

ENVIRONMENTAL DYNAMICS AND NEED FOR BIOPROSPECTING

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Abstract :

Dynamic environment influences behaviour of economic system. Due to survival instinct of man no economic system is static. Man has always learned from nature and used the same knowledge to mend and bend the nature for his survival with less effort. History of man-nature relationship in Indian subcontinent provides many examples of this phenomenon. For example, firstly, all ancestors of man who were hunters and gatherers by Holocene (10000 BC) realized much less energy is required for cultivation than hunting and gathering resultantly they started agriculture. Later Aryans, who were nomadic pastorals, adopted agriculture with same reason. In both the cases man was doing fundamental economic calculation about his efforts and yield in return and how to reduce efforts and raise the yield. The trend continued on the principle - to lightly exploit wide range of resources by causing minimum disturbance to nature rather than intensively exploiting few. This principle has given rise to Indigenous Traditional knowledge (ITK). But due to need and greed of man and lack of attention of economists towards dilemma of resource depletion has damaged the equilibrium of nature giving rise to loss of biodiversity as well as created menace of climate change. The climate change has affected agriculture the most; making even survival of ITK based farmers difficult resulting in increase in incidences of suicides. In this situation farmers have found solution in the form of making adaptive changes in ITK based farming practices. With such changes farmers of Azamgarh in Uttar Pradesh have successfully combated the effect of climate change on their agriculture and helped themselves to maintain their economic stability intact. Such changes in environmental dynamics need to be safeguarded from biopiracy by geographical indication tagging to form proper base for bioprospecting in future to strengthen the environmental dynamics based on economic needs.

Index Terms - Environmental Dynamics, Climate change, Biopiracy, Bioprospecting, ITK, GI

All ancestors of hominids were hunters and gatherers from prior to Paleocene (65 mya) till dawn of Holocene (10000 BC). They used to wander following seasonal migratory animals, mainly herbivorous, searching food and water and by observing them man might have began gathering plants on the way. Due to his ability to remember he might have noted the places of availability of these perennial food supplies and have exploited them time and again. This also might be his first lesson from nature which helped him to domesticate animals and plants and further multiply them by rearing animals and growing plants as per need and this was the beginning of agriculture. This phenomenon existed with application of opportunist, adaptive and improvising qualities of hunters and gatherers in different eco-climatic conditions in Holocene. This also taught man that energy required for agriculture was much less than that required for hunting.

According to V. G. Childe it is Neolithic period when man shifted from food gathering to food production. He argued that Neolithic revolution transformed human life by giving man control over food production. This was also beginning of era of man to use whatever he has always learned from nature to utilize the same knowledge to mend and bend the nature for his survival with less effort. For all such efforts the underline principle was to lightly exploit wide range of resources by causing minimum disturbance to nature rather than intensively exploiting few. This principle has given rise to Indigenous Traditional knowledge (ITK). Later Aryans who were nomadic pastorals adopted agriculture with same reason and principle.

In that situation also man was doing a fundamental economic calculation about his efforts and yield in return and how to reduce efforts and raise the yield. These calculations were based on factors such as climate and geography of the area, increasing population, urge for sedentary life, knowledge of gathering converting in to domestication and cultivation leading to agriculture. The result of these economic calculations can be summarized as in Table 1. This also reveals that dynamic environment influences behaviour of economic system. Due to survival instinct of man no economic system is static. This interaction with environment was going smoothly in India on the basis of ITK till the arrival of European traders in early seventeenth century.

Table 1 Yield and Economic Calculations in Various Periods

No	Period	Yield calculation	Economic calculation
1	Pre-domestication	Yield / Human effort	Man realized that plants provide food with less effort than by hunting
2	10,000 BC – 1000 BC	Yield / Seed sown	Except for the Harappan civilization where agriculture was developed differently.

3	1000 BC – Till date	Yield / Land area	By 1000 BC when Aryan reached the Eastern India and cultural scenario including agriculture changed
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Fourteenth century onwards European farmers started adopting commercial methods of farming due to increase in land and man power availability, use of knowledge from field of engineering (drainage and flood control) and chemistry (use of new fertilizers and pesticides) along with social factor (defeudalization). All these cumulatively resulted in surplus production for sale as well as improving economic condition of population. The traders took advantage of the situation and to satisfy growing demands of the population they turned towards the East especially, India. Various trading companies were formed around 1600 AD. Formation of East India Company on 31 December 1600 during the reign of Queen Elizabeth is one of the results of the commercial revolution. This commercial revolution was at the cost of nature.

The primary concern of the British rulers was to promote the commerce of their country in India. The commercial revolution in England, which closely followed the industrial revolution, profoundly affected agriculture in India and India became land of raw material supplier and market for finished products. British rulers broke the backbone of ITK based agriculture with help of botanical gardens, agriculture research and experiment stations, etc. experimentally proving improved results by using inorganic inputs in agriculture but it was at the cost of land quality which came to notice vary late.

Doyen of economics Malthus in *An Essay on the Principles of Population* (1798) framed the fundamental principle of environmentalism on the postulate that the power of population is indefinitely greater than the power in the Earth to produce subsistence for man. The principle says: population, when unchecked, increases in a geometrical ratio and subsistence increases only in an arithmetical ratio. In this essay he appears to address only food supply for increasing population and other needs of population are not considered which consume more natural resources. It will be adventurous to say that since the days of Malthus, economists have tended to ignore the dilemma of resource depletion. Traditionally, economists have been concerned with the efficiency of resource use. As a result drastic increase in industrialization, over utilization of resources to satisfy need and greed of man has resulted in climate change affecting biodiversity leading loss of ecological balance which distressing economic conditions especially farmers who practice ITK based farming.

In the study of impact of climate change on predominantly ITK based rainfed agriculture in Dharwad district of Karnataka the findings revealed that due to increasing incidents of occurrences of droughts the farmers have begun to act in response to climate change by either adopting technological coping mechanism or shifting to other professions and in worst situation of change of profession they end up committing suicides. The study infers that this happens due to short term effect of yield and income loss which leads to change of profession and failing in it leads to suicide as long term effect.

The famers have always tried to overcome environmental hazards affecting their economic status which is the base of environmental dynamics influencing economic condition. The efforts of farmers of Azamgarh district of Uttar Pradesh are noteworthy to mention. To combat such developments farmers' have developed, through trial and error, a number of adaptive practices in their subsistence farming. These include crop diversification, agronomic manipulations and mixed cropping with more than 10 crops with minimal use of external inputs and considering soil type, season, nutrient demand, soil fertility, cost of cultivation, and local ecological knowledge. These farmers also used ITK to manage insect pests and tools like *Pahiya* (made from babool (*Acacia nilotica*) wood) for planting sugarcane.

These adaptations helped farmers to reduce environmental risks and minimize crop failures and enhance livelihood. Three major legume based model developed by these farmers can be described as...

Model No 1: Black gram + Sorghum (summer) + Rice (early) - Pea and Sugarcane-Wheat for loam soil with proper slope and irrigation.

Model No 2: Green gram + Sorghum + Okra (summer) – Paddy (early) – Potato for medium textured, gently sloping and irrigated soils.

Model No 3: Cow pea + Maize + Okra (summer) – Paddy – Wheat for medium textured, gently sloping and irrigated soil.

Advantages of all three models can be enumerated as food security with pulses, fodder for cattle, and improvement in soil fertility, crop diversification, and reduction in environmental risks and ensures higher profits. Approximately 80% farmers accepted their location specific crop systems to be economically viable, ecologically sustainable, technically feasible, cost effective, compatible to be turned with past experience, socially justifiable, culturally acceptable.

In both spatially separated studies the fact highlighted is that the environmental hazards affect economic status and farmers are trying to overcome that by using various means available with them. These means include material, techniques and method of their

application. This combination has threat of biopiracy. At the same time these techniques are spatially unique and geographical indication tagging can be done as these are just modifications in existing ITK practices. If it is done it will be of a great importance in bioprospecting of the modifications in future which will help farmers to safeguard their IPR and economic interest. Farming is one example and in many other fields of life this process of GI tagging is essential for proper bioprospecting to strengthen the environmental dynamics based on economic needs.

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