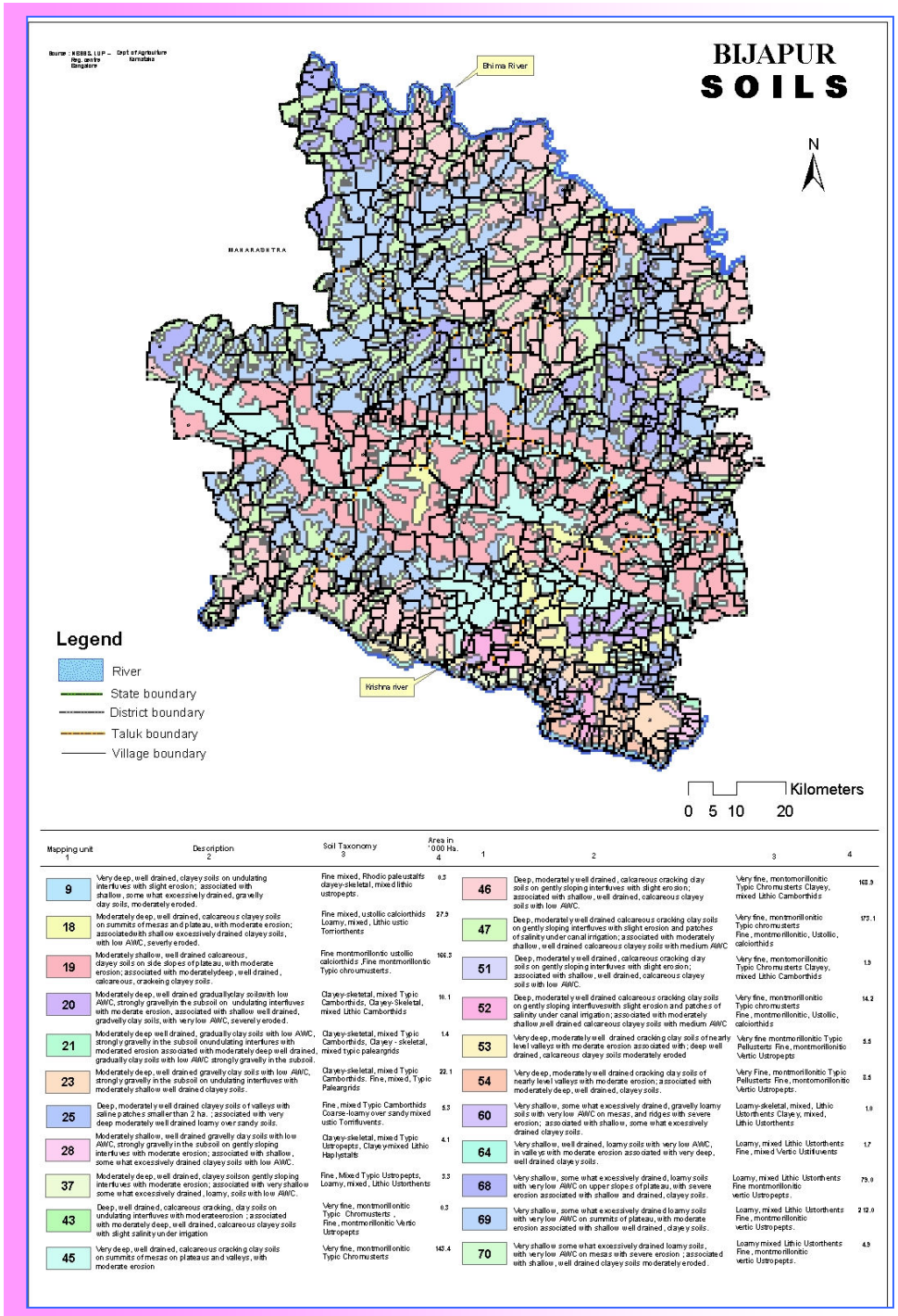



Rainfall during *Kharif* months at Bijapur
150
125
100
75
50
25
0
MM
June
July
August
A
B
C
A
B
C
C
1
7
13
19
25
31
37
43
49
55
61
67
73
79
85
91
97
ANNUM



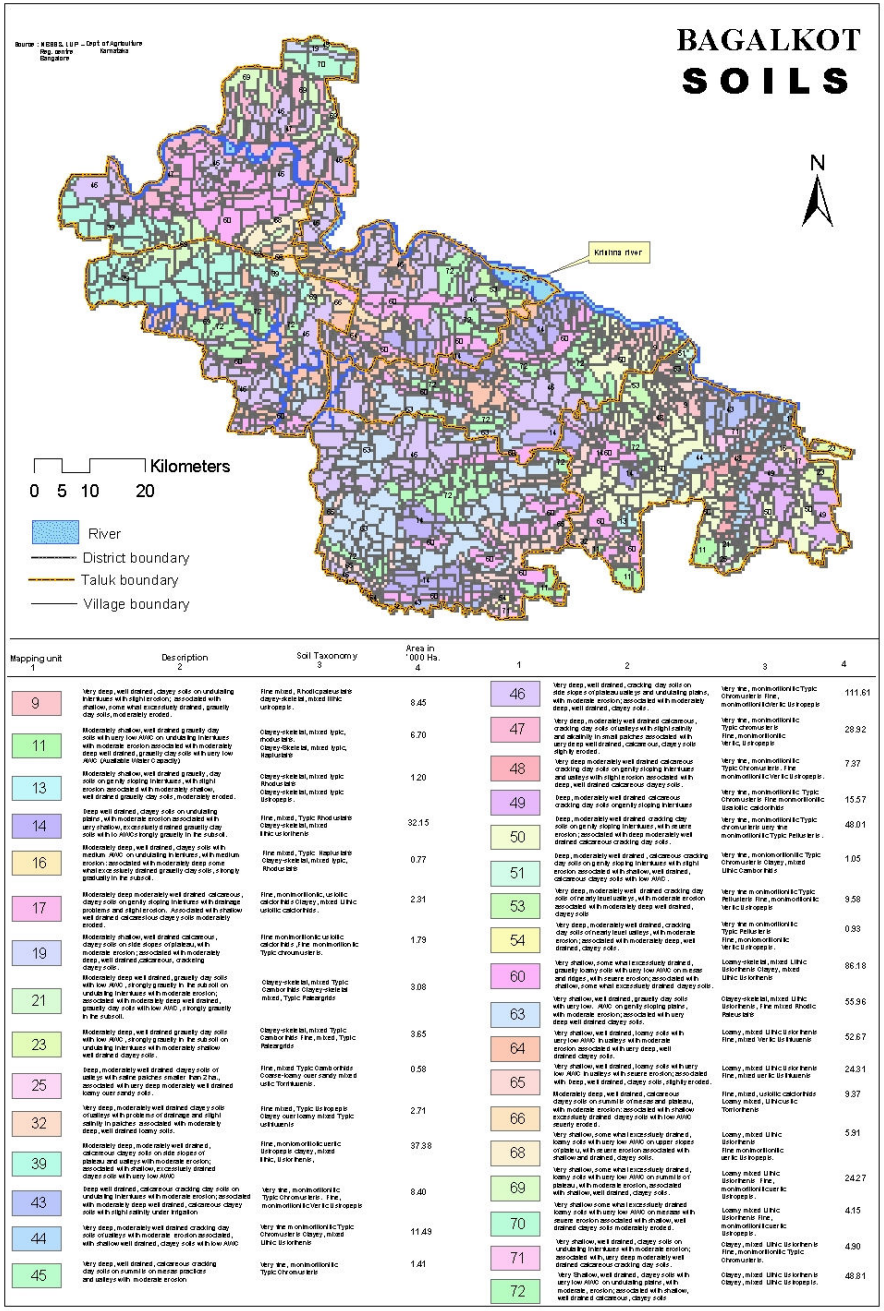
Schematic diagram showing weeks with at least 10.0 mm in weeks/groups of weeks at different talukas of Bijapur district

Soil Resource



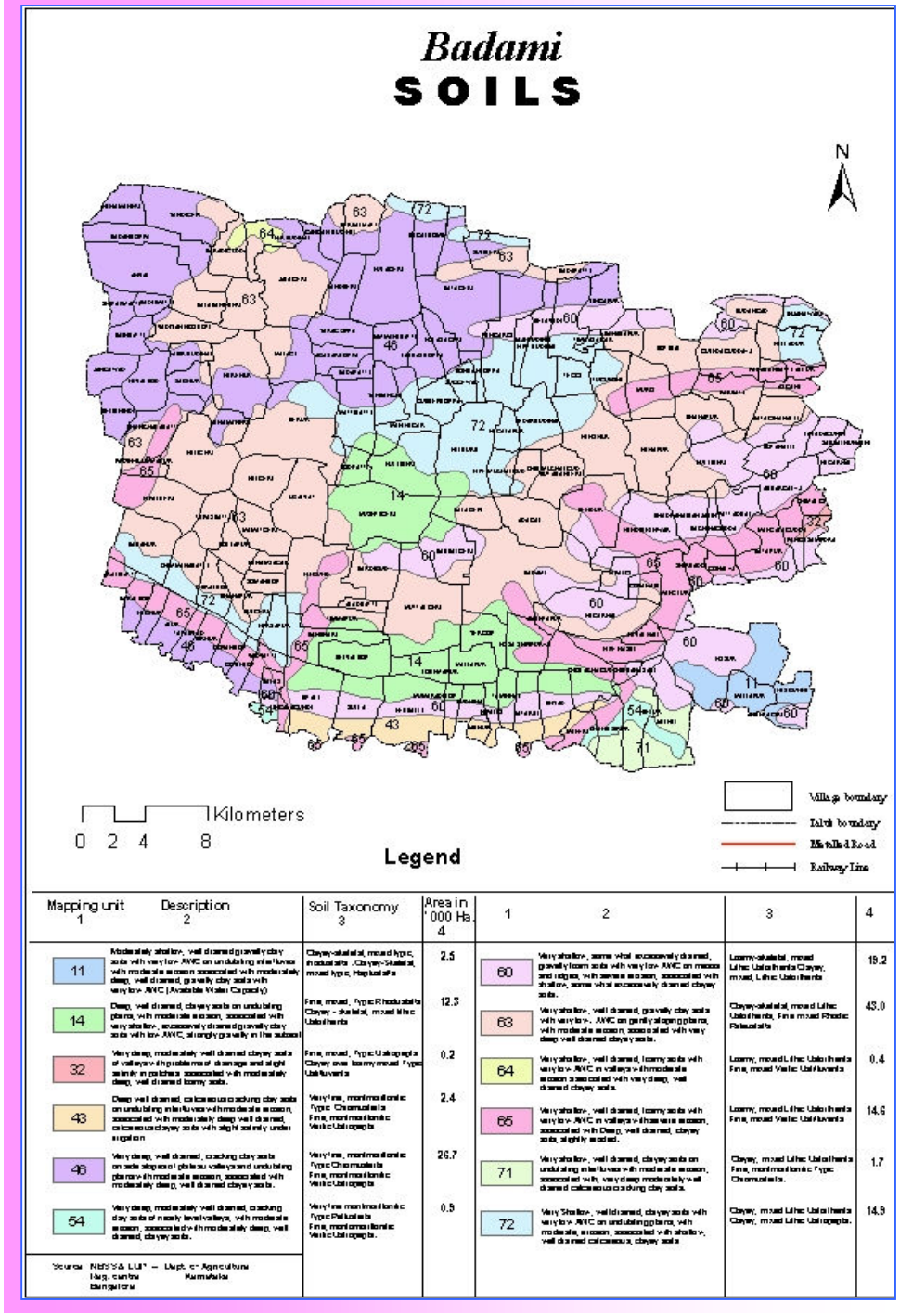
Mapping unit 1	Description 2	Soil Taxonomy 3	Area in '000 Ha. 4
9	Very deep, well drained, clayey soils on undulating interfluves with slight erosion; associated with shallow, some what excessively drained, gravelly clay soils, moderately eroded.	Fine mixed, Rhodic paleustalfs clayey-skeletal, mixed lithic ustropepts.	0.3
18	Moderately deep, well drained, calcareous clayey soils on summits of mesas and plateau, with moderate erosion; associatedwith shallow excessively drained clayey soils, with low AWC, severly eroded.	Fine mixed, ustollic calciorthids Loamy, mixed, Lithic ustic Torriorthents	27.9
19	Moderately shallow, well drained calcareous, clayey soils on side slopes of plateau, with moderate erosion; associated with moderatelydeep, well drained, calcareous, crackeing clayey soils.	Fine montmorillonitic ustollic calciorthids ;Fine montmorillonitic Typic chromusterts.	166.3
20	Moderately deep, well drained gradualllyclay soilswith low AWC, strongly gravellyin the subsoil on undulating interfluves with moderate erosion, associated with shallow well drained, gradvelly clay soils, with very low AWC, severely eroded.	Clayey-skeletal, mixed Typic Camborthids, Clayey-Skeletal, mixed Lithic Camborthids	16.1
21	Moderately deep well drained, gradually clay soils with low AWC, strongly gravelly in the subsoil onundulating interfluves with moderated erosion associated with moderately deep well drained, gradually clay soils with low AWC strongly gravelly in the subsoil.	Clayey-skeletal, mixed Typic Camborthids, Clayey - skeletal, mixed typic paleargrids	1.4
23	Moderately deep, well drained gravelly clay soils with low AWC, strongly gravelly in the subsoil on undulating interfluves with moderately shallow well drained clayey soils.	Clayey-skeletal, mixed Typic Camborthids. Fine, mixed, Typic Paleargrids	22.1
25	Deep, moderately well drained clayey soils of valleys with saline patches smaller than 2 ha. ; associated with very deep moderately well drained loamy over sandy soils.	Fine, mixed Typic Camborthids Coarse-loamy over sandy mixed ustic Torrifluvents.	5.3
28	Moderately shallow, well drained gravelly clay soils with low AWC, strongly gravelly in the subsoil on gently sloping interfluves with moderate erosion; associated with shallow, some what excessively drained clayey soils with low AWC.	Clayey-skeletal, mixed Typic Ustropepts, Clayeymixed Lithic Haplustalfs	4.1
37	Moderately deep, well drained, clayey soilson gently sloping interfluves with moderate erosion; associated with very shallow some what excessively drained, loamy, soils with low AWC.	Fine, Mixed Typic Ustropepts; Loamy, mixed , Lithic Ustorthents	3.3
43	Deep, well drained, calcareous cracking, clay soils on undulating interfluves with moderateerosion ; associated with moderately deep, well drained, calcareous clayey soils with slight salinity under irrigation	Very fine, montmorillonitic Typic Chromusterts , Fine, montmorillonitic Vertic Ustropepts	0.3
45	Very deep, well drained, calcareous cracking clay soils on summits of mesas on plateaus and valleys, with moderate erosion	Very fine, montmorillonitic Typic Chromusterts	143.4
46	Deep, moderately well drained, calcareous cracking clay soils on gently sloping interfluves with slight erosion; associated with shallow, well drained, calcareous clayey soils with low AWC.	Very fine, montomorillonitic Typic Chromusterts Clayey, mixed Lithic Camborthids	163.9
47	Deep, moderately well drained calcareous cracking clay soils on gently sloping interfluves with slight erosion and patches of salinity under canal irrigation; associated with moderately shallow , well drained calcareous clayey soils with medium AWC	Very fine, montmorillonitic Typic chromusterts Fine, montmorillonitic, Ustollic, calciorthids	173.1
51	Deep, moderately well drained, calcareous cracking clay soils on gently sloping interfluves with slight erosion; associated with shallow, well drained, calcareous clayey soils with low AWC.	Very fine, montomorillonitic Typic Chromusterts Clayey, mixed Lithic Camborthids	1.9
52	Deep, moderately well drained calcareous cracking clay soils on gently sloping interfluveswith slight erosion and patches of salinity under canal irrigation; associated with moderately shallow well drained calcareous clayey soils with medium AWC	Very fine, montmorillonitic Typic chromusterts Fine, montmorillonitic, Ustollic, calciorthids	14.2
53	Very deep, moderately well drained cracking clay soils of nearly level valleys with moderate erosion associated with; deep well drained, calcareous clayey soils moderately eroded	Very fine montmorillonitic Typic Pellusterts Fine, montmorillonitic Vertic Ustropepts	5.5
54	Very deep, moderately well drained cracking clay soils of nearly level valleys with moderate erosion; associated with moderately deep, well drained, clayey soils.	Very Fine, montmorillonitic Typic Pellusterts Fine, montomorillonitic Vertic Ustropepts.	3.5
60	Very shallow, some what excessively drained, gravelly loamy soils with very low AWC on mesas, and ridges with severe erosion; associated with shallow, some what excessively drained clayey soils.	Loamy-skeletal, mixed, Lithic Ustorthents Clayey, mixed, Lithic Ustorthents	1.8
64	Very shallow, well drained, loamy soils with very low AWC, in valleys with moderate erosion associated with very deep, well drained clayey soils.	Loamy, mixed Lithic Ustorthents Fine, mixed Vertic Ustifluvents	1.7
68	Very shallow, some what excessively drained, loamy soils with very low AWC on upper slopes of plateau, with severe erosion associated with shallow and drained, clayey soils.	Loamy, mixed Lithic Ustorthents Fine montmorillonitic vertic Ustropepts.	79.9
69	Very shallow, some what excessively drained loamy soils with very low AWC on summits of plateau, with moderate erosion associated with shallow well drained , claye y soils.	Loamy, mixed Lithic Ustorthents Fine, montmorillonitic vertic Ustropepts.	212.0
70	Very shallow some what excessively drained loamy soils, with very low AWC on mesas with severe erosion ; associated with shallow, well drained clayey soils moderately eroded.	Loamy mixed Lithic Ustorthents Fine, montmorillonitic vertic Ustropepts.	4.9

Total Area (ha.)	Soils With	
	Low to very low AWC	Medium to high AWC
10,49,882	5,38,300	5,11,582



Mapping unit 1	Description 2	Soil Taxonomy 3	Area in '000 Ha. 4
9	Very deep, well drained, clayey soils on undulating interfluves with slight erosion; associated with shallow, some what excessively drained, gravelly clay soils, moderately eroded.	Fine mixed, Rhodicpaleustalfs clayey-skeletal, mixed Ithic Ustropepts.	8.45
11	Moderately shallow, well drained gravelly clay soils with very low AWC on undulating interfluves with moderate erosion associated with moderately deep well drained, gravelly clay soils with very low AWC (Available Water Capacity)	Clayey-skeletal, mixed typic, rhodustalfs Clayey-Skeletal, mixed typic, Haplustalfs	6.70
13	Moderately shallow, well drained gravelly, clay soils on gently sloping interfluves, with slight erosion associated with moderately shallow, well drained gravelly clay soils, moderately eroded.	Clayey-skeletal, mixed typic Rhodustalfs Clayey-skeletal, mixed typic Ustropepts.	1.20
14	Deep well drained, clayey soils on undulating plains, with moderate erosion associated with very shallow, excessively drained gravelly clay soils with no AWC strongly gravelly in the subsoil.	Fine, mixed, Typic Rhodustalfs Clayey-skeletal, mixed Ithic Ustorthents.	32.15
16	Moderately deep, well drained, clayey soils with medium AWC on undulating interfluves, with medium erosion; associated with moderately deep some what excessively drained gravelly clay soils, strongly gravelly in the subsoil.	Fine mixed, Typic, Haplustalfs Clayey-skeletal, mixed typic, Rhodustalfs	0.77
17	Moderately deep moderately well drained calcareous, clayey soils on gently sloping interfluves with drainage problems and slight erosion. Associated with shallow well drained calcareous clayey soils moderately eroded.	Fine, montmorillonitic, ustollic calciorthids Clayey, mixed Ulnic ustollic calciorthids.	2.31
19	Moderately shallow, well drained calcareous, clayey soils on side slopes of plateau, with moderate erosion; associated with moderately deep, well drained, calcareous, cracking clayey soils.	Fine montmorillonitic ustollic calciorthids Fine montmorillonitic Typic chromusterts.	1.79
21	Moderately deep well drained, gravelly clay soils with low AWC, strongly gravelly in the sub soil on undulating interfluves with moderate erosion; associated with moderately deep well drained, gravelly clay soils with low AWC, strongly gravelly in the subsoil.	Clayey-skeletal, mixed Typic Camborthids Clayey-skeletal mixed, Typic Paleargrids	3.08
23	Moderately deep, well drained gravelly clay soils with low AWC, strongly gravelly in the sub soil on undulating interfluves with moderately shallow well drained clayey soils.	Clayey-skeletal, mixed Typic Camborthids Fine, mixed, Typic Paleargrids	3.65
25	Deep, moderately well drained clayey soils or usilps with saline patches smaller than 2ha., associated with very deep moderately well drained loamy over sandy soils.	Fine, mixed Typic Camborthids Coarse-loamy over sandy mixed ustic Torrifluvents.	0.58
32	Very deep, moderately well drained clayey soils of usilips with problems of drainage and slight salinity in patches associated with moderately deep, well drained loamy soils.	Fine mixed, Typic Ustropepts Clayey over loamy mixed Typic ustifluvents	2.71
39	Moderately deep, moderately well drained, calcareous clayey soils on side slopes of plateau and usilips with moderate erosion; associated with shallow, excessively drained clayey soils with very low AWC	Fine, montmorillonitic ustic Ustropepts clayey, mixed Ithic, Ustorthents,	37.38
43	Deep well drained, calcareous cracking clay soils on undulating interfluves with moderate erosion; associated with moderately deep well drained, calcareous clayey soils with slight salinity under irrigation.	Very fine, montmorillonitic Typic Chromusterts. Fine, montmorillonitic Vertic ustic Ustropepts	8.40
44	Very deep, moderately well drained cracking clay soils of usilips with moderate erosion associated, with shallow well drained, clayey soils with low AWC	Very fine montmorillonitic Typic Chromusterts Clayey, mixed Ulnic Ustorthents	11.49
45	Very deep, well drained, calcareous cracking clay soils on summits on mesitar plateaus and usilips with moderate erosion.	Very fine, montmorillonitic Typic Chromusterts	1.41
46	Very deep, well drained, cracking clay soils on side slopes of plateau usilips and undulating plains, with moderate erosion; associated with moderately deep, well drained, clayey soils.	Very fine, montmorillonitic Typic Chromusterts Fine, montmorillonitic Vertic Ustropepts	111.61
47	Very deep, moderately well drained calcareous, cracking clay soils of usilips with slight salinity and alkalinity in small patches associated with very deep well drained, calcareous, clayey soils slightly eroded.	Very fine, montmorillonitic Typic chromusterts Fine, montmorillonitic Vertic, Ustropepts	28.92
48	Very deep moderately well drained calcareous cracking clay soils on gently sloping interfluves and usilleys with slight erosion associated with deep, well drained calcareous clayey soils.	Very fine, montmorillonitic Typic Chromusterts. Fine montmorillonitic Vertic Ustropepts.	7.37
49	Deep, moderately well drained calcareous cracking clay soils on gently sloping interfluves	Very fine, montmorillonitic Typic Chromusterts Fine montmorillonitic Sodic calciorthids	15.57
50	Deep, moderately well drained cracking clay soils on gently sloping interfluves, with severe erosion; associated with deep moderately well drained calcareous cracking clay soils.	Very fine, montmorillonitic Typic chromusterts very fine montmorillonitic Typic Pelluderts.	48.01
51	Deep, moderately well drained, calcareous cracking clay soils on gently sloping interfluves with slight erosion associated with shallow, well drained, calcareous clayey soils with low AWC .	Very fine, montmorillonitic Typic Chromusterts Clayey, mixed Ulnic Camborthids	1.05
53	Very deep, moderately well drained cracking clay soils on nearly level valleys, with moderate erosion associated with moderately deep well drained, clayey soils	Very fine montmorillonitic Typic Pelluderts Fine, montmorillonitic Vertic Ustropepts	9.58
54	Very deep, moderately well drained, cracking clay soils of nearly level valleys, with moderate erosion; associated with moderately deep, well drained, clayey soils.	Very fine montmorillonitic Typic Pelluderts Fine, montmorillonitic Vertic Ustropepts.	0.93
60	Very shallow, some what excessively drained, gravelly loamy soils with very low AWC on scarp and ridges, with severe erosion; associated with shallow, some what excessively drained clayey soils.	Loamy-skeletal, mixed Ulnic Ustorthents Clayey, mixed Ulnic Ustorthents	86.18
63	Very shallow, well drained, gravelly clay soils with very low AWC on scarp and ridges, with severe erosion; associated with shallow, some what excessively drained clayey soils.	Clayey-skeletal, mixed Ulnic Ustorthents, Fine mixed Rhodic Paleustalfs	55.96
64	Very shallow, well drained, loamy soils with very low AWC in valleys with moderate erosion associated with very deep, well drained clayey soils.	Loamy, mixed Ulnic Ustorthents Fine, mixed Vertic Ustifluvents	52.67
65	Very shallow, well drained, loamy soils with very low AWC in valleys with severe erosion; associated with deep, well drained, clayey soils, slightly eroded.	Loamy, mixed Ulnic Ustorthents Fine, mixed vertic Ustifluvents	24.31
66	Moderately deep, well drained, calcareous clayey soils on summits of mesitar and plateaus, with moderate erosion; associated with shallow excessively drained clayey soils with low AWC severly eroded.	Fine, mixed, ustollic calciorthids Loamy mixed, Ulnic ustic Torriorthents	9.37
68	Very shallow, some what excessively drained, loamy soils with very low AWC on upper slopes of plateau, with severe erosion associated with shallow and drained, clayey soils.	Loamy, mixed Ulnic Ustorthents Fine montmorillonitic vertic Ustropepts.	5.91
69	Very shallow, some what excessively drained, loamy soils with very low AWC on summits or plateau, with moderate erosion, associated with shallow, well drained, clayey soils.	Loamy mixed Ulnic Ustorthents Fine, montmorillonitic ustic Ustropepts.	24.27
70	Very shallow some what excessively drained loamy soils with very low AWC on narrows with severe erosion associated with shallow, well drained clayey soils moderately eroded.	Loamy mixed Ulnic Ustorthents fine, montmorillonitic ustic Ustropepts.	4.15
71	Very shallow, well drained, clayey soils on undulating interfluves with moderate erosion; associated with, very deep moderately well drained calcareous cracking clay soils.	Clayey, mixed Ulnic Ustorthents Fine, montmorillonitic Typic Chromusterts.	4.90
72	Very Shallow, well drained, clayey soils with very low AWC on undulating plains, with moderate, erosion; associated with shallow, well drained calcareous, clayey soils	Clayey, mixed Ulnic Ustorthents Clayey, mixed Ulnic Ustropepts.	48.81

Total Area (ha.)	Soils With	
	Low to very low AWC	Medium to high AWC
6,61,620	4,07,130	2,54,487

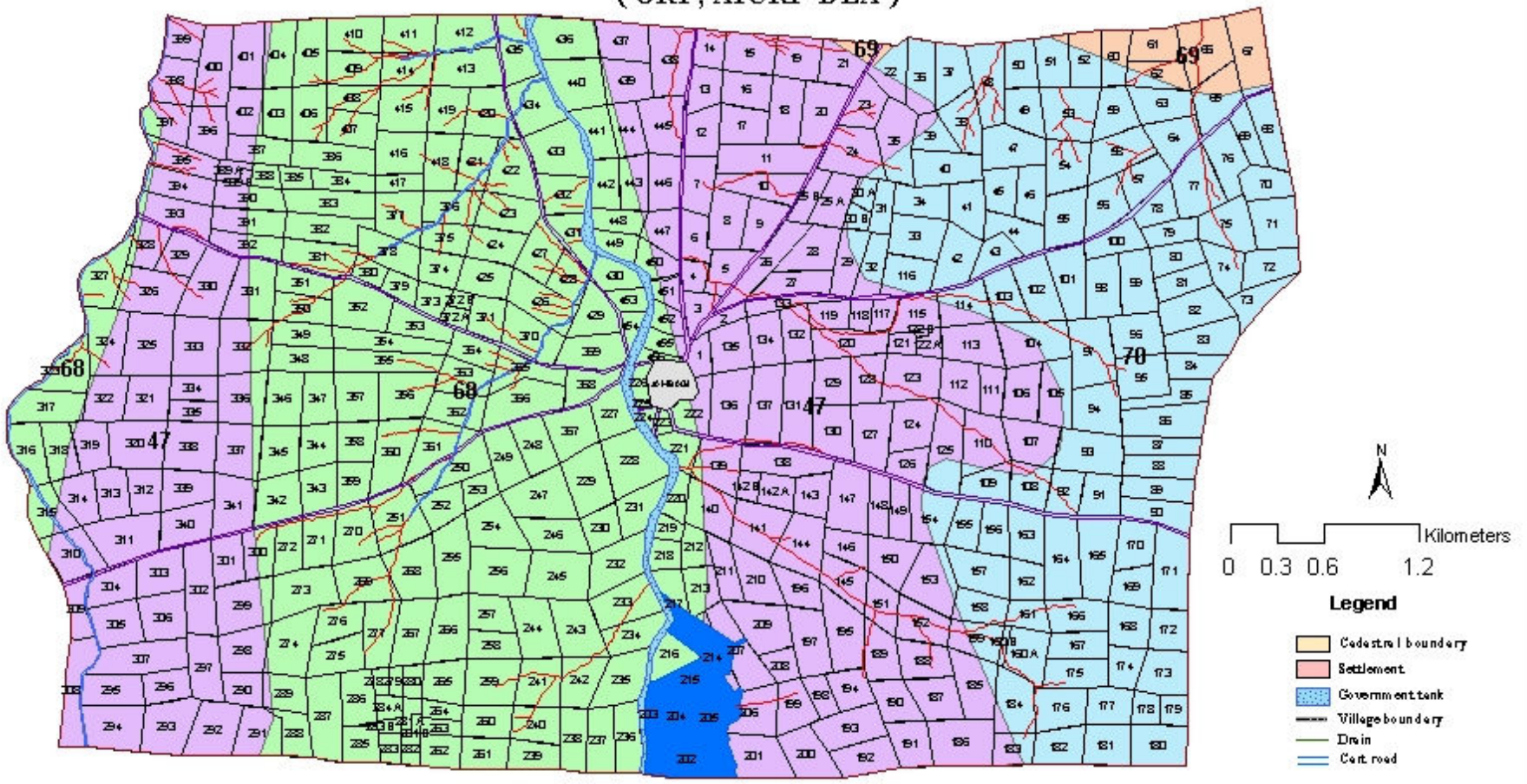


Mapping unit 1	Description 2	Soil Taxonomy 3	Area in '000 Ha. 4
11	Moderately shallow, well drained gravelly clay soils with very low AWC on undulating interfluves with moderate erosion associated with moderately deep, well drained, gravelly clay soils with very low AWC (Available Water Capacity)	Clayey-skeletal, mixed hyperthermic Rhodustalfs - Clayey-Skeletal, mixed hyperthermic Haplustalfs	2.5
14	Deep, well drained, clayey soils on undulating plains, with moderate erosion, associated with very shallow, excessively drained gravelly clay soils with low AWC, strongly gravelly in the subsoil	Fine, mixed, hyperthermic Rhodustalfs Clayey - skeletal, mixed Lithic Ustorthents	12.3
32	Very deep, moderately well drained clayey soils of valleys with problems of drainage and slight salinity in patches associated with moderately deep, well drained loamy soils.	Fine, mixed, hyperthermic Ustropepts Clayey over loamy mixed Typic Ustifluvents	0.2
43	Deep well drained, calcareous cracking clay soils on undulating interfluves with moderate erosion, associated with moderately deep well drained, calcareous clayey soils with slight salinity under irrigation	Very fine, montmorillonitic hyperthermic Chromustalfs Fine, montmorillonitic hyperthermic Vertic Ustropepts	2.4
46	Very deep, well drained, cracking clay soils on side slopes of plateau valleys and undulating plains with moderate erosion, associated with moderately deep, well drained clayey soils.	Very fine, montmorillonitic hyperthermic Chromustalfs Fine, montmorillonitic hyperthermic Vertic Ustropepts	26.7
54	Very deep, moderately well drained, cracking clay soils of nearly level valleys, with moderate erosion, associated with moderately deep, well drained, clayey soils.	Very fine montmorillonitic hyperthermic Paltustalfs Fine, montmorillonitic hyperthermic Vertic Ustropepts.	0.9
60	Very shallow, somewhat excessively drained, gravelly loam soils with very low AWC on mesas and ridges, with severe erosion, associated with shallow, somewhat excessively drained clayey soils.	Loamy-skeletal, mixed Lithic Ustorthents Clayey, mixed, Lithic Ustorthents	19.2
63	Very shallow, well drained, gravelly clay soils with very low AWC on gently sloping plains, with moderate erosion, associated with very deep well drained clayey soils.	Clayey-skeletal, mixed Lithic Ustorthents, Fine mixed Rhodic Paleustalfs	43.0
64	Very shallow, well drained, loamy soils with very low AWC in valleys with moderate erosion associated with very deep, well drained clayey soils.	Loamy, mixed Lithic Ustorthents Fine, mixed Vertic Usthfluvents	0.4
65	Very shallow, well drained, loamy soils with very low AWC in valleys with severe erosion, associated with Deep, well drained, clayey soils, slightly eroded.	Loamy, mixed Lithic Ustorthents Fine, mixed Vertic Usthfluvents	14.6
71	Very shallow, well drained, clayey soils on undulating interfluves with moderate erosion, associated with, very deep moderately well drained calcareous cracking clay soils.	Clayey, mixed Lithic Ustorthents Fine, montmorillonitic Typic Chromustalfs.	1.7
72	Very Shallow, well drained, clayey soils with very low AWC on undulating plains, with moderate erosion, associated with shallow, well drained calcareous, clayey soils	Clayey, mixed Lithic Ustorthents Clayey, mixed Lithic Ustropepts.	14.9

Source: NBSS&LUP – Dept. of Agriculture Marg, Gandhi Nagar, Bangalore Karnataka

Total Area (ha.)	Soils With	
	Low to very low AWC	Medium to high AWC
1,39,009	1,07,025	31,984

Soil map of Jambagi village, Bijapur taluk
(ORP, AICRP-DLA)



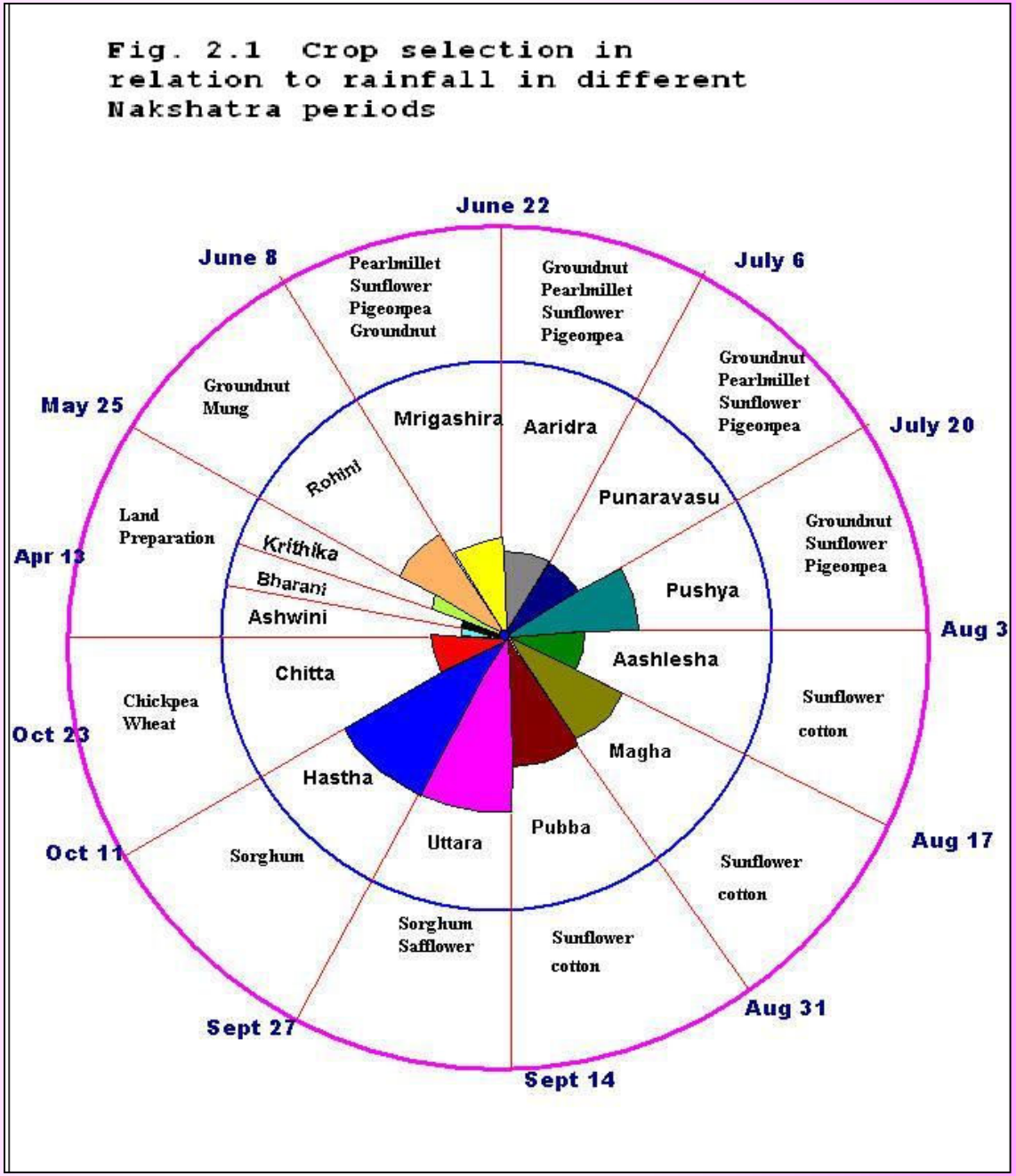
Mapping unit 1	Description 2	Soil Taxonomy 3	Area in Ha. 4	1	2	3	4
47	Very deep, moderately well drained calcareous, cracking clay soils of valleys with slight salinity and alkalinity in small patches, associated with very deep well drained, calcareous, clayey soils slightly eroded.	Very fine montmorillonitic hyperthermic Typic chromusterts Fine montmorillonitic Vertic Ustropepts	1230 (38%)	69	Very shallow, somewhat excessively drained loamy soils with very low AWC on summits of plateau, with moderate erosion associated with shallow well drained, clayey soils.	Loamy, mixed Lithic Ustorthents Fine, montmorillonitic vertic Ustropepts.	43 (1%)
68	Very shallow, somewhat excessively drained, loamy soils with very low AWC on upper slopes of plateau, with severe erosion associated with shallow and drained, clayey soils.	Loamy, mixed Lithic Ustorthents Fine montmorillonitic vertic Ustropepts.	1281 (39%)	70	Very shallow somewhat excessively drained loamy soils, with very low AWC on mesas with severe erosion, associated with shallow, well drained clayey soils moderately eroded.	Loamy mixed Lithic Ustorthents Fine, montmorillonitic vertic Ustropepts.	868 (23%)

Source : NBSS&LUP – Dept of Agriculture Reg. centre Karnataka Bangalore

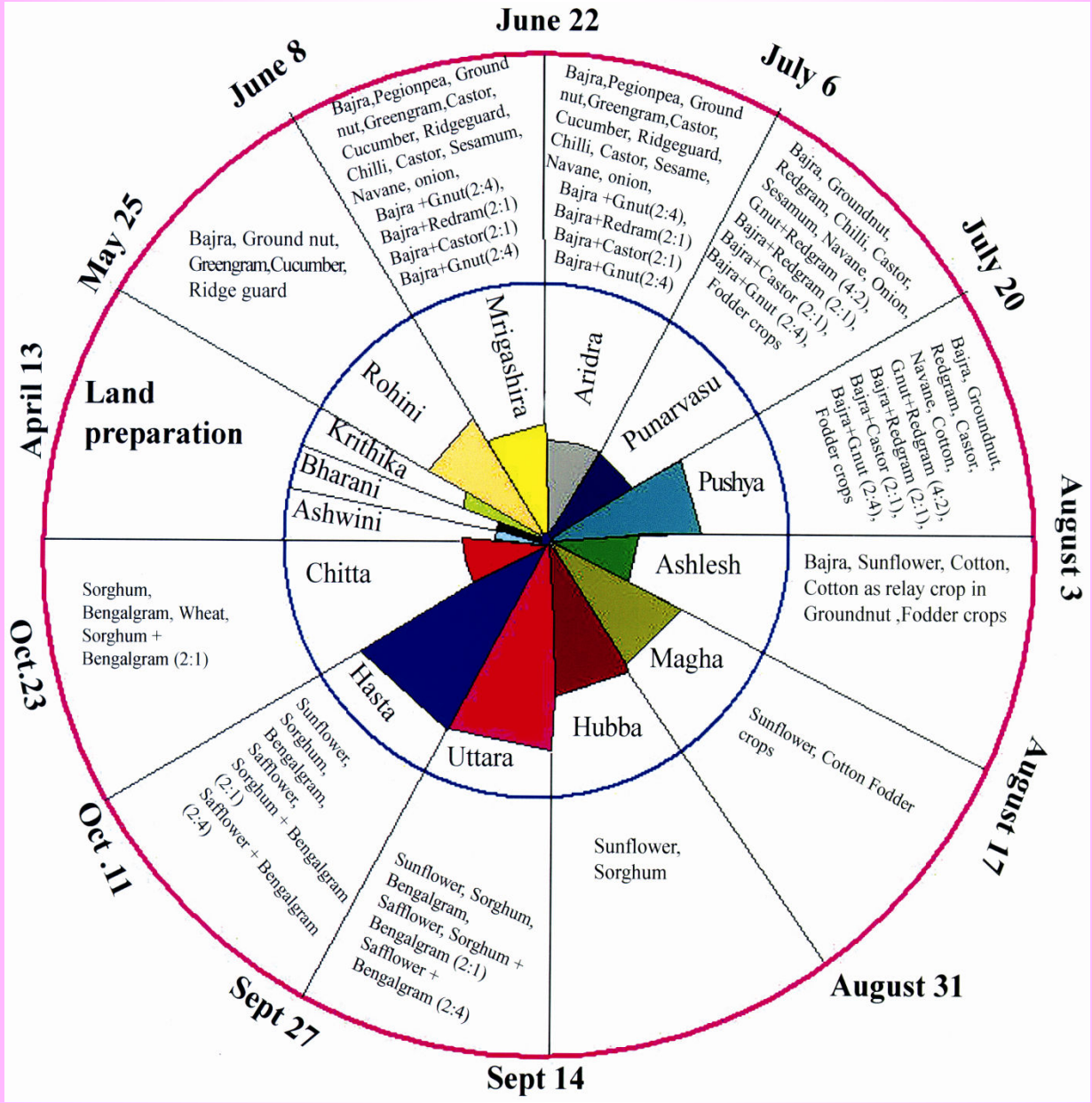
Total Area (ha.)	Soils With	
	Low to very low AWC	Medium to high AWC
3,555	2,275	1,280

MANAGEMENT PRACTICES

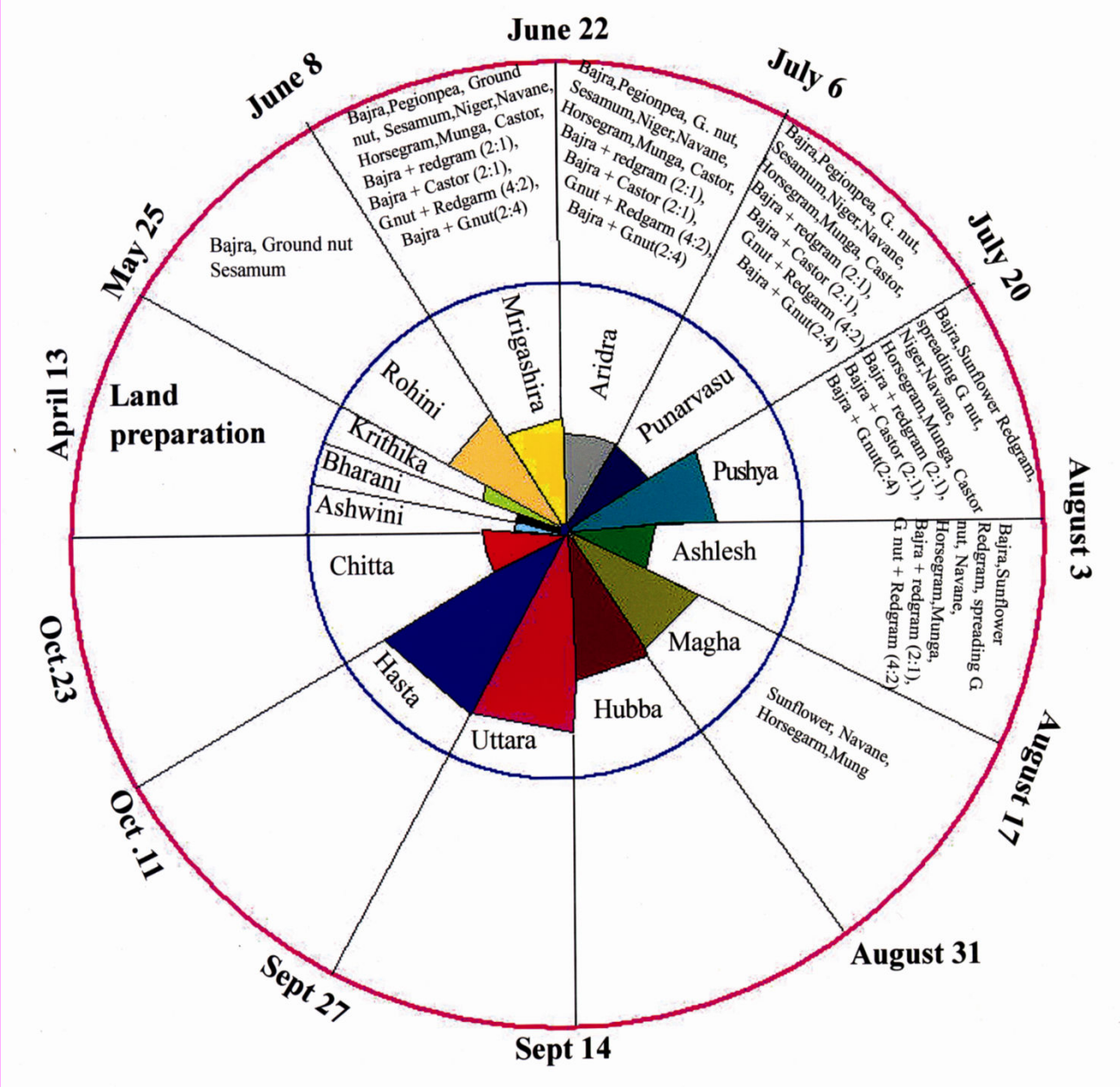
Fig. 2.1 Crop selection in relation to rainfall in different Nakshatra periods



Climatic Normals



Crop and cropping system for medium to deep black soil.



Crop and cropping system for shallow black and red soils.

i. Increased rainfall and low variability

- **Terrace and inter-terrace land management practices.**
- **Sequence and relay cropping system of high value crops**



ii. Increased rainfall and increased variability

- Terrace and inter-terrace land management practices.
- Wider row spacing with frequent inter-cultivation.
- Green manuring and green leaf manuring.
- Setrow cultivation.





Agronomic Practices for spatial variation in intraseasonal fluctuations

Rainfall Situation			Crop Suggested	
No.	**High**	**Low**	**Red soils / Shallow black soils**	**Medium to deep black soil**
1	June, July	August	Groundnut, Pearlmillet, Sesamum	Greengram, Sesamum and Sunflower, Sunflower + Greengram
2	June, August	July	Groundnut + Pearlmillet, Groundnut + pigeonpea, Groundnut + Sesamum	Sunflower and Sesamum with 135 cm row spacing and sowing the conservation furrow
3.	July	June, August	Pearlmillet with 135 cm spacing, Groundnut with 75 to 90 cm spacing, sesamum with 135 cm spacing. Sowing should be in the conservation furrow for these situations.	*Kharif* – fallow *Rabi* – Sorghum, Sunflower and chickpea
4	June	July, August		
5	August	June, July		

Decreased rainfall and high variability

- Terrace and inter-terrace land management practices.
- Zing conservation bench terraces
- Entire land grading to 0.1 – 0.2 % with rainwater impounding and surplus structures through inter-plot rainwater harvesting technique.
- Gravel sand mulching and pebble mulching.
- Farm pond water utilization technique through micro-irrigation systems.
- Agri-horti system.

Agronomic Practices for Severe Drought Situations




T1
Sandmulch
(5 cm depth)

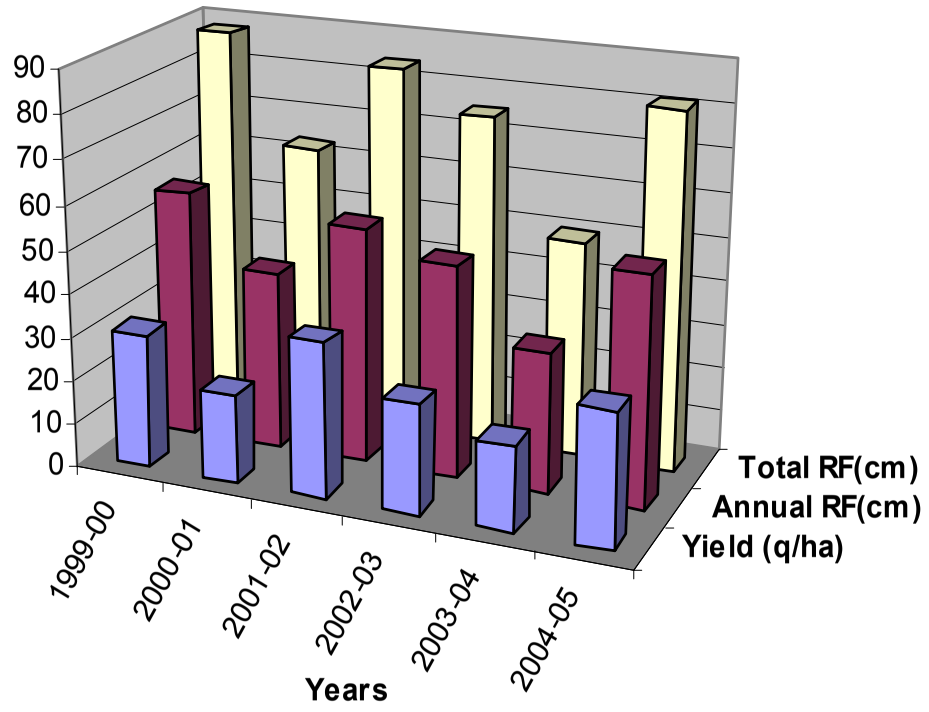




Drought Proofing

Zingg. Conservation Bench Terrace

Grain yield of *Rabi* sorghum(q/ha) under Zingg Conservation bench terrace (Ramavadagi field)



Zingg conservation bench terrace yielded 20 quintal *rabi* sorghum per ha over zonal average of 3.5 q/ha during the drought year 2003.



Foundation seed production plot of M 35-1, a *rabi* jowar variety, in severe drought year (2003-04) in Ramawadagi field



The leveled and zingg terraced land with wheat and Bengal gram crop in Ramawadagi field (During 2003-04)

Conclusion

The present challenge of dryland agriculture is to manage spatial and temporal variability associated with rainwater and soil resources by applying suitable technology and principles and to relocate both the resources appropriately with other inputs and practices to localized condition within a field to achieve improved crop production and environment quality.

Further, suitable crops and cropping systems and management options in terms of crop rotation, sequence cropping and contingent crop planning can be developed as advance advice to the farmers. Therefore, such utilities are required for different regions


Thank You