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Agro-Climatic Zonal Planning and Agricultural Development: A Sub-Regional View

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India's experiment with planning for well over three and a half decades has resulted in many notable successes as well as many deficiencies in the agricultural front. It has achieved a major technological breakthrough resulting in the upgradation of crop productivity, increased use of growth promoting inputs and converted the nation from an importer to a marginal exporter of foodgrains. Nevertheless, there have also been causes for concern. The major cause is disparities in growth between irrigated and unirrigated regions, crops, small and large farmers under different bio-physical and socio-economic environments. The disparities in the growth may be attributed to the lack of scientific utilisation of available resources, both natural and man-made and slow transformation of agricultural technologies due to bio-physical and socio-economic constraints. The basic need in these circumstances is to review the agricultural policy, to recast our priorities and to formulate integrated multi-sector programmes within agriculture to reverse the downward slide and to put the economy on the path of equitable growth. It is necessary to identify the critical problems in each region and plan for their removal. This is the fundamental objective of Agro-Climatic Regional Planning (ACRP) initiated in mid-1988. The ACRP aims at reducing regional imbalances in agricultural growth and policy on farm development through agro-climatic regions and sub-regions, diversification of agriculture and boosting of farm exports, distribution of quality seeds, agricultural credit and higher employment generation in the farm sector. It is imperative therefore to examine the need and criteria for regionalisation to understand the disparities in agricultural growth at the sub-regional levels for fixing priorities for agricultural development. In this paper it is proposed to examine the concept of ACRP in the Eastern Plateau and Hills Region (Zone VII) to identify the various constraints responsible for slow agricultural growth and to suggest sources of growth for agricultural development.

NEED AND CRITERIA FOR REGIONALISATION

In the ACRP programme the country was divided into 15 agro-climatic regions after examining the earlier attempts at regionalisation of the agricultural economy by various scholars and professional/expert bodies, the National Commission on Agriculture and the Indian Council of Agricultural Research (ICAR). The criteria adopted were homogeneity in agro-characteristics and feasibility in terms of planning and operationalisation with reference to the geographical area covered. A Zonal Planning Team was appointed for planning for each region. Each planning team then decided to divide the region or zone into several sub-zones, the number of sub-zones or sub-regions being restricted to five or six for each zone, in order not to clutter up the overall perspective (Government of India, 1989). The advantage of regional planning is that it overcomes the danger of over-generalisation and lack of focus on problems and prospects that are specific to agro-climatic, demographic,

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economic, ecological and sociological conditions. Such a decentralisation would also make policy formulation and implementation much simpler as the regions would be more or less homogeneous. Viewed from this perspective, the agro-climatic regions identified by the Planning Commission still tend to have considerable heterogeneity. In fact, even as small a unit as a district cannot sometimes be homogeneous and agro-climatic regions often cut across the boundaries of administrative units. Somewhere one has to trade-off the administrative conveniences required for the exercise with technical finesse. In this section of the paper it is proposed to identify the sub-regions in the Eastern Plateau and Hills Region which has been designated as Zone VII by the Planning Commission using the above criteria. The Planning Commission has also taken into account the ICAR (National Agricultural Research Project - NARP) Zone. It is worthwhile to examine the compatibility between NARP and Regional - Sub-regional approaches for designing agricultural strategies.

In the ICAR (NARP) zonal scheme the State is the indivisible unit, not the district. In the ACRP a region defined by the cluster of districts is the unit. ICAR zones therefore tend to cut across district boundaries without violating State boundaries. ACRP sub-regions tend to cut across State boundaries, while tending to keep districts inviolate. The NARP has identified 120 agro-climatic zones in the country which we have described as ICAR zones. These zones have been identified with the purpose of developing location-specific and problem-oriented research and developmental strategies for increasing agricultural production. Since each State has been considered as a unit for classifying agro-climatic zones, some of the zones contiguous to other States having similar characteristics appear with separate name and number. Such combination in sub-regions of the Zonal Planning Programme of the Planning Commission would tend to reduce the zone numbers from 120 to about 70 to 75. Such sub-regional plans were expected to reveal State to State differences in attitudes and bias on different agricultural sectors, focus the strengths and weaknesses of different States in similar areas and even them out, provide a more balanced growth, consider unified sub-regional constraints and resources, utilise local resources optimally, provide better input supply and output marketing logistics, involve people in making them learn from their neighbours in other districts and States, strengthen the democratic and administrative base, make people more plan conscious and give strength and reality to zonal plans.

In Zone VII there are 34 revenue districts of five States. These districts are covered by the 18 ICAR zones, some of these zones extending beyond the districts of Zone VII. While dividing Zone VII into five sub-regions, on the basis of physical conditions, topography, soil type to a certain extent, geological formation, rainfall, cropping patterns, development of irrigation, mineral and power resources, ethnic and anthropological similarities and so on, more than one ICAR zone had necessarily to be accommodated in each sub-region. Spill-over of an ICAR zone into two sub-regions occurs only at the restricted tehsils/sub-divisions where the ICAR zones have cut across district boundaries. In Zone VII we have only five such small areas, as indicated in Table I. Some of the ICAR zones in Zone No. VII are large, containing several districts. Examples are ICAR zones 9 of Maharashtra, 1 and 3 of Madhya Pradesh and 4 and 5 of Bihar. Some ICAR zones form a part of a district such as zones 6 and 7 of Orissa. While preparing plans for most of the sectors of Zone VII, we have started from districts, taken the NARP and other data on situational recommendations, summed up for the districts and gone over to the sub-region and then to the zone. There is thus no basic incompatibility between the NARP zonal approach and the regional-sub-regional approach. While delineating sub-regions also commonality of factors

between different districts was examined and a small range for each factor was fixed to outline the sub-regions. This range is necessarily larger than the range of factors in the NARP zones. Common factors for the sub-regions are indicated in Table II.

TABLE I. ICAR AND AGRO-CLIMATIC REGIONAL ZONES OF ZONE VII

State		Sub-regions of Zone VII
Maharashtra	SR-I	8(72) (Warora and Rajura tehsils of Chandrapur), 9(73) (rest of Chandrapur, Bhandara and Gadchiroli)
Madhya Pradesh	SR-I	1(53) (excluding the Kanker tehsil of Bastar and district of Raigarh).
	SR-II	1(53) (Raigarh, Sarangarh and Ghargoda tehsils of Raigarh). 3(55) (districts Shahdol and Sarguja and Joshpur and Dharmajaiagarh tehsil of Raigarh).
Bihar	SR-V	1(53) (only Kanker tehsil of Bastar), 2(54)
	SR-III	4(17) (excluding North-eastern Ranchi)
	SR-IV	4(17) (North-eastern Ranchi only) 5(18), 6(19)
West Bengal	SR-IV	5(119) (district of Purulia only)
Orissa	SR-I	1 (only Kuchinda sub-division of Sambalpur). 9(82), 10(83)
	SR-II	1 (74) (excluding Kuchinda sub-division of Sambalpur). 2(75), 3(76), (Anandapur block of Keonjhar only)
	SR-V	5(78), 6(79), 7(80), 8(81)

SR = Represents Sub-region numbers. Figures in and outside parentheses indicate ICAR serial numbers and ICAR State Zones respectively.

ZONAL AND SUB-REGIONAL PROFILE OF ZONE VII

Zone VII, the Eastern Plateau and Hills Region, consists of 34 inland districts - nine inland districts of Orissa, 12 Chotanagpur districts of Bihar, one hill and plateau districts of West Bengal, nine Chhattisgarh and Central Plateau districts of Madhya Pradesh and three Wainganga districts of Maharashtra. The salient features of the sub-zones of Zone VII are presented in Table II. Details of the zone and sub-regions are also given in ACRP-Zone VII documents (ACRP, 1989 *a, b*, 1990).

Topography of Zone VII is undulating and folded with plateau tables and watersheds of Mahanadi, Brahmani, Baitarani, Salandi, Subarnarekha, Bhudhabalang, Narmada, Indira-vati, Nagavali, Vasundhara, Son and Godavari tributary systems. About 33 per cent of the total population are tribals. Agricultural workers and landless labour constitute about 39 and 17 per cent respectively of the total population. About 50 per cent of the total population of the zone is living below the poverty line. The zone has a fairly large growth in industry and mining but these organised sectors have not been able to absorb the increase of population. Also due to large scale fragmentation of holdings, more and more people have been falling back on agriculture for employment. The zone has about 41 per cent of the area under forest cover, but about 30 to 40 per cent of the area consists of degraded forest land and forest blanks. There has been a very sharp decline in both minor and major forest products during the period 1970-88. Loss of forest cover is increasing soil erosion, flood and terminal drought spells in monsoon season. The zone has about 13.50 and 8.25 per cent of the waste and fallow land respectively. The net cropped area and cropping intensity in the zone are about 31 and 129 per cent respectively. The net irrigated area in the zone is only 5.10 per cent and the total estimated groundwater potential in the zone is 21,772.54 cubic metres, of which hardly 6.75 per cent is tapped. Canals, tanks, tubewells and open wells contribute 33, 52, 1.5 and 3 per cent respectively. The average utilisation of irrigated area is 82 per cent for cereals and millets, 2 per cent for pulses, 2.3 per cent for sugarcane, 7.5 per cent for fruits and vegetables, 3 per cent for oilseeds. The total area under cereals shows a

TABLE II. PROFILE OF ZONE VII

Sub-region and districts (1)	Average rainfall (mm) and temperature* (2)	Rainfall pattern (3)	Type of soil (4)	Soil suborder (5)	Crop ranking (6)	Basic constraints (7)
Sub-region I Maharashtra: Bhandara, Chandrapur and Gadchiroli Madhya Pradesh: Balaghat, Raj Nandgaon, Durg, Raipur, Bilaspur Orissa: Sambalpur, Bolangir, Dhenkanal	1,200-1,300 34°-24°K 30°-16°R 38°-21°S	E ₄ B ₁ A ₂ B ₁ D ₁ E ₃ A ₂ B ₁ C ₁ A ₂ B ₁ C ₁ A ₂ B ₁ C ₁ A ₂ C ₁	E ₄ D ₁ E ₃ E ₂ D ₁	Usalfs, Ochrepts with Orthents and Usterts at centre and with Usterts in the west	Rice Pulses Millets Oilseeds Linseed Wheat	1. Soil cements in receding moisture 2. Low fertility 3. Acidity 4. Moisture stress in <i>khary</i> rice 5. Non-descript pulse and millet varieties with low yield 6. Pests and diseases in irrigated rice and groundwater
Sub-region II Madhya Pradesh: Shahdol, Surguja, Raigarh Orissa: Sundargarh, Keonjhar, Mayurbhanj	1,250-1,350 33°-21°K 29°-13°R 37°-18°S	E ₄ D ₁ E ₃ E ₂ D ₁ A ₂ C ₁ B ₁ A ₂ B ₁ A ₂ B ₁	E ₄ C ₁ E ₃ C ₁ E ₃	Usalfs, Ochrepts and occasional Orthents, Aqualfs and Aquepts	Rice Pulses Millets Wheat Maize Oilseeds	1. Undulating topography - no know-how of slope and hillside cultivation. 2. Wastelands in heavy rains and very dry 3. Excessive run-off and soil erosion in receding monsoon 4. Low fertility 5. Low organic content 6. Forest destruction. Land carved out of natural forests 7. Medium skill tribals 8. Little irrigation
Sub-region III Bihar: Hazaribagh, Giridih, Dhanbad, Deoghar, Goddā, Sahibganj, Santal Pargana	1,200-1,400 34°-22°K 28°-15°R 38°-21°S	E ₄ A ₂ B ₁ C ₁ A ₂ B ₁	E ₄ C ₁ E ₃	Usalfs, Aqualfs, Ochrepts, Orthents	Rice Maize Wheat Pulses	1. Heavy weeds 2. Zinc, boron, iron and molybdenum deficiencies 3. Almost mono-crop 4. Acid soil 5. Low fertility 6. Low rice yields 7. Short duration high-yielding rice varieties not available

(Contd.)

TABLE II (Contd.)

Sub-region and districts (1)	Average rainfall (mm) and temperature (2)	Rainfall pattern ¹ (3)	Type of soil (4)	Soil suborder (5)	Crop ranking (6)	Basic constraints (7)
Sub-region IV Bihar: Palamu, Gumla, Lohardaga, Ranchi, Singbhum	1,350-1,450 33°-25°K 28°-16°R 36°-22°S	E ₄ A ₂ B ₁ C ₁ C ₁ E ₃ A ₂ B ₁	Red loamy, Red and yellow, mixed red and black in eastern end	Ustalfs, Ochrepts, Orthents, Aqualfs in patches, Ustents in eastern end	Rice Maize Pulses Vegetables Wheat, Potato Millets, Oilseeds,	1. Mountainous topography 2. Eroded soils 3. Prolonged drought 4. Weed in rice 5. High evaporation 6. Low fertiliser use 7. Low fertility 8. Tribals with high skill but low resources 9. Deforestation 10. Low irrigation
West Bengal: Purulia	1,400-1,550 32°-23°K 29°-13°R 36°-22°S	E ₄ A ₂ C ₂ E ₃ D ₃ B ₁ A ₃ D ₂ E ₂ B ₁ A ₂ B ₁ A ₂ B ₂	Red sandy Red loamy patches of black	Ustalfs, Ochrepts, Orthents, Aqualfs	Rice Millets Oilseeds Wheat Finger Millet Vegetables	1. Mountainous topography 2. Pests 3. Underdeveloped tribals 4. High run-off and erosion 5. Bored and zinc deficiency 6. Low yield seeds 7. Poor irrigation 8. Shifting cultivation 9. Inadequate communication 10. Poor marketing 11. Inadequate techniques for jholi cultivation and high slope cultivation.

* Average maximum and minimum temperature °C
K=Winter (June-Sept.)
R=Rainy (Oct.-Jan.)
S=Summer (Feb.-May)

¹ Monthly rainfall
Feb.-May | June-Sept. | Oct.-Jan.

A > 300 mm
B = 200-300 mm
C = 100-200 mm

D = 50-100 mm
E < 50 mm

decreasing trend while the area under fruits, vegetables and pulses shows a marginal increase. The percentages of area under oilseeds, sugarcane, other food crops and non-food crops and fibers are low and sensibly constant. The average yields of rice, wheat and maize are one tonne or less per hectare. Animal husbandry is abysmally poor in the zone. Lack of fodder production and scarcity of animal feed in the zone act as a constraint to animal husbandry growth. Fish production in the zone has increased almost two fold during the period 1976-89. However, this is insufficient for the zone itself. Processing and refrigerated transport are totally absent.

The scenario revealed above by the profile of the zone and sub-regions shows that low agricultural productivity levels have been tied up with high poverty and poor infrastructural base in the zone for a long time, and that exploitation of natural resources such as minerals and forest wealth has not been able to generate enough employment to reduce the pressure on agriculture. It also reveals that there is no short-term strategy that has been omitted in the past which could be used in the Eighth Five Year Plan for effecting a dramatic change. However, it definitely calls for a long-term planning and implementation programme, with rational and appropriate priorities and quantum jumps in investment starting with the grass-roots of water and land resources improvement. Yield levels and outputs in this zone are so low that doubling it, which may still be considered low performance in other zones, would revolutionise the economy of the zone.

TABLE III DEVELOPMENT STRATEGIES, ZONAL AND SUB-REGIONAL PRIORITIES

Strategies (1)	Priorities					
	Zone (2)	Sub-region I (3)	Sub-region II (4)	Sub-region III (5)	Sub-region IV (6)	Sub-region V (7)
1. Water resources development	1	1	1	1	1	1
(a) New major and medium irrigation schemes	-	9	9	9	9	9
(b) On-going major and medium irrigation schemes	-	1	1	1	3	3
(c) Minor irrigation schemes	-	2	2	2	1	1
(d) Micro irrigation-cum-water harvesting schemes	-	4	4	4	2	2
(e) Irrigation tanks	-	3	3	6	6	6
(f) Dug wells	-	5	7	7	8	7
(g) Bore wells	-	6	6	5	5	5
(h) Water recycling tanks	-	4	5	3	4	4
(i) Water management in major irrigation systems	-	8	8	8	7	8
2. Soil and water conservation	2	2	2	2	2	2
3. Improvement of problem soils	3	4	3	5	10	13
4. Seed multiplication and supply	5	5	5	3	4	7
5. Other input supply	6	6	6	9	6	11
6. Credit expansion	7	7	7	7	8	6
7. Marketing and transport	11	12	13	11	12	5
8. Crop agronomy	4	3	4	4	3	4
9. Horticulture and special crops	8	8	9	8	5	3
10. Fodder and feed development and animal husbandry	9	9	10	6	7	12
11. Tribal agricultural development	12	13	12	12	13	9
12. Forest development	10	10	11	10	11	10
13. Sericulture	13	15	8	14	8	
14. Inland fisheries	14	11	15	15	15	15
15. Agro-processing	15	14	14	19	13	14

ZONAL AND SUB-REGIONAL DEVELOPMENTAL PERSPECTIVE AND SOURCES OF GROWTH

The central elements of development of VII Zone is a massive water and land development programme to support optimal crop/horticulture mix, joint fodder and animal husbandry development programme, inland fishery expansion, forest development, a special component of tribal agriculture with its own appropriate technology and under separate authority and upgradation of input supply, transportation and marketing and institutional credit systems, designed jointly in terms of target achievement and employment generation. Sources of quick growth are improvement of crop agronomy, vegetable and spices development, seed production, sericulture, fodder and animal husbandry, poultry growth, marketing and transport expansion. Moderate and long-term sources of growth are general horticulture, plantation cropping, community and industrial forestry, fishery development, dairy processing and other agro-processing. Sub-regions of Zone VII are more uniform than other zones of the country from the point of view of topography, land capacity, ethnic composition and stages of development. Only sub-region V presents a more difficult terrain, more predominantly tribal composition and lower achievements in agricultural development. Sub-regional priorities may, therefore, tend to be similar. They are delineated in Table III, priorities being graded 1 onwards in descending order. Priorities are fixed on the basis of estimated cost, return to investment, employment potentialities, area brought under growth promoting activities, targeted growth rates and appropriateness of a particular strategy in terms of bio-physical and socio-economic environment of sub-zones. Most of the priorities are self-explanatory and details are given in the ACRP-Zone VII Documents (ACRPU, 1989 *a, b*, 1990).

SUGGESTIVE INFERENCES

The following are some of the policies which may provide a strong base in effective implementation of the suggested developmental strategies in this paper.

- (1) A major breakthrough in high-yielding, disease and moisture stress resistant germ-plasma and varieties in crops, oilseeds, sugarcane, pulses, vegetables, fruits and fibers is required urgently.
- (2) Appropriate technologies and varieties for upland rice and lowland rice.
- (3) Breakthrough in hybrid paddy technology and hybrid seed production.
- (4) Tailoring of crop and plant varieties to rainfall distribution, soil moisture storage capacities for optimal utilisation of the crop growth period.
- (5) Exploration of possibilities of biotechnologies and other frontier research in the crop, plant, animal and fisheries scene.
- (6) Computer compatible system for agro-meteorological decision making.
- (7) Computer compatible information system for monitoring, evaluation and feed-back analysis of the production process and redressal of weaknesses through reallocation of resources and revision of strategies during an operation.
- (8) Develop integrated input management packages.
- (9) Establish a complementarity between agricultural and non-agricultural growth in the zone.
- (10) Studies related to water balance for the zone, working out packages of agricultural farming system for the different types of tribals in the zone, profitability of alternative cropping and cropping-horticulture systems for different districts and assessment of employment generation programmes may be undertaken for in-depth understanding of the problems.
- (11) infrastructural base, including expansion of marketing, transport, storage, credit, electric power for irrigation pumps, custom hiring of farm equipment and other services, and effective extension services, need to be developed on priority basis.

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