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NATP PME *notes* 6

Task Force on Prioritization, Monitoring & Evaluation

Delineation and Characterization of Agro-Ecoregions

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January 2001

The production system research (PSR) under the National Agricultural Technology Project (NATP) is contemplated for applied and adaptive research for a well-defined target domain. It examines and prioritizes research needs of a production system taking care of all sub-systems like crops, livestock, natural resources and socio-economic, and their inter-linkages. A multi-disciplinary and system-based research design is the unique feature of this approach. This is in significant contrast to the conventional research planning approach based on disciplines and commodities.

Why Agro-Ecoregional Approach?

An agro-ecoregion (or agro-ecosystem) is a homogenous geographical area. The production environment of the region in terms of agro-climate, resource endowments and socio-economic conditions is homogenous, and majority of the farmers have similar production constraints and research needs. Specific advantages of agro-ecoregional approach for research planning are: (i) better identification of production constraints and research needs, (ii) better targeting of prospective technologies, (iii) improved assessment of farmers' responses to new technologies, and (iv) wider adoption and larger impact of research outputs. Accordingly, the NATP has divided the entire country into 5 broad agro-ecosystems (namely Arid, Coastal, Hill & Mountain, Irrigated and Rainfed). These are further divided into 14 production systems. This note delineates, maps and characterizes these agro-ecosystems and production systems in a more systematic and objective manner.

Framework for the Delineation

A number of attempts have been made in the past to delineate different agro-climatic regions of the country (for example, National Bureau of Soil Survey and Land Use Planning (NBSSLUP), Planning Commission, National Agricultural Research Project, and International Crops Research Institute for the Semi-Arid Tropics). The NBSSLUP's classification was primarily based on agro-climatic factors, while others incorporated socio-economic variables as well. The framework used here has incorporated key elements of all the past approaches. The specific steps used for the delineation are:

1. Arid, Coastal and Hill & Mountain Agro-ecoregions delineated by the NBSSLUP were retained as such, as topography, soil type and climate largely determine agricultural activities in these regions.
2. The remaining districts were classified into irrigated and rainfed agro-ecosystems based on the extent of irrigated area. The districts having 40 per cent or more irrigated area were included in the Irrigated Agro-ecosystem and the remaining districts were set in the Rainfed Agro-ecosystem.
3. To identify production systems, all districts within an agro-ecosystem were grouped using cluster analysis. We used cropping pattern for cluster analysis because it is a result of all climatic, physical and socio-economic factors. The sub-regions of Hill & Mountain and Coastal Agro-ecosystems were retained as production systems as effect of external interventions like irrigation is slow and limited, owing to topography, soils and climatic conditions of these regions.
4. To maintain contiguity, scattered districts were merged with the dominant agro-ecosystem or production system. The major changes on this account were made in the rainfed rice-based production system.

Characterization

As seen from the maps, the delineated production systems cut across administrative boundaries, suggesting a need for closer linkages between research institutions, particularly SAUs. The salient characteristics of the agro-ecosystems and production systems reveal three broad patterns (Table 1). First, livestock contributes significantly to agricultural output in all the production systems, and therefore, R&D strategy must consider crop-livestock linkages. Second, research strategy may differ between high input use-high productivity regions (Irrigated and Coastal ecosystems) and low input use-low productivity regions (Rainfed and Arid ecosystems). Third, pearl millet- and horticultural-based production systems of the Arid and Hill Agro-ecosystems, respectively, have very low productivity and high incidence of rural illiteracy. These fragile systems need more research efforts than that justified by their economic significance. List of districts in each agro-ecosystem and production system is given in Table 2.

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PME is a major theme of the National Agricultural Technology Project (NATP). PME notes are meant to disseminate concepts and information regarding this activity. Please address comments, questions and contributions to Director, NCAP.

Map 1: Agro-ecological zones and production systems

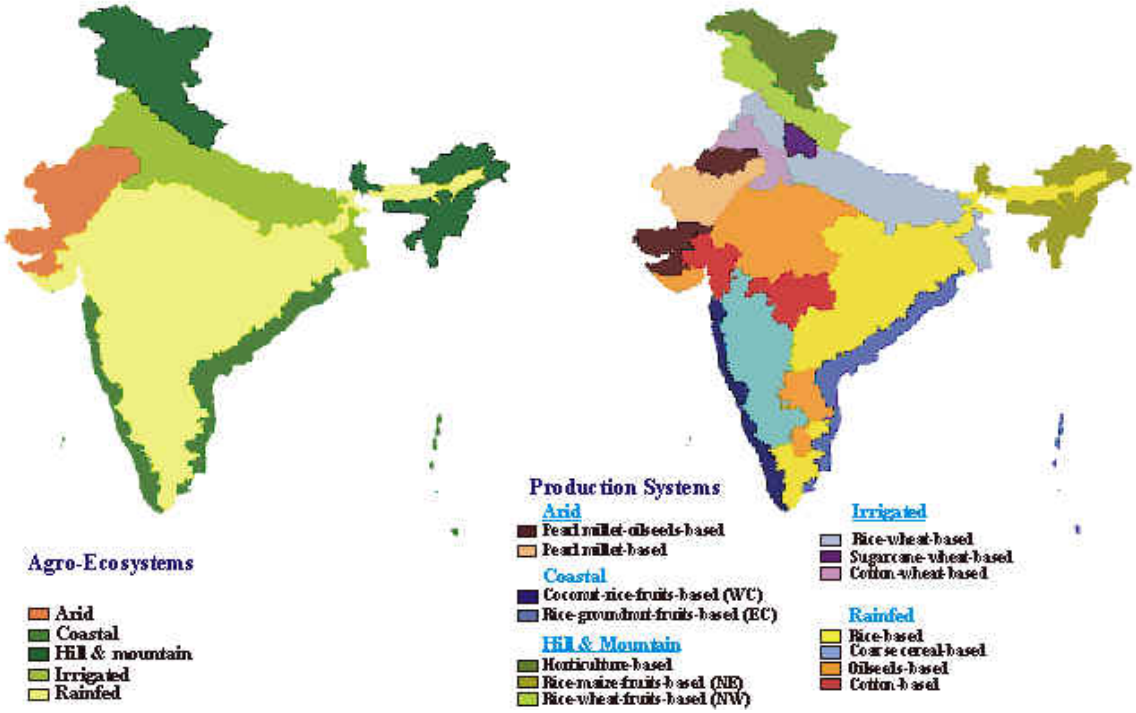

Table 2. List of districts in various agro-ecosystems (AES) and production systems

AES	Production system	State	District
Arid	Pearl millet-based	Rajasthan	Barmer, Jaisalmer, Jalore, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi
	Pearl millet-oilseeds-based	Gujarat	Banaskantha, Jamnagar, Kutch, Rajkot
		Rajasthan	Bikaner, Churu
Coastal	Rice-gnut-fruits-based (EC)	Union Territories	Andaman & Nicobar, Dadra & Nagar Haveli, Daman & Diu, Lakshadweep, Pondicherry
		Andhra Pradesh	East Godavari, Guntur, Krishna, Nellore, Prakasam, Srikakulam, Vishakhapatnam, Vizyanagaram, West Godavari
		Orissa	Baleshwar, Cuttack, Ganjam, Puri
		Tamil Nadu	Chengai Anna, Madras, Ramanathapuram, South Arcot, Thanjavur
	Coconut-rice-fruits-based (WC)	Goa	North and South Goa
		Karnataka	Dakshin Kannada, Uttar Kannada
		Kerala	Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvanathapuram, Thrissur, Wayanad
		Maharashtra	Bombay, Raigarh, Ratnagiri, Sindhudurg, Thane
		Tamil Nadu	Kanyakumari
Hill & Mountain	Horticulture-based	Himachal Pradesh	Kinnaur, Lahul Spiti
		Jammu & Kashmir	Gilgit, Kargil, Ladakh
	Rice-maize-fruits-based (NE)	North-east states	Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura
		Assam	Cachar, Hailakandi, Karbi-Anglong, Karimganj, N.C. Hills
		West Bengal	Darjiling, Jalpaiguri
	Rice-wheat-fruits-based (NW)	Himachal Pradesh	Bilaspur, Chamba, Hamirpur, Kangra, Kullu, Mandi, Shimla, Sirmaur, Solan, Una
		Jammu & Kashmir	Anantnag, Badgam, Baramula, Chilas, Doda, Jammu, Kathua, Kupwara, Mirpur, Pulwama, Punch, Rajauri, Srinagar, Udhampur
		Uttar Pradesh	Almora, Chamoli, Dehradun, Garhwal, Nainital, Pithoragarh, Tehri Garhwal, Uttarkashi
Irrigated	Rice-wheat-based	Bihar	Aurangabad, Begusarai, Bhagalpur, Bhojpur, Darbhanga, Gaya, Gopalganj, Jehanabad, Khagaria, Madhepura, Madhubani, Munger, Muzaffarpur, Nalanda, Newada, Pashchim Champaran, Patna, Purbi Champaran, Purnea, Rohtas, Saharsa, Samastipur, Saran, Siwan, Vaishali
		Haryana	Ambala, Faridabad, Jind, Kaithal, Karnal, Kurukshetra, Panipat, Sonipat
		Punjab	Amritsar, Firozpur, Gurdaspur, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Patiala, Roopnagar, Sangrur
		Uttar Pradesh	Agra, Aligarh, Allahabad, Azamgarh, Bahraich, Ballia, Barabanki, Bareilly, Basti, Budaun, Bulandshahar, Deoria, Etah, Etawah, Faizabad, Farrukhabad, Fatehpur, Firozabad, Ghazipur, Gonda, Gorakhpur, Hardoi, Jaunpur, Kanpur(Rural and Urban), Kheri, Lucknow, Maharajganj, Mainpuri, Mathura, Mau, Mirzapur, Pilibhit, Pratapgarh, Rae-bareli, Rampur, Shahjahanpur, Siddharthanagar, Sitapur, Sonbhadra, Sultanpur, Unnao, Varanasi
		West Bengal	Bardhaman, Birbhum, Calcutta, Haora, Hugli, Maldah, Murshidabad, Nadia, 24 Parganas (North and South)
	Cotton-wheat-based	Haryana	Bhiwani, Gurgaon, Hissar, Mahendragarh, Rewari, Rohtak, Sirsa
		Punjab	Bhatinda and Faridkot
		Rajasthan	Alwar, Bharatpur, Ganganagar and Jaipur
	Sugarcane-wheat-based	Haryana	Yamunanagar
		Uttar Pradesh	Bijnor, Ghaziabad, Haridwar, Meerut, Moradabad, Muzaffarnagar, Saharanpur.
Rainfed	Rice-based	Andhra Pradesh	Adilabad, Hyderabad, Karimnagar, Khammam, Mahbubnagar, Medak, Nalgonda, Nizamabad, Rangareddi, Warangal
		Assam	Barpeta, Bongaigaon, Darrang, Dhemji, Dhubri, Dibrugarh, Goalpara, Golaghat, Jorhat, Kamrup, Kokrajhar, Lakhimpur, Marigaon, Nagaon, Nalbari, Sibsagar, Sonitpur, Tinsukia
		Bihar	Deoghar, Dhanbad, Dumka, Giridh, Godda, Gumla, Hazaribag, Katihar, Kishangunj, Lohardagga, Palamu, Singhbhum(East and West), Ranchi, Araria, Sahibganj and Sitamarhi
		Madhya Pradesh	Balaghat, Bastar, Bilaspur, Damoh, Durg, Jabalpur, Mandla, Panna, Raigarh, Raipur, Rajnandgaon, Rewa, Satna, Shahdol, Sidhi, Surguja
		Maharashtra	Bhandara, Gadchiroli
		Orissa	Bolangir, Dhenkanal, Kalahandi, Keonjhar, Koraput, Mayurbhanj, Phulbani, Sambalpur, Sundergarh
		Tamil Nadu	Chidambaranar, Coimbatore, Dindigul Anna, Kamarajar, Madurai, Nilgiri, North Arcot, Pasumpon Thevar, Periyar, Puddukottai, Tiruchirapalli, Tirunelveli, Tiruvannamalai
		West Bengal	Purulia, West Dinajpur, Bankura, Medinapur, Koch Bihar
	Coarse cereal-based	Karnataka	Bangalore, Belgaum, Bellary, Bidar, Bijapur, Chikamagalur, Chitradurga, Dharwad, Gulbarga, Hassan, Kodagu, Kolar, Mandya, Mysore, Raichur, Shimoga, Tumkur
		Maharashtra	Ahmadnagar, Aurangabad, Beed, Dhule, Nasik, Jalna, Kolhapur, Latur, Osmanabad, Pune, Sangli, Satara and Solapur
	Oilseed-based	Andhra Pradesh	Anantapur, Chittor, Cuddapah, Kurnool
		Gujarat	Amreli, Bhavnagar, Junagarh, Sabarkantha
		Madhya Pradesh	Betul, Bhind, Bhopal, Chhatarpur, Chhindwara, Datia, Dewas, Dhar, East Nimar, Guna, Gwalior, Hoshangabad, Indore, Jhabua, Mandsaur, Morena, Narsinghpur, Raisen, Rajgarh, Ratlam, Sagar, Sehore, Seoni, Shajapur, Shivpuri, Tikamgarh, Ujjain, Vidisha, West Nimar
		Rajasthan	Ajmer, Banswara, Bhilwara, Bundi, Chittaurgarh, Dholpur, Dungarpur, Jhalawar, Kota, Sawai Madhopur, Tonk, Udaipur
		Tamil Nadu	Dharmapuri, Salem
		Uttar Pradesh	Banda, Hamirpur, Jalaun, Jhansi, Lalitpur
	Cotton-based	Gujarat	Ahmedabad, Bharuch, Gandhinagar, Kheda, Mehsana, Panch Mahals, Surat, Surendranagar, The Dangs, Vadodara, Valsad
		Maharashtra	Akola, Amravati, Buldhana, Chandrapur, Jalgaon, Nagpur, Nanded, Parbhani, Wardha, Yeotmal

Note: The list includes all states and districts as existed in 1991.