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ARID AND SEMI-ARID LANDS: ENVIRONMENTAL ISSUES, FUTURE RESEARCH TASKS AND SUSTAINABLE DEVELOPMENT*

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Conventionally the purpose of addresses delivered on conferences is to provide an introduction which should get the paticipants as also the general public in proper mood for the ensuing deliberations. I have opted to focus on the focal theme of this conference. I am not quite sure whether I will succeed in performing this task. Let me begin by first sharing with you all my difficulties in fully capturing the four parts of the focal theme of this conference. But before I do the I am tempted to first contextualise this focal theme in time and space.

Twentyeight years ago a symposium on arid zone, the first ever on the theme, was organised by the National Committee for the Geographical Congress. The venue was Jodhpur with its prestigious Central Arid Zone Research Institute established in 1959 with assistance from UNESCO. Asian Environmental Council deserves all kudos for selecting this theme which is most appropriate at the present juncture. One-quarter of a century (since the first effort) is long enough a period to take stock of things; to evaluate our research efforts in this regard; to draw up a balance sheet of our successes and failures in order to draw up an agenda of future research tasks in the context of the ongoing worldwide debate on environment and sustainable development.

ARID AND SEMI-ARID LANDS

About 35 per cent of the land surface of the world has been classified as drylands (40.0 million to 49.0 million square kilometres). On the basis of differences in the levels of aridity the drylands are further classified as extremely arid (4%); arid (15%) and semi-arid (14%) (Furley nad Newey, 1983). A combination of aridity and vegetation for each of these subdivisions of drylands characterises their respective environments. The extremely arid are most unlikely to have vegetation cover unless there is groundwater within a few metres of the surface. The arid regions are characterised by very sparse vegetation which is unlikely to include trees and may not have any season in which crops could be cultivated using natural precipitation alone. The semi-arid environments stand out with a continuous vegetation cover but are too dry or vaiable to permit normal raising of rainfed crops on a secure, regular basis (Walker, 1979). Thus, all drylands are environments with permanent, seasonal or peridoic moisture deficiency and are distributed in tropical, subtropical, temperate and polar latitudes (Barrows, 1991).

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ARID AND SEMI-ARID LANDS IN INDIA

The main arid zone of our country is located in northwest India and covers western Rajasthan, Saurashtra and Kutch of Gujarat, southwestern parts of Punjab and Western Haryana. This constitues about 90% of the arid zone. There are a few small arid pockets (in all covering 30,120 square kilometres) in Peninsular India (Anantapur, Kurnool and Cuddapah districts in Andhra pradesh; Raichur, Bellery, Chitradurg and Dharwar districts in Karnataka; and Sholapur, Dhulia and Nasik districts of Maharashtra). The total number of arid and semi-arid districts in India work out to 125 (Agroclimatic Atlas of India, 1978).

INDIAN GEOGRAPHY AND RESEARCH OUTPUT

Focussing on Arid and semi-arid lands : An Assessment

A comprehensive view of geographic research focussing on arid and semi-arid lands is beyond the scope of this presentation. However, for the purpose of drawing up an agenda for further research it is imperative to look into, howsoever briefly and superficially, our research efforts in this regard. Scanning through the three volumes on progress of research in geography (ICSSR 1972, 1979 and 1983) and select professional journals published by various professional bodies of Indian geographers enables us to have an idea of the nature, directions, quality and quantity of our research efforts. Some of the pioneer investigations concentrated on the aspects of land use and cropping patterns in the arid regions in general and in the Rajasthan desert in particular (Chandershekhar & Sundram, 1962; Yadav, 1965; Bhardawaj, 1965; Ahmad, 1968) . The symposium on arid zone held at Jodypur in 1968 whose proceedings were later published in 1971 covered such as climatic conditions, geomorphology, soils; geology and chemistry of subsurface water; hydrological characteri-stics, geomorphological control on the distribution of evaporites, grasslands reclamation and utilisation; zoogeography of the rodents and desert gerbil; cropping patterns etc. The focus in the individual presentations was on the Rajasthan desert. The physical-geographic aspects of the desert region emerged as the dominant thrust but there were also some studies on sedentarization of nomads, trends in urbanisation, population distribution and urban ecology. It may be noted that not all presentations in the symposium were by geographers. In the sixties as whole agroclimatological studies of arid and semi-arid zones of India attracted considerable attention (Krishnan, 1968; Krishanan, 1969). An important landmark during the seventies was the publication of the Agroclimatic Atlas of India which accurately mapped the arid and semi-arid zones, in addition to other agroclimatic regions of India. This atlas and its maps later became the basis for promoting research on arid and semi-arid regions during the eighties and nineties. The focus was gradually widened to include the drought prone areas of Karnataka (Naganna and Barai, 1982); Maharshtra (Subramaniam & Rao, 1984) and Rajasthan (Subramaniam & Rao, 1987). Most of these studies aimed at methodological refinemets in techniques of Agroclimatic classifications. In parts these were repetitive and had very narrow frame of reference.

There has been a steady shift in favour of more substantive studies in recent years. From pure classificatory studies, interest in issue-based themes of problem areas at micro levels marks an important departure (Gupta and Khatri,

1989); Ramachandran, 1992; Gregory, 1991; Penchalaiah nd Ramanaiah, 1992), Against this background, setting up of the Asian Enviornmental Council in 1992-93 and its commitment to 'promote and support the cause of physicobiological and human environment' is indeed a very welcome development. The Council has already given ample proof of its seriousness of purpose by bringing out the Changing Contours of Arid Ecology in two volumes. Charity, it is rightly said, begings at home and Asian Environmental Council has proved it by first focussing on arid ecology in its publication series and now by selecting the present focal theme for the 17th I. I.G. Conference at Jaipur.

THE TASKS AHEAD : ENVIRONMENTAL ISSUES RELATING TO ARID AND SEMI-ARID LAND:

The burden of future research

Our future research tasks are indeed full of challenges. But these are centainly tied down to our past and present if we look at time as a dimension in continuum. In so far as research on the arid and semi-arid lands in Indian geography is concerned, its beginnings are located in the early sixties. As has been noted earlier so far we have mostly looked at different aspects of selected areas which lie in the arid and semi-arid regions of India. In tune with the systems paradigm we need to orient our research designs in which these lands are visualised as ecological systems. Rather than probing the individual aspects separately, almost in isloation, from other aspects of these ecosystems, our immediate task would be to attempt integrative studies of the physical, social and economic components of these ecosystems. For arriving at generalisations comparative studies of such ecosystems at the regional, national and global scales would be crucial in our research endeavours.

There is neither the need nor the time for going into the whole range of environmental issues : from water to air pollution to solid and hazardous wastes, land and habitat, atmospheric changes, etc. It is desirable to narrow down our focus to those issues which are most crucial with reference to the arid and semi-arid ecosystems. Within and amongst these ecosystmes as also within the larger ecospace of which these and other ecosystems are integral parts, there are "manysided encounters and reciprocal influencing of enviornmental factors" which we shall have to explore for solving the emerging environmental problems (Neef,1984). Land degradation, droughts, desertification, depletion of vegetation, availability of surface and underground water, changes in landuse, among many other, are the most important environmental issues in the present case. Further, some issues relate more specifically to the arid and semi-arid lands. For example we can perform "important tasks in terms of analysing the factors which comprise the natural potential complex and in terms of investigating the exploitation of natural potential by man particularly in the realms of land use". Some theoretical and empirical studies of this kind have been completed in Germany focussing on specific dry regions(Stein and Schulze, 1978; Horst,1988). In the semi-arid regions where the already precarious balance between available surface water and limited cropland is getting disturbed over time, stablizing the river/ stream banks is urgently required. We have witnessed how in parts of Rajasthan even small drainage basins experience long periods of low discharge as also relatively large flood discharge. Scarce water resources need appropriate management strategies which may include bank and bed protection of smaller

streams and deepening of river bends. In the semi-arid lands further loss of vegetaion (resulting from overuse, overgrazing, repeated droughts) needs to be checked through afforestration schemes especially in the vicinity of towns, around wells and on dunes. Study of some such efforts made in Upper Volta can be useful (Weinstabel and Zech, 1982). The impact of the Five Year Aravali Afforestration Project launched with the financial assistance of the Overseas Economic Coorperation (OEC), Japan in 1992 would be worthy of a rigorous scientific study. The study should cover the impact of the project on : desertification, requirements of the local people relating to fuel and fodder, vegetation cover, ground water, etc.

In addition to the environmental issues listed herein which need to be incorporated in developing our research designs for the arid and semi-arid ecosystems, the economic demographic and social components which have so far remained grossly neglected also deserve due attention. Within the integrating structures of these ecosystems the human-economic dimensions lend meaning to the environmental aspects. It is by visualising all the present correlates together that we can work out the strategy for safeguarding these apparently fragile and yet so enduring environments in future.

SUSTAINABLE DEVEOPMENT

Sustainable development is currently a fashionable catchword which seems to have entered all fora: the academic as well as the professional. It is a term which trespasses all disciplinary boundaries. Already there is more of confusion and less of clarity around this term. It figures probably for the first time in the early 1970's in the Cocoyoc Declaration.It gained currency as fast as it changed meanings through multiple usages. I shall, however, confine myself to the bearing 'sustainability' has on ecosytems especially those with marginal locations in terms of settlement and utilization of resources (Kuhnen, 1992). The arid and semi-arid lands certainly belong to this category. Production and the productive forces sustain on ecosystem provided the production is ecologically sustainable. In social terms sustainability also implies an economic-social order which ensures equity of income, power and opportunities which together lay the foundations for the stability of ecosystems. Kuhnen lists four main strategies in this regard: traditional strategies of production, optimization and exchange; division of labour and subsidies from other regions; relief through migrations; and reintroduction of the concept of social responsibility or the strategy of intensification. On the whole sustainability warrants a holistic rather than a sectoral approuch. For sustaining an ecosystem, along with its people and economy, there is yet another basic codition: waging fight against the various power structures, the welfare and power of which essentially result from their non-sustainable economic behaviour (Boesler, 1994). Filling gaps in our researches is our professional responsibility. Addressing ourselves to the challenges of sustaining various ecosystems is our moral and social responsibility. Both reinforce each other and we all have to take up the challenge- right now before it is too late.

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