

**ESTABLISHMENT OF CENTRE FOR BIORESOURCES AND
SUSTAINABLE DEVELOPMENT IN ARUNACHAL PRADESH**

CONCEPT PAPER

SUBMITTED TO

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CONCEPT PAPER ON THE ESTABLISHMENT OF CENTRE FOR BIORESOURCES AND SUSTAINABLE DEVELOPMENT IN ARUNACHAL PRADESH

RATIONALE:

North-East India comprising of eight states namely Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Tripura and Sikkim which fall under two biodiversity hotspots of the world i, e., Himalayan and Indo-Burma. The state of Arunachal Pradesh and Sikkim are under Eastern Himalayan Biodiversity Hotspot while the remaining six states viz. Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura are under Indo-Burma Biodiversity Hotspot. All the states of North-East India have their own characteristic biodiversity and unique bioresources.

Arunachal Pradesh with an area of 83,743 Sq. Km., has the resources in abundance with the highest forest cover in the country and is least populated. It is a nature's laboratory unto it and has many endemic and vast areas are still unexplored. In Arunachal Pradesh that one can still hope to find new species and records hitherto to the world.

An estimated number of 5000 flowering plants, 600 orchids, 400 ferns, 48 gymnosperms and an equally high number of unexplored algae, fungi, lichens and bryophytes inhabit the diverse habitats that occur in at least six broad forest types of Arunachal Pradesh. The different habitat and ecosystem types of Arunachal Pradesh in particular described above are home to more than 100 species of mammal, 650 birds, 83 reptiles, 130 fishes and 7 non-human primates and innumerable species of insects and other life forms. This rich flora and fauna form rich genetic resources which are highly useful for the human population.

The diversity is directly related to the food, culture and way of life of 10.91 Lakhs (As per 2001 census) of more 25 indigenous ethnic communities (with more than 125 sub-tribes) inhabiting the hills of the state with distinct diversity. These communities depend on biodiversity for their sustenance and various daily needs. Indigenous knowledge inherited through the ages in the sustainable use of biodiversity is unparalleled with any region of the country. In fact, our knowledge based on biodiversity of little explored region is grossly inadequate and necessitates its detailed exploration, documentation, sustainable development through proper and scientific understanding.

Modern Arunachal Pradesh is on the cross-roads of age – old tradition and modern development, but on what cost! Should it be on biodiversity, culture, traditional knowledge that have evolved and sustained over a period of years through synthesis and churning of natural selection and adoption? The developments taking place around the world, throughout the country including Arunachal Pradesh needs to have reorientation, as the result so far has been erosion of biodiversity, bioresources gradually and steadily. In order to reverse the and halt the process of such an erosion, irreparable loss, there is a need to have understanding on various aspects of bioresources, its conservation and man's role and extent of interventions towards its sustainable development.

Hence, it is important and call of the time to develop, maintain the rich bioresources, biodiversity of Arunachal Pradesh, as it is an essential component and measure of the environment quality. Besides, the effects of decline in biological diversity would hit hardest

the indigenous people who are directly dependent on their natural environment, if not scientifically studies, conserved and most importantly developed sustainably.

Mission:

Development of Bio-Resources and their sustainable utilization through biotechnological interventions for socio-economic growth in the Arunachal Pradesh in particular.

Right kind of development, conservation and use of bioresources requires a strong institutional setup and properly developed human capacity. In this regard there is a basic need of integrating science and society which is possible through institutional setup and networking. In this regard, the proposal of setting up of a **Bioresources Development Centre** at Itanagar in Arunachal Pradesh should be vigorously persuaded with Arunachal Pradesh State Council for Science and Technology as the nodal agency to take lead in this direction.

Objectives:

- To set up state-of-art biotechnology research facilities at Arunachal Pradesh for work on sustainable development of bioresources, using tools of modern biology,
- To study and document the unique biodiversity and bioresources of Arunachal Pradesh,
- To undertake biotechnological interventions for sustainable development and utilization of bioresources of Arunachal Pradesh,
- To generate technological packages for employment generation and economic progress of the state in particular,
- To undertake capacity building (human resource development) in bioresources conservation, development and utilization and
- To collaborate with other institutions/organisations/universities regionally/nationally in further research pursuits in bioresources.

Areas of Focus:

As a result of the recommendation made in the Final Report of the State Biodiversity Strategy and Action Plan for Initiating and Strengthening of Research and Development in Bioresources, the following areas of focus on bioresources development have been identified and which need immediate attention.

1. Medicinal Plant Resources:

Arunachal Pradesh can be termed as nature's repository of medicinal plants. The people of this remote state with their indigenous skill and close association with plants have accumulated an envious treasure of knowledge related to the utilization of plants surrounding their settlements. This traditional knowledge of medicinal plant is becoming a potential source for the Pharmaceutical Industries. Collection of the raw plant materials in bulk for these industries has posed a great threat to this wild wealth and large numbers of

such species have already become rare and threatened. A sustainable utilization of this wealth is urgently required.

2. Medicinal and nutraceutical value of orchids for commercialization:

The use of orchids as medicine and nutraceutical has a very long history in Indian and Chinese Materia Medica. Many orchid species viz. *Dendrobium loddigesii*, *D. Plicatile*, *D. nobile*, *D. cumalati*, *D. moscatum*, *D. crepidatum*, *Sophronites coccinea*, *Bletilla striata*, etc. have been chemically and pharmacologically investigated for bioactive molecules since 1892 and many orchid alkaloids, terpenoids and phenolic compounds have been identified by European, Chinese, Japanese and Korean researchers. From the traditional knowledge of Arunachal Pradesh, some orchid species are known for their medicinal and nutraceutical values. Report indicated that very limited work has been done on the evaluation of medicinal and nutraceutical values of orchid species grown in India.

Looking into the possibilities of identifying orchids with medicinal and nutraceutical values and availability of rich orchid diversity at Arunachal Pradesh, the following activities are proposed to be taken in the institute.

- a) Chemical prospecting of orchid species of Arunachal Pradesh for medicinal and nutraceutical values.
- b) In-vitro mass multiplication protocol development of the identified orchid species for bio-mass production.

3. Mountain and High Altitude Microbiology:

Extremophiles i, e. microorganisms living in very harsh natural conditions of mountain and high-altitude areas of eastern Himalayas are not yet sufficiently understood for their potential utilization in sustainable development of State. Microorganisms living in natural cold conditions have attracted the attention of scientists for use in manufacturing of cold active enzymes for washing powder, textile industry and bioremediation processes. Japanese companies are very active in this research area. India too is a player in this industrial biotechnology sector which focuses on producing enzymes for textile and paper industries.

Arunachal Pradesh could become an organic state for producing the important cash crops viz. apple, large cardamom, kiwi, orange, ginger, pineapple etc. by utilizing useful bio fertilizers and bio-pesticides/bio-controlling agents in adequate quantities.

Considering the above facts, researchable issues which need immediate attention are proposed as under;

- a) Prospecting for cold tolerant industrially useful enzymes from extremophiles.
- b) Development of bio-fertilizers and bio-pesticides/bio-control agents for quality crop production in the mountain areas.

4. Aquatic Bioresources (Fish Genetics and Breeding):

India and its neighbouring countries in South-East Asia are home to rich genetic resources of freshwater fishes. They are widely distributed in inland water bodies and are

highly favoured for commercial farming. The reasons for the popularity of carps in aquaculture include enormity of resources and good range of varieties for selection, relatively simple and well-tested culture techniques etc. apart from the fast growing exotic and Indian Major Carps, several minor carps are widely distributed in different freshwater bodies in the Indian region of the Indo-Burma Biodiversity Hotspot supporting commercially important capture and culture fisheries. Considering these facts, the present studies were proposed on priority species with the following objectives.

- a) Collection and broodstock development of the selected commercially important indigenous fishes of Arunachal Pradesh.
- b) Population genetics study of the selected indigenous fishes of Arunachal Pradesh.
- c) To improve growth rate of selected indigenous fishes of Arunachal Pradesh through selective breeding.
- d) To develop package of practices for culture of selected indigenous fishes of Arunachal Pradesh.

5. Insect Bioresources:

Insects are the most diverse group of organisms on earth comprising approximately 7,50,000 -8,40,000 described species. From time immemorial insect has been one of the most beneficial animal to the mankind. They provide valuable bioresources for the welfare of human being like silk, honey, natural dyes, nutritious food items, therapeutic value, bio-control agent etc. thus insects play a vital role in their own way in maintaining the quality of human's life. Therefore, it is proposed to take up exploring therapeutic, dyeing and nutritional value of insect bioresources of Arunachal Pradesh for sustainable utilization with the following objectives.

- a) Survey, collection, preservation, identification and documentation of insect bioresources having therapeutic, dyeing and nutritional properties based on traditional knowledge of the ethnic groups of Arunachal Pradesh.
- b) Traditional knowledge based specific chemical evaluation for therapeutic, dyeing and nutritional values for possible product development and value addition.
- c) Development of mass breeding technology for sustainable utilization of the potential insect species of therapeutic, dyeing and nutritional values.

6. Bioresources Database & Bioinformatics:

In Arunachal Pradesh an estimated number of 5000 flowering plants, 600 orchids, 400 ferns, 48 gymnosperms and an equally high number of unexplored algae, fungi, lichens and bryophytes inhabit the diverse habitats that occur in at least six broad forest types of Arunachal Pradesh. The different habitat and ecosystem types of Arunachal Pradesh in particular described above are home to more than 100 species of mammal, 650 birds, 83 reptiles, 130 fishes and 7 non-human primates and innumerable species of insects and other life forms. Scientific documentation of this rich bioresources of the state is very much essential for safeguarding of the bioresources through development of database of

Arunachal Pradesh in this line. Development of the bioresources database of the Arunachal Pradesh region of the Indo-Burma biodiversity hotspot will be developed with following objectives.

- a) Development of computerized interactive and informative database of the bioresources of Arunachal Pradesh hotspot region.
- b) Development of separate database on priority areas of the proposed Instituteto provide maximum available information.
- c) To develop an information base on the bioresources and biodiversity using Biotechnology System Network (BTISNet).
- d) To conduct training courses in the specialized areas to meet the special requirements of the manpower development.
- e) Development of website with all the information and activities of the Institute.

Measures:

Arunachal Pradesh which is resource rich state particularly in terms of bio-resources has to harness it for industrial and economic development along with its sustainable management and utilization. The basis of any management plan has to be research and development. There is need to strengthen this sector. Hence, in this direction it is proposed to Department of Biotechnology, Government of India to peruse the proposal and extend support to establish the **Centre for Bioresources and Sustainable Development Centre** in Arunachal Pradesh under the aegis of Arunachal Pradesh State Council for Science & Technology for initiating and pursuing research and developmental activities in the field of Biotechnology.

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