

**GEOGRAPHY OF SUGAR CANE CULTIVATION**  
**IN**  
**EASTERN HARYANA**

**Volume II**

**by**

**Devinder Singh Sandhu**

Certified to be the authenticated copy of the Ph.D. Thesis (Vol. II) submitted by Shri Devinder Singh Sandhu and accepted by the University for award of Ph.D. Degree of the University.

*P. N. Chelwandi*

Assistant Registrar (Conduct)

Kurukshetra University

Kurukshetra-132119

*N. K. Goswami*

*Jalups*

19/4/78

**Thesis Submitted for The Degree of Doctor of Philosophy**

**in**

**The Faculty of Science:**

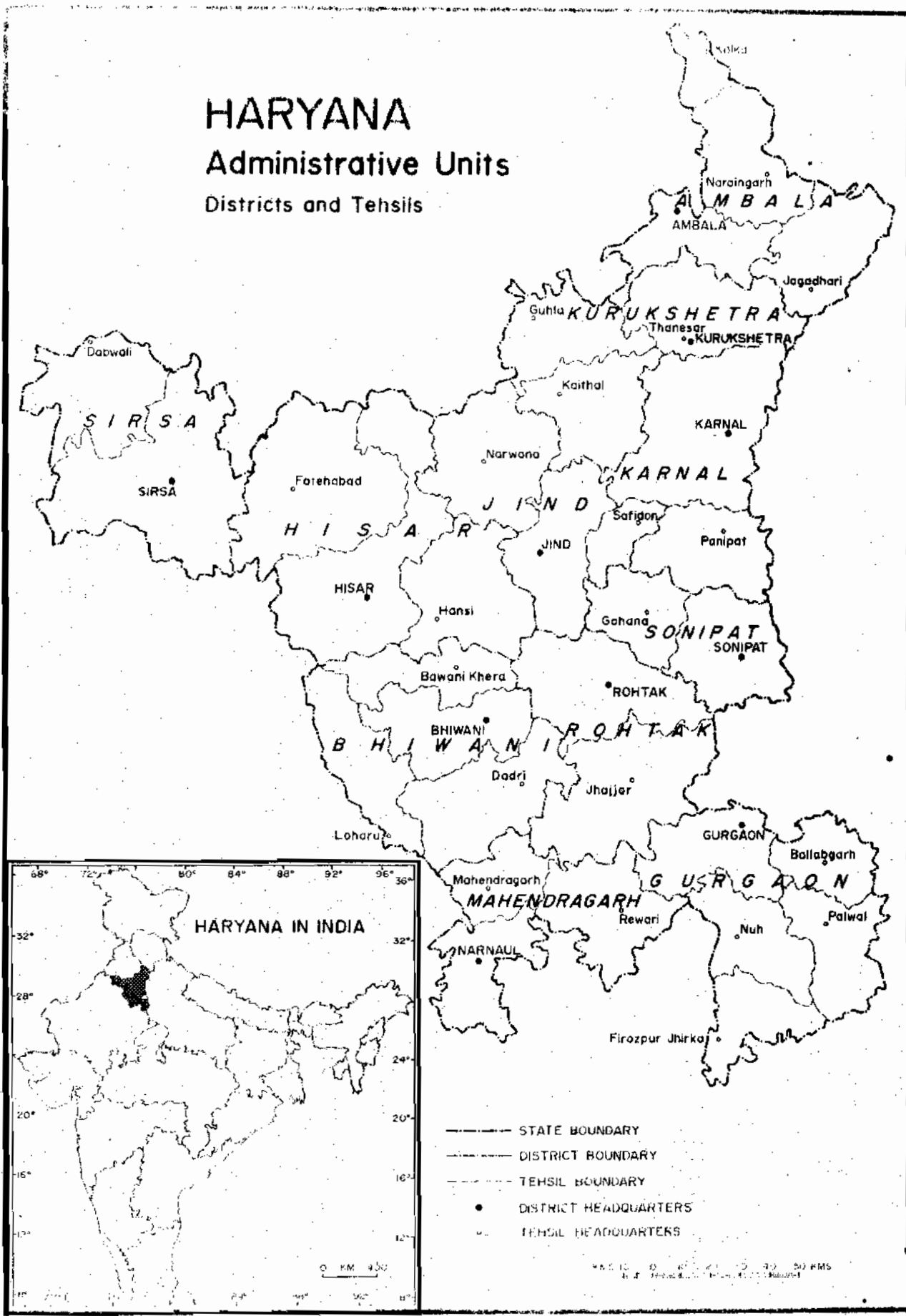
**KURUKSHETRA UNIVERSITY KURUKSHETRA**

**1977**

# HARYANA

## Administrative Units

### Districts and Tehsils



<u>Identification Number</u>	<u>Assessment Circle</u>	<u>District</u>
25	Mohan	Rohtak
26	Southern Mehri	"
27	Mehri San	"
28	Mehri Deyan	"
29	Mehri Awal	"
30	Mehri	"
31	Barani	"
32	Rajputana	"
33	Barani	"
34	Northern Dohri	"
35	Southern Dohri	"
36	Gurgaon	Gurgaon
37	Shuder	"
38	Dahar	"
39	Shangar	"
40	Khaddar	"
41	K <sub>n</sub> addar	"
42	Sohana	"
43	Shangar	"

### KEY TO FIGURE 2

Identification Number	Assessment Circle	District
1	Kandi	Ahola
2	Khaddar Sam	"
3	Bhangar	"
4	Ahola	"
6	Khaddar Yamuna South	"
7	Khaddar Yamuna North	"
8	Chhachhra Northern	Kurukshetra
9	Khaddar Thanesar	"
9	Bhangar Thanesar	"
10	Chhachhra Southern	"
11	Hardah Indri	Karnal
12	Bhangar Indri	"
13	Khaddar Indri	"
14	Khaddar Karnal	"
20	Khaddar Paripat	"
15	Bhangar Karnal	"
16	Hardah Karnal	"
19	Paripat Khas	"
18	Bhangar Paripat	"
17	Jind Khas	Jind
21	Khaddar	Sonapat
22	Bhangar	"
23	Eastern Nahri	Sonapat
24	Western Nahri	"

Figure 2

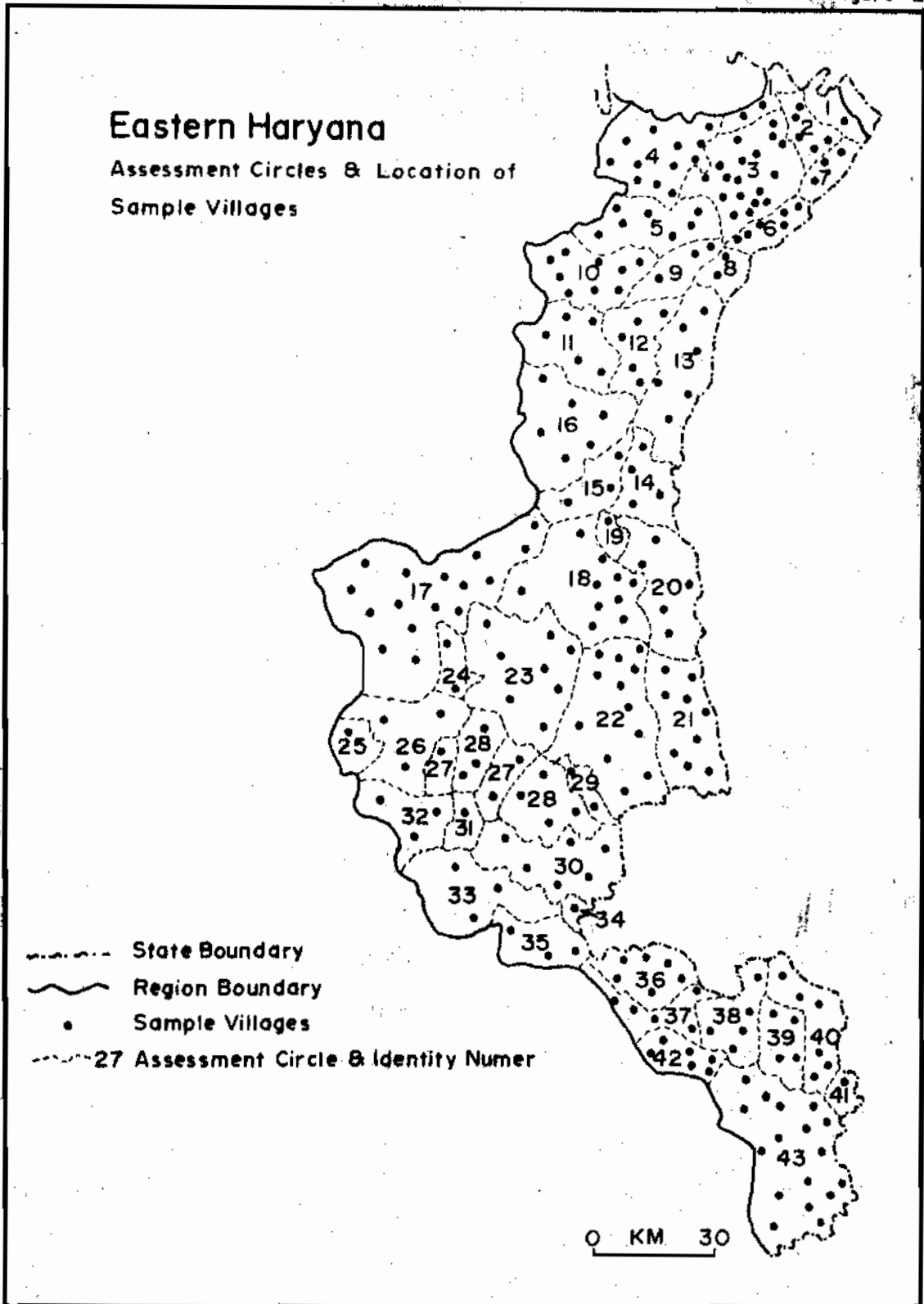
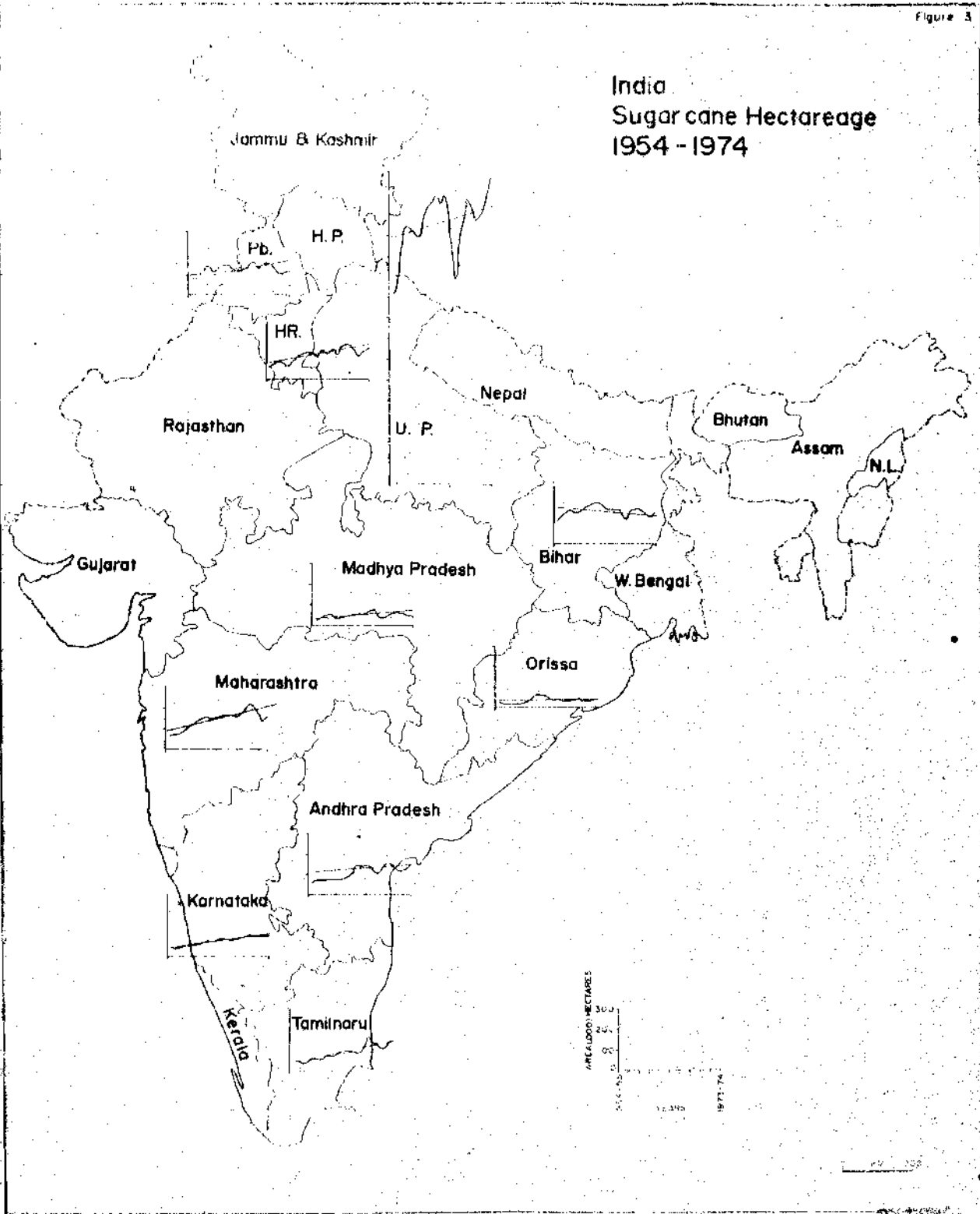


Figure 3

# India Sugar cane Hectareage 1954 - 1974



# India Sugar cane Hectareage and Progressive Time Relationships

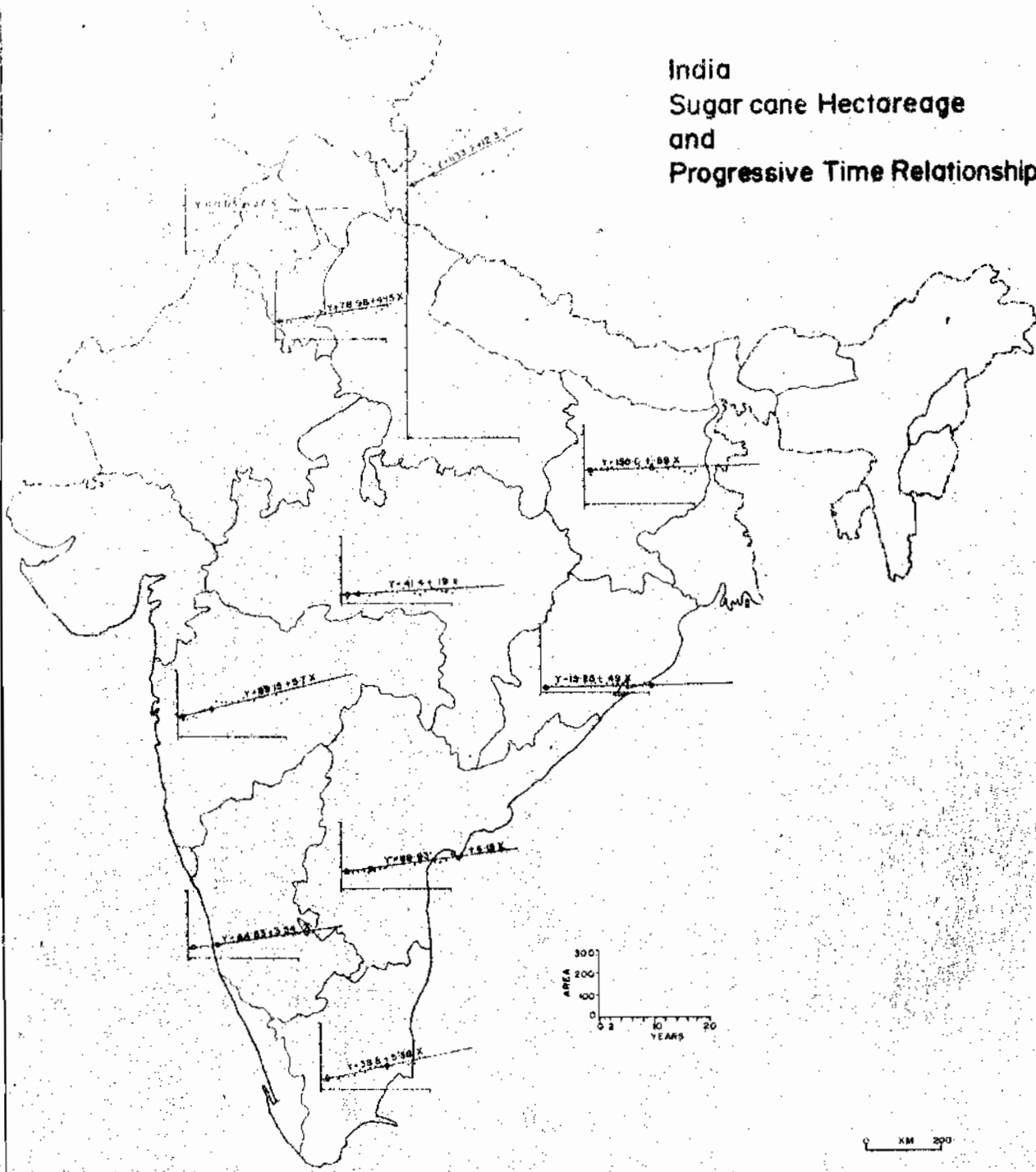


Figure 5

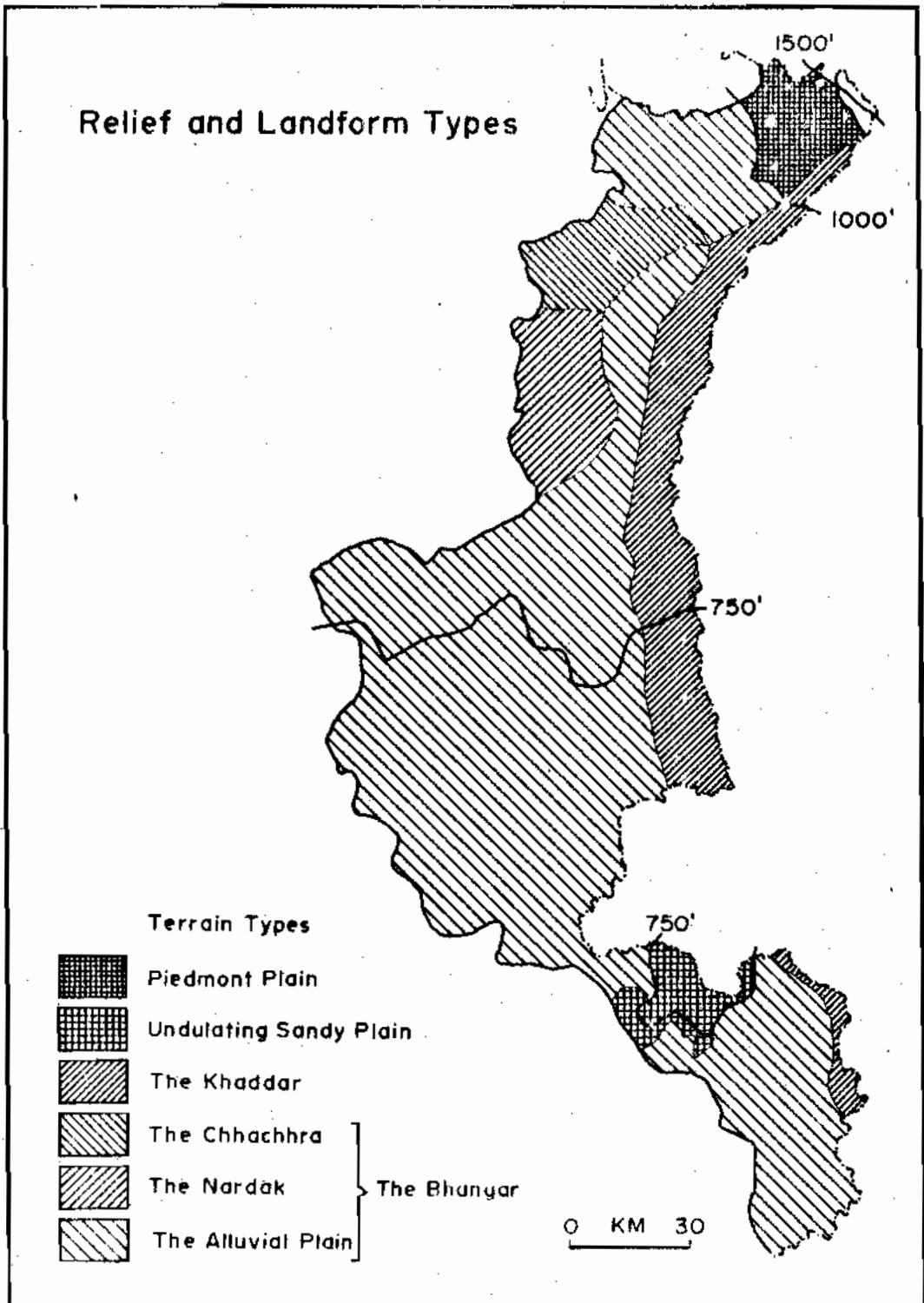


Figure 6

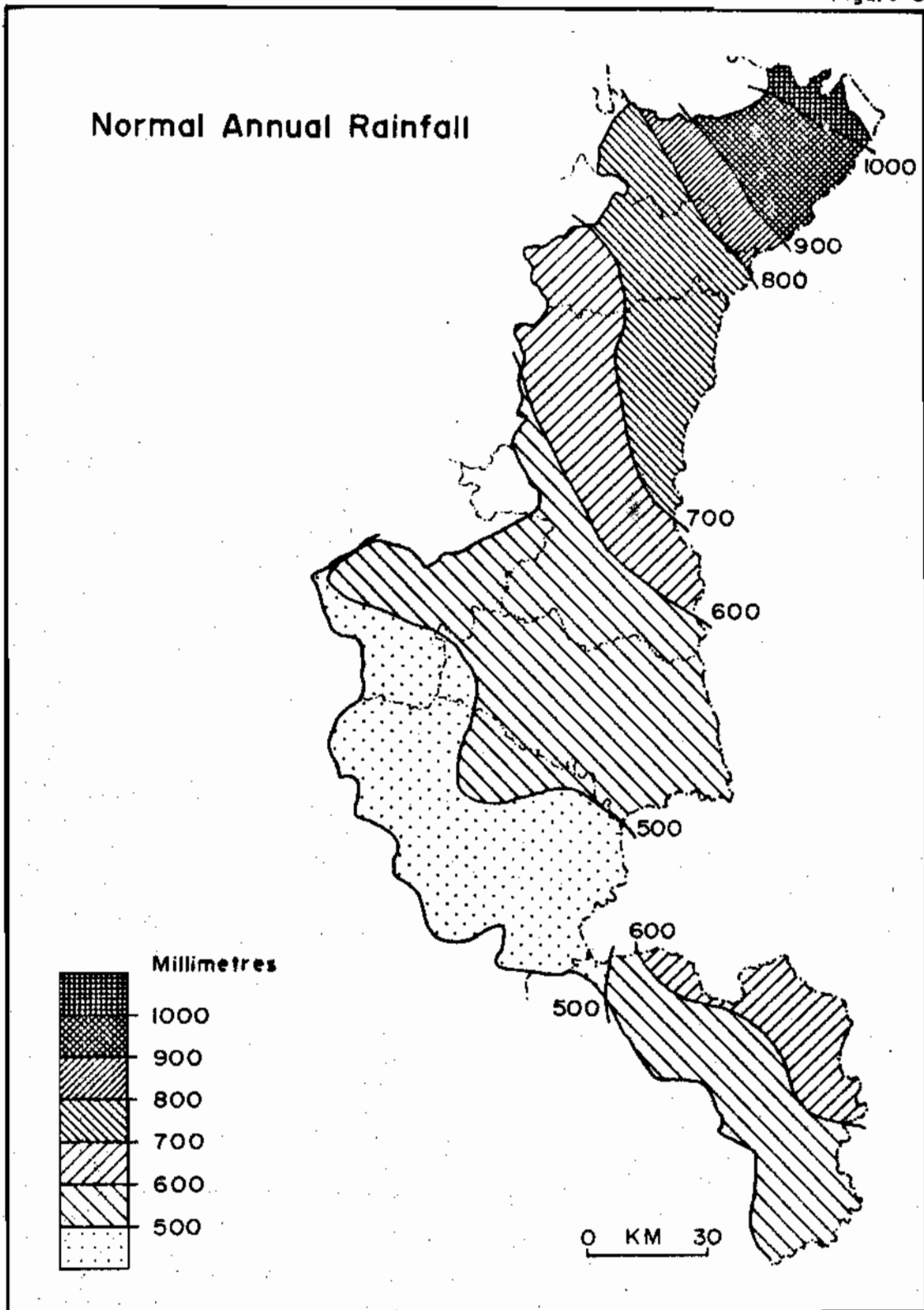


Figure 7

### Haryana Distribution of Rainfall Monthly

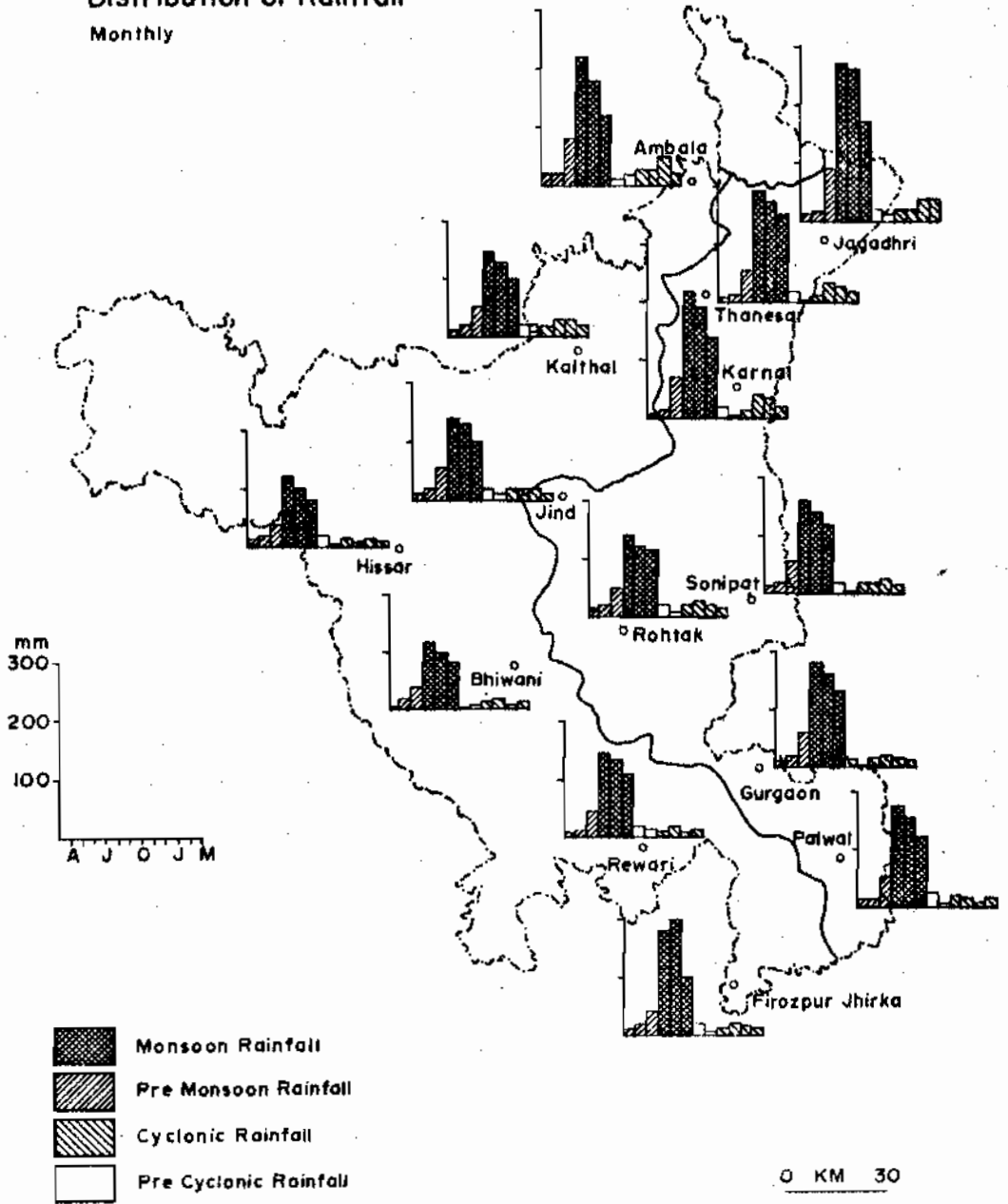


Figure 8

**Coefficient of Variation  
in  
Monsoon Rainfall  
(July to Sept.)**

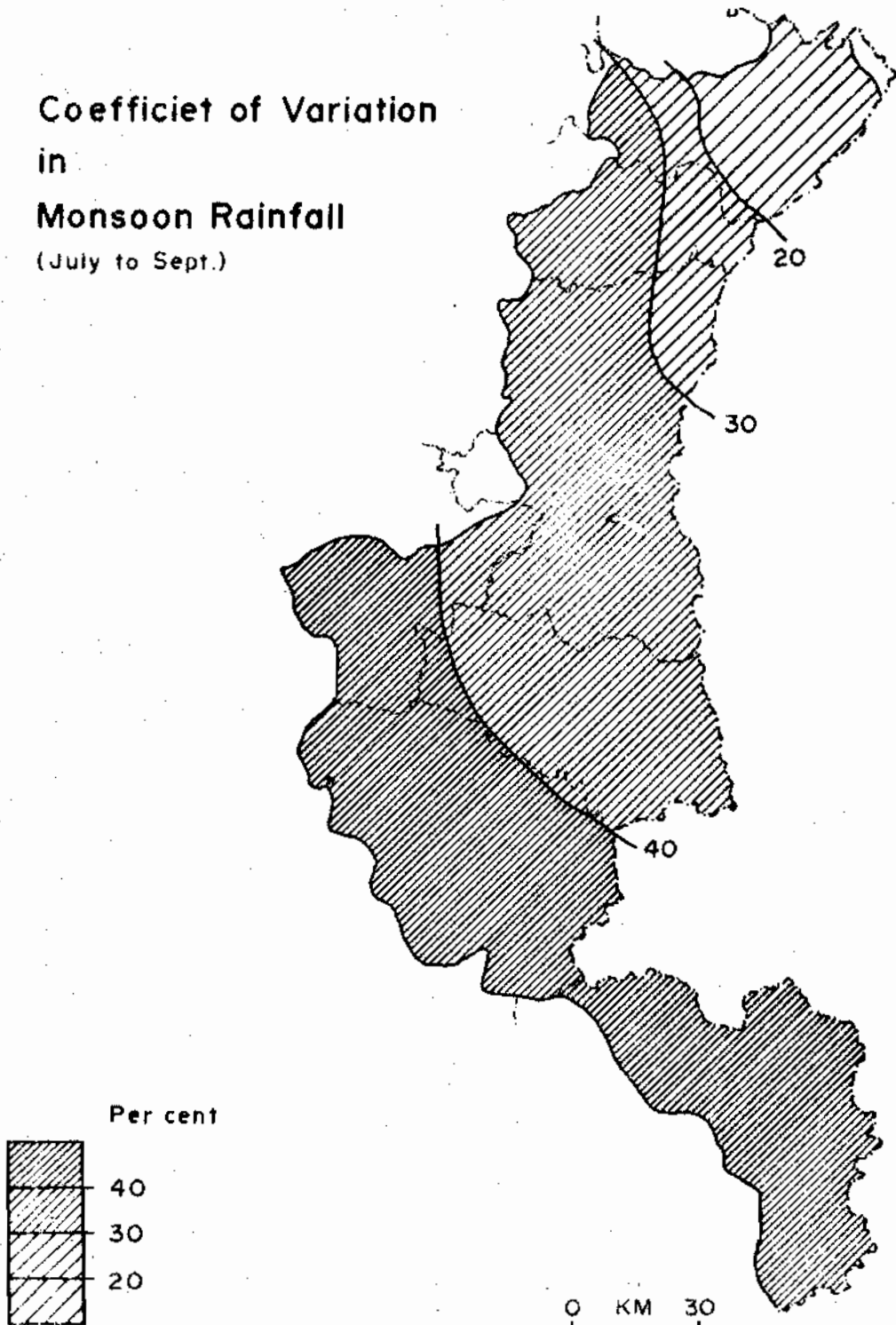


Figure 9

**Coefficient of Variation  
in  
Cyclonic Rainfall  
(Dec. to Feb.)**

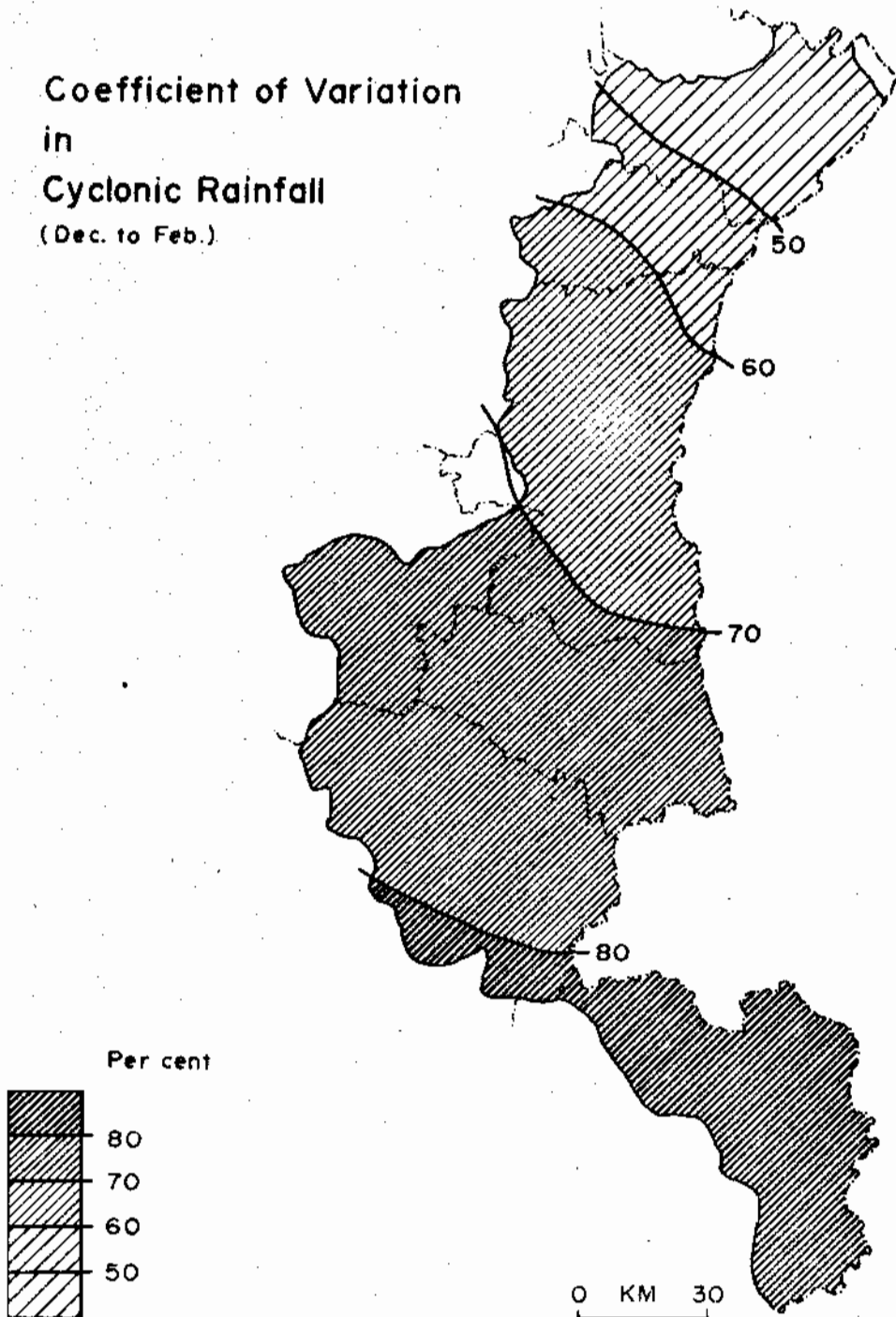


Figure 10

**Coefficient of Variation  
in  
Pre-Monsoon Rainfall  
(March to June)**

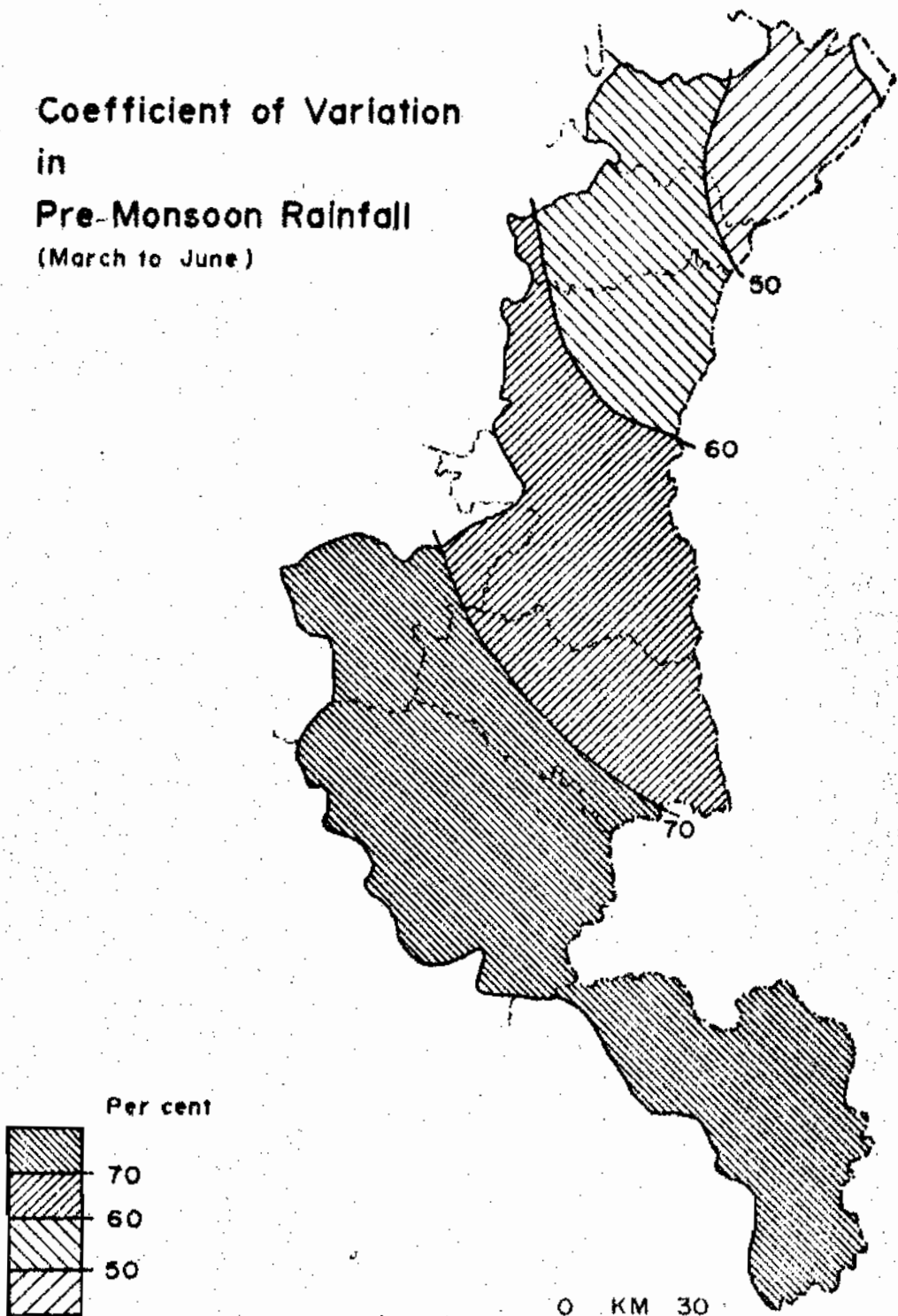
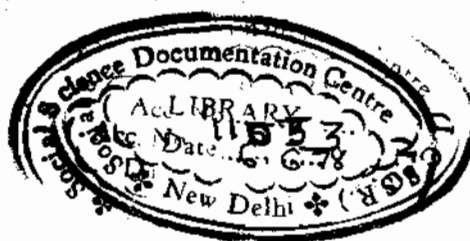
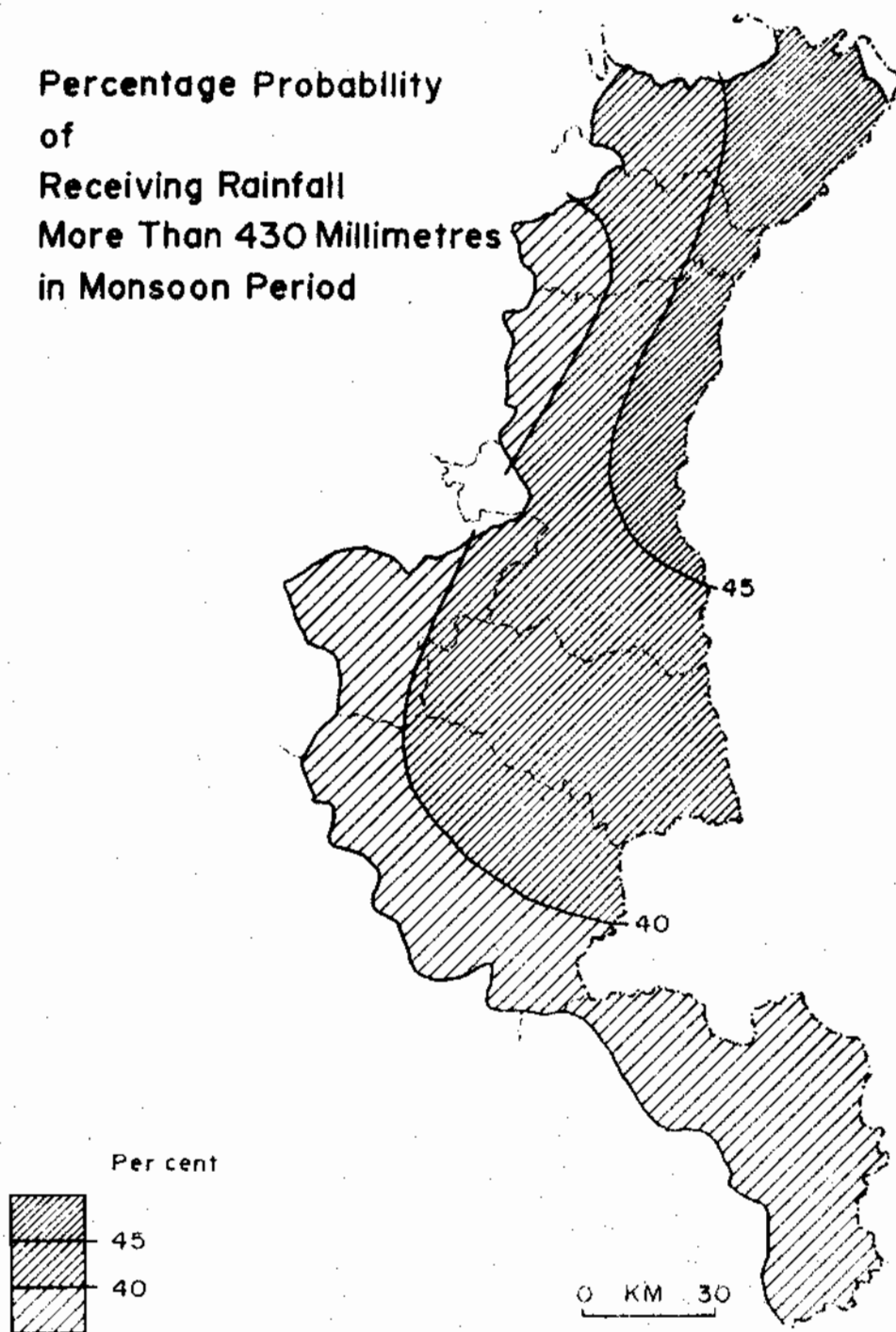


Figure 11

Percentage Probability  
of  
Receiving Rainfall  
More Than 430 Millimetres  
in Monsoon Period



TS  
371:2

Figure 12

**Percentage Probability  
of  
Receiving Rainfall  
More Than 110 Millimetres  
In Cyclonic Period**

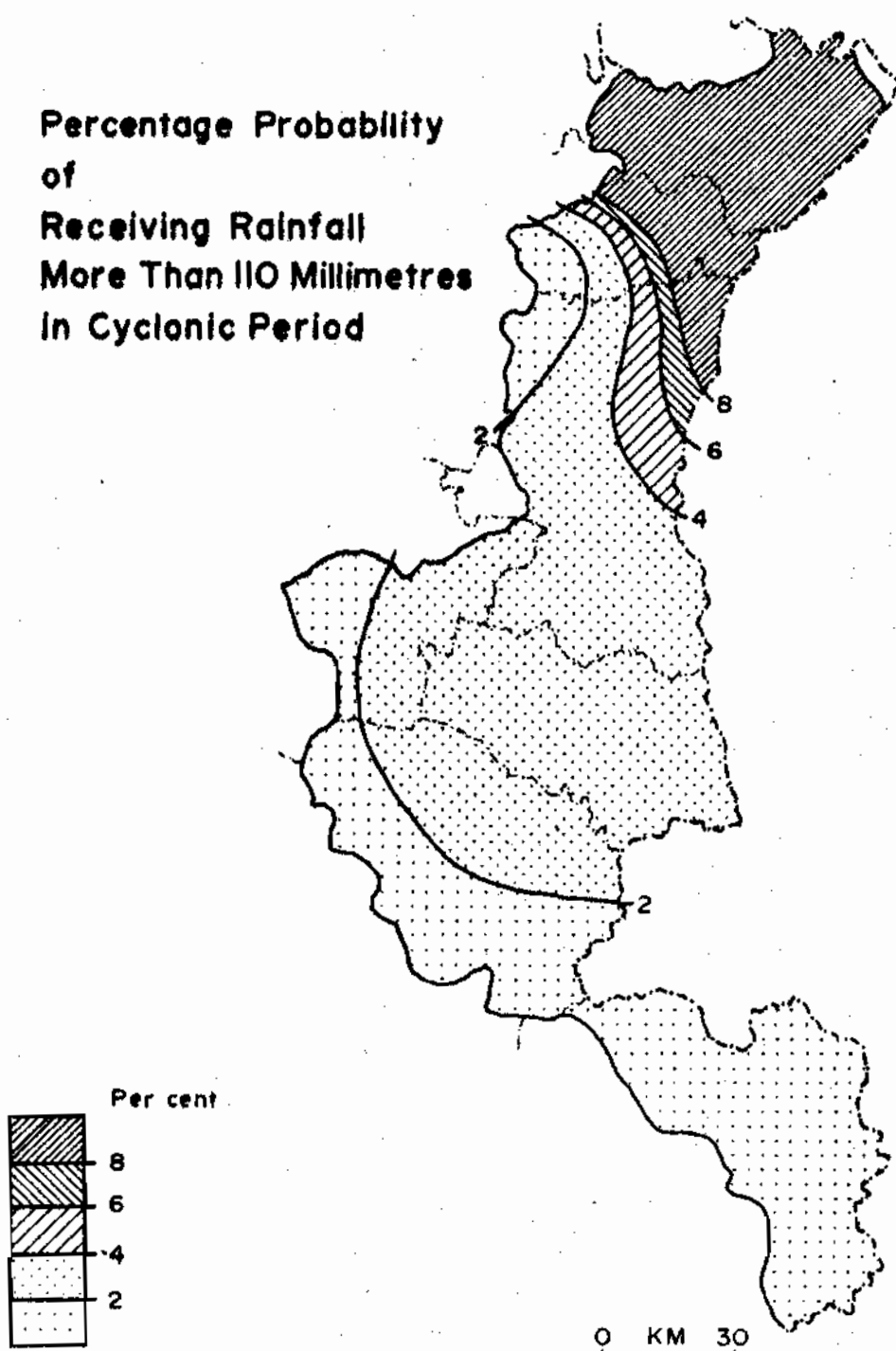


Figure 13

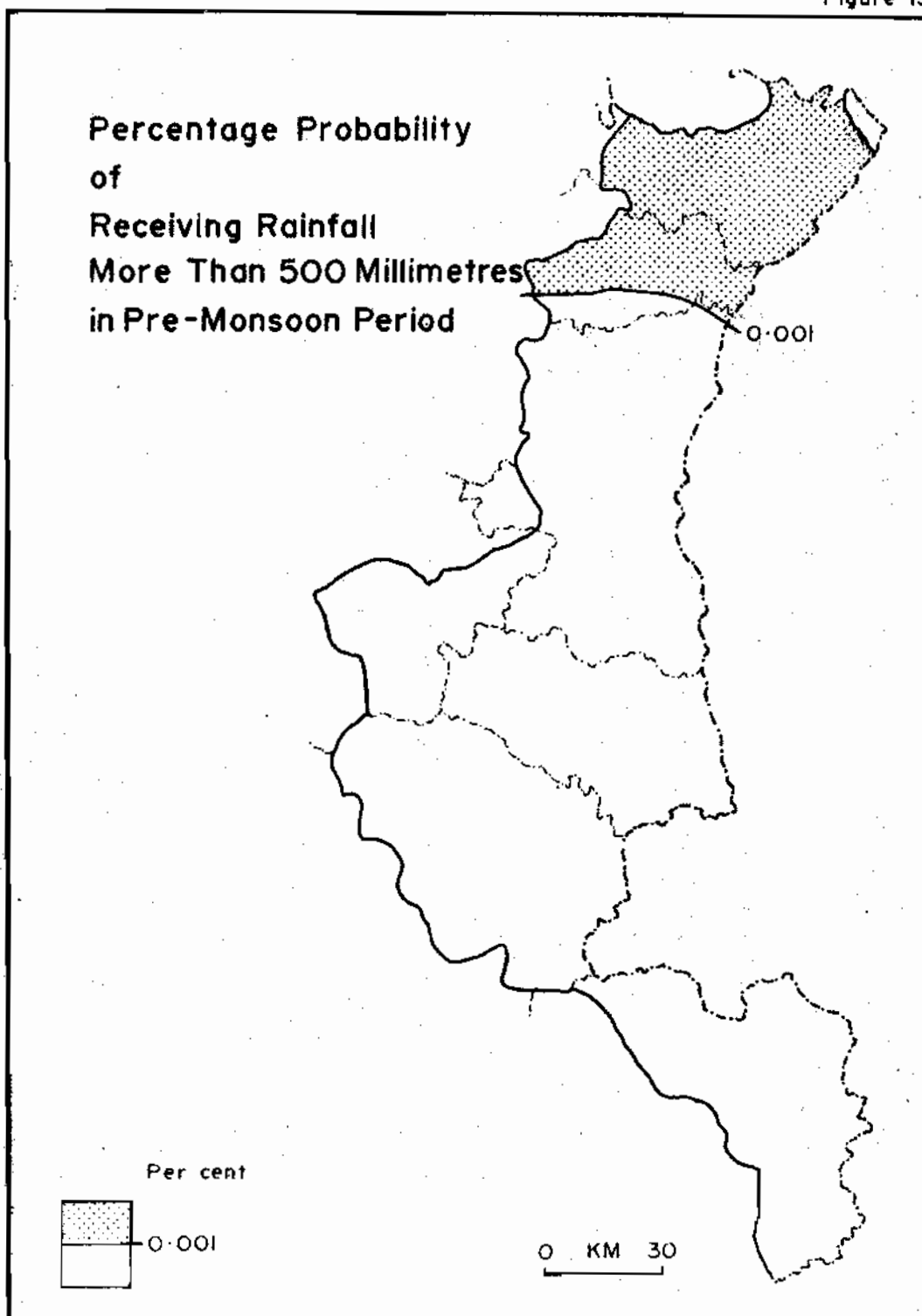


Figure 14

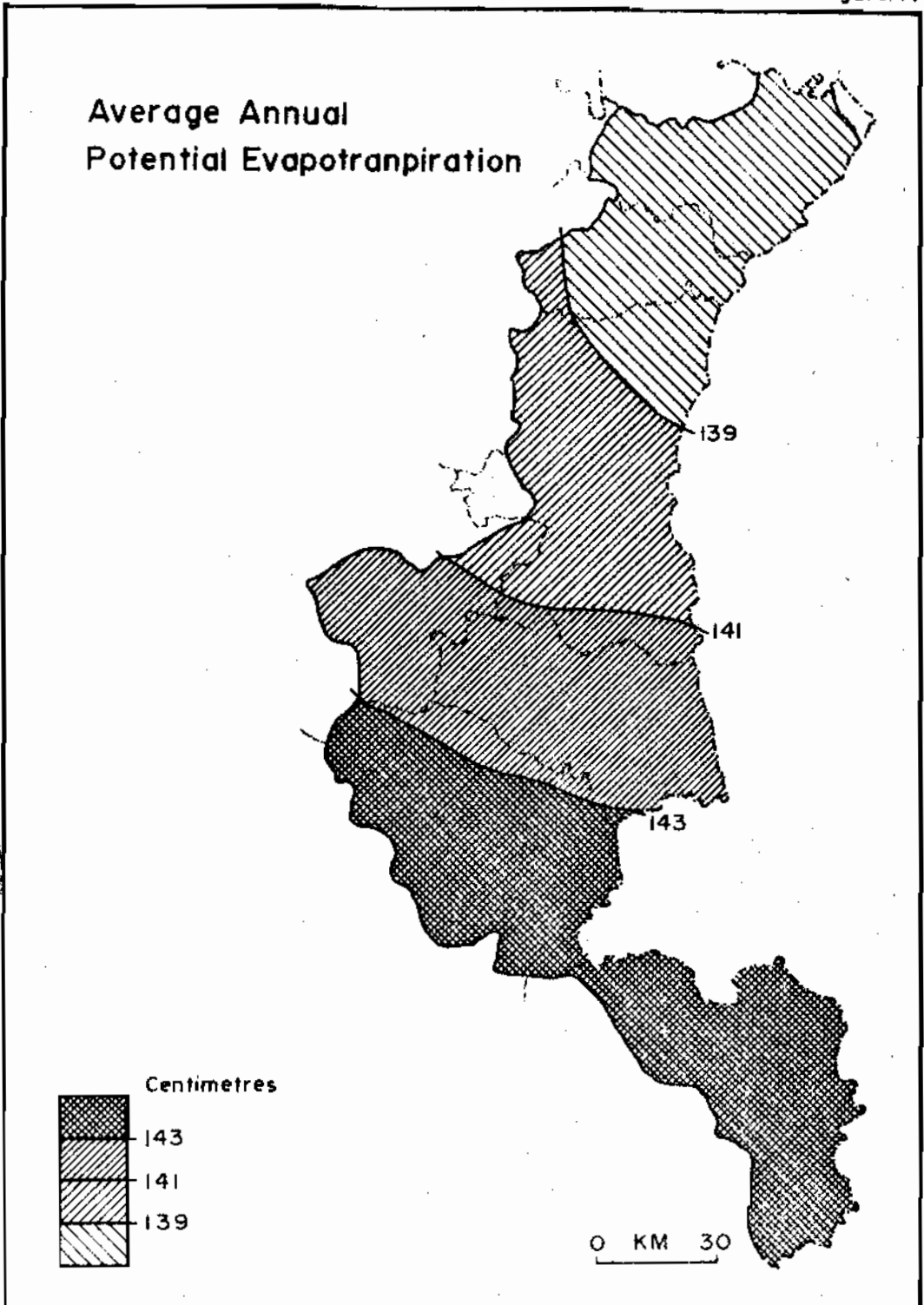


Figure 15

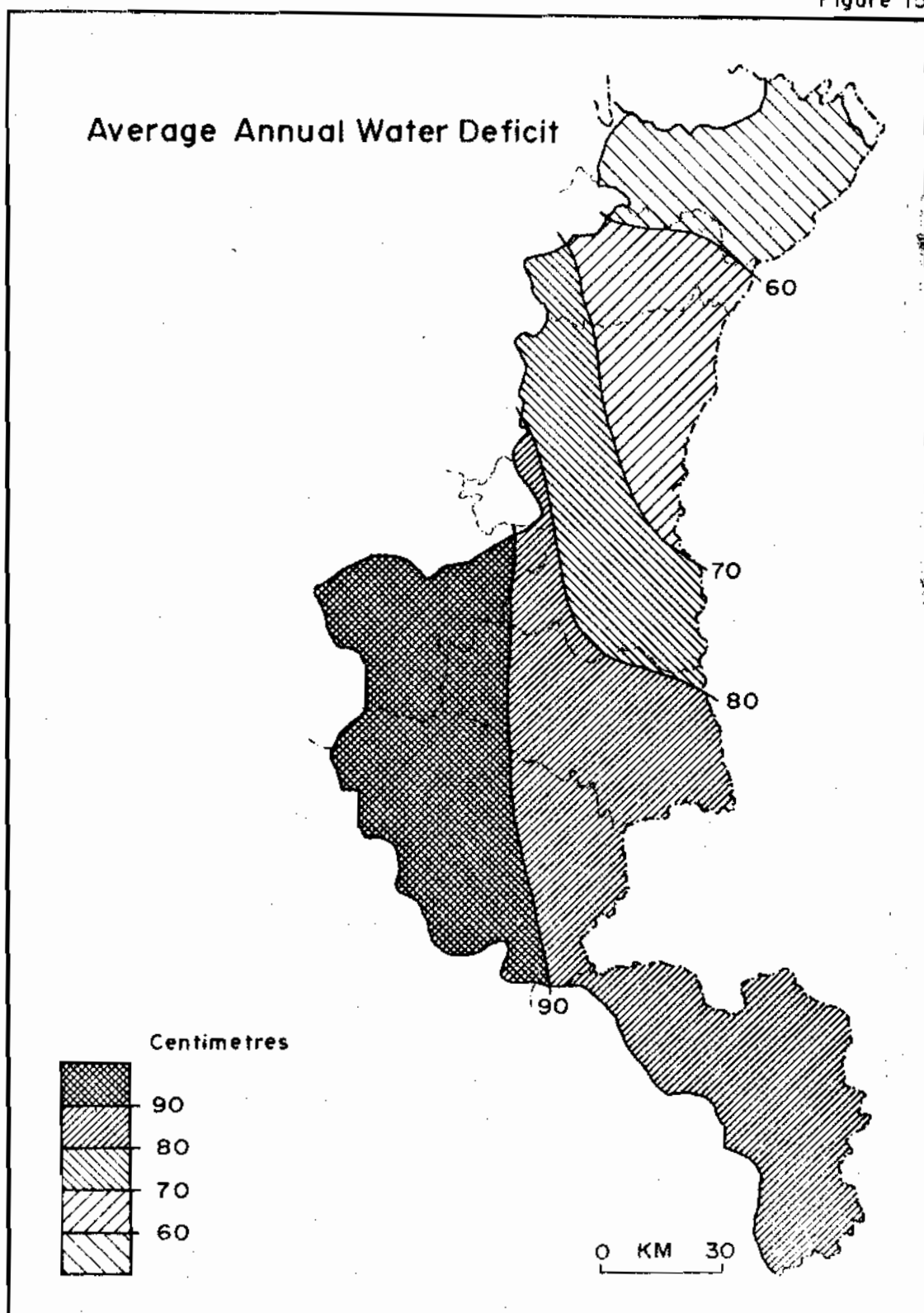


Figure 16

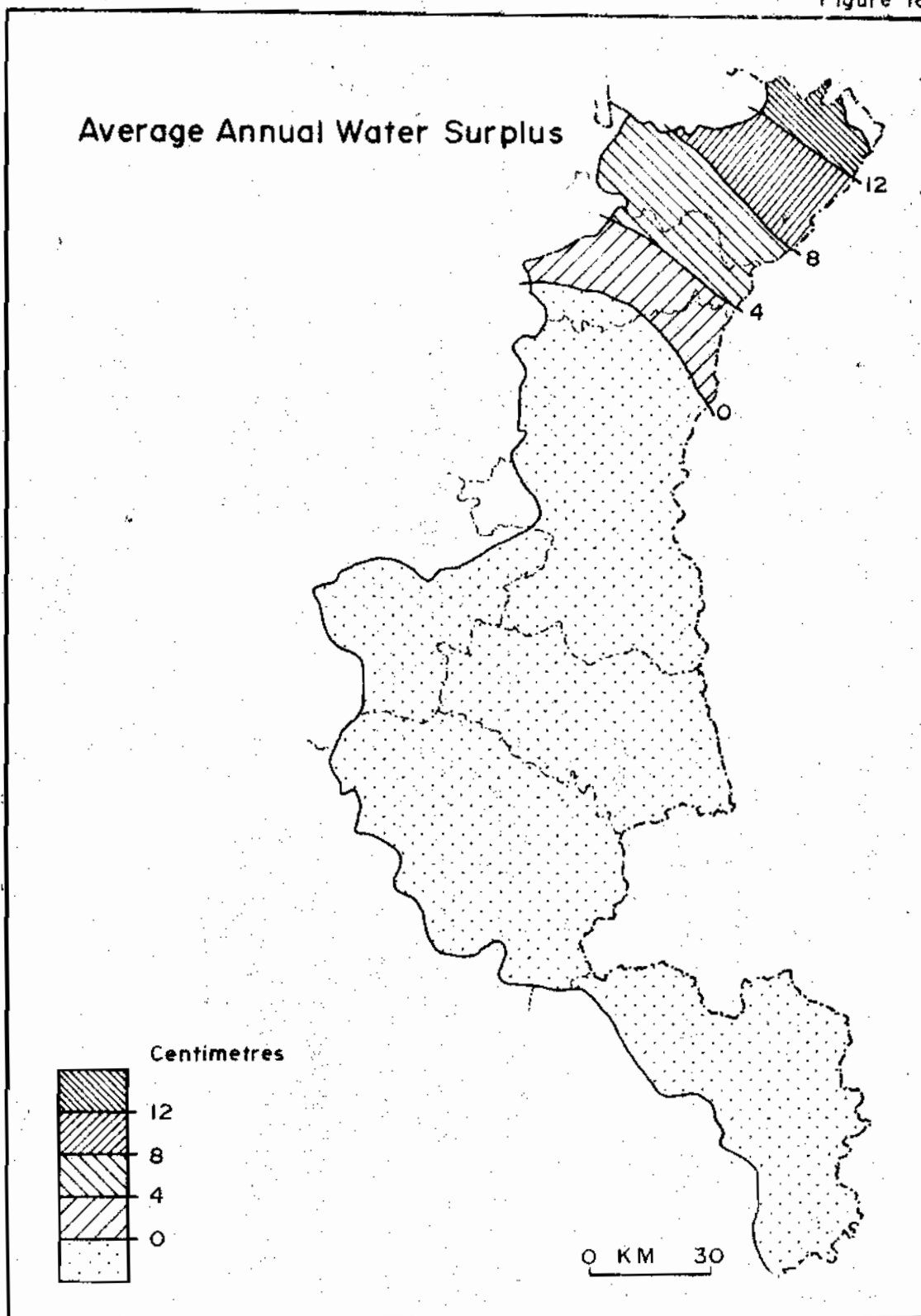


Figure 17

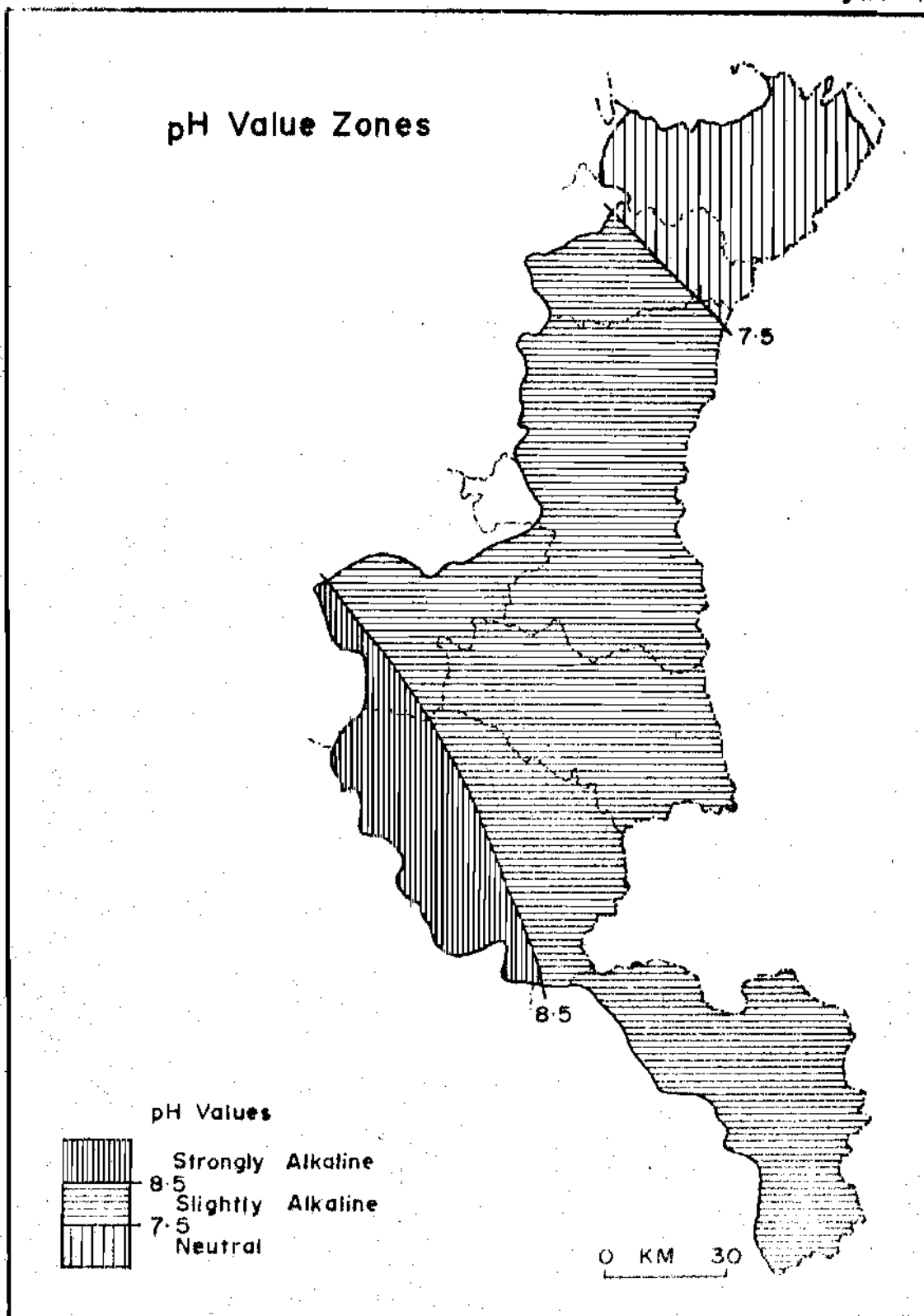


Figure 18

### Soil Zones

Based on Rainfall and Chemical Characteristics

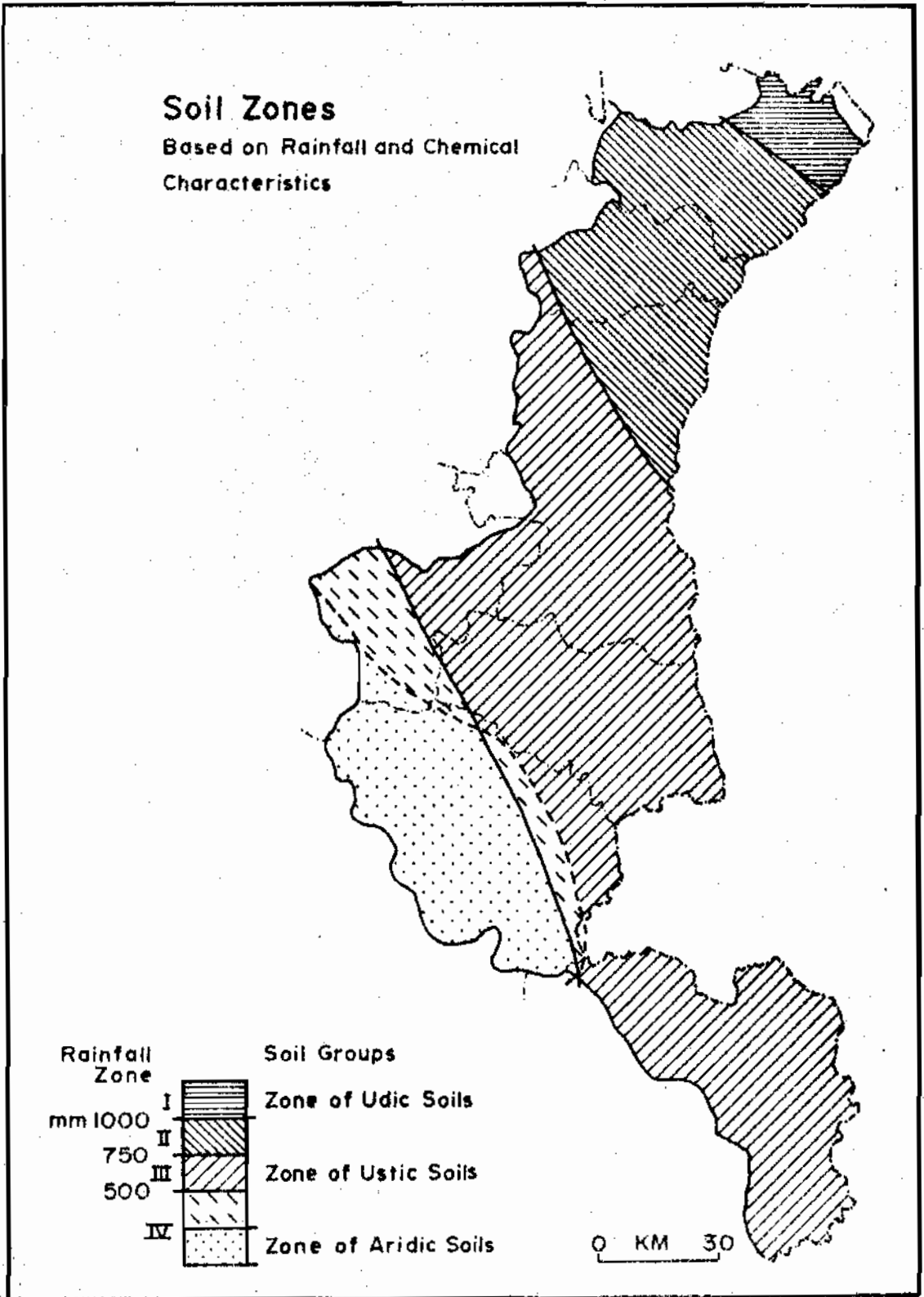


Figure 19

### Soils of Eastern Haryana (Textural Classification)

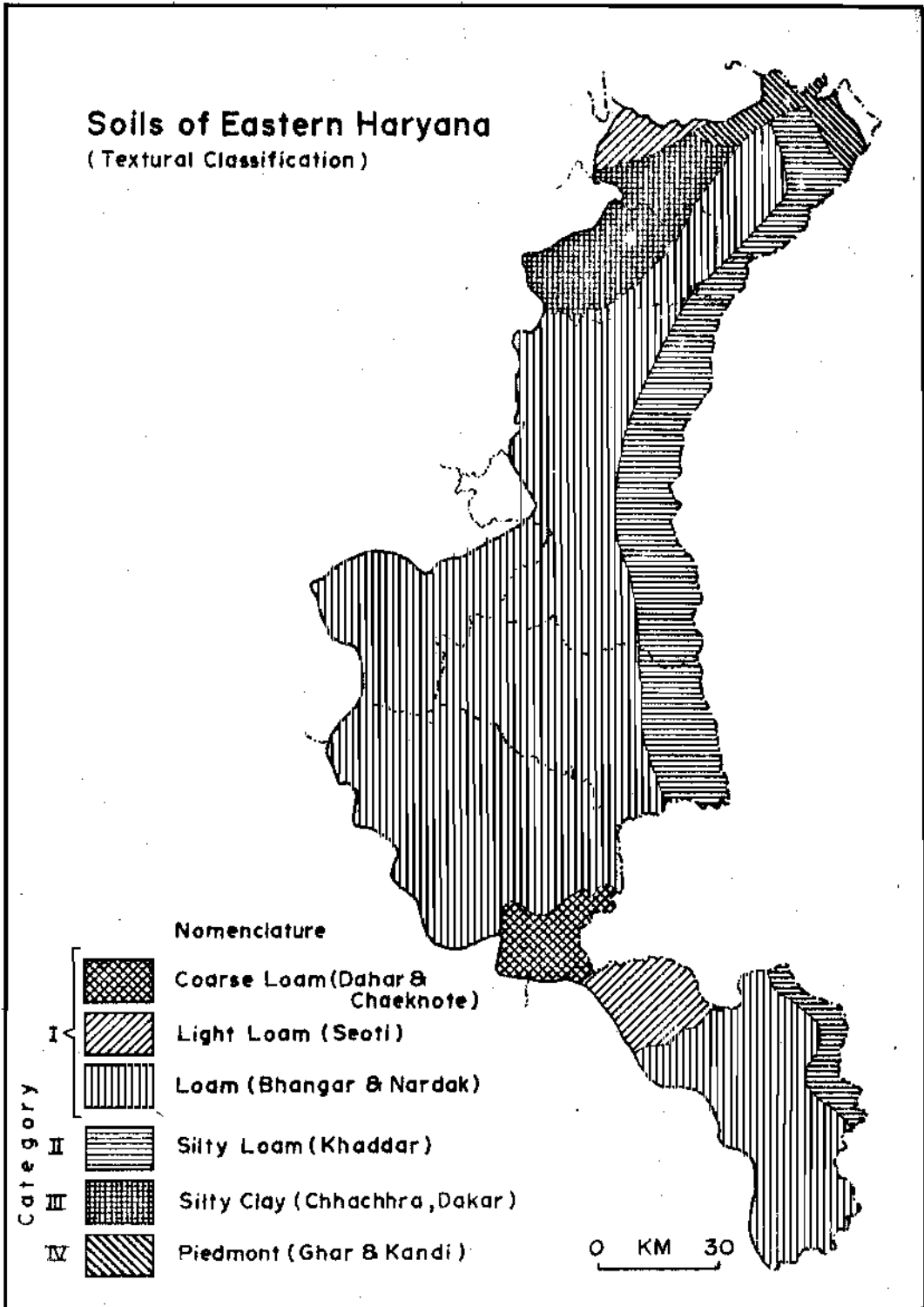


Figure 20

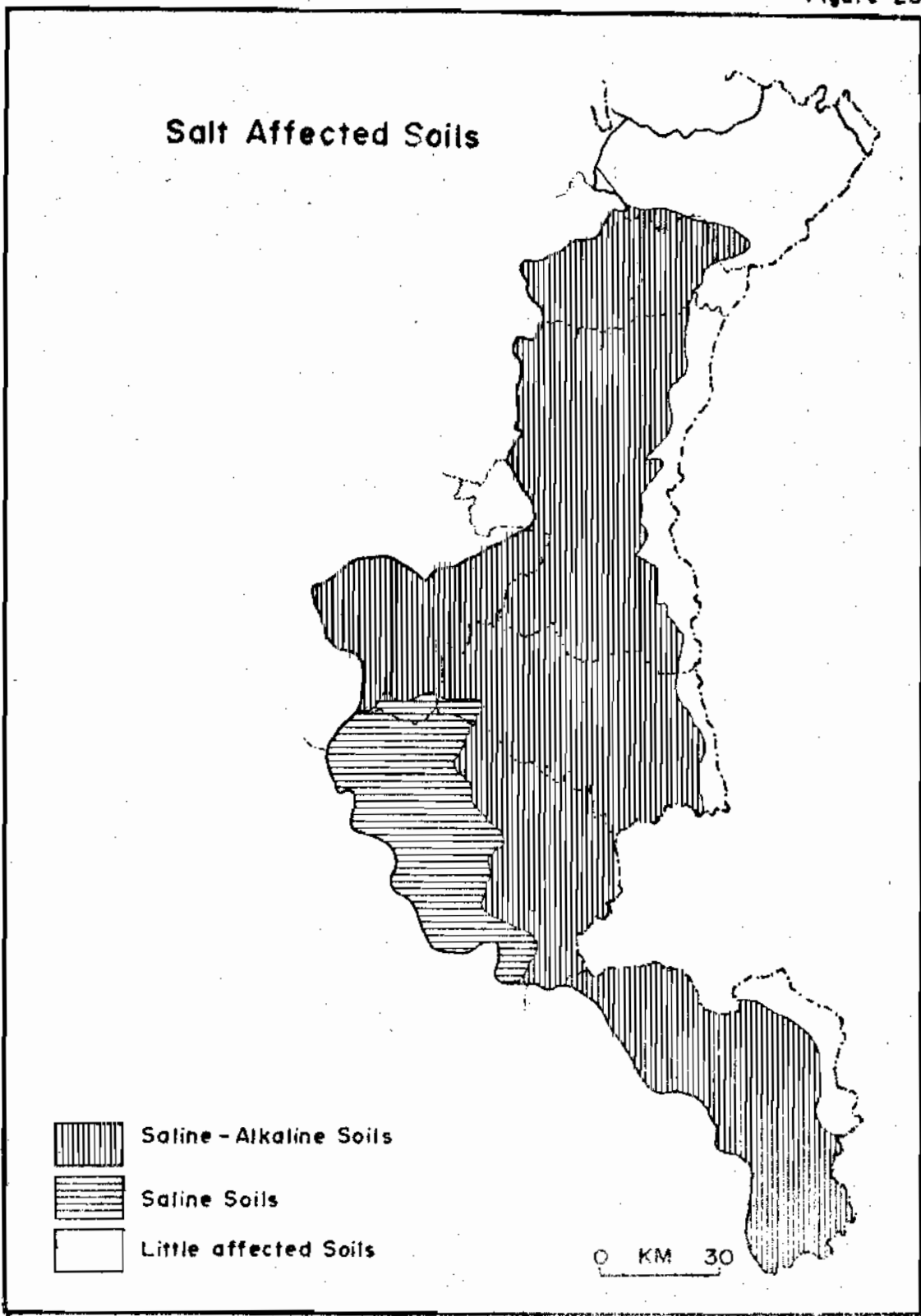
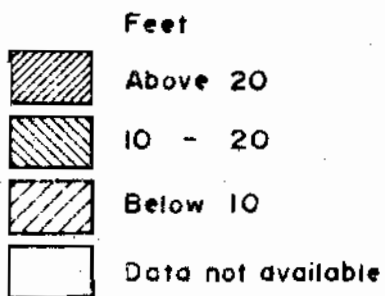


Figure 21

# Sub-Soil Water Depths

June, 1953



0 KM 30

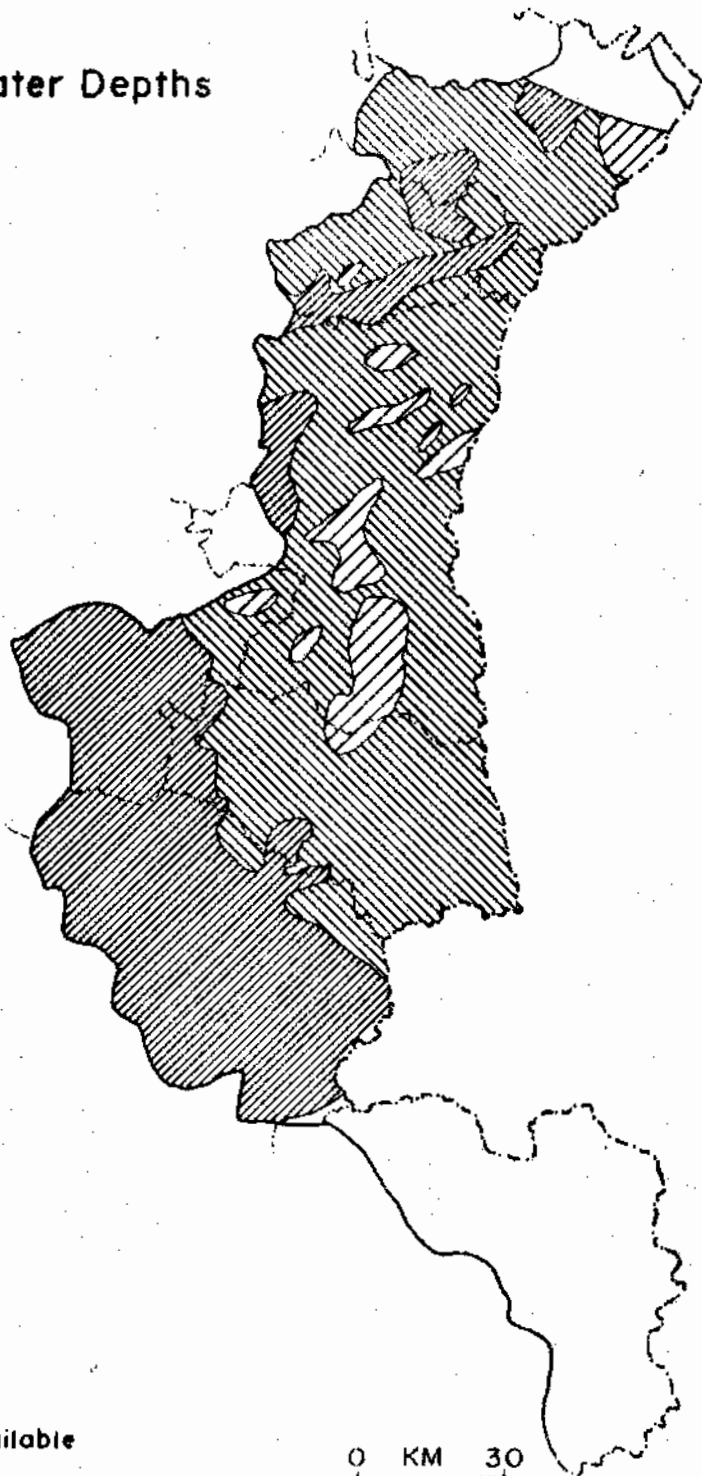
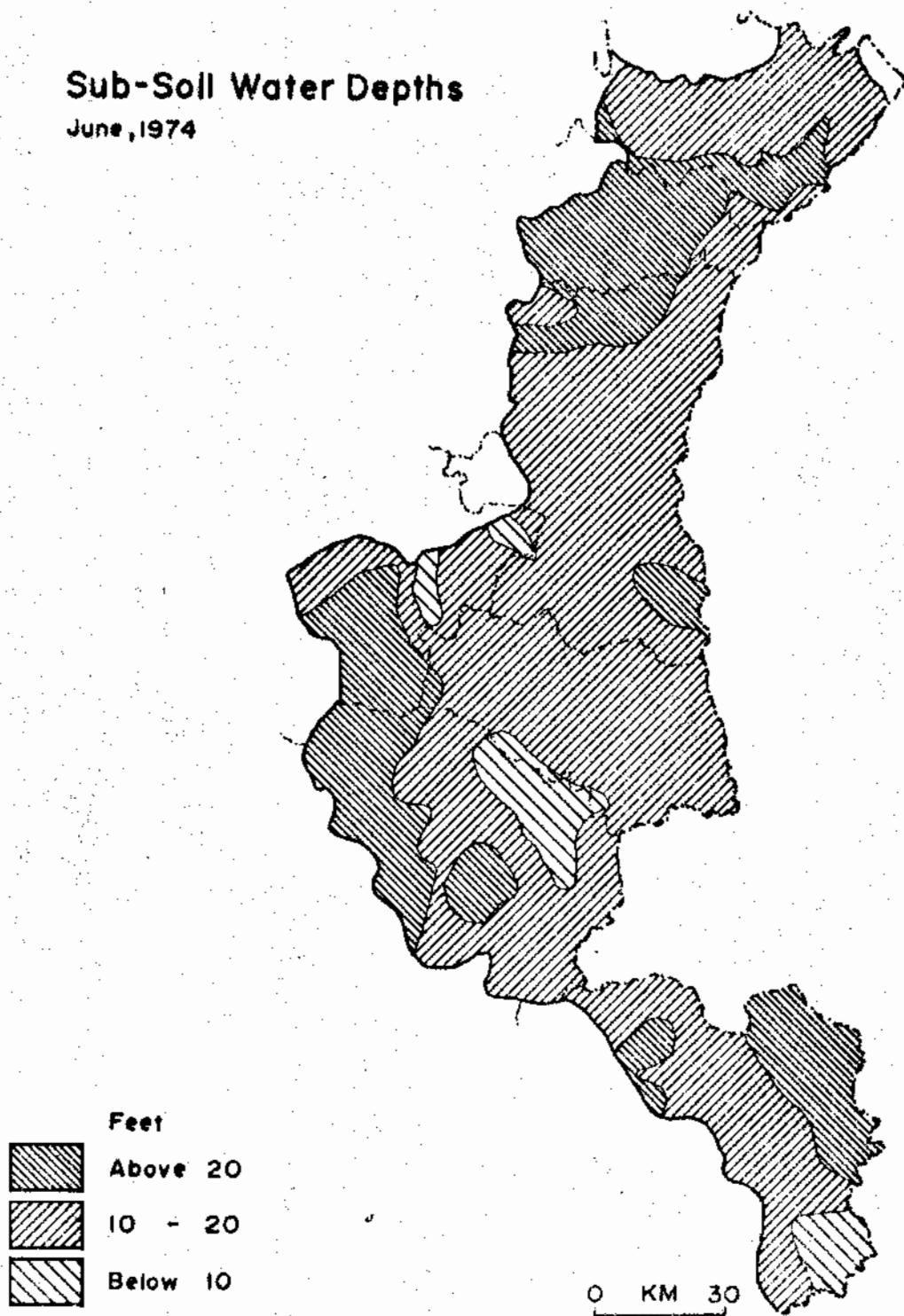


Figure 22

# Sub-Soil Water Depths

June, 1974



Feet



Above 20



10 - 20

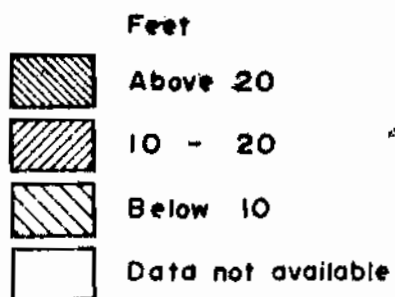


Below 10

0 KM 30

Figure 23

### Sub-Soil Water Depths October, 1974



0 KM 30

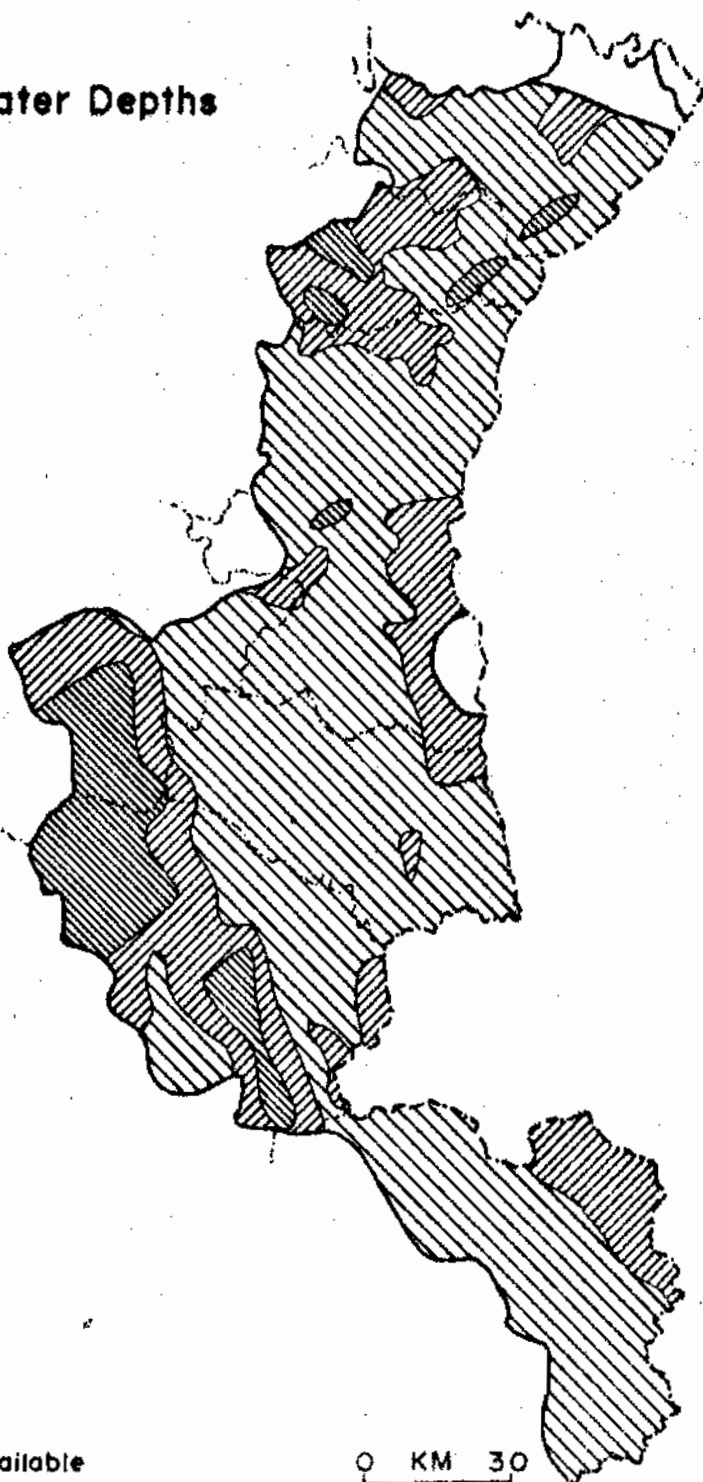


Figure 24

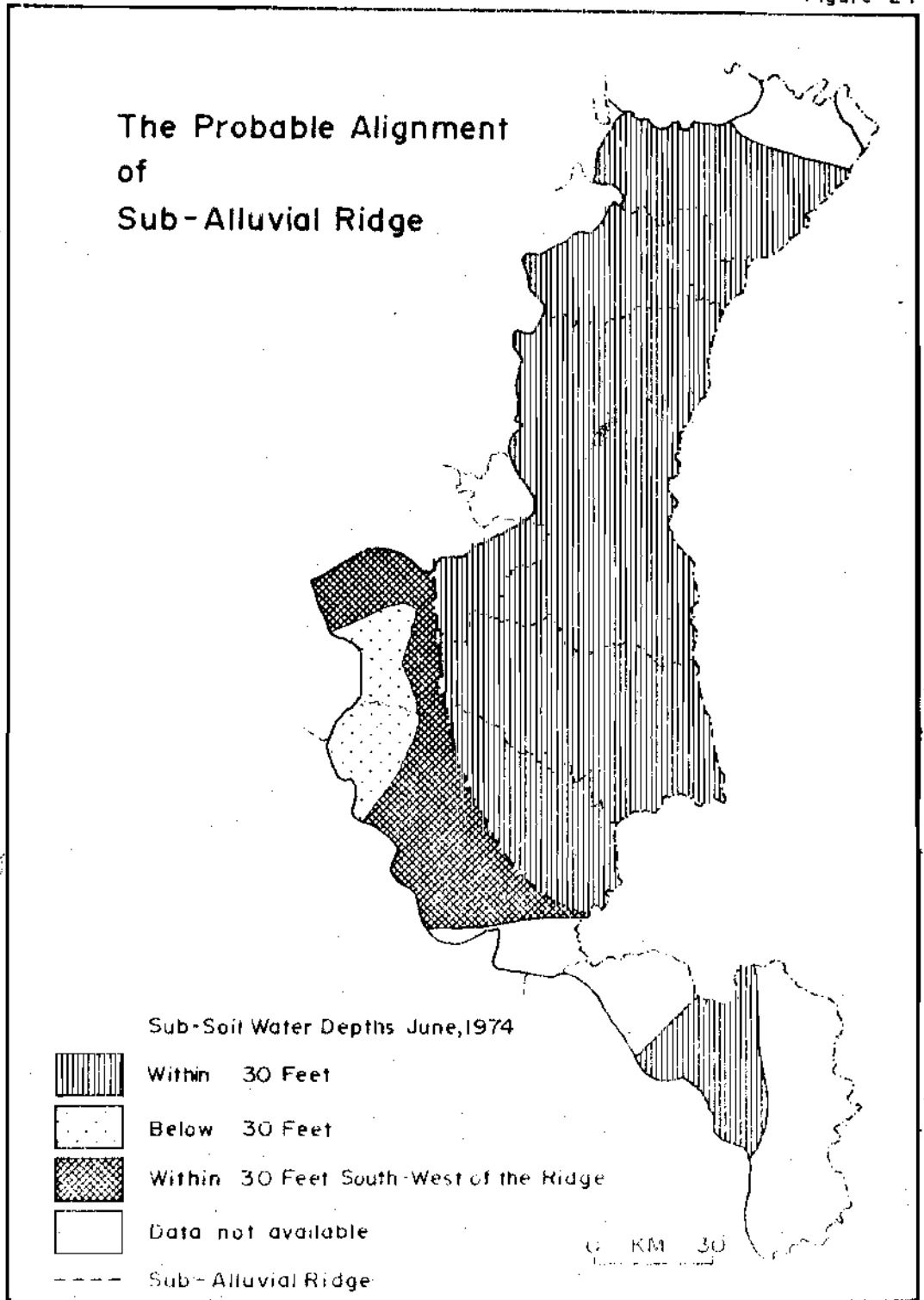


Figure 25

# Ground Water Quality 1974

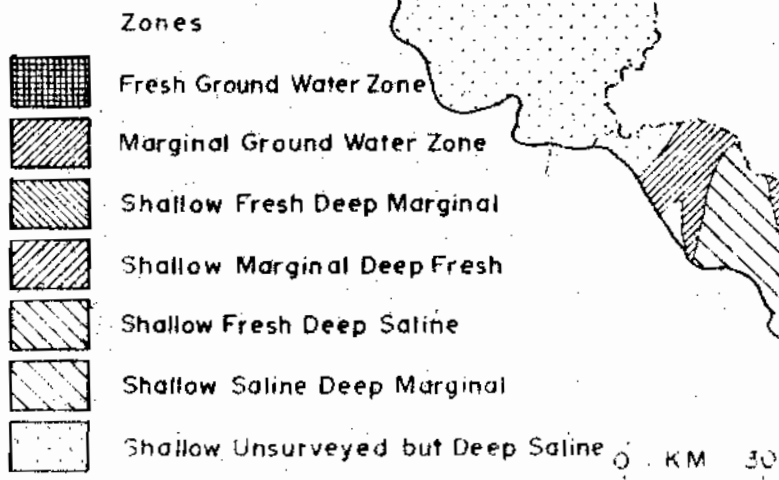


Figure 26

### Water Table Rise During Rainy Season June, 1974 to Oct, 1974

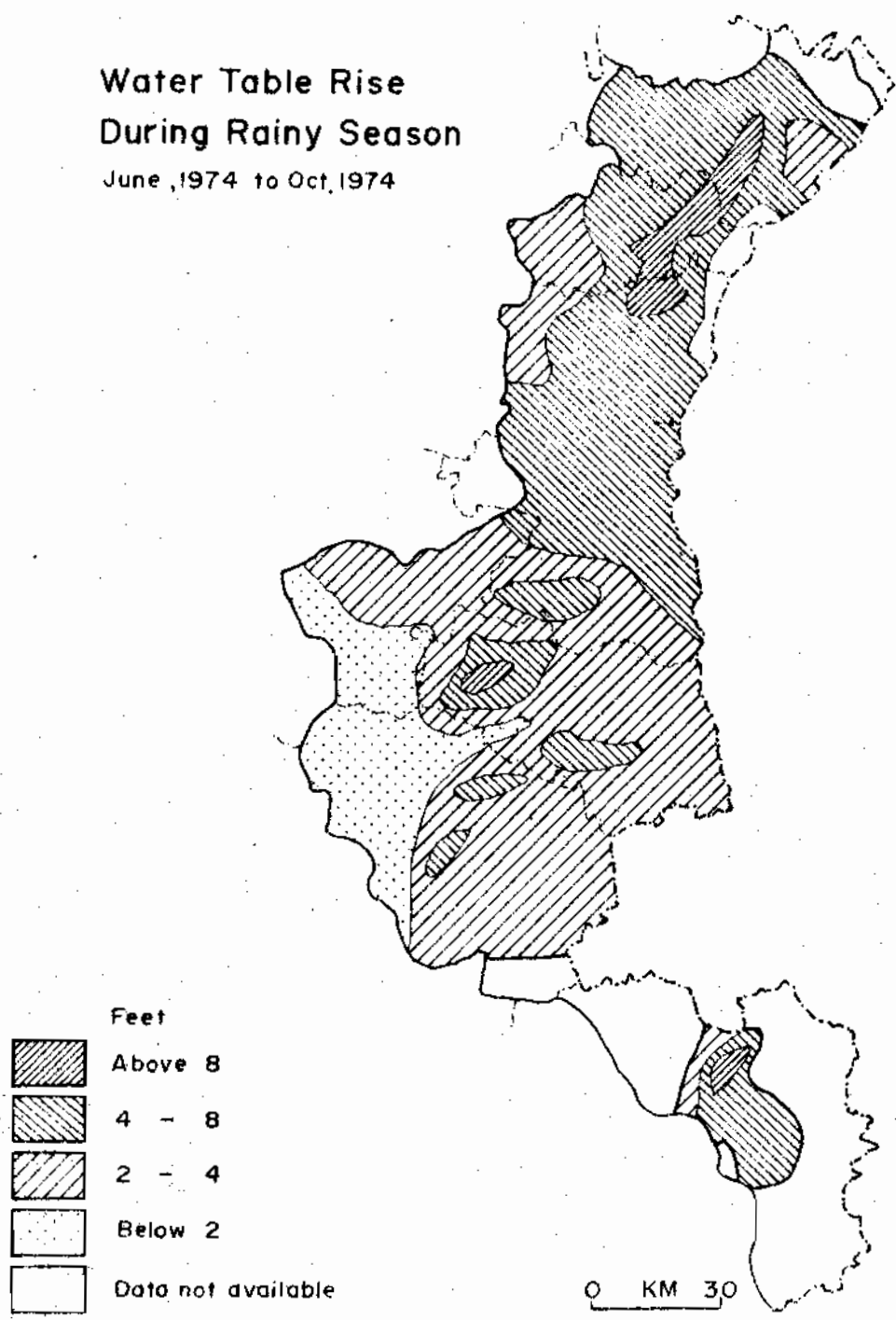
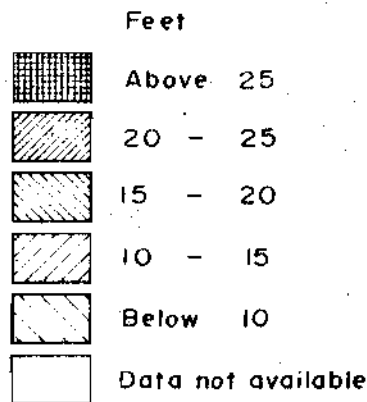


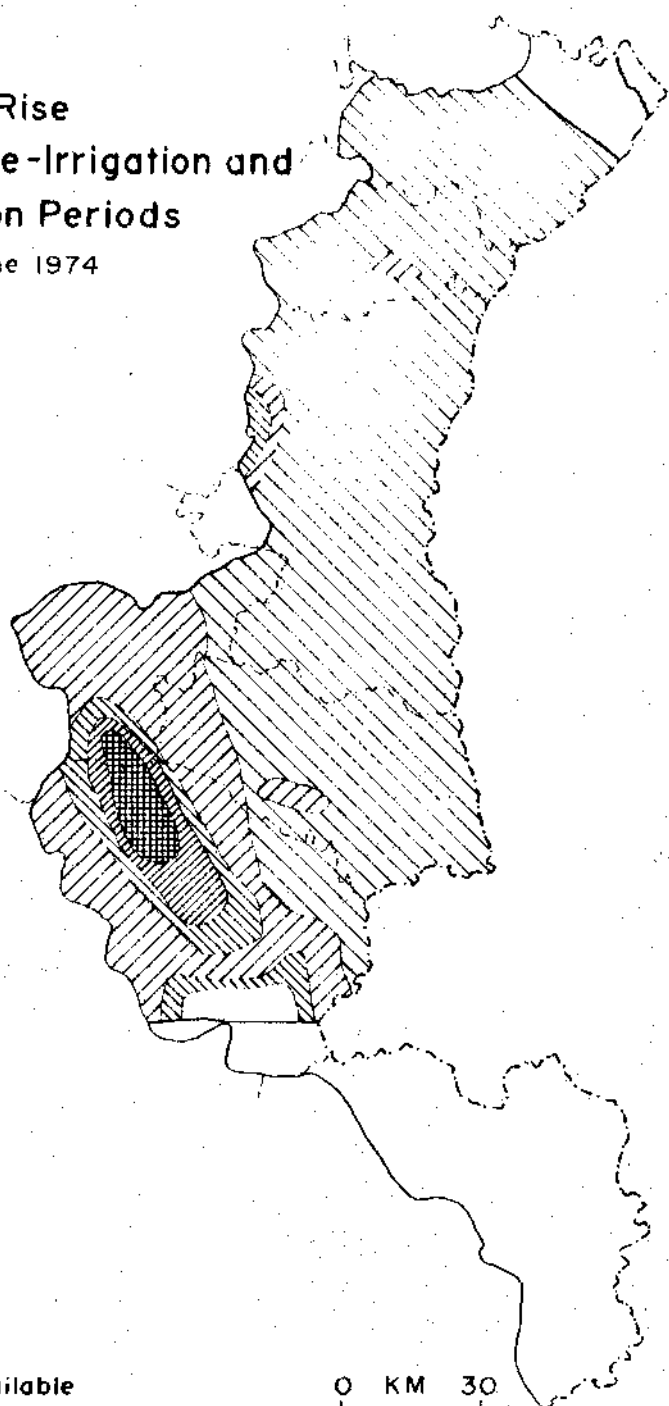
Figure 27

# Water Table Rise During The Pre-Irrigation and Post-Irrigation Periods





June 1953 to June 1974



0 KM 30



**Impact of Deep Tube-Wells  
and  
Augmentation Canals on  
Water Table**  
1970 - 1974

-  Decrease in Water Level
-  Increase in Water Level
-  No Change
-  Data not available

0 KM 30

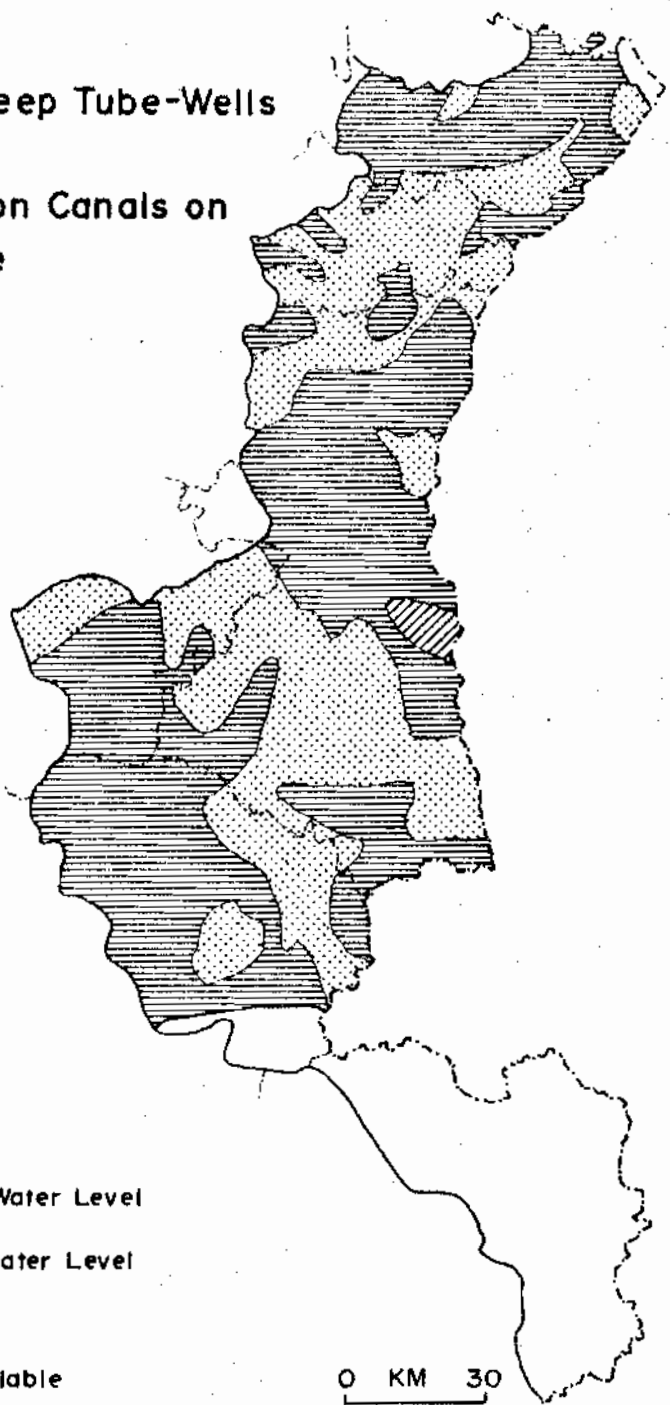


Figure 29

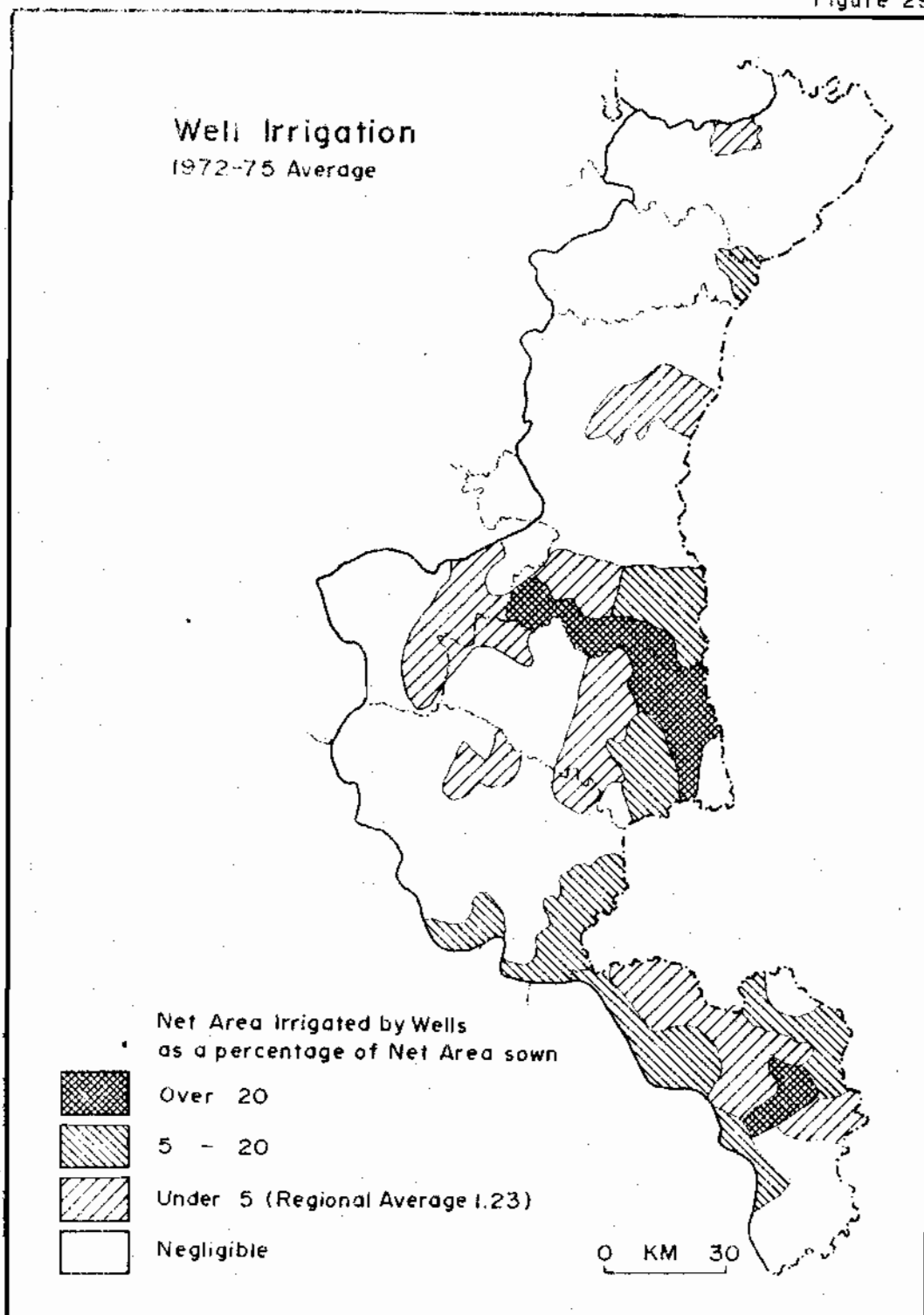


Figure 30

### Tube - Well Irrigation

1972 - 75 Average

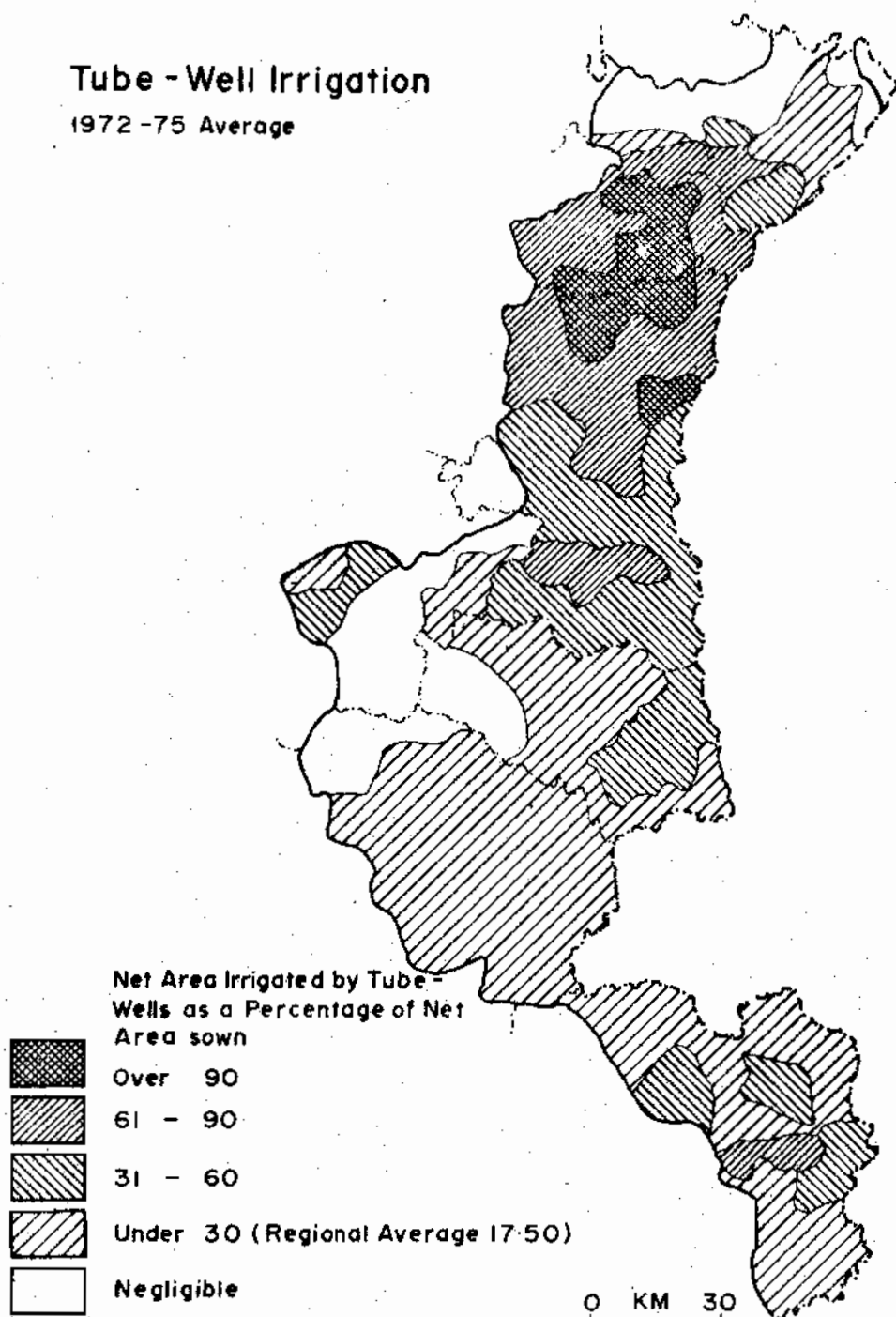


Figure 31

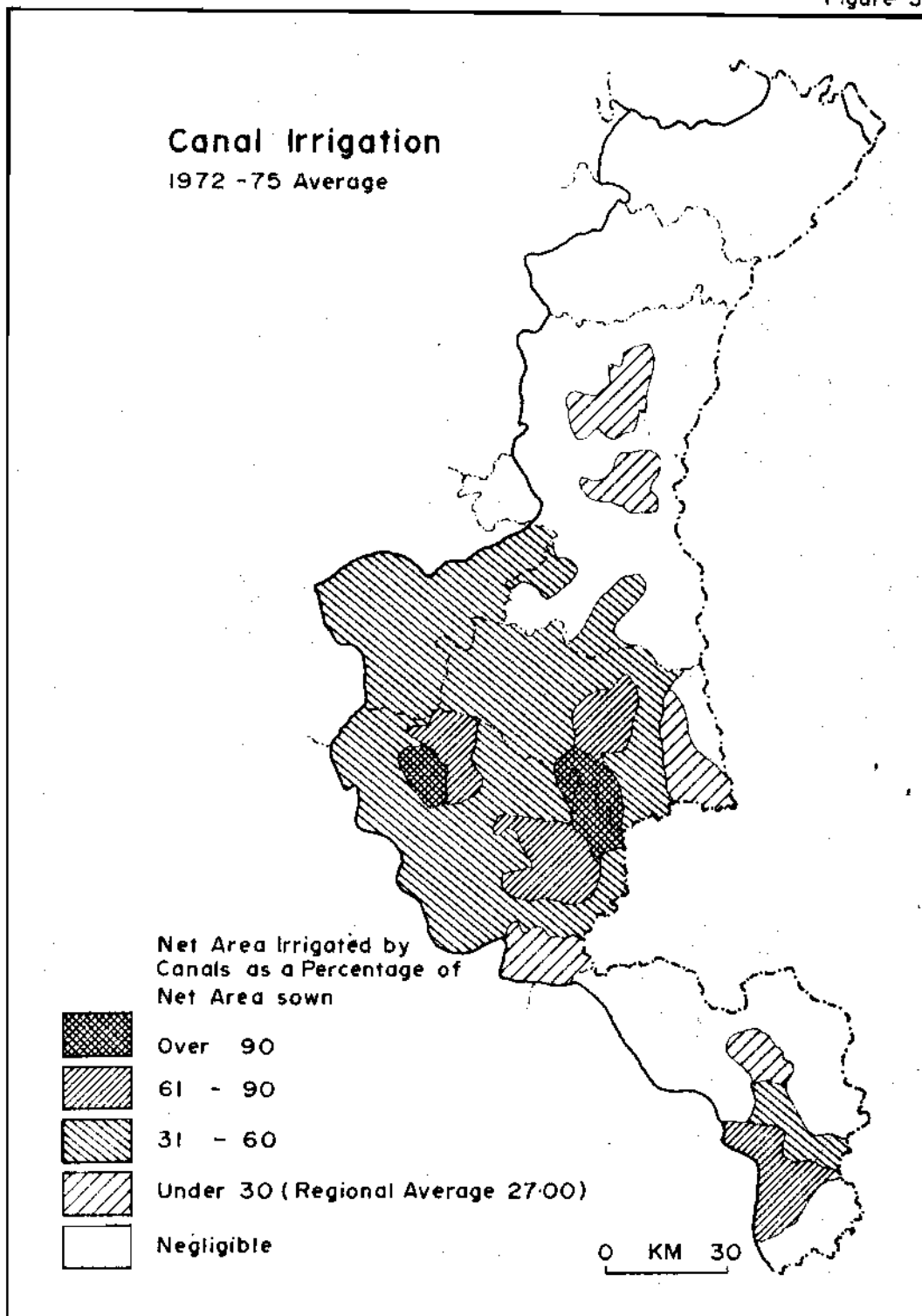
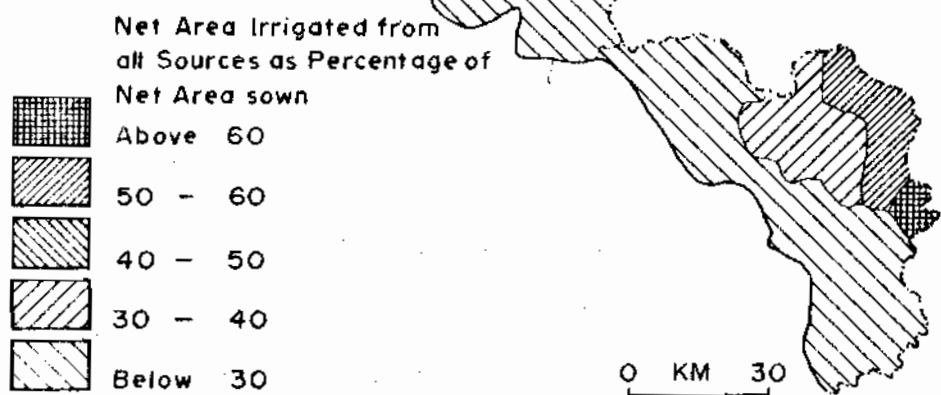
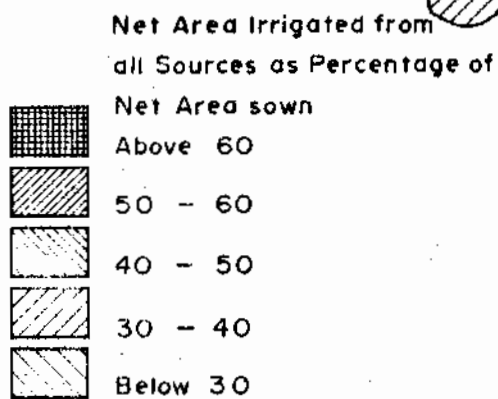


Figure 32

**Overall  
Intensity of Irrigation**  
1960-63 Average



**Overall  
Intensity of Irrigation  
1966-69 Average**



0 KM 30

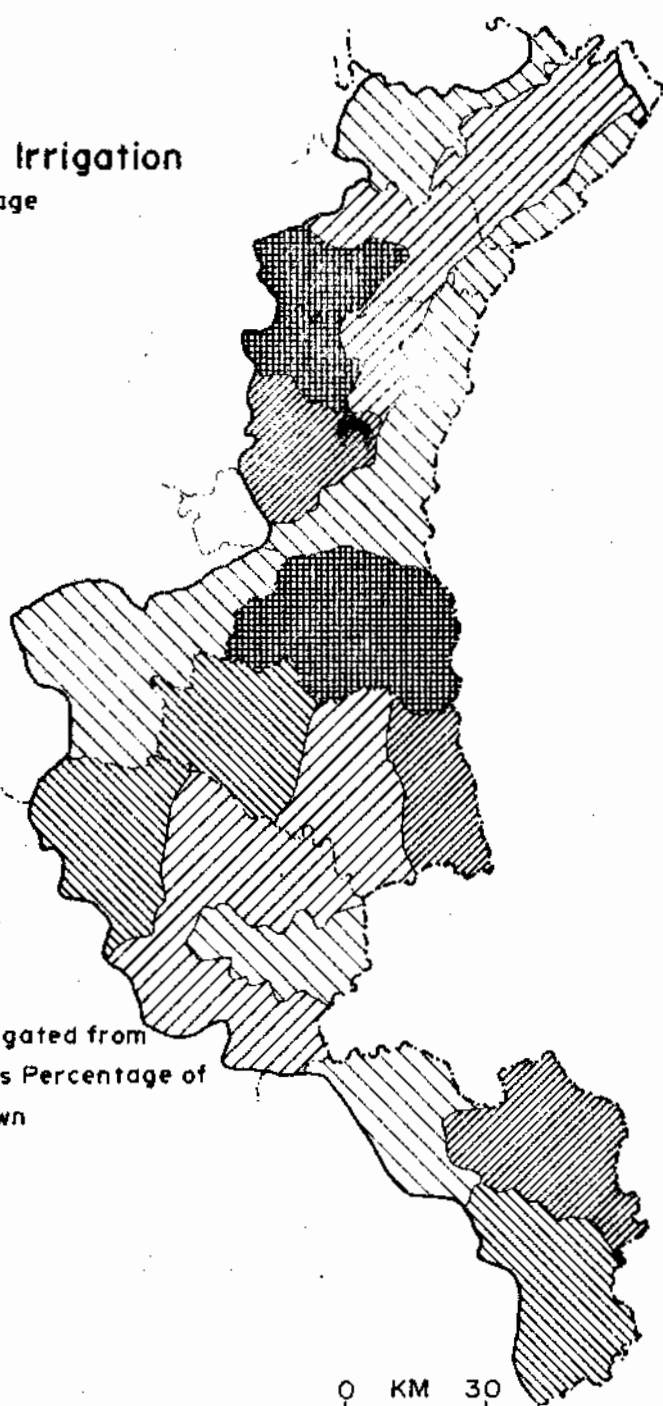


Figure 34

**Overall  
Intensity of Irrigation**  
1972 - 75 Average

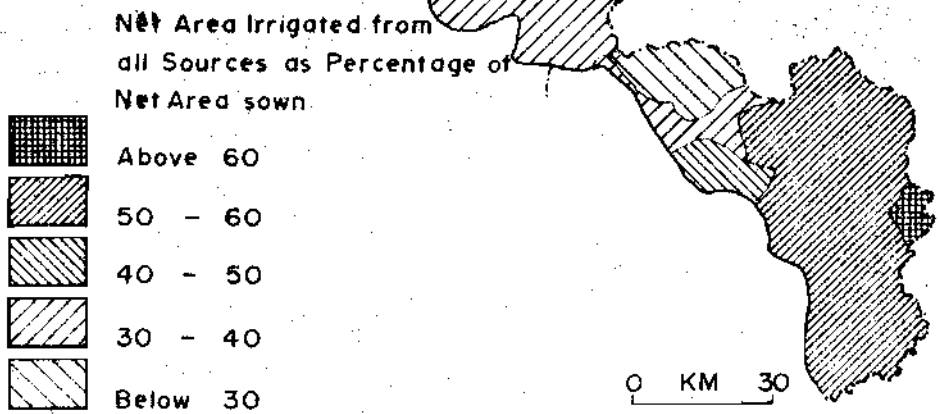


Figure 35

### Sugar cane Irrigated Hectareage

1960-63 Average

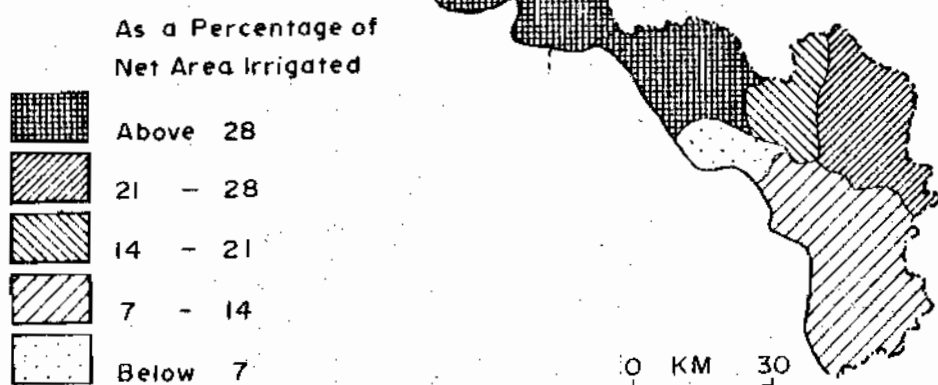
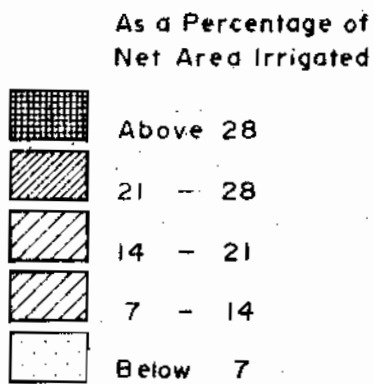


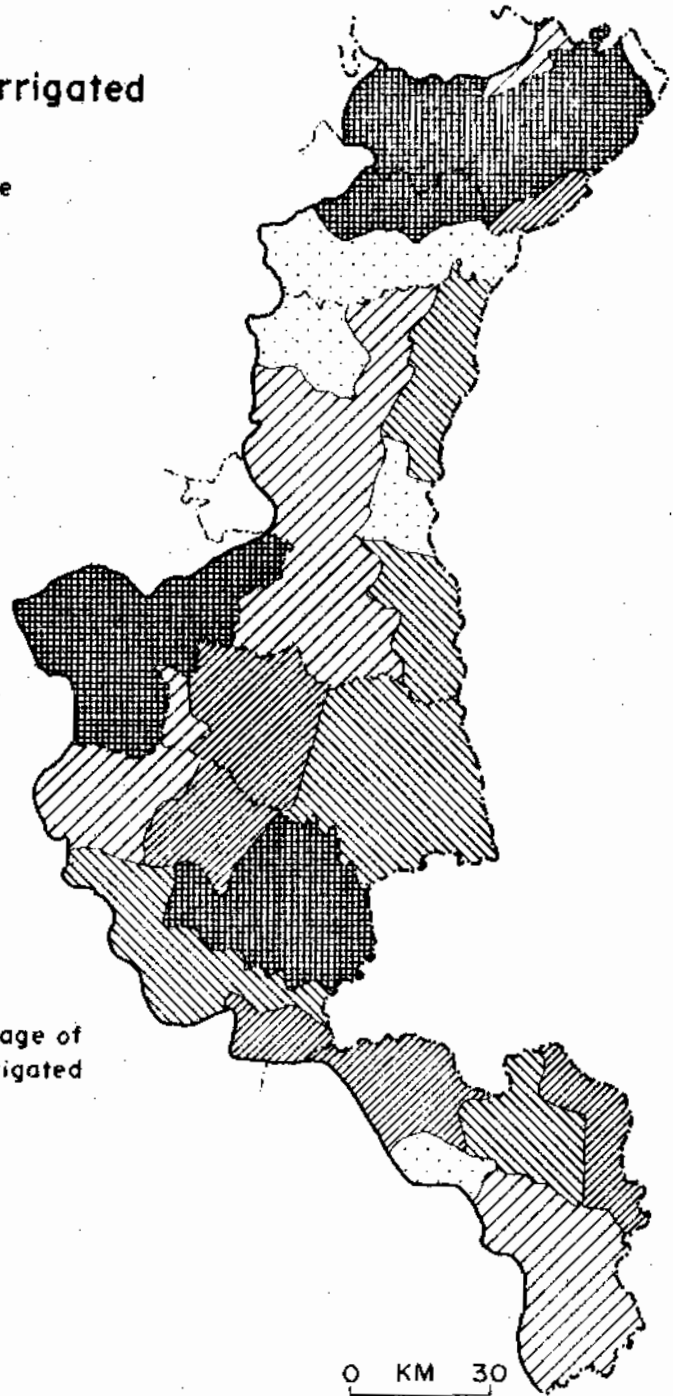
Figure 36

### Sugar cane Irrigated Hectareage

1966-69 Average



0 KM 30



### Sugar cane Irrigated Hectareage

1972 - 75 Average

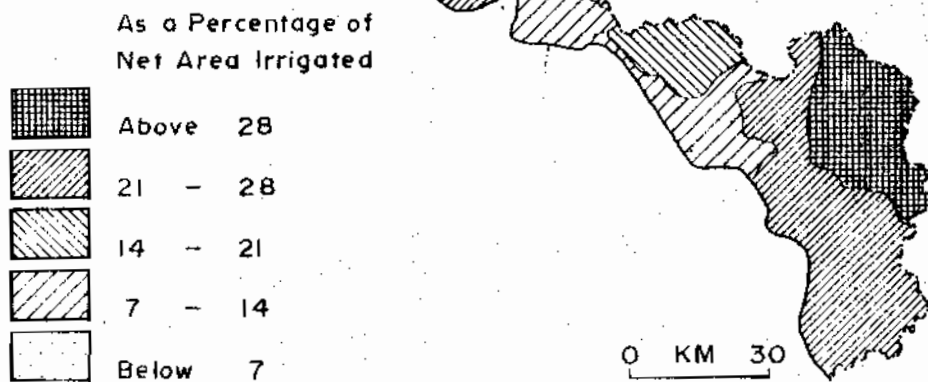
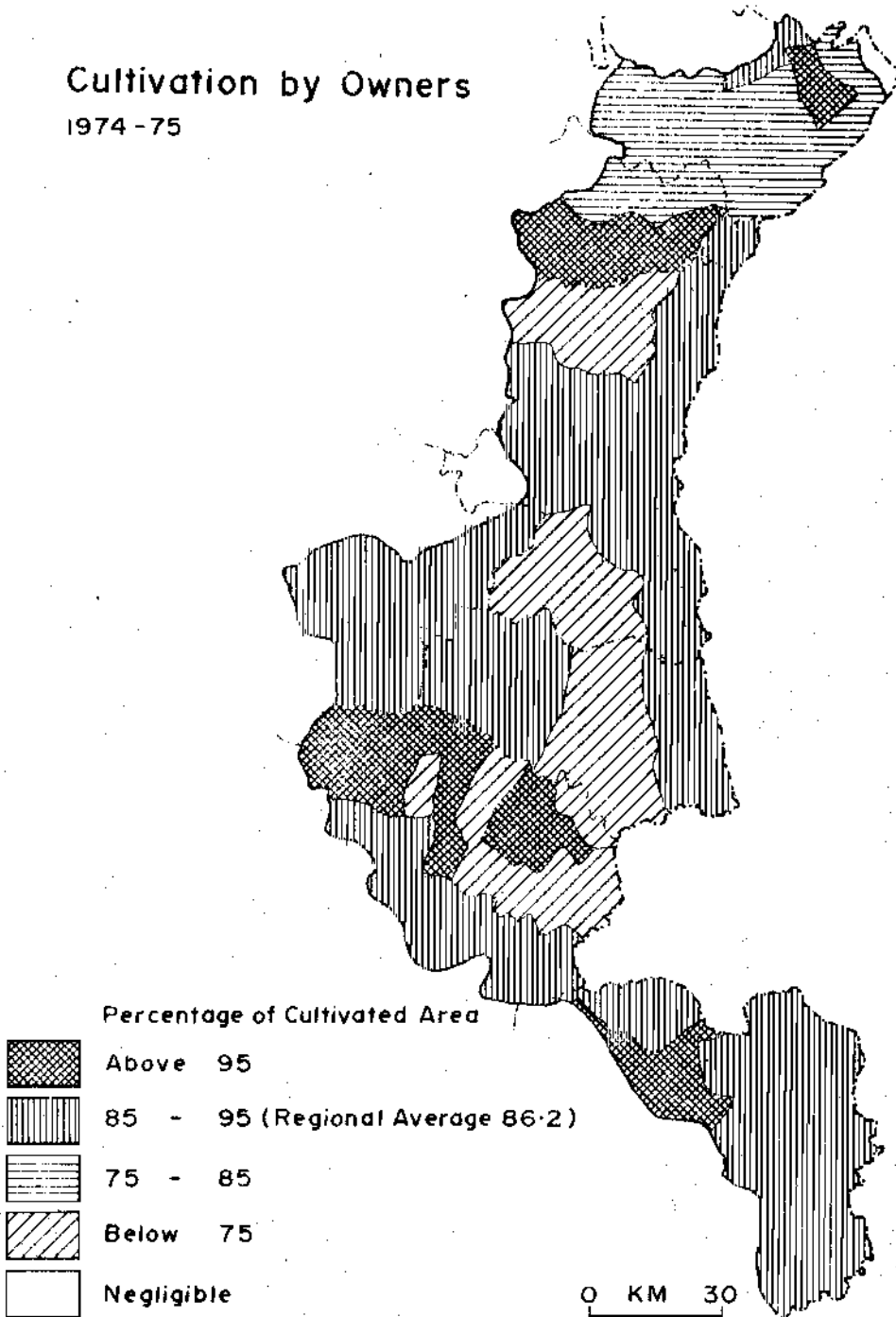


Figure 38

### Cultivation by Owners 1974 - 75



### Cultivation by Tenants-at-Will 1974-75

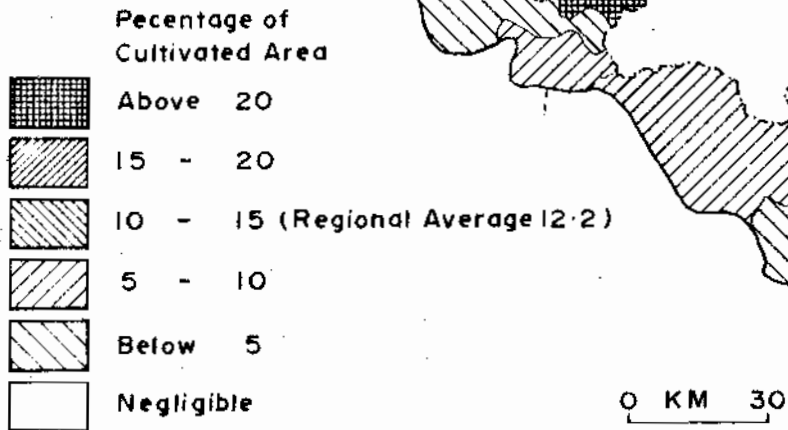


Figure 40

### Cultivation by Leasees

1974-75

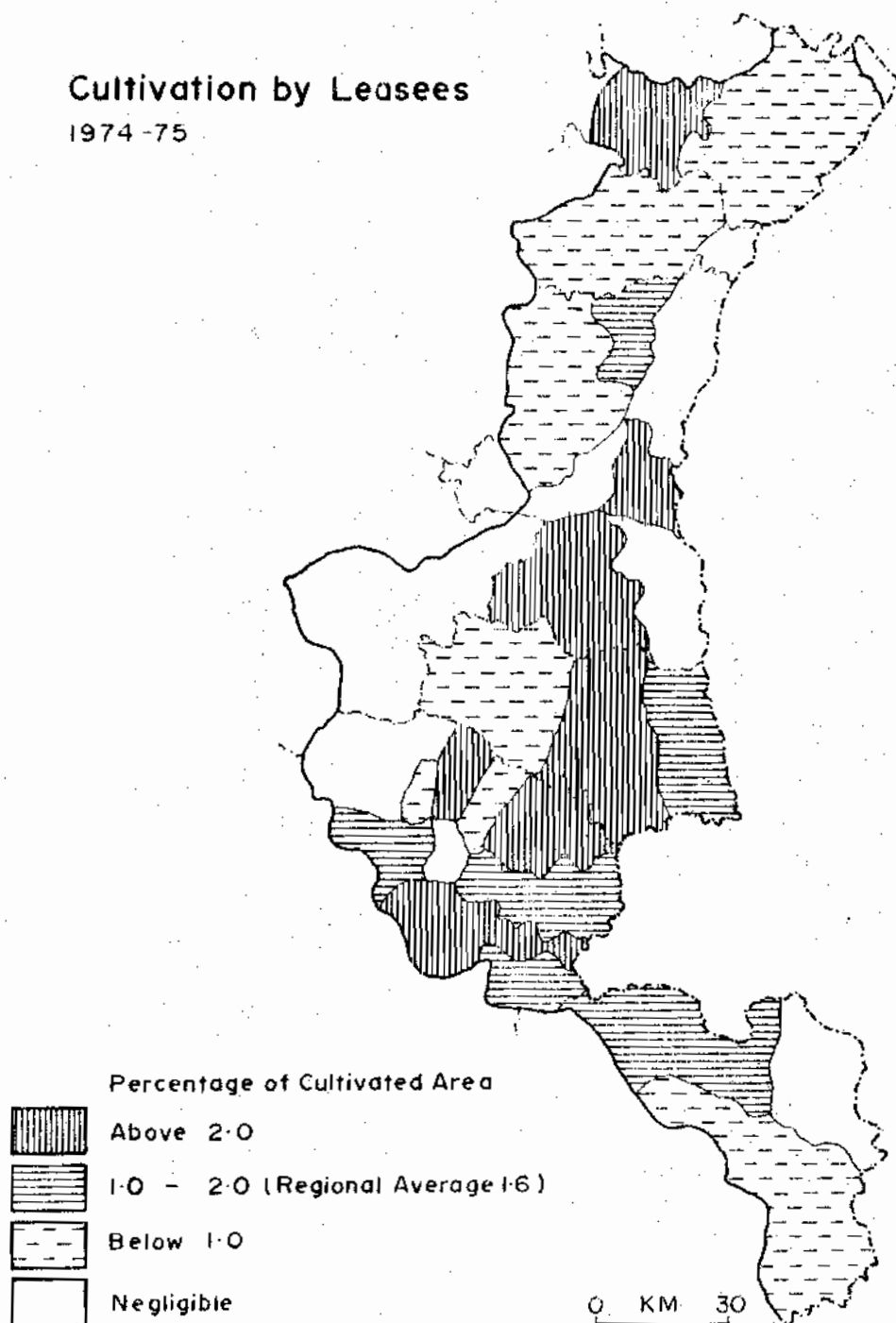
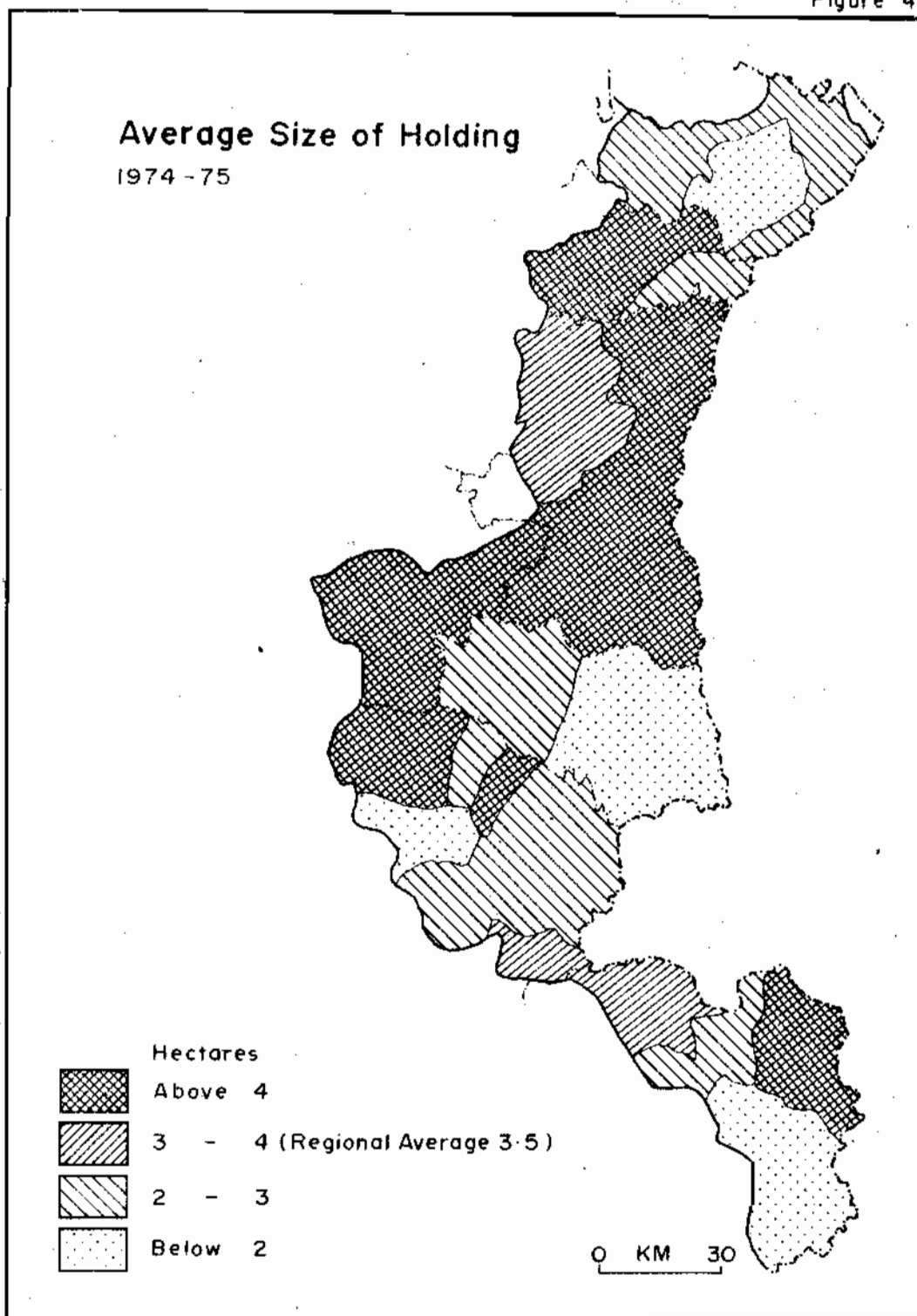
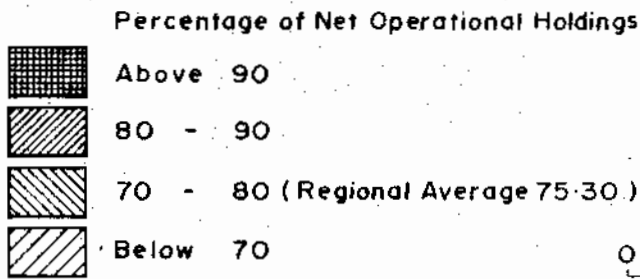


Figure 41



# Owners Holdings 1971



0 KM 30

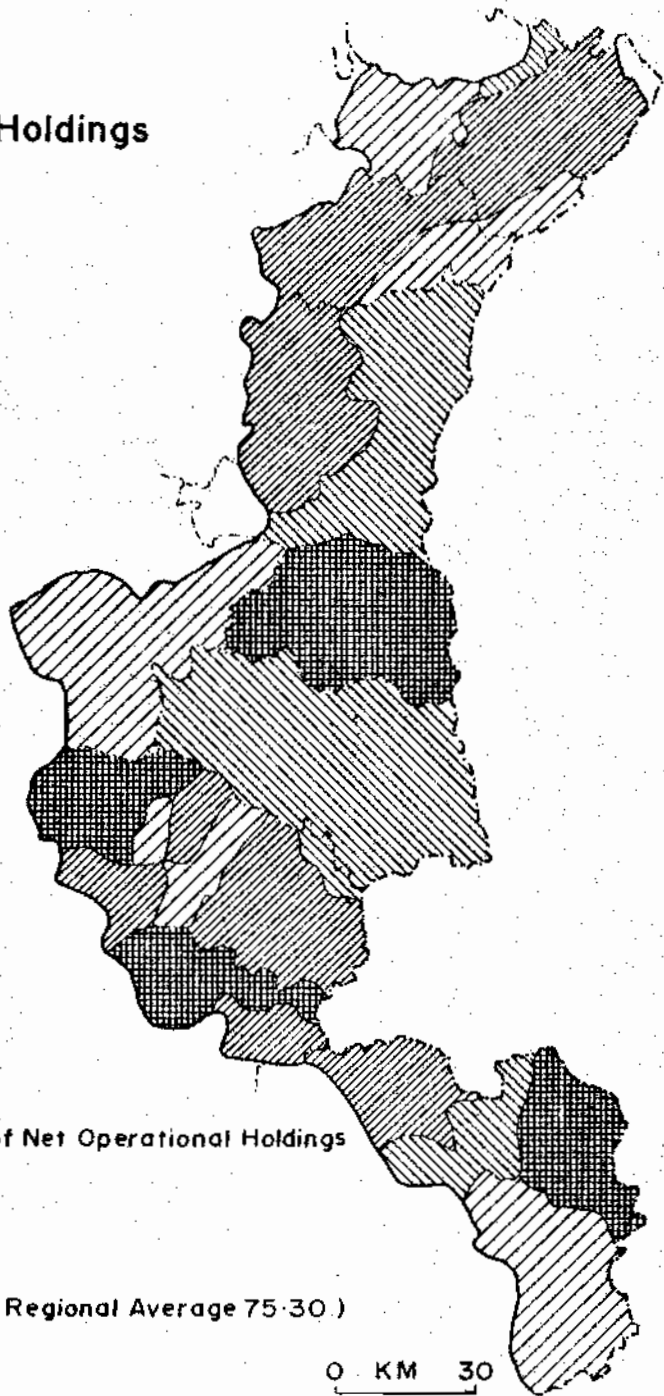


Figure 43

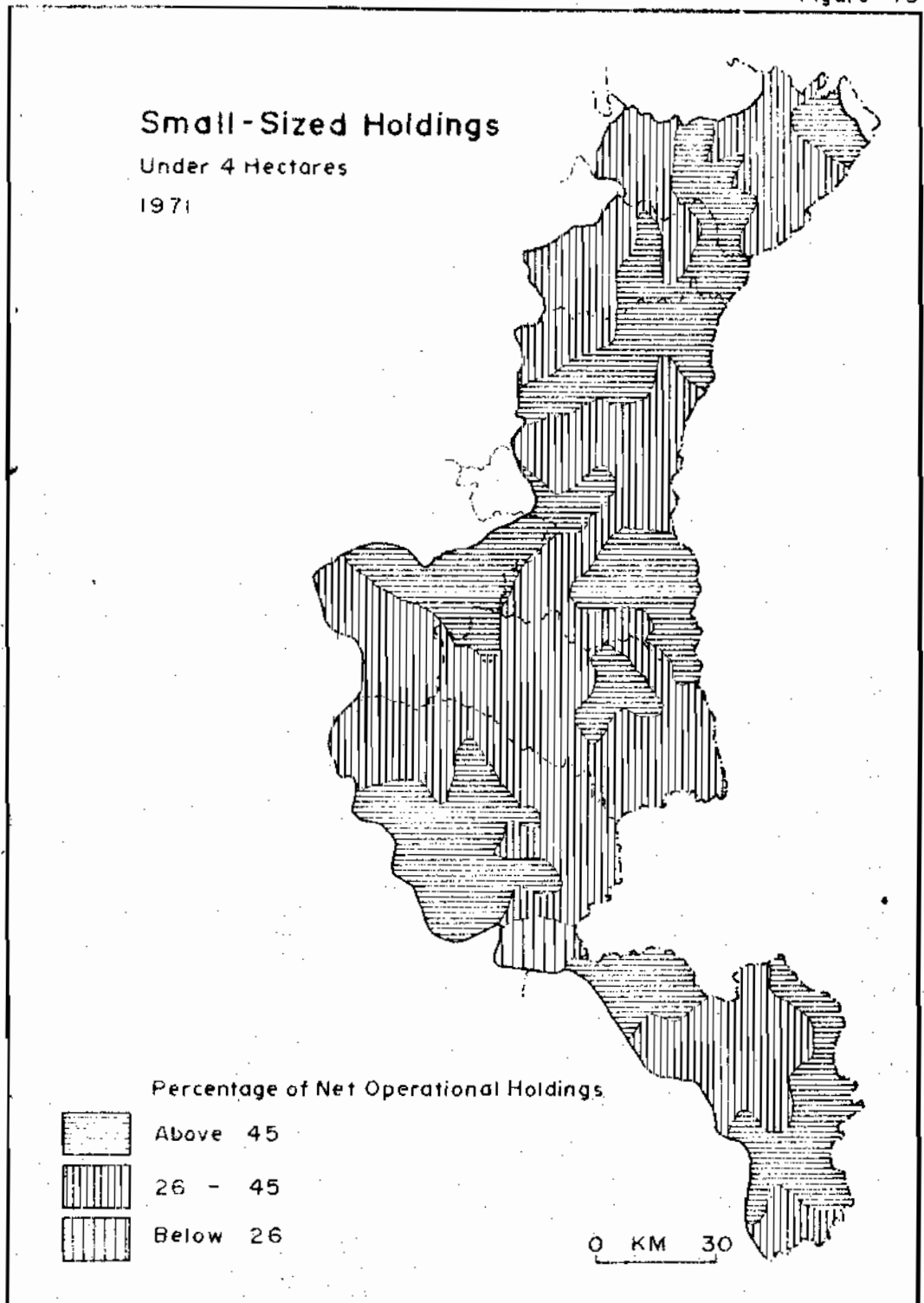
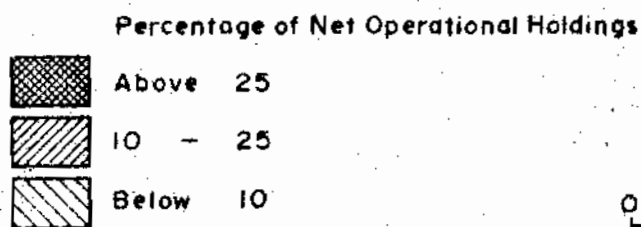


Figure 44

### Medium-Sized Holdings

4.01 to 8.00 Hectares

1971



0 KM 30

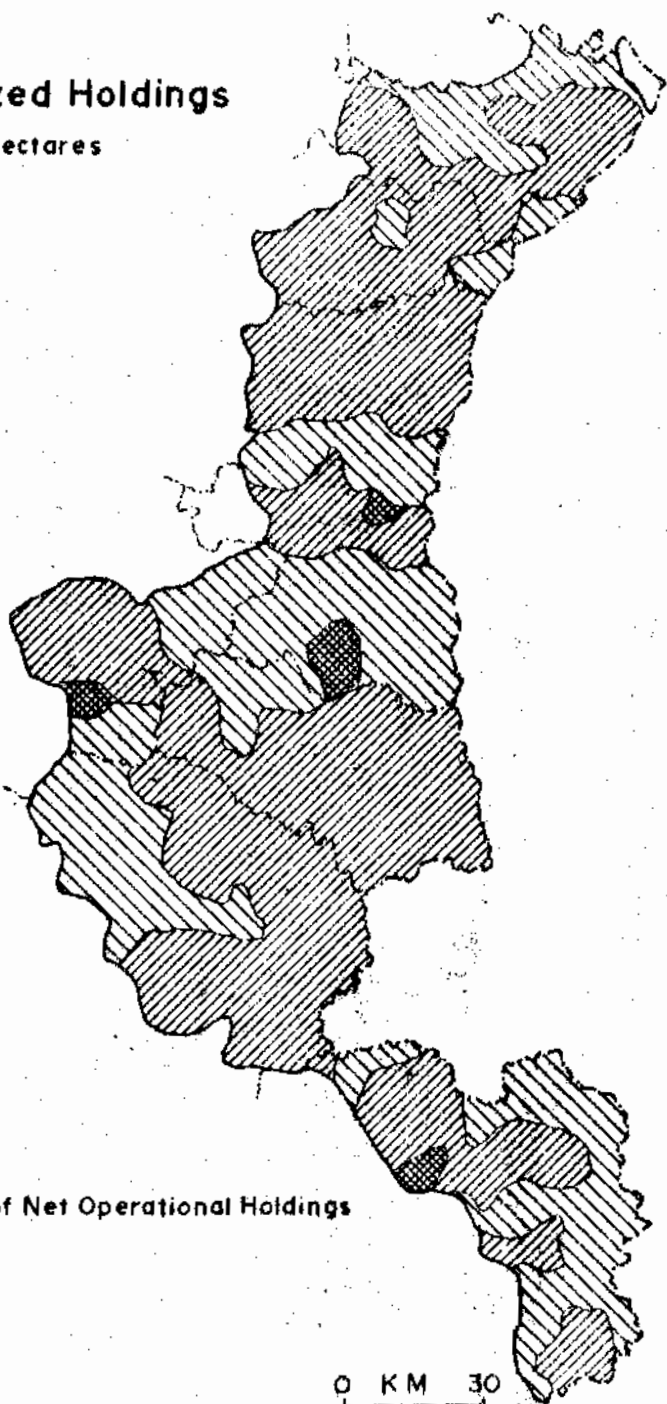


Figure 45

### Large - Sized Holdings

Above 8 Hectares

1971

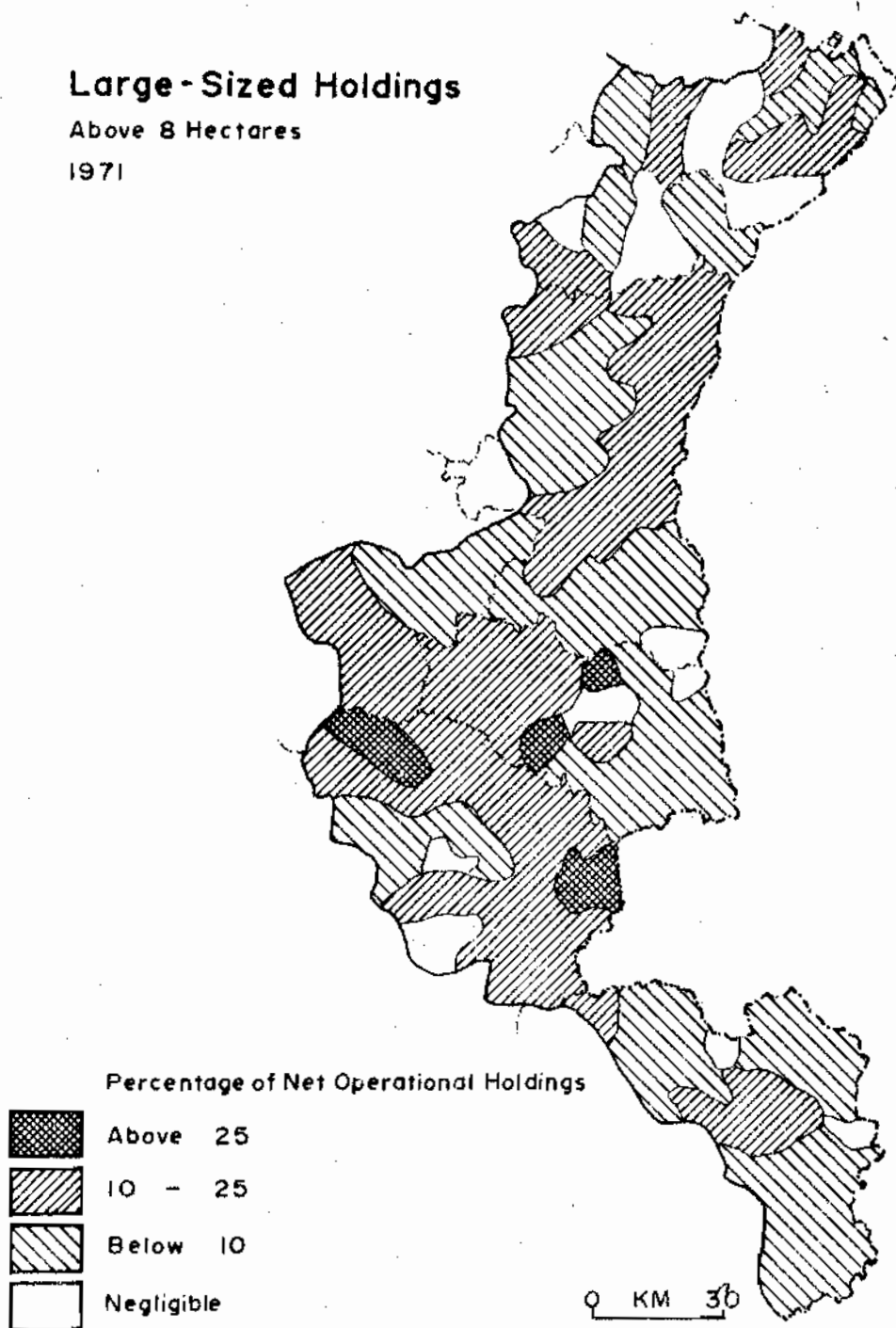
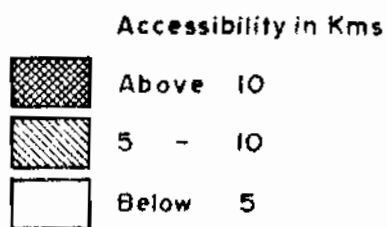


Figure 46

Road Accessibility  
in  
Eastern Haryana  
1961



Position on 31-3-1961.

0 KM 30

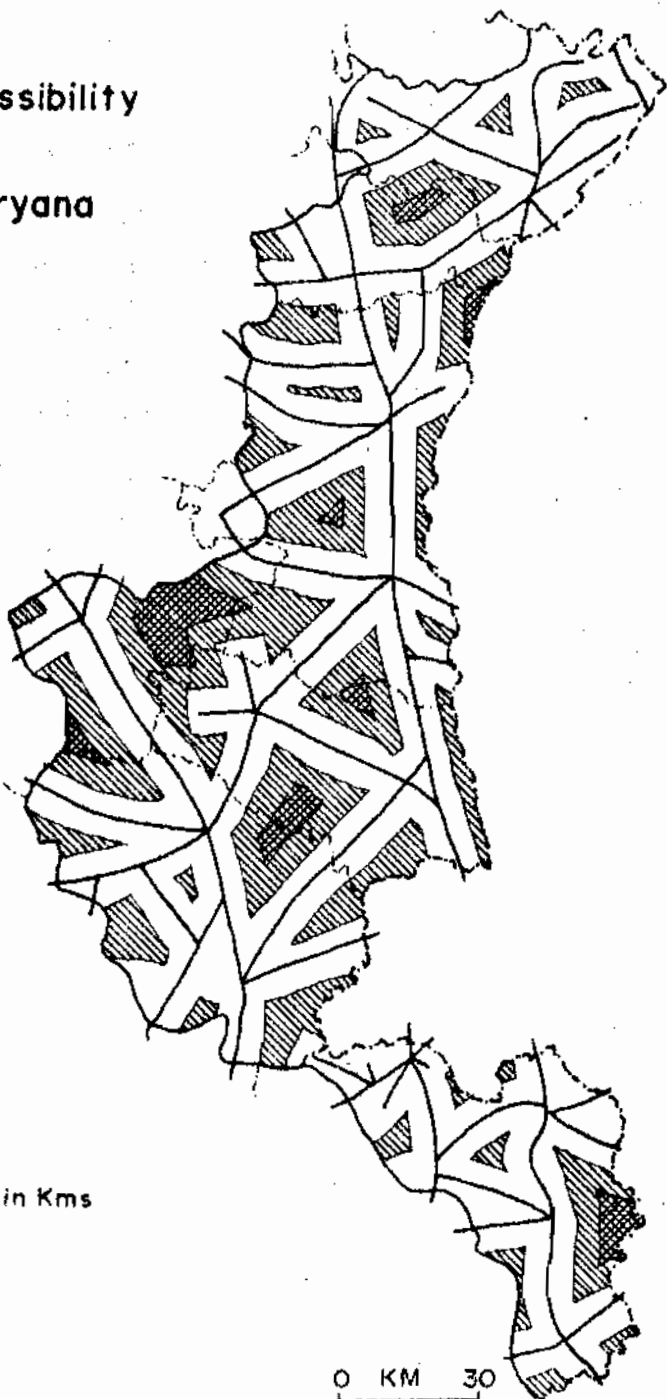
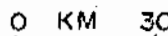


Figure 47

**Road Accessibility  
in  
Eastern Haryana  
1974**

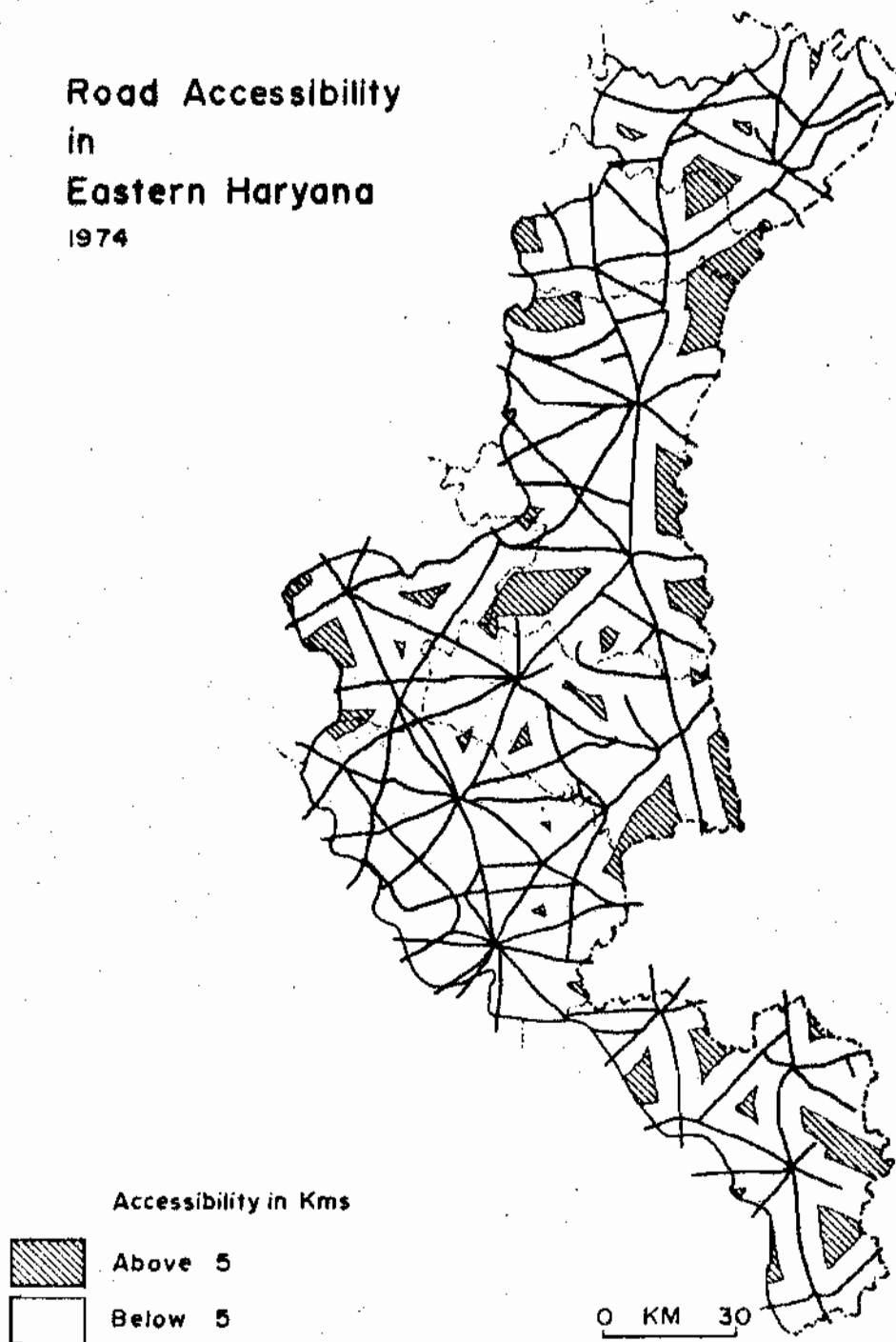





Figure 48

### Areas Made Accessible 1961-74

-  Within 5 - 10 Kms
-  Within 5 Kms from Road
-  No Change

0 KM 30

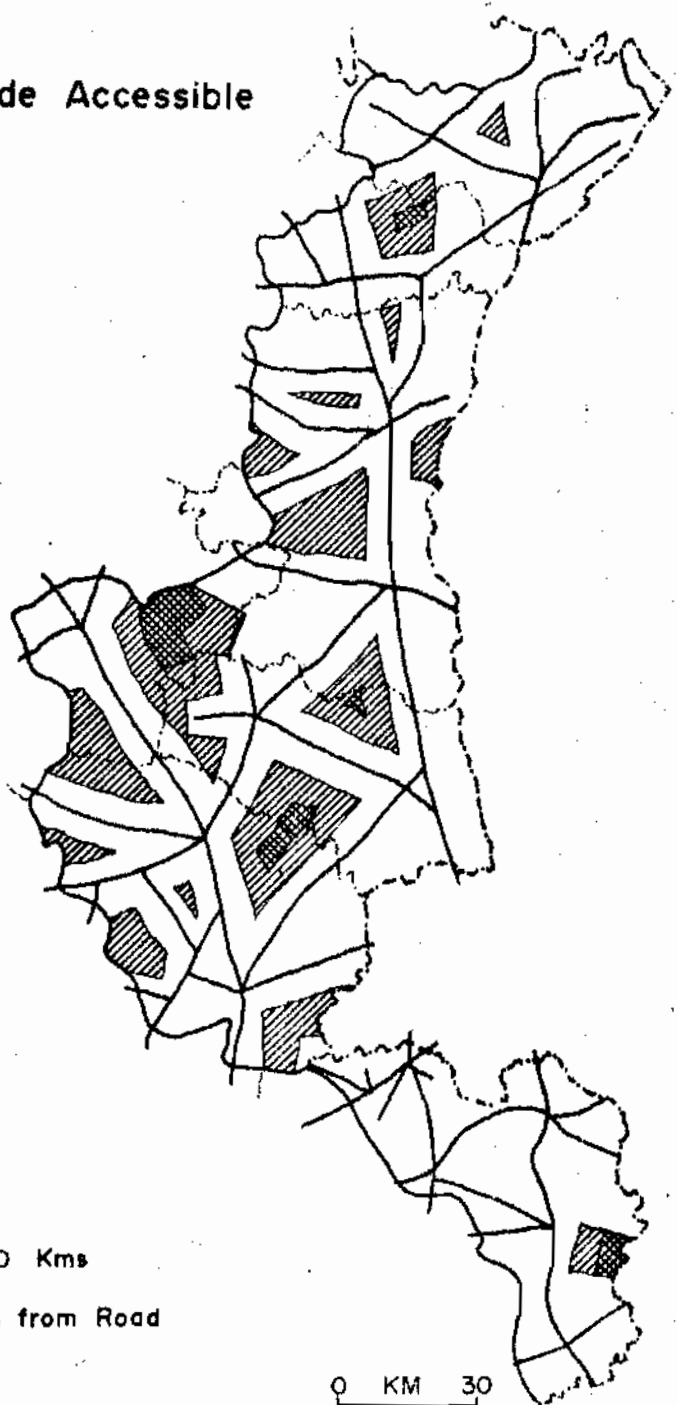
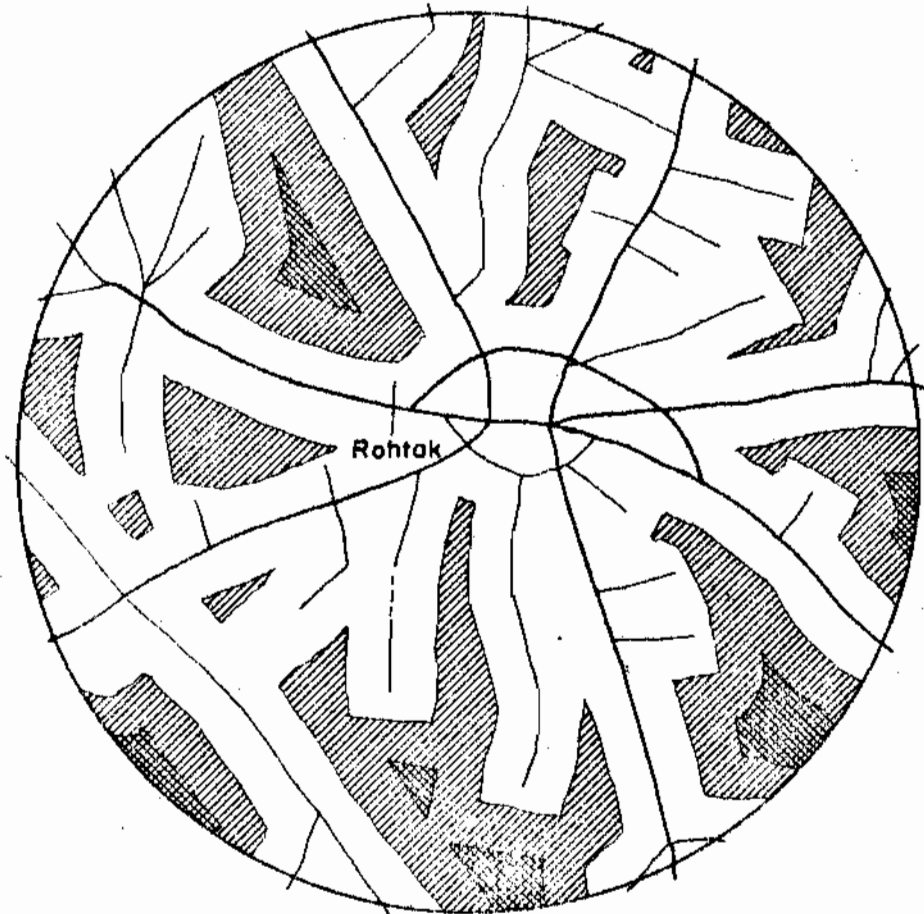
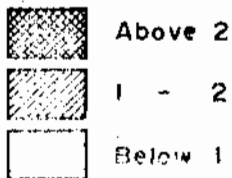


Figure 4e

### Road Accessibility in Sugar Mill Zone of Rohtak 1974

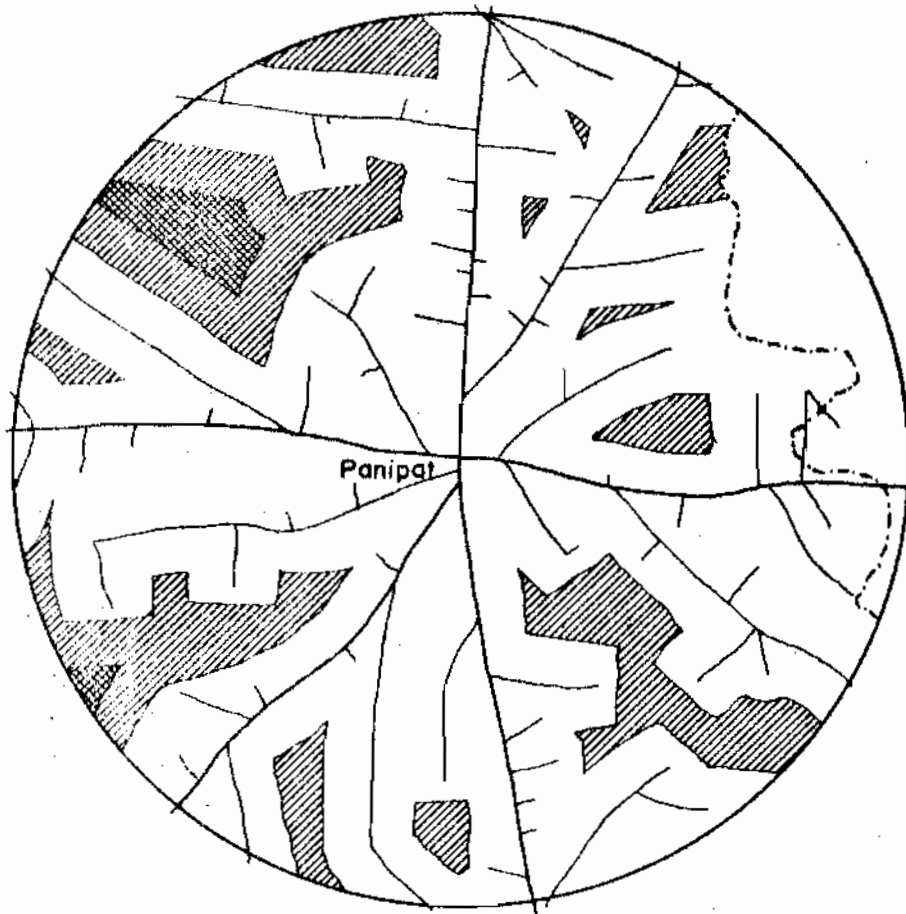


Accessibility in Kms

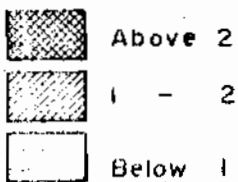


0 KM 2

### Road Accessibility in Sugar Mill Zone of Panipat 1974

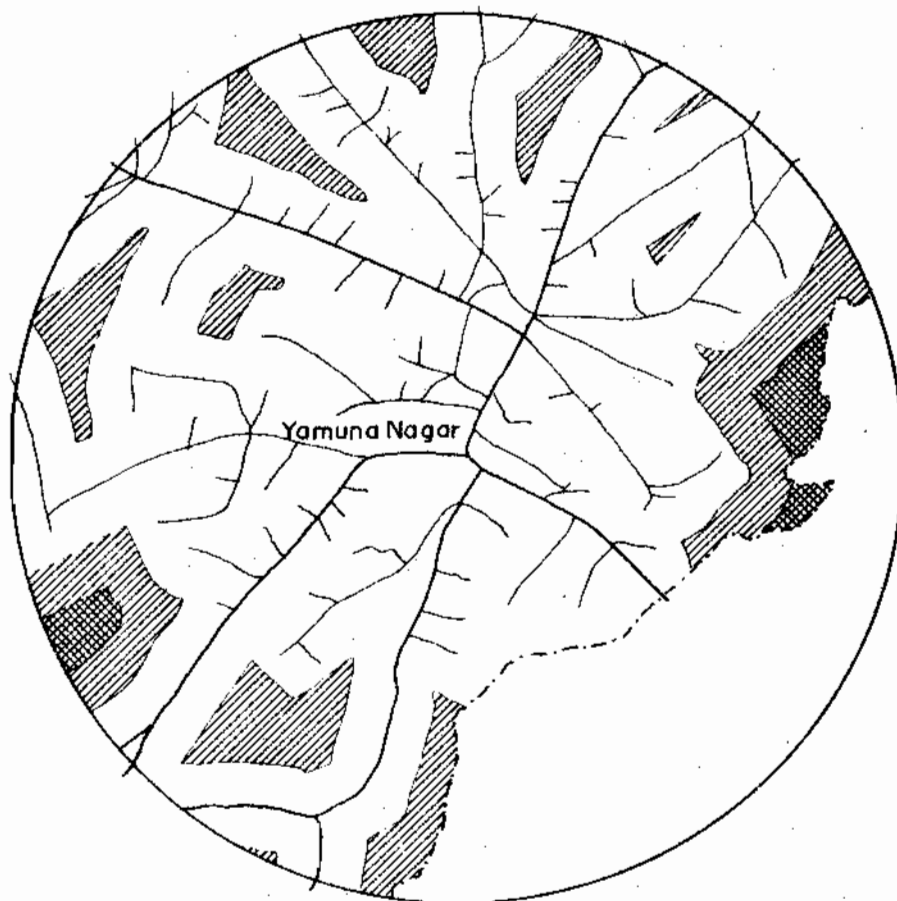


Accessibility in Kms






0 KM 2

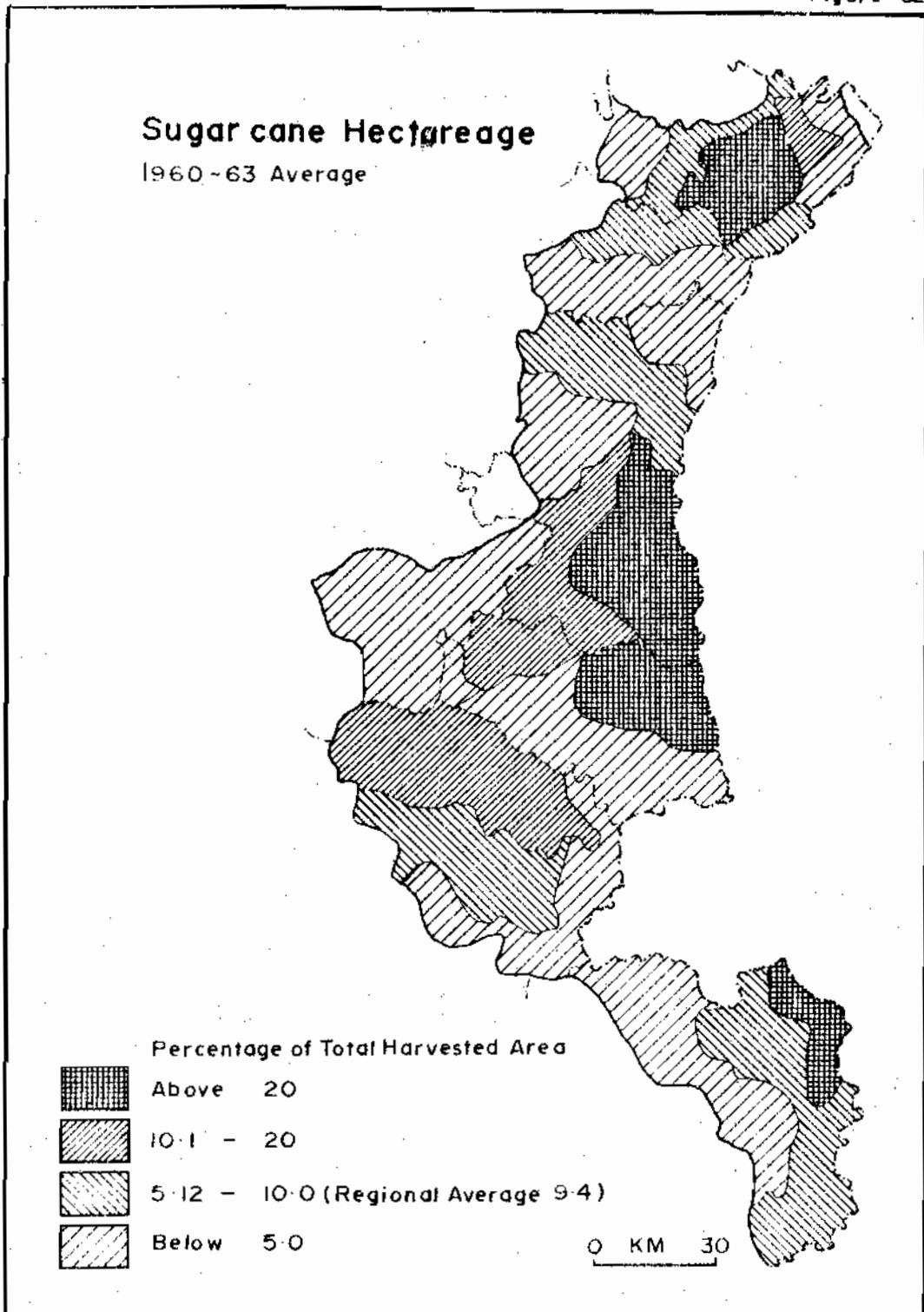
### Road Accessibility in Sugar Mill Zone of Yamuna Nagar 1974



Accessibility in Kms

-  Above 2
-  1 - 2
-  Below 1

0 KM 2



### Sugar cane Hectareage

1966 - 69 Average

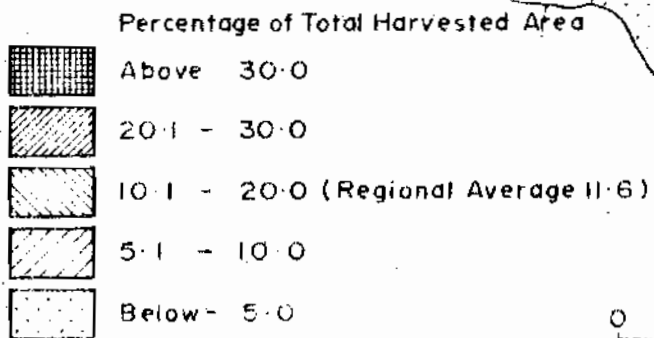


Figure 54

### Sugar cane Hectareage 1972 -75 Average

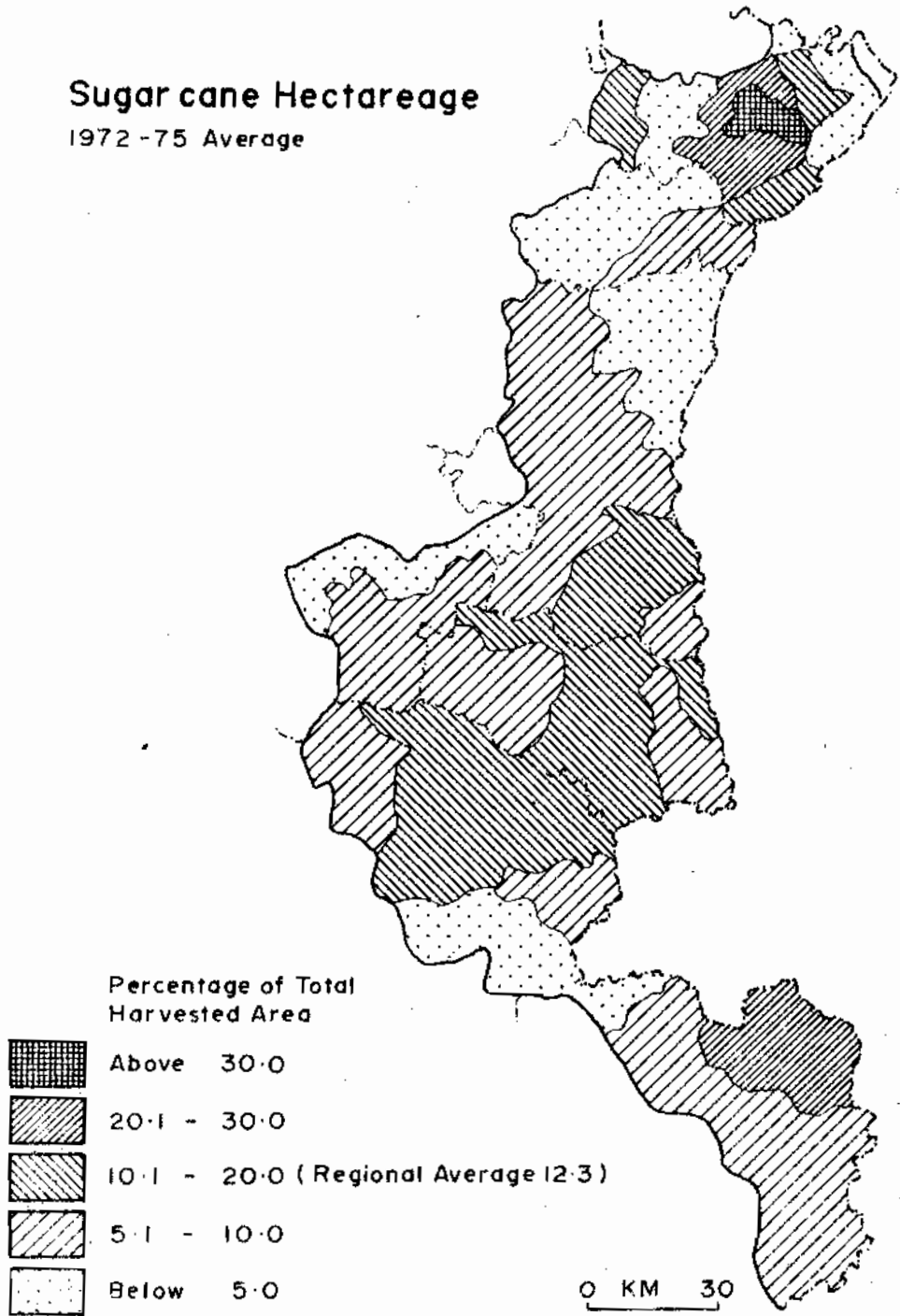
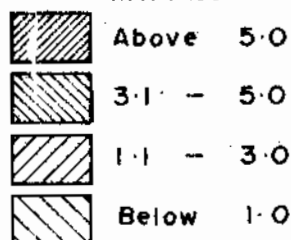


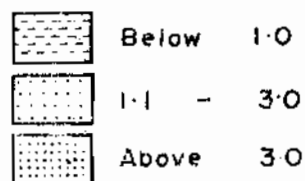
Figure 55

**Volume of Change  
in  
Sugar cane Hectareage  
1960-63 to 1972-75**

**Percentage of Harvested  
Area Involved in Change**  
Increase



Decrease



0 KM 30

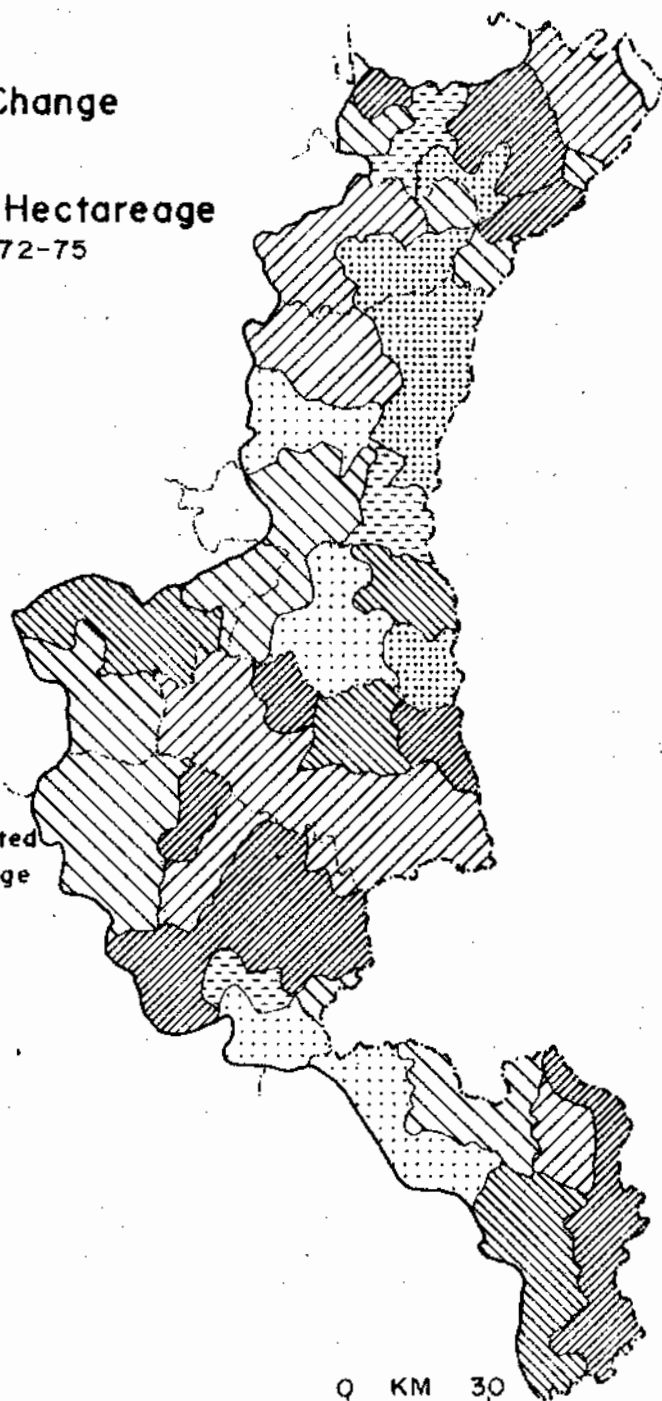


Figure 56

**Intensity of Sugar cane  
Cultivation**  
1960 - 63

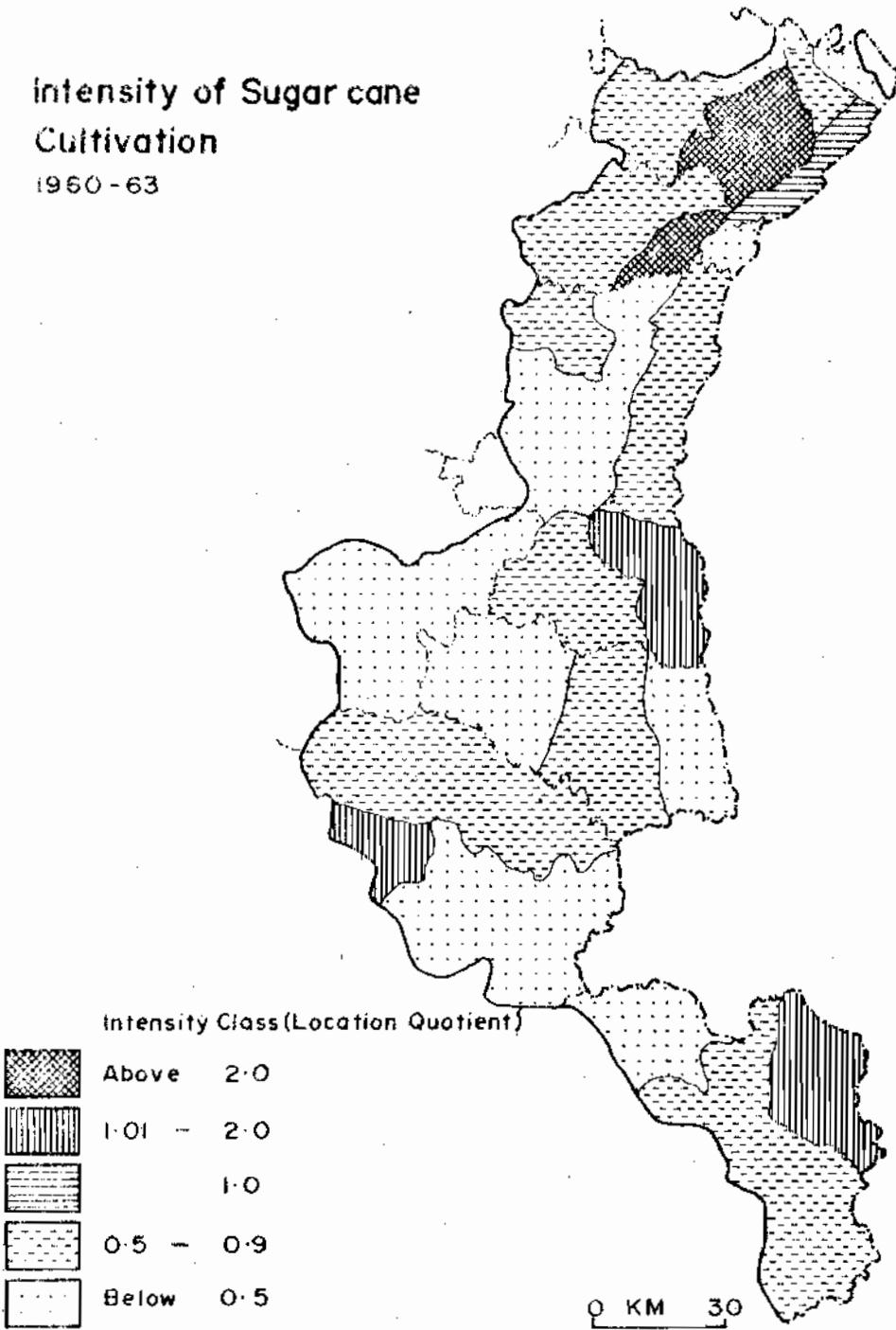
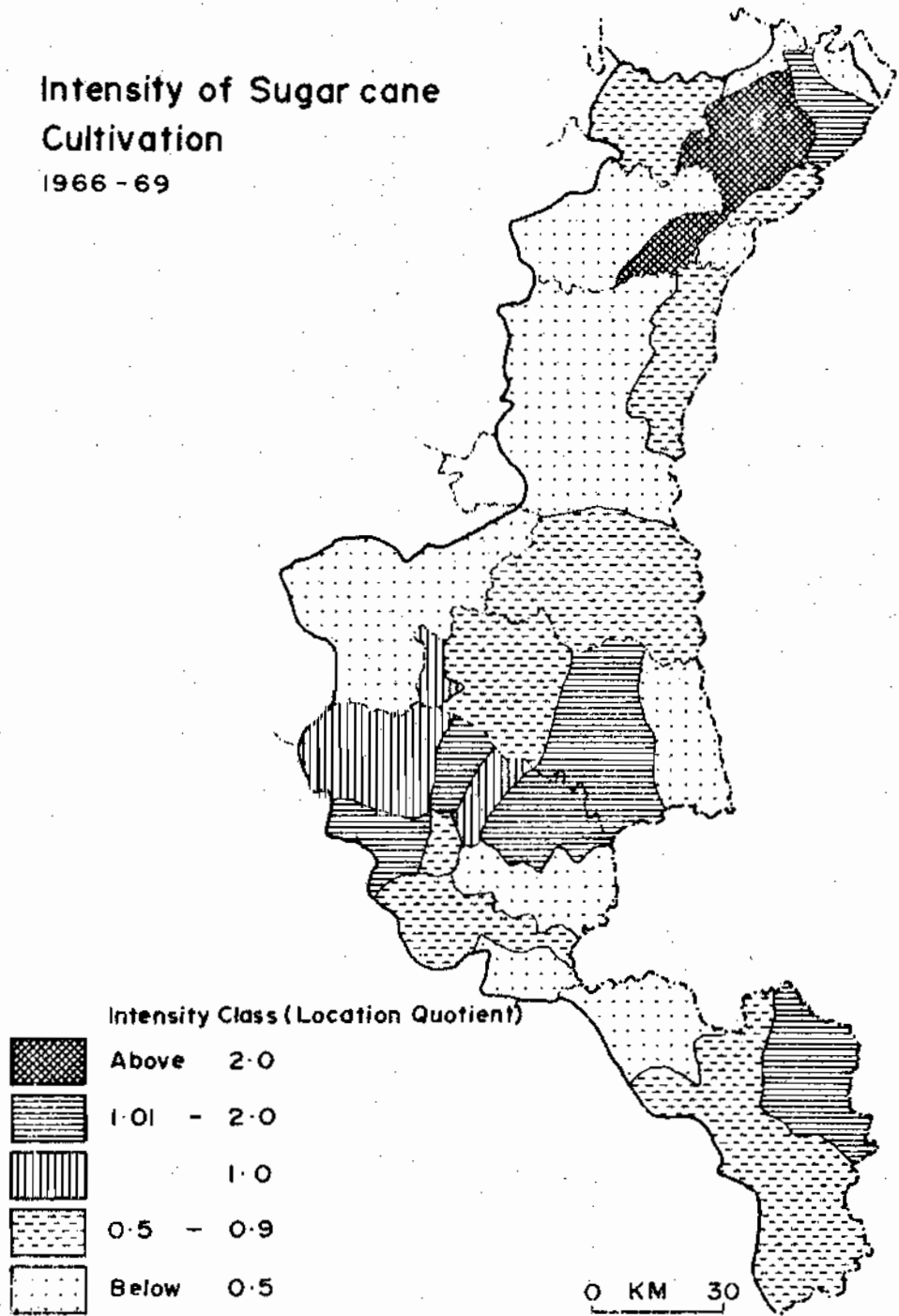


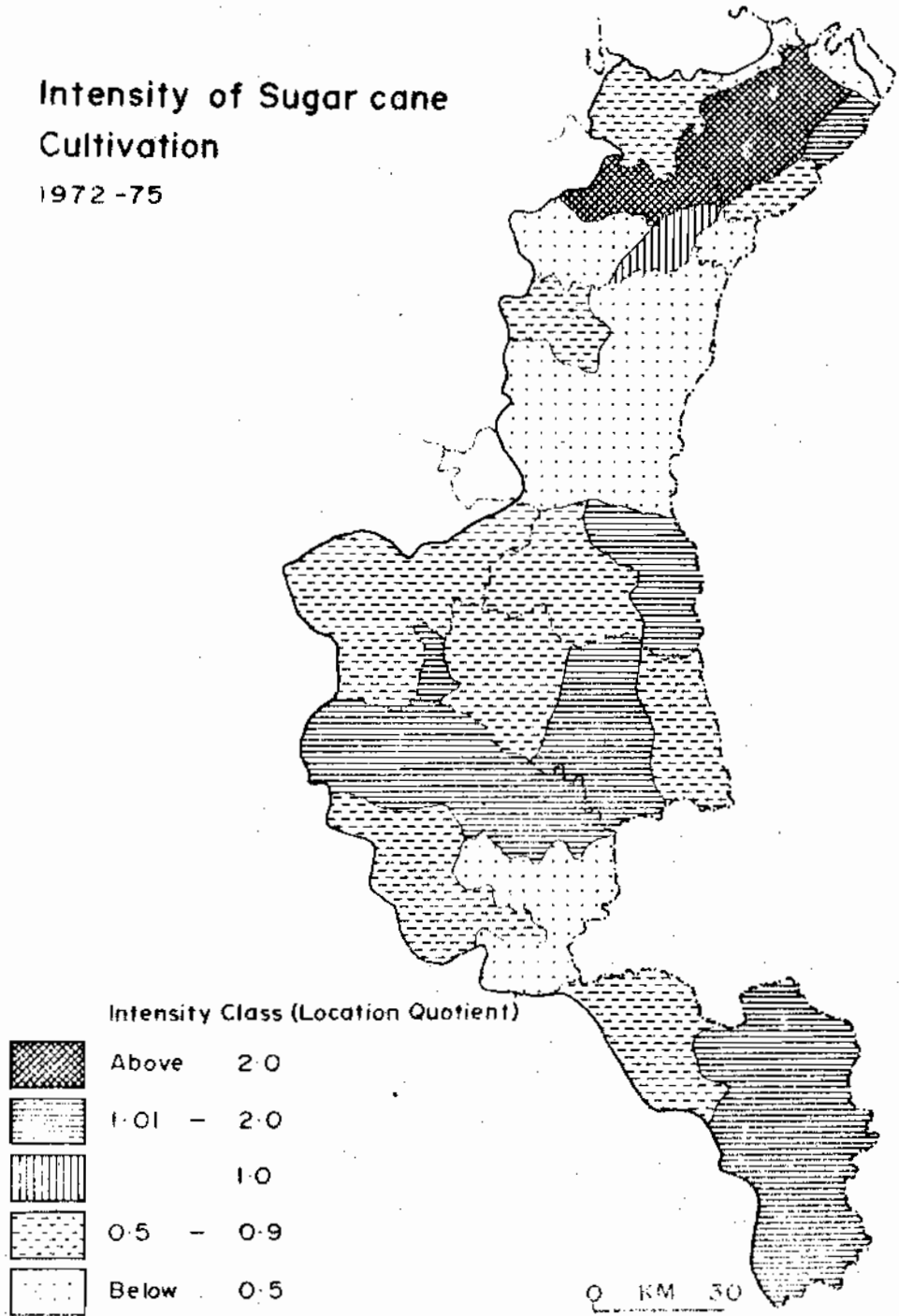
Figure 57

**Intensity of Sugar cane  
Cultivation**  
1966 - 69



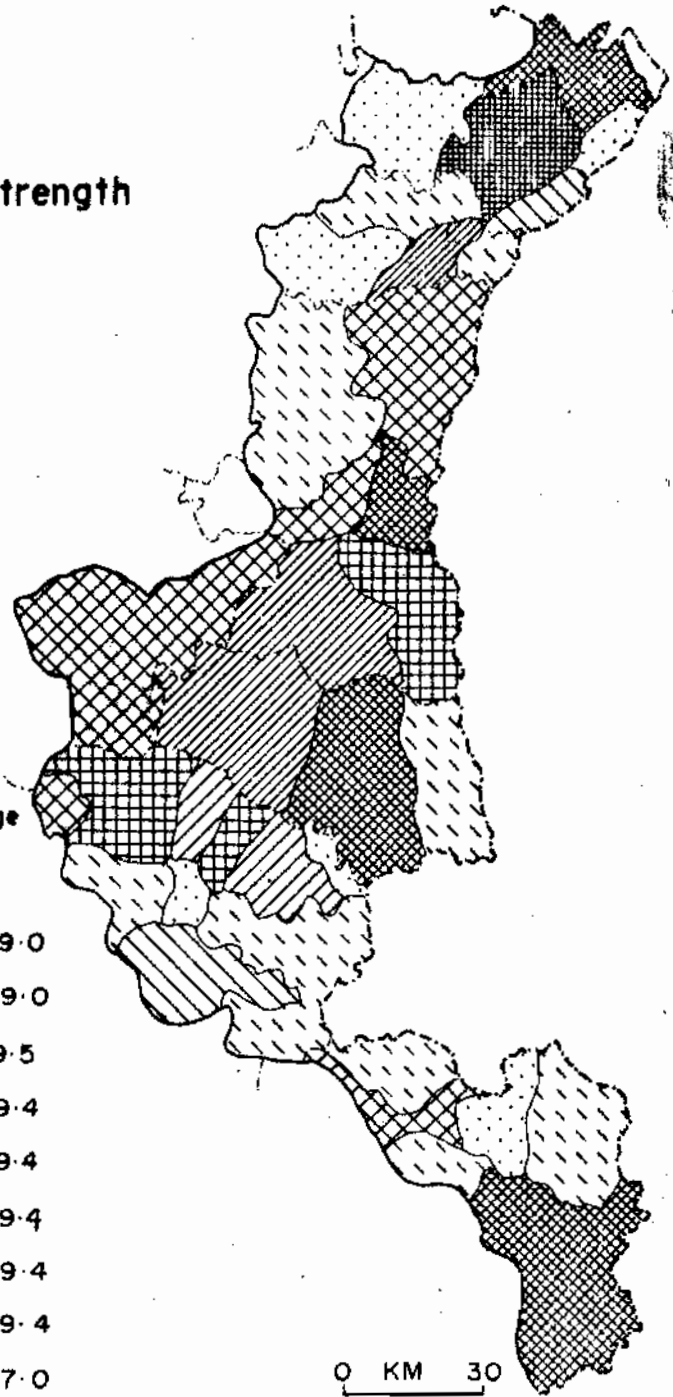
### Intensity of Sugar cane Cultivation

1972 - 75



**Ranking  
and  
Percentage Strength  
1960 - 63**










Ranking	Percentage Strength
First	28.7
Second	Above 19.0
	9.4 - 19.0
Third	8.6 - 9.5
Fourth	5.0 - 9.4
Fifth	Above 9.4
	5.0 - 9.4
Sixth	Above 9.4
	5.0 - 9.4
Seventh	1.0 - 7.0

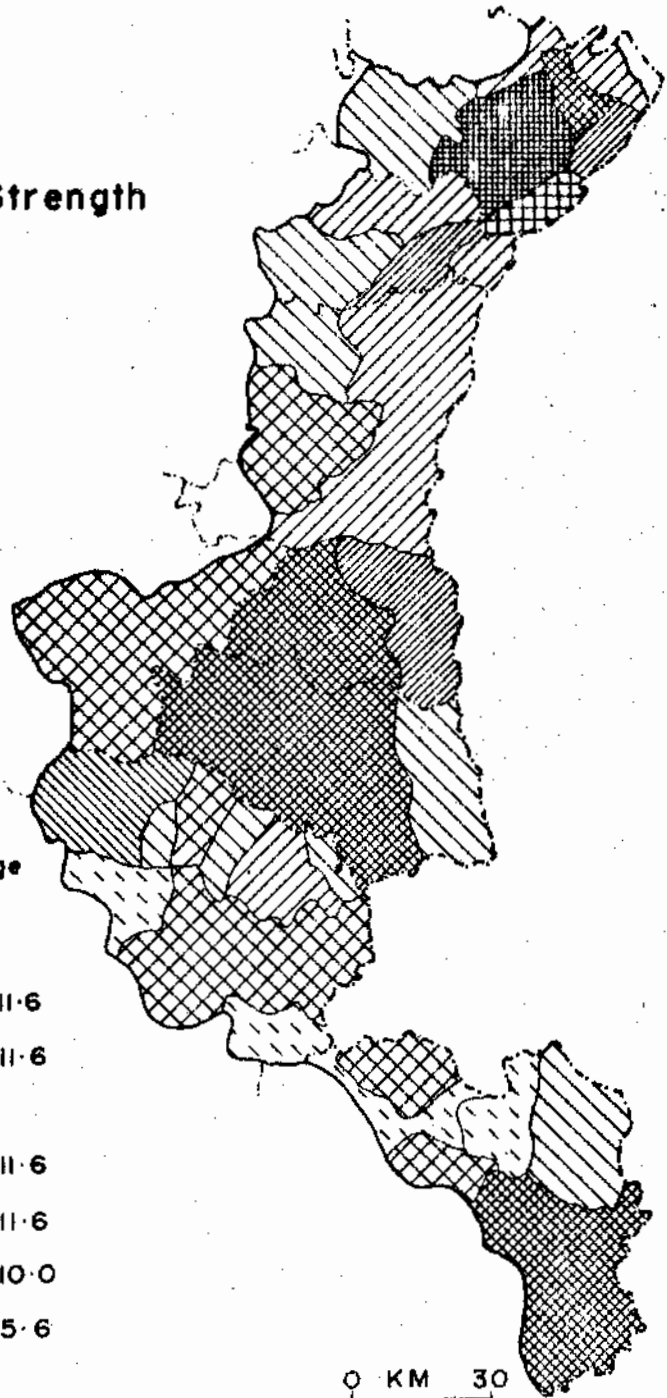


0 KM 30

Figure 60

**Ranking  
and  
Percentage Strength  
1966-69**











	Ranking	Percentage Strength
	First	28.0
	Second	Above 11.6
		9.4 - 11.6
	Third	12.4
	Fourth	Above 11.6
		8.1 - 11.6
	Fifth	5.9 - 10.0
	Sixth	3.1 - 5.6
	Seventh	6.3

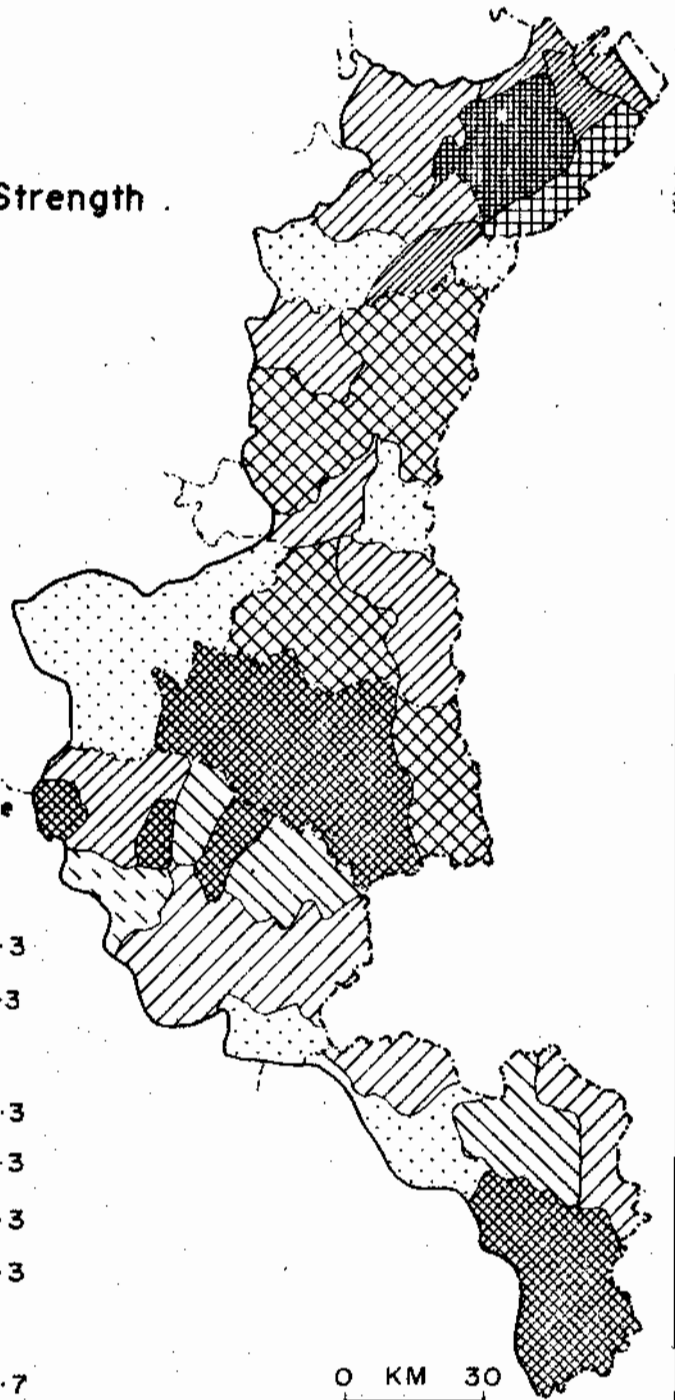


0 KM 30

Figure 61

### Ranking and Percentage Strength 1972-75

	Ranking	Percentage Strength
	First	22.7
	Second	Above 9.3
		8.9 - 9.3
	Third	12.8
	Fourth	Above 9.3
		6.8 - 9.3
	Fifth	Above 9.3
		5.0 - 9.3
	Sixth	6.6
	Seventh	3.3 - 6.7



0 KM 30

**Patterns  
of  
Crop Diversification  
1972 - 75**

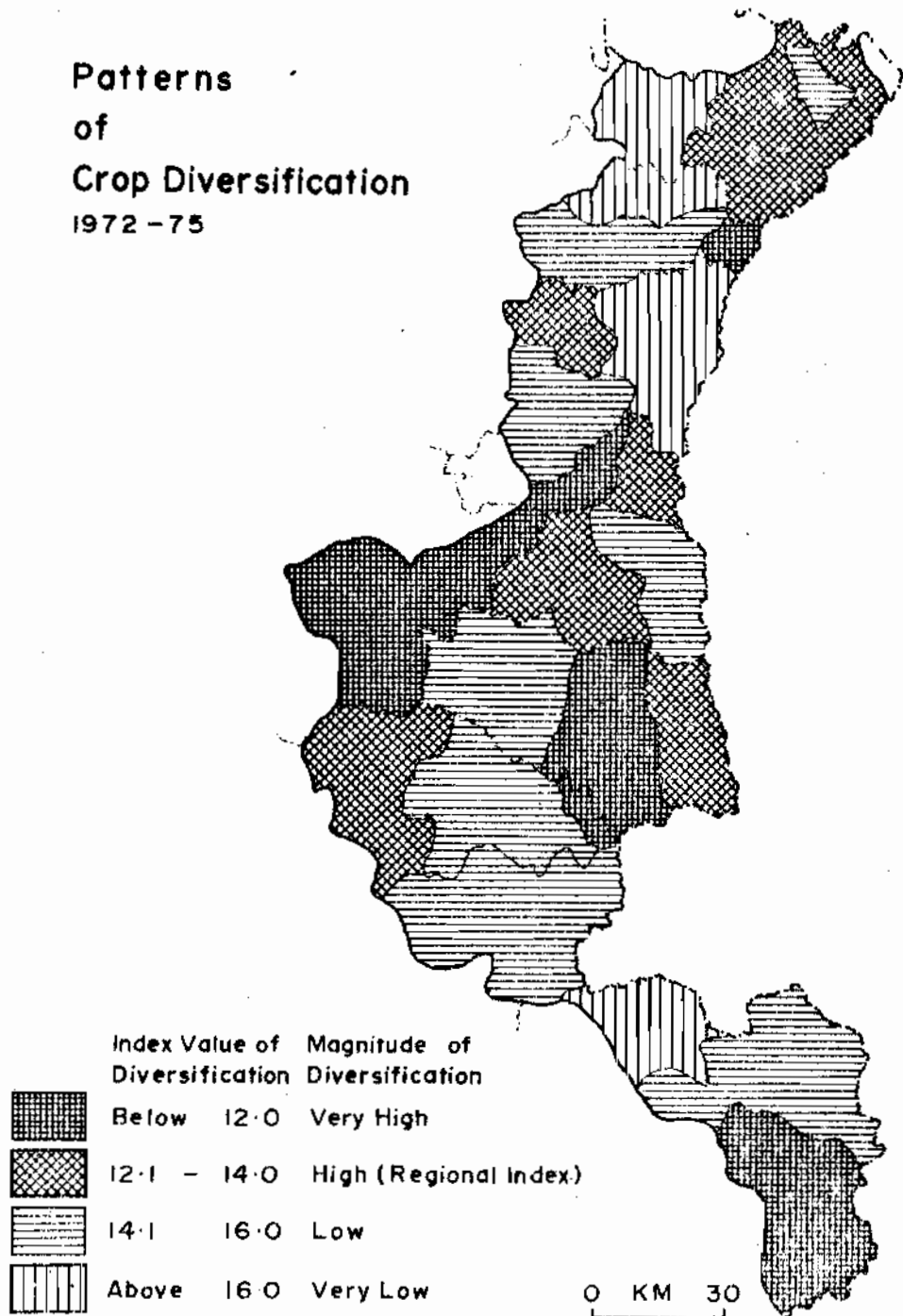
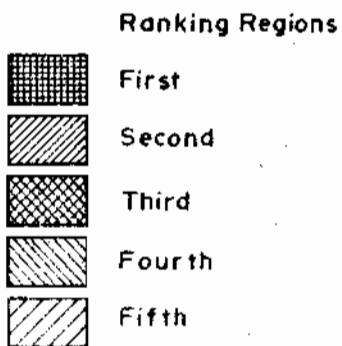


Figure 63

**Ranking Regions  
of  
Sugar cane Cultivation  
(Based on Crop-Combinations)  
1972 - 75 Average**



0 KM 30

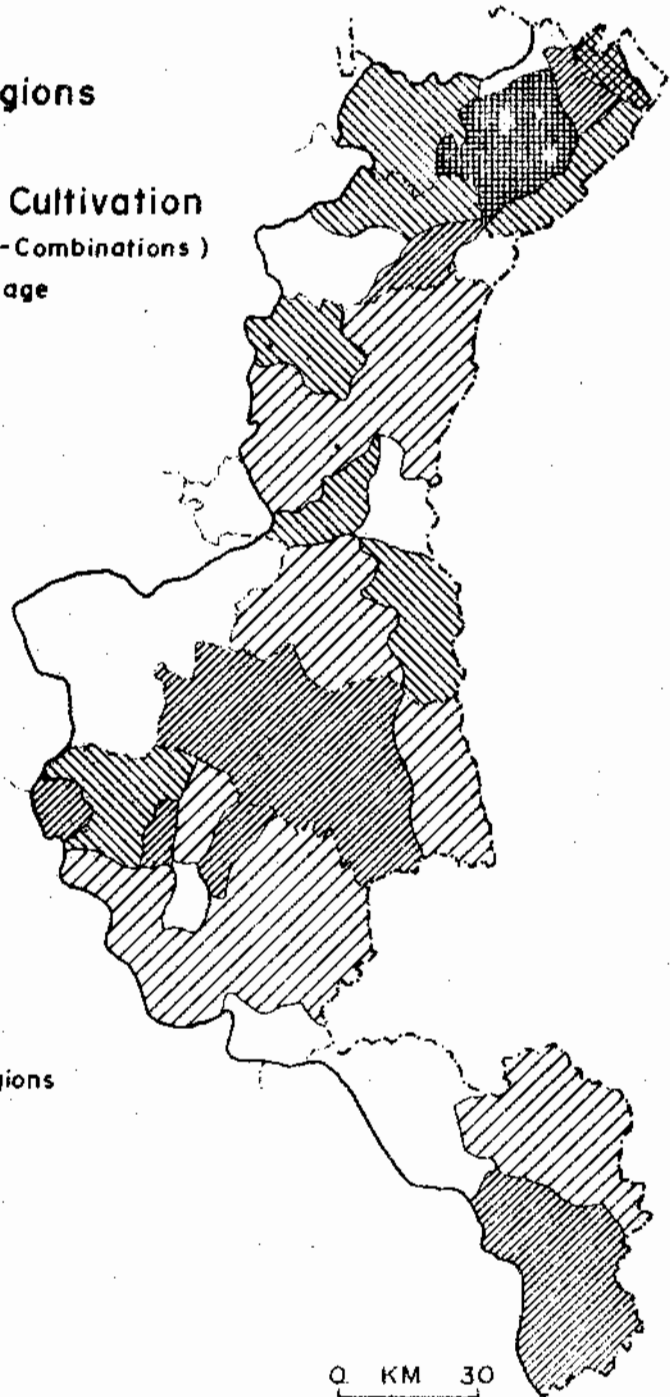
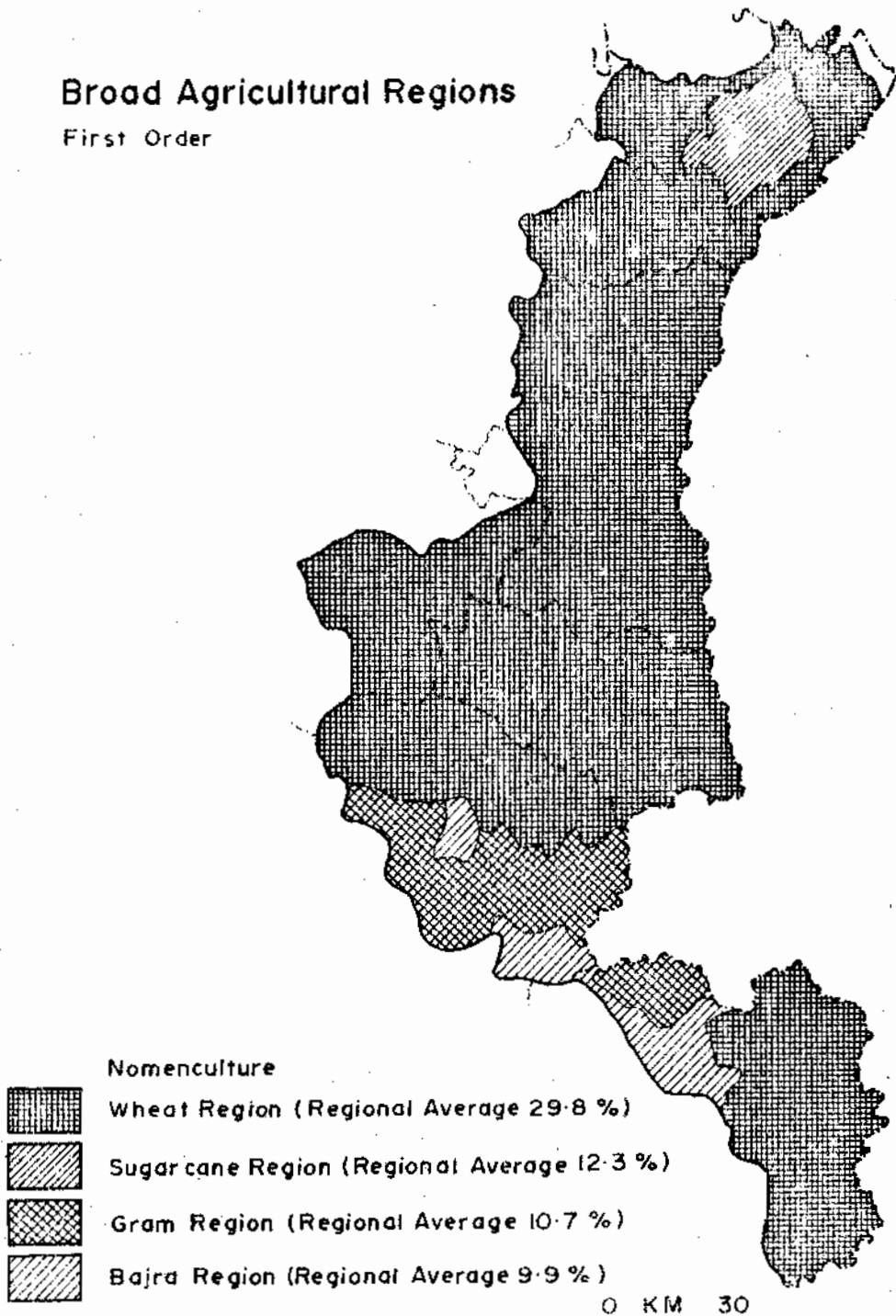


Figure 64

### Broad Agricultural Regions First Order










## Percentage Strength and Concentration Degree of First Ranking Crops

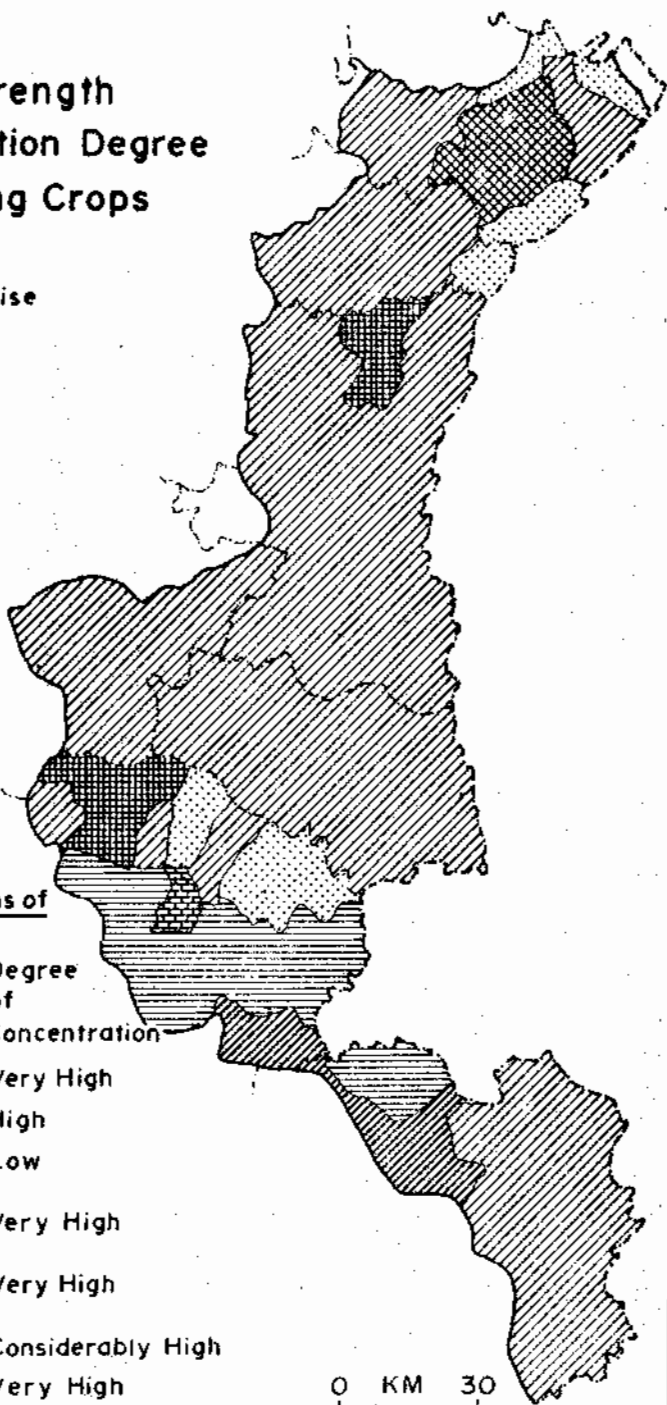
1972 - 75 Average

Assessment Circle-wise












Agricultural Regions of  
Second Order

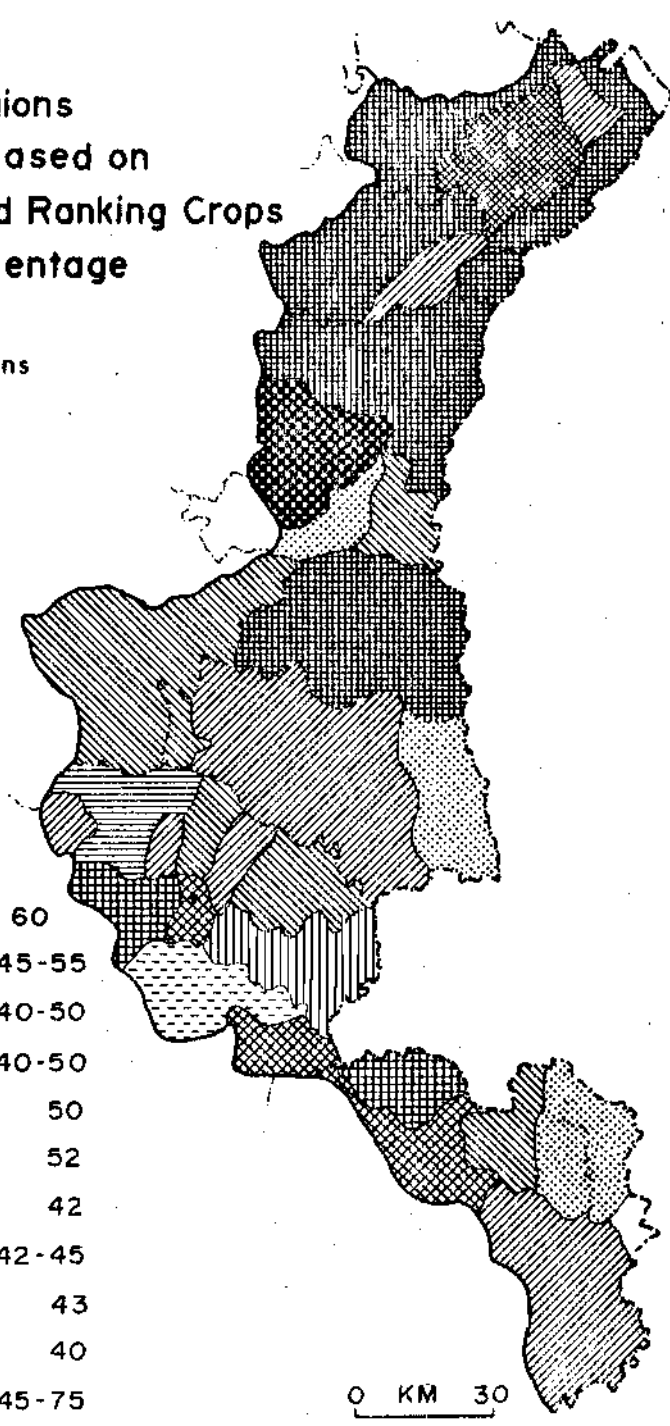
	Percentage of Gross Cropped Area	Degree of Concentration
	Above 42	Very High
	28 - 42	High
	Below 28	Low
	22.7	Very High
	21 - 27	Very High
	Above 30	Considerably High
	20 - 30	Very High

0 KM 30



**Agricultural Regions  
of Third Order based on  
First and Second Ranking Crops  
in Terms of Percentage  
Strength  
Two Crop Combinations**

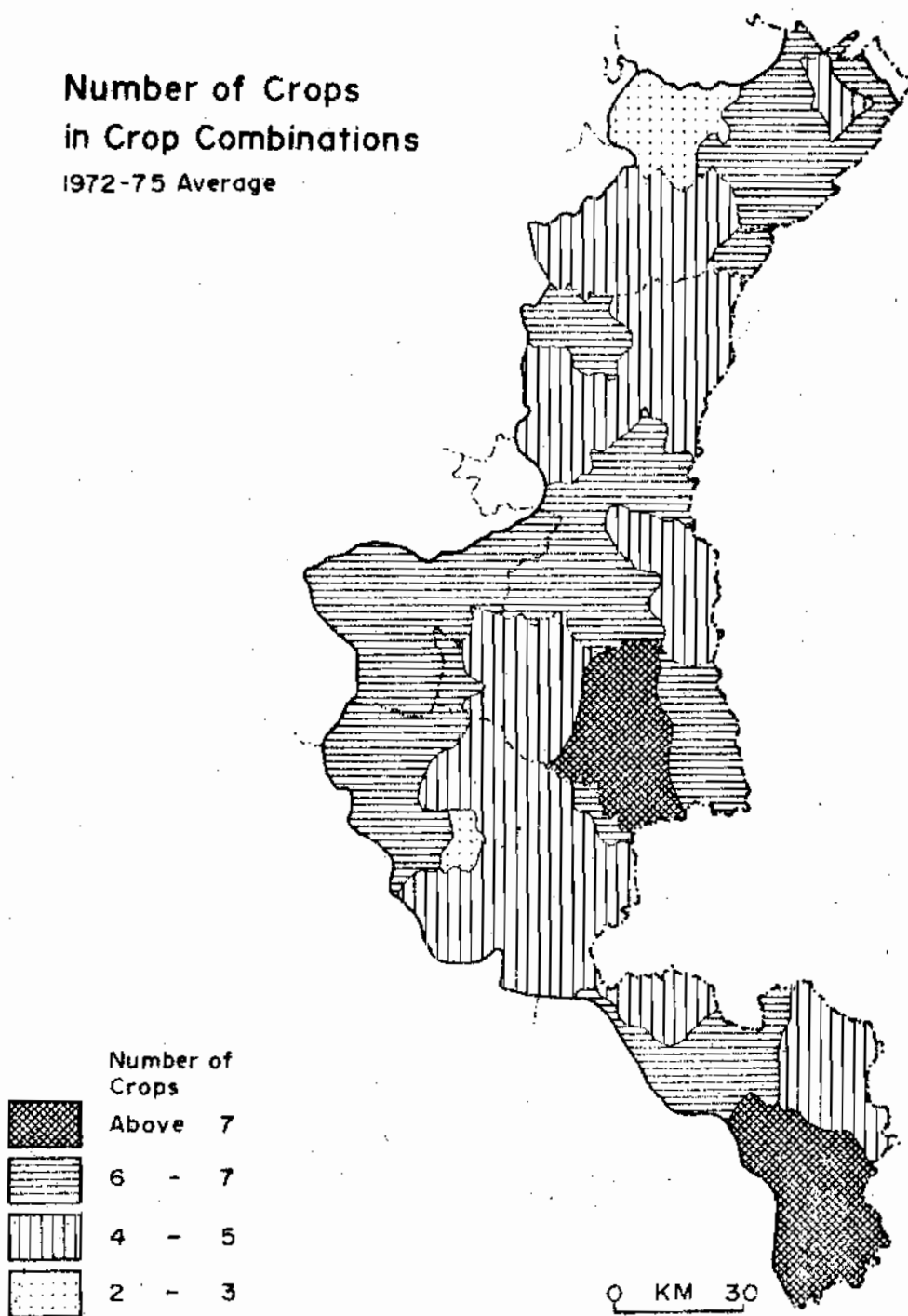
Cummulative Percentage of First two Ranks	
	Wheat-Rice 30-60
	Wheat-Sugar cane 45-55
	Wheat-Gram 40-50
	Wheat-Bajra 40-50
	Wheat-Fodder 50
	Wheat-Jowar 52
	Sugar cane-Wheat 42
	Gram-Wheat 42-45
	Gram-Jowar 43
	Gram-Bajra 40
	Bajra-Gram 45-75



0 KM 30

Figure 67

















**Number of Crops  
in Crop Combinations**  
1972-75 Average



# Agricultural Regions of Fourth Order within Wheat Region

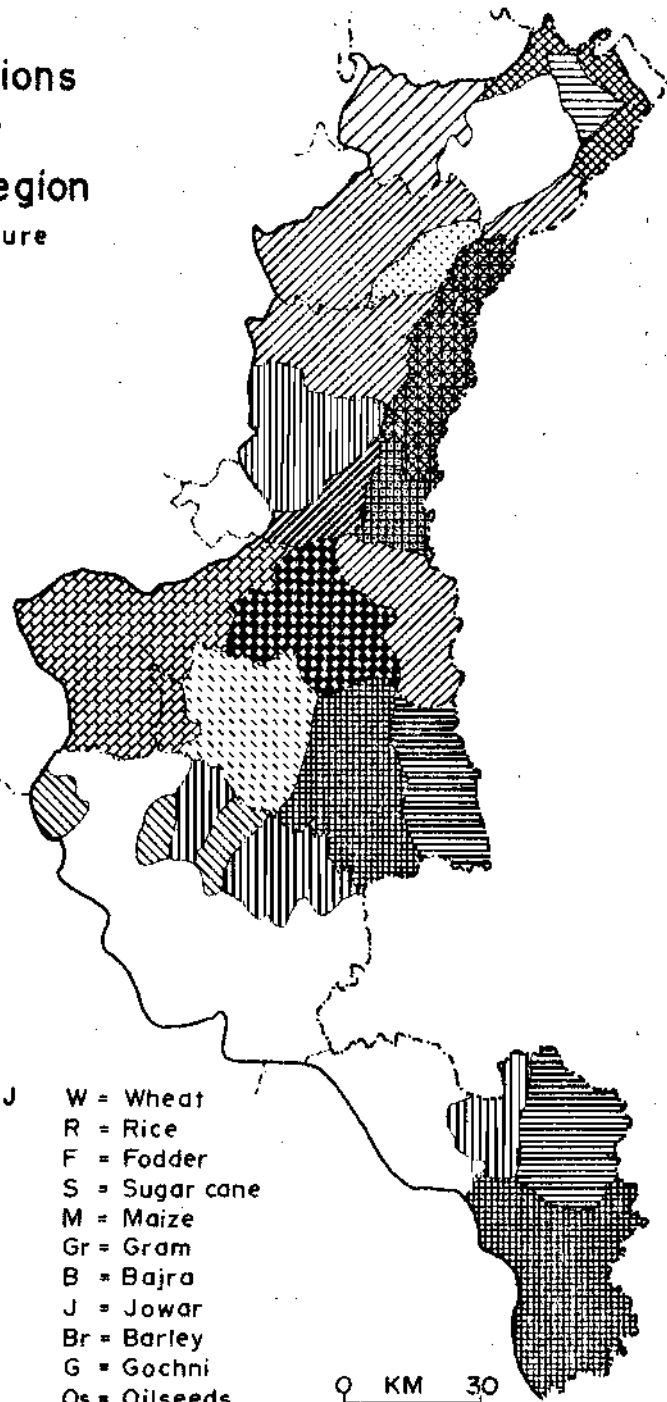
Based on Crop Structure  
1972-75

### Crop Combinations

-  W-R-F
-  W-R-F-S-M
-  W-R-S-F-Gr-M
-  W-R-B-J-S-F-Gr
-  W-R-M-B-F-S-Br
-  W-S-J-B-Gr
-  W-S-F-R-M
-  W-S-B-J-R
-  W-S-R-F-M
-  W-S-F-Gr-B-M-G-J
-  W-B-J-Gr-S
-  W-B-G-S-R-F-M
-  W-Gr-J-B-S
-  W-Gr-F-M-R-S
-  W-Gr-B-J-M-F-S
-  W-F-M-R-S

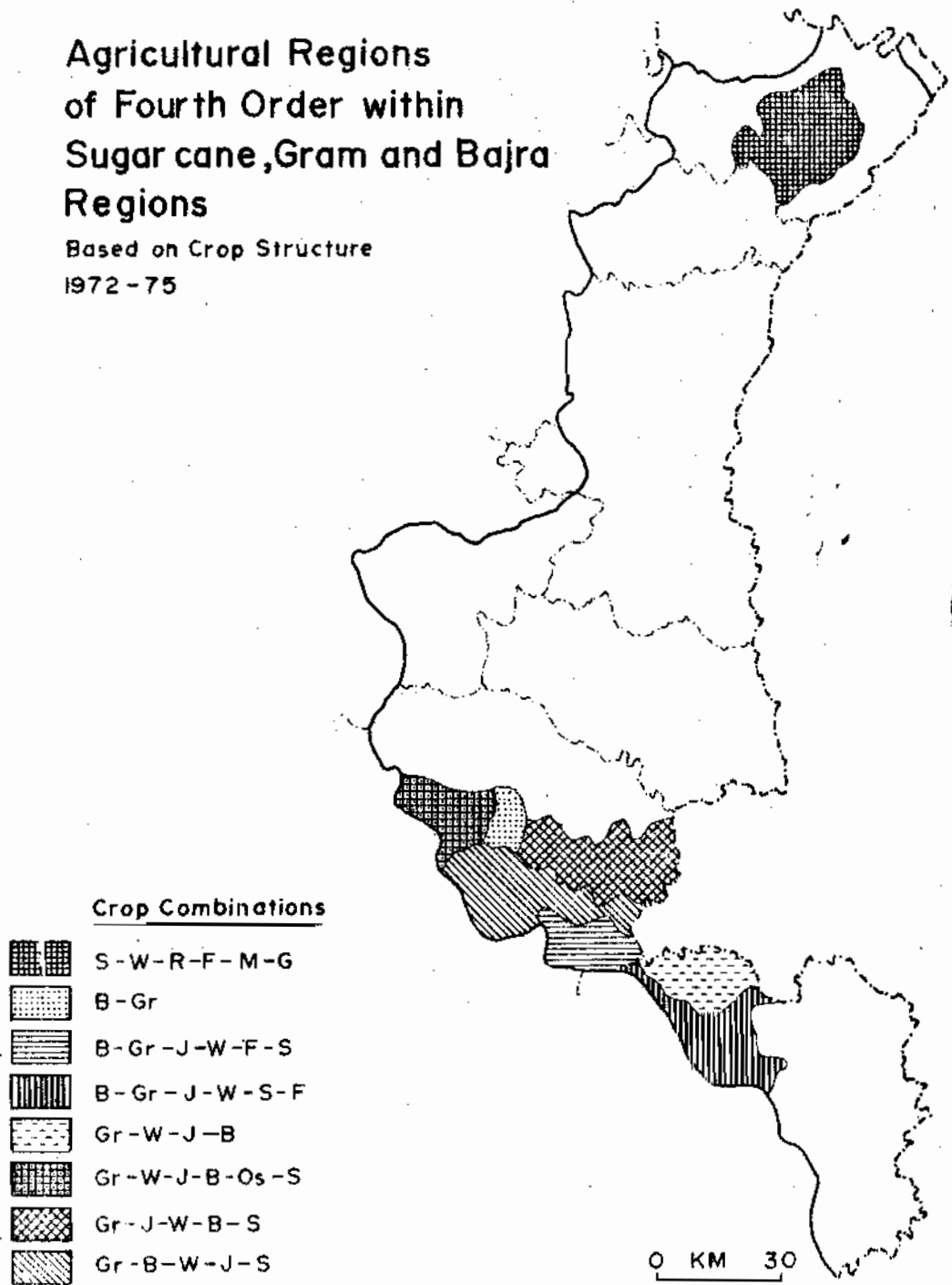
- W = Wheat
- R = Rice
- F = Fodder
- S = Sugar cane
- M = Maize
- Gr = Gram
- B = Bajra
- J = Jowar
- Br = Barley
- G = Gochni
- Os = Oilseeds

0 KM 30











### Agricultural Regions of Fourth Order within Sugar cane, Gram and Bajra Regions

Based on Crop Structure  
1972-75



Crop Combinations

-  S-W-R-F-M-G
-  B-Gr
-  B-Gr-J-W-F-S
-  B-Gr-J-W-S-F
-  Gr-W-J-B
-  Gr-W-J-B-Os-S
-  Gr-J-W-B-S
-  Gr-B-W-J-S

0 KM 30