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CHANGING CROPPING PATTERN IN PANCHAGANGA BASIN, MAHARASHTRA: A GEOGRAPHICAL INVESTIGATION

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ABSTRACT:

Cropping pattern simply means the proportion of area under different crops at a point of time, whereas changes in cropping pattern refer to change in proportion of area under different crops at two different times. Present paper aims to study cropping pattern and changes therein for individual crops in general and irrigated crops in particular in the region. The selected region for the present investigation is the 'Panchaganga Basin' of south Maharashtra state comprising 7 tahsils of Kolhapur district, Maharashtra. For the present investigation, data regarding area under different crops has been compiled from Socio-Economic Review and District Statistical Abstracts of Kolhapur District, 1973- 78 and 2003-08. When we include sugarcane, fruits and vegetables, condiments and spices, the total food crops has occupy about 77.43 per cent during the period 2001- 05. Among the non-food crops groundnut shares (9.22%) major area. The share of sugarcane has increased by 10.03 percent on the contrary the share of sereals has decreased by 12.34 percent.

INTRODUCTION:

As a consequence of the higher level of adoption of new agricultural technology, India became self sufficient in food production. At the same time due to heavy agro-inputs and unscientific agricultural practices, the problems of land degradation, soil degradation in the form of soil becoming saline and waterlogged have emerged as major challenges of irrigated farming. Improper land use and cropping pattern results in to degradation of land. Cropping pattern simply means the proportion of area under different crops at a point of time, whereas changes in cropping pattern refer to change in proportion of area under different crops at two different times. Such changes, though governed by ecological situation, socio-economic and technological factors also determine which of the feasible crops the farmers will choose. In case of irrigated crops, the choices are directly governed by the specific purpose for which the irrigated crops are to be grown and these are also conditioned by the geographical factors and modified by the emergent, social and economic circumstances (Mamoria, 1979).

OBJECTIVE:

Present paper aims to study cropping pattern and changes therein for individual crops in general and irrigated crops in particular in the region.

STUDY REGION:

The selected region for the present investigation is the 'Panchaganga Basin' of south Maharashtra state comprising 7 tahsils of Kolhapur district namely Shahuwadi, Panhala, Gagan-Bawada, Karveer, Hatkanagle, & Shirol (Fig. 1). The triangular tract region lies between 16^0 13" and 17^0 11" north latitude, and 73^0 41" and 74^0 42" east longitudes. It covers about 45752.2sq.km area and supports 26, 11,547 (2.6 % of state) population. The river Panchaganga is well- watered and agriculturally developed part of the state (Shinde, 1973). This region is topographically complex, having river valley flood plains to the east and hilly ranges to the west. Climatically this region haves temperate climate. The region located in rain shadow zone of Western Ghats receives a decreasing amount of rainfall from the west (6000mm) to east (500mm). The soils of the region are mainly derived from the Deccan trap (Deshpande, 1971). Pedologically this region has laterite, brownish and black soils.

DATABASE AND METHODOLOGY:

For the present investigation, data regarding area under different crops has been compiled from Socio-Economic Review and District Statistical Abstracts of Kolhapur District, 1973- 78 and 2003-08. Simple percentage of area under different crops and group of crops has been computes of both comparative periods and changes in this period have been observed. The same analysis has been made in case of irrigated cropping pattern.

CROPPING PATTERN AND CHANGES:

The area under study grows a variety of crops. However, foodgrains constitute a major produce of agricultural land (49.82%). The main foodgrains grown are rice (32.48%), jowar (5.58%) and pulses (4.72%).Among the non-food crops groundnut shares (9.22%) major area followed by soyabean (5.59%) and other oil seeds (5.01%). Among the irrigated crops sugarcane alone shares over $3/4^{th}$ of the irrigated land followed by rice (7.07%), wheat (4.57%), fruits, vegetables, condiments and spices.

Rice:

Being a tropical monsoon crop, rice requires temperature of 21°C during sowing and 37°C during harvesting. It requires high rainfall or assured irrigation facilities. Rice occupies about 32.48 per cent of total cropped area having more variations at tahsil level. The south western hilly tract, particularly Radhanagri has high proportion of rice(Above 40%), the central and some

northern tahsils like Shahuwadi, Panhala and Gagan Bawada are having moderate (30 to 40%) proportion. This is due to high rainfall and undulating topography, whereas very low share (Below 30 percent) of this crop is confined to the eastern most tahsils namely Hatkangale and Shirol.

Rice occupies about 7.07 per cent of the total irrigated area in the region. Its spatial distribution resembles with the general distribution. More than 21 per cent of the total irrigated area is occupied by paddy cultivation in Hatkanangle tahsil. Elsewhere its proportion is insignificant. However, it is observed during the field work that recently farmers are cultivating rice on hill slopes. More particularly it is noted on hilly slope in Radhanagri, Gagan Bawada and Shahuwadi tahsils. This unscientific practice helps to accelerate the soil erosion on large scale thereby contributing to soil degradation in western part.

The share of rice has decreased marginally during the period under study. The significant decrease in the area under rice has been found in Gagan Bawada tahsil (Below -4 percent). The moderate decrease has been observed in Shirol, Hatkanangle, Panhala and Shahuwadi (0 to -4 percent) tahsils. This might be because of tough competition of rice with cash crop like sugarcane. Introduction of high yielding varieties, increasing irrigation facilities and attractive prices have encouraged the sugarcane cultivation in this region. However, only Karveer and Radhanagri tahsils have shown an increasing trend.

The decrease of 11.05 per cent in irrigated area under rice is experience from 1971 to 2005. Shahuwadi tahsil experience highest decrease in region (37.32 per cent). The significant decrease of over 10 per cent is noted in five tahsils where sugarcane has replaced this crop, and in remaining two tahsils i.e. Panhala and Hatkanangle the decrease is below 5 per cent.

Jowar:

Jowar is grown both as kharif and rabbi crop. It can withstand drought to a considerable extent and is grown both as dry as well as an irrigated crop. It is a staple food in the region and also used as a fodder. The spatial pattern of jowar is a reflection of topography, climate, and irrigation facilities.

Jowar shares about 5.58 per cent of the gross area sown. Its high share (Above 6 percent) is confined to the Shirol and Hatkangale tahsil, which is due to deep black and black soils and relatively dry climate. However, a few pockets of Kharif jowar are observed in the central tahsils, while the northern and south western hilly tract particularly Shahuwadi, Gagan Bawada and Radhanagri tahsils have very limited area under jowar cultivation. This is mainly due to adverse ecological condition prevailing in these tahsils. During study period jowar has lost 9 per cent of cultivated area. The major loss is observed in Shirol and Hatkangale tahsils. The increased irrigation facilities caused shifting the farmers from jowar cultivation to sugarcane cultivation.

During the period 1971 to 1975, jowar was having 2.81% of the irrigated land but now it has lost that one also. Jowar being a cereal crop could not compete to share increased irrigation facilities.

Foodgrains:

This group includes sereals and pulses. The total share of sereals and pulses is 45.1 and 4.72 per cent respectively. Out of the total cropped area this group has occupied 49.82 per cent. During the period of observation its share has been decreased by 10.93%. It is mainly because the foodgrains could not compete with cash crops in sharing the increased irrigated area. The area under sugarcane has increased by 10.03% and Jowar percentage has decreased by 9.0.

Table 1 : Panchganga Basin: Cropping Pattern

Sr. No.			Crops	1971-75		2001-05		Changes in % there in
				Area in Hectare	% of G. C. Area	Area in Hectare	% of G. C. Area	
A		1	Rice	77879.76	32.97	100232.96	32.48	-0.49
		2	Wheat	1795.23	0.76	5554.78	1.80	1.04
		3	Jowar (Total)	34440.00	14.58	17219.82	5.58	-9.00
		4	Other Sereals	21377.37	9.05	16170.59	5.24	-3.81
	1		**Total Sereals**	**135492.35**	**57.36**	**139178.15**	**45.10**	**-12.26**
		1	Gram	590.54	0.25	7930.99	2.57	2.32
		2	Tur	3047.16	1.29	2036.75	0.66	-0.63
		3	Other Pulses	4369.96	1.85	4598.13	1.49	-0.36
	2		**Total Pulses**	**8007.65**	**3.39**	**14565.87**	**4.72**	**1.33**
			Total Foodgrains	**143500.01**	**60.75**	**153744.02**	**49.82**	**-10.93**
		1	Sugarcane	31770.78	13.45	72459.05	23.48	10.03
		2	Condiments & Species	3566.83	1.51	4598.13	1.49	-0.02
		3	Fruits & Vegetables	944.86	0.40	6943.48	2.25	1.85
		4	Misc. food crops	0.00	0.00	1203.54	0.39	0.39
			Total food crops	**179782.48**	**76.11**	**238948.21**	**77.43**	**1.32**
B	1		**Total fibers**	**0.00**		**92.58**	**0.03**	**0.03**
	2	1	Groundnut	31133.01	13.18	28452.83	9.22	-3.96
		2	Soyabean	0.00	0.00	17250.68	5.59	5.59
		3	Other oil Seeds	1559.01	0.66	15460.81	5.01	4.35
			Total oil seeds	**32692.02**	**13.84**	**61164.32**	**19.82**	**5.98**
		1	**Total drugs & Narcotics**	**3968.40**	**1.68**	**1203.54**	**0.39**	**-1.29**
		1	Misc. non food crops	19771.11	8.37	7190.36	2.33	-6.04
			Non food crops	**56431.52**	**23.89**	**69650.79**	**22.57**	**-1.32**
			Gross Cropped Area	**236214.00**	**100.00**	**308599.00**	**100.00**	**+- 1.32**

Source: Socio-Economic Review & District Statistical Abstracts of Kolhapur District 1973- 78 & 2003-08.

The spatial distribution of food grains reveals that Radhanagri, Gagan Bawada and Shahuwadi tahsils are having above 40% of gross cropped area under foodgrains. The moderate percentage (30 to 40 percent) under foodgrains is observed in Hatkangale, Karveer and Gaganbawda tahsils. The eastern tahsil is having below 30 per cent area under foodgrains of gross cropped area. The hectarage under these crops has decreased from 1, 43,500 to 1,53,744 hectares during the period under review and overall decline is by 10.93 per cent. Tahsil wise analysis shows that all the tahsils have lost their area under foodgrains. However, decrease above 18 per cent is observed in Gagan Bawada and Shirol tahsils. The decrease in area between 6 to 18 percent is largely confined to Hatkangale and Shahuwadi tahsils, where a trend of practicing sugarcane seems to be dominant. The Radhanagri, Karveer and Panhala tahsil have lost less area as compare to other. Among the irrigated crops, these crops together share about 14.76 per cent area. The proportion of irrigated land under these crops has decreased by 13.93 per cent.

Sugarcane:

Upper Krishna basin is known as 'Sugar Bowl' of Maharashtra since long, wherein, Kolhapur one of the leading and well known market of jaggery in India is located (Jadhav, 1984). Sugarcane, a premier cash crop has occupied 23.48 per cent of total cropped area (17.33 state) and uses 75.75 per cent of gross area irrigated, while ranking first among all irrigated crops. However, its spatial distribution differs largely throughout the region. Relatively significant (over 30 and 20 to 30) percentage of the cultivated area under sugarcane is confined to the Panhala, Gagan Bawada, Shirol, Karveer and Hatkangale tahsils.

This is the area where irrigation facilities are comparatively more developed. Besides, the fertile alluvial tracts, vicinity of sugar factories and market, well developed network of transportation, suitability of moisture and temperature conditions, are other contributory factors which have stimulated the extension of cane cultivation in this part of the region (Pawar, 1989) By contrast, low proportion (below 20 per cent) is noted in the northern and south western parts which can be well attributed to the poor irrigation facilities, less fertile soils and moisture deficiency in these parts.

Sugarcane alone shares above $3/4^{th}$ of the irrigated land and uses more than 75 per cent of the total irrigation water. It ranks first among irrigated crops in all the tahsils. In particular, the highest per cent of irrigated area under this crop is found in Gagan Bawada tahsil i.e. 85 per cent. It is mainly because most of the irrigated area available in the tahsil is brought under cane cultivation. Shahuwadi, Radhanagri, Shirol, Panhala and Karveer tahsils also record high proportion, (above 75 percent) mainly due to the availability of perennial sources of irrigation like lifts; fertile soils and impetus provided by sugar factories and co-operative credit societies.

The moderate percentage (63.36%) of the irrigated area under this crop is observed in only Hatkanangle tahsil. The insignificant area under cane cultivation is noted in the Shahuwadi tahsil located to north western parts of the region. The seasonal sources of water (local and wells) seems to have been responsible for such a state. Nevertheless, the spatial distribution of sugarcane is largely related to the perennial sources of irrigation**.**

The period under investigation has witnessed phenomenal growth in the area under sugarcane which rose from 31,770 hectares (13.45%) to 72,459 (23.48%). The significant increase over 20 per cent of the cultivated area is confined to Shirol and Gagan Bawada tahsils. It is made possible due to the increase in perennial (lifts) sources of irrigation and also the special efforts made by co-operative, particularly sugar factories, which have supported peasants in all respects to grow sugarcane. As rightly pointed out by Randhir Singh (1985), it is heartening to note that right from sowing to harvesting state the sugarcane crop is supervised and controlled by the co-operatives with an assured remunerative price to the cultivators coupled with full facilities. Here the co-operative movement provides a viable model for the whole nation to follow. Significant increase (10 to 20 percent) is observed in Panhala and Hatkangale tahsils. On the contrary, notable decrease (Below 1.28 per cent) is observed mainly in the Karveer tahsil. Though it is a traditional cane cultivated area of region, recently farmers prefer other irrigated crops like rice, wheat, turmeric, etc. As per the change in proportion of sugarcane crop in irrigated area the concern region experience 6.30 per cent increase as a whole. Above 24 per cent increase has been observed in Shirol and Shahuwadi tahsils which shows the increasing tendency of sugarcane cropping in irrigated area. The increase is also found in Gagan Bawada and Hatkanangle tahsils. On the contrary Panhala, Karveer and Radhanagri tahsils observed decrease in proportion of sugarcane cropping in irrigated area.

Groundnut:

Oil seeds grown in the region include groundnuts, castor, seasamum, safflower, sunflower seeds, etc. which together constitute about 19.82 per cent of the gross cultivated area (22.17% District). Out of the total area under oilseeds; groundnut alone shares about 50 per cent area. Being a tropical crop, it requires temperature of 20 to 25°C and 5 to 8 months to grow fully. About 750 to 850 mm of rainfall may be considered necessary, though it is grown in areas receiving rainfall below 500 mm. Significant proportion of cultivated land under this crop (above 10 %) is confined to the central parts of the region. The moderate proportion (5 to 10 percent) is noted in tahsils of Shirol, Shahuwadi, Panhala and Radhanagri.

The area under Groundnut has decreased from 31,133 to 28,452 hectare during the last three and half decades, particularly in tahsils viz., Panhala, Hatkanangle and Shirol. The increase under this crop is noted particularly in Gagan Bawada tahsil (Above 4 percent). As soon as the irrigation facilities are made available, this group of crops, particularly groundnut is replaced by crops like sugarcane, wheat and fruits.

Table 2 : Panchganga Basin: Irrigated Area Under different Crops

Sr. No.			Crops	1971-75		2001-05		Changes in % there in
				Area in Hectare	% of G. I. Area	Area in Hectare	% of G. I. Area	
A	1	1	Rice	8361.08	18.12	6341.04	7.07	-11.05
		2	Wheat	1702.67	3.69	4098.81	4.57	0.88
		3	Jowar (Total)	1296.61	2.81	0.00	0.00	-2.81
		4	Other Sereals	1638.07	3.55	529.17	0.59	-2.96
			Total Sereals	**12998.43**	**28.17**	**10969.01**	**12.23**	**-15.94**
	2		**Pulses**	**239.94**	**0.52**	**2269.14**	**2.53**	**2.01**
			Total Foodgrains	**13238.37**	**28.69**	**13238.16**	**14.76**	**-13.93**
		1	Sugarcane	32046.18	69.45	67939.72	75.75	6.30
		2	Condiments & Species	300.00	0.65	2816.25	3.14	2.49
		3	Fruits & Vegetables	305.00	0.66	2879.03	3.21	2.55
		4	Misc. food crops	28.40	0.06	179.38	0.20	0.14
			Total food crops	**45917.94**	**99.51**	**87052.53**	**97.06**	**-2.45**
B	1		**Fibers**	**35.60**	**0.08**	**35.88**	**0.04**	**-0.04**
	2	1	Groundnut	0.20	0.00	1022.46	1.14	1.14
		2	Other oil Seeds	0.00	0.00	260.10	0.29	0.29
			Total oil seeds	**0.00**	**0.00**	**1282.56**	**1.43**	**1.43**
	3		**Total drugs & Narcotics**	**81.00**	**0.18**	**161.44**	**0.18**	**0.00**
	4		Misc. non food crops	106.13	0.23	1156.99	1.29	1.06
			Total non food crops	**222.93**	**0.48**	**2636.87**	**2.94**	**2.45**
			Total gross cropped area	**46142.80**	**100.00**	**89689.40**	**100.00**	**+- 2.45**

Source: *Socio-Economic Review & District Statistical Abstracts of Kolhapur District 1973- 78 & 2003-08.*

Soyabean:

This crop has shown significant growth in areal extent. During the

base period, its share was negligible but after 1996 it has shown remarkable increase. Shirol tahsil

have highest percentage under this crop (above 10 % of gross cropped area). Hatkangale and Karveer taluka are having moderate area under this crop (5 to 10 %). These are the three tahsils having high concentration of sugarcane cultivation. But during last two decade sugarcane farming is facing many problems. As a results sugarcane growers have selected soyabean as an alternative crop to sugarcane.

The area under this crop is decreasing from east to west That is because of adverse topographic and climatic conditions. The change is particularly observed in eastern tahsils. Shirol tahsil has shown significant increase (above 10 percent) under the period of investigation. Moderate change is observed in Karveer and Hatkangale tahsil. Shahuwadi, Radhanagri and Gagan Bawada tahsils are having insignificant change (Below 5 percent).

CONCLUSIONS:

The spatial analysis of foodgrains reveals that Radhanagri, Gagan Bawada and Shahuwadi tahsils are having above 40% of gross cropped area under foodgrains. The period under investigation has witnessed phenomenal growth in the area under sugarcane which rose from 31,770 hectares (13.45%) to 72,459 (23.48%). The significant increase over 20 per cent of the cultivated area is confined to Shirol and Gagan Bawada tahsils When we include sugarcane, fruits and vegetables, condiments and spices, the total food crops has occupy about 77.43 per cent during the period 2001- 05. Among the non-food crops groundnut shares (9.22%) major area followed by soyabean (5.59%) and other oil seeds (5.01%). Among the irrigated crops sugarcane alone shares over 3/4th of the irrigated land followed by rice (7.07%), wheat (4.57%), fruits, vegetables, condiments and spices The share of sugarcane has increased by 10.03 percent on the contrary the share of sereals has decreased by 12.34 percent. The monotonous cropping pattern results in land degradation.

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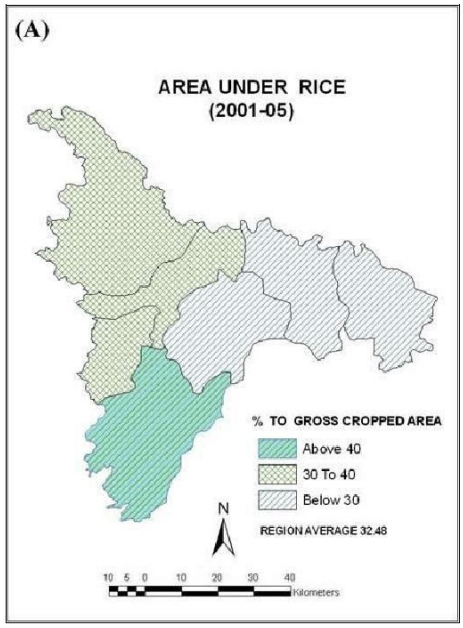
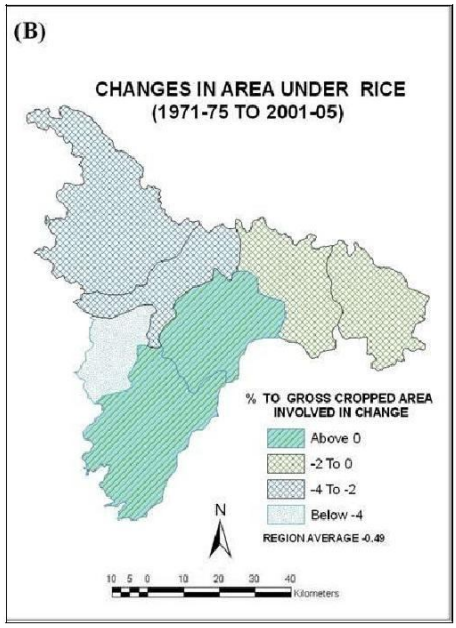
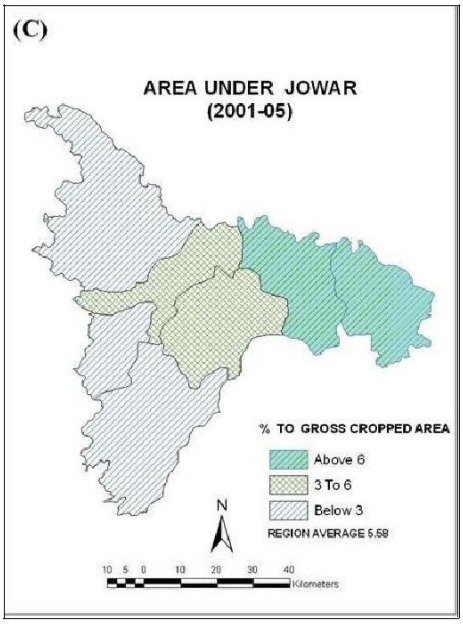
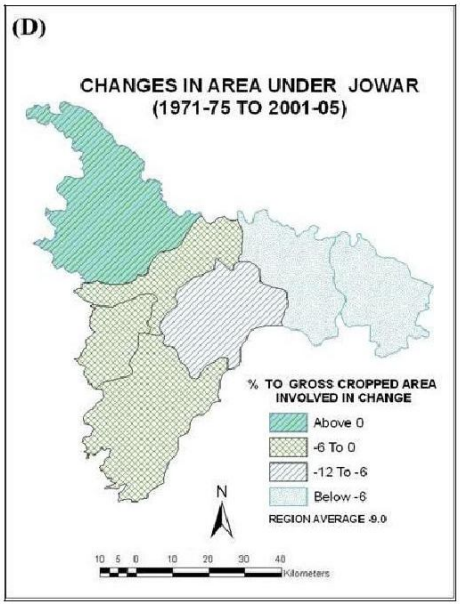
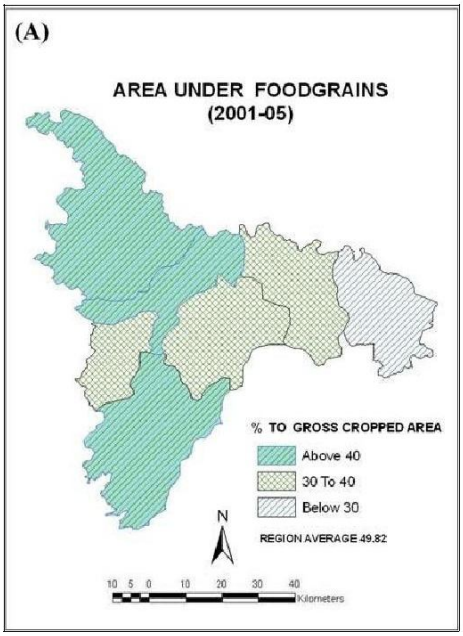
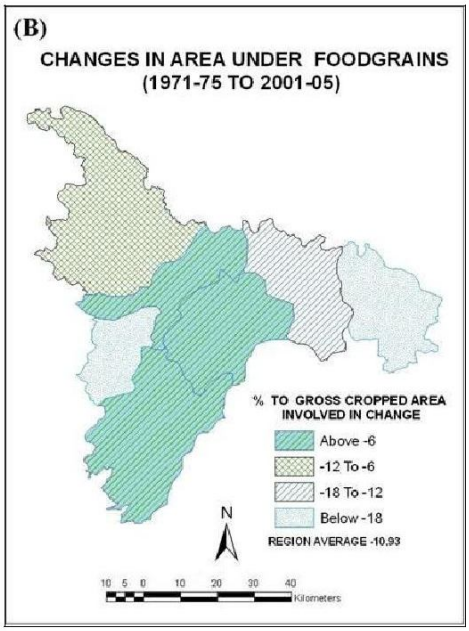

(A)
AREA UNDER RICE
(2001-05)
% TO GROSS CROPPED AREA
Above 40
30 To 40
Below 30
REGION AVERAGE 32.48
N
10 5 0 10 20 30 40
Kilometers

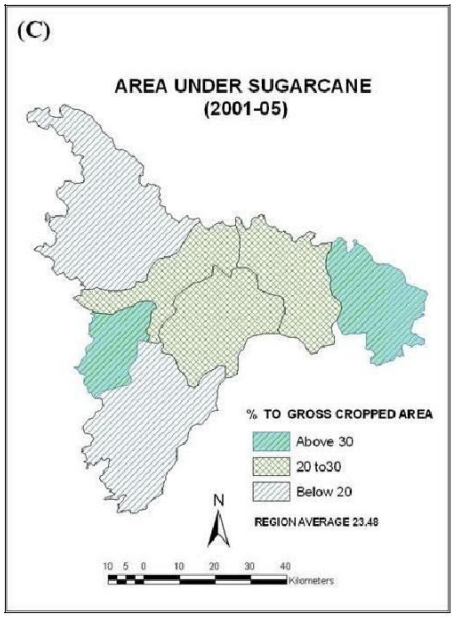

(B)
CHANGES IN AREA UNDER RICE
(1971-75 TO 2001-05)
% TO GROSS CROPPED AREA
INVOLVED IN CHANGE
Above 0
-2 To 0
-4 To -2
Below -4
REGION AVERAGE -0.49
N
10 5 0 10 20 30 40
Kilometers

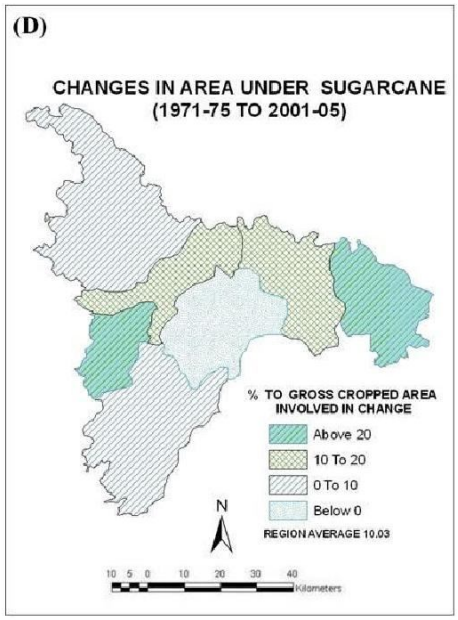

(C)
AREA UNDER JOWAR
(2001-05)
% TO GROSS CROPPED AREA
Above 6
3 To 6
Below 3
REGION AVERAGE 5.58
N
10 5 0 10 20 30 40
Kilometers

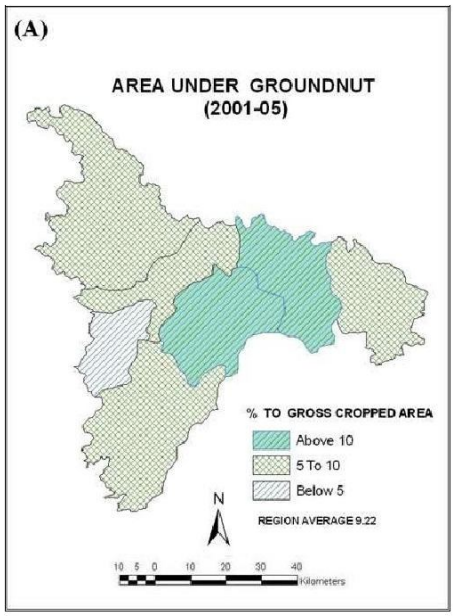

(D)
CHANGES IN AREA UNDER JOWAR
(1971-75 TO 2001-05)
% TO GROSS CROPPED AREA
INVOLVED IN CHANGE
Above 0
-6 To 0
-12 To -6
Below -6
REGION AVERAGE -9.0
N
10 5 0 10 20 30 40
Kilometers

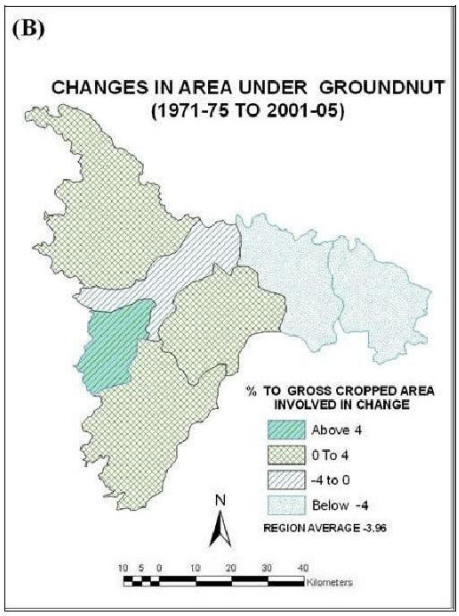

(A)
AREA UNDER FOODGRAINS
(2001-05)
% TO GROSS CROPPED AREA
Above 40
30 To 40
Below 30
REGION AVERAGE 49.82
N
10 5 0 10 20 30 40
Kilometers

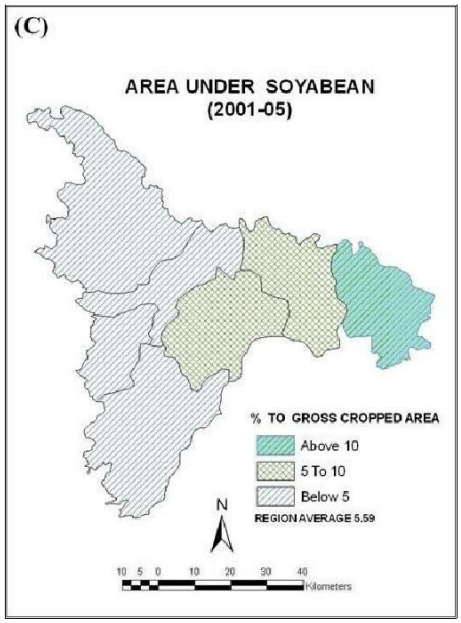

(B)
CHANGES IN AREA UNDER FOODGRAINS
(1971-75 TO 2001-05)
% TO GROSS CROPPED AREA
INVOLVED IN CHANGE
Above -6
-12 To -6
-18 To -12
Below -18
REGION AVERAGE -10.93
N
10 5 0 10 20 30 40
Kilometers

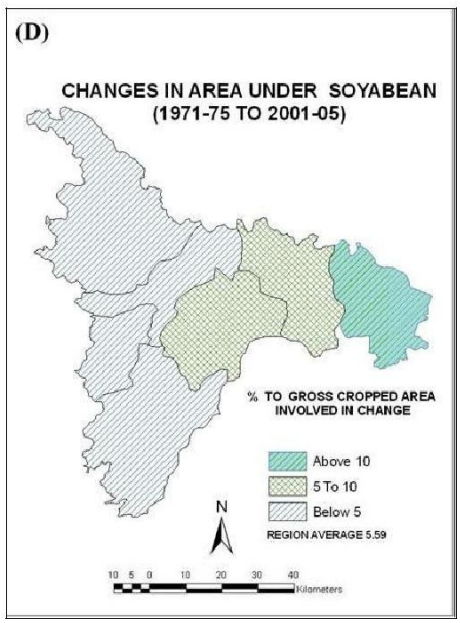

(C)
AREA UNDER SUGARCANE
(2001-05)
% TO GROSS CROPPED AREA
Above 30
20 to30
Below 20
REGION AVERAGE 23.48
N
10 5 0 10 20 30 40
Kilometers


(D)
CHANGES IN AREA UNDER SUGARCANE
(1971-75 TO 2001-05)
% TO GROSS CROPPED AREA
INVOLVED IN CHANGE
Above 20
10 To 20
0 To 10
Below 0
REGION AVERAGE 10.03
N
10 5 0 10 20 30 40
Kilometers


(A)
AREA UNDER GROUNDNUT
(2001-05)
% TO GROSS CROPPED AREA
Above 10
5 To 10
Below 5
REGION AVERAGE 9.22
N
10 5 0 10 20 30 40
Kilometers


(B)
CHANGES IN AREA UNDER GROUNDNUT
(1971-75 TO 2001-05)
% TO GROSS CROPPED AREA
INVOLVED IN CHANGE
Above 4
0 To 4
-4 to 0
Below -4
REGION AVERAGE -3.96
N
10 5 0 10 20 30 40
Kilometers


(C)
AREA UNDER SOYABEAN
(2001-05)
% TO GROSS CROPPED AREA
Above 10
5 To 10
Below 5
REGION AVERAGE 5.59
N
10 5 0 10 20 30 40
Kilometers


(D)
CHANGES IN AREA UNDER SOYABEAN
(1971-75 TO 2001-05)
% TO GROSS CROPPED AREA
INVOLVED IN CHANGE
Above 10
5 To 10
Below 5
REGION AVERAGE 5.59
N
10 5 0 10 20 30 40
Kilometers