

**UPDATED NATIONAL STATE – OF - THE - ART REPORT ON
BIOTECHNOLOGY**

1.0 NAME OF THE COUNTRY: BHUTAN

**2.0 NAME, ADDRESS, AND CONTACT DETAILS INCLUDING
TELEPHONE, FAX, E-MAIL, ETC. OF THE FOCAL MINISTRY
/ INSTITUTION ON BIOTECHNOLOGY**

Council for RNR Research of Bhutan (CoRRB),
Ministry of Agriculture, Thimphu,
Bhutan.
Tel: +(975)-02-322936/323514, Fax: +(975)-02-322504
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**3.0 NAME, ADDRESS AND MAJOR ACTIVITIES OF THE KEY
R&D ORGANIZATIONS / ACADEMIC INSTITUTIONS
INVOLVED IN BIOTECHNOLOGY ACTIVITIES
(GOVERNMENT, NGOs, AND PRIVATE ORGANIZATIONS)**

- a. RNR Research Centre,
Council for RNR Research of Bhutan,
Ministry of Agriculture, Yusipang,
Thimphu.
Tel: +(975)-02-3216002/321603 Fax: 321601
e-mail: lib@druknet.bt

- b. National Centre for Animal Health,
Department of Livestock,
Ministry of Agriculture,
Serbithang, Thimphu,
Bhutan.
Tel: +(975)-02-351083/351093 Fax: 351095

- c. National Biodiversity Centre,
Ministry of Agriculture,
Serbithang, Thimphu,
Tel: +(975)-02-351218/351417 Fax: 351219

- d. Bhutan National AI & Semen Processing Centre
Department of Livestock,
Ministry of Agriculture,
Wangchutaba, Thimphu,
Bhutan.
Tel: +(975)-02-351102 Fax: 351222

- e. National Warm Water Fish Culture Centre,
Department of Livestock,
Ministry of Agriculture,
Galephu, Bhutan.
Tel: +(975)-06-251190 Fax: 251129

4.0 PRESENT STATUS OF DIFFERENT AREAS OF BIOTECHNOLOGY

The use of biotechnology in Bhutan is still in its embryonic stage. There are many areas where the technology needs to be applied to benefit from its merits. So far, the technology has been introduced in the areas of agriculture, health and livestock. Bhutan has long been recognized as one of the 10th Global “Hotspots” of biodiversity. Therefore, the vast diversity offers immense opportunity for the Kingdom to explore and benefit through sustainable application of biotechnology.

4.1 Plant biotechnology

The Druk Seed Corporation and Council for RNR Research of Bhutan are the only organizations which give focus on plant biotechnology by following the protocols and recipes developed by international organizations.

Plant Tissue Culture

Tissue culture technique was introduced in Bhutan since mid sixties. It was applied for in-vitro rapid multiplication of plants such as potato, ornamental plants, apple plants, medicinal & aromatic plants etc. In the national seed

potato production system, pre-basic seeds are produced from the in-vitro plantlets for production of certified seeds. The technique has been used in commercial production of healthy ornamental plants such as orchids, Calla lily, rhododendron etc. Some medicinal & aromatic plants are also multiplied for research purposes. The Druk Seed Corporation has the capacity to use tissue culture techniques to produce pre-basic seed potatoes, orchids, banana and other ornamental plants on a commercial scale. In the Council of RNR Research for Bhutan (CoRRB), the use of tissue technique is limited to the micro propagation of potato and aromatic & medicinal plants for research purposes only.

Medicinal & Aromatic Plants (MAP)

The kingdom is rich in medicinal and aromatic plants. Some of the wild medicinal plants are being domesticated to reduce pressure in the wild. The domesticated plants are multiplied in the field for commercial production. Products of aromatic plants such as lemon grass oil are being produced by the farmers to enhance their income and livelihood. The potential for sustainable production and marketing of medicinal & aromatic plants is under study. The National Institute of Traditional Medicine is responsible in collection, production and supply of traditional medicine. The traditional medicine system exists along with the modern medicine. The National Institute of Traditional Medicine, Department of Agriculture and Council for RNR Research of Bhutan work jointly on R&D and Extension on MAP. A project funded by EU is currently working on MAP.

Crop breeding

Breeding techniques involving sophisticated method is not yet applied due to limited capacity and infrastructure. Thus, conventional techniques of manual pollination are applied for breeding activities. Breeding for higher yields, resistance to diseases and adaptability to higher altitudes especially for paddy rice are the main areas of research focus.

4.2 Animal biotechnology

The National Centre for Animal Health, National AI & Semen Processing Centre, National Horse & Brown Swiss Cross Breeding Programme, and National Jersey Breeding Centre under the Department of Livestock of the Ministry of Agriculture are the organizations involved in animal biotechnology.

Semen Production and Artificial Insemination (AI)

Farmers prefer Mithun breed to the local cattle breed because of its better adaptability to the existing terrain and contain more fat in the milk. To suffice the preference of the farmers, Mithun semen is collected and preserved for Artificial Insemination. AI for Mithun, Jersey and Brown Swiss are now available to the farmers through extension centres.

4.3 Health and Industrial biotechnology

Health biotechnology

The National Centre for Animal Health is fully equipped and has capacity to produce local vaccines for viral and bacterial diseases of animals. It produces five different types of local vaccines for the following diseases based on the internationally recommended protocols.

1. Classical Swan Fever
2. Newcastle
3. Anthrax
4. Black Quarter
5. Hemorrhagic Septicemia

The centre has the capacity and facilities to diagnose most all diseases. However, diagnostic kits have to be imported as the centre does not have the capacity to develop kits in their own centre. Some of the common diseases and parasites are FMD, Black Quarter, Rabies, Gid and Liver fluke..

Industrial biotechnology

Other than alcohol distillery, there is no industry where biotechnology is applied. There are three distillery units, which belong to the Army Welfare Project. Raw materials (molasses) are imported from India.

There are two food processing centers and one feed formulation center. The two food processing centers are; Bhutan Agro-Industries Ltd and Bhutan

Fruit Products Pvt. Ltd. The products of the later are very popular in the market of India and Bangladesh which are marketed under the brand “DRUK”. The popular products of these two food processing centers are fruit juices, ketchups, pickles, jams etc.

4.4 Others

National Warm Water Fish Culture Centre (NWWFCC) and National Cold Water Fishery Centre (NCWFC) are the only two centers, which deals in aquaculture. The NWWFCC is responsible to develop and enhance warm water fish culture, and employs the following activities.

- applies the Pituitary Gland extract and the Synthetic Hormone Ovuprim to induce breed cultivable carps
- conducts research on culture of substrate based fish food organism using maize talk, hay and beaten bamboo sticks to raise fish fry and ornamental fishes
- conducts research on breeds of different carps species
- study the potential of using local fishes as aquarium species

The Cold Water Fishery Centre was established very recently and is located at about 3000m a.s.l. At present Trout species is common in the cold waters of Bhutan, which were introduced from abroad. The CWFC shall evaluate different species of Trout and recommend a suitable species for fish farming.

5.0 GOVERNMENT POLICY REGARDING APPLICATION OF BIOTEC. IN NATIONAL DEVELOPMENT

Though there is no department for biotechnology, its techniques are already in use in various organizations. It clearly indicates that government policy is in favour of biotechnology for national development. Tissue Culture Laboratories were established since three decades ago and are fully functional till date. Vaccine production center is established for control of animal diseases and five types of different vaccines are produced in the centre.

6.0 PRIORITY AREA FOR COOPERATION

- Genetic engineering for crop improvement
- Genetic engineering for improvement of livestock
- Diagnosis and vaccine production
- HRD in biotechnology

- Exchange of scientific expertise

7.0 AREA OF EXPERTISE AVAILABLE FOR COOPERATION

- In-vitro multiplication of plants through tissue culture techniques
- Production of vaccines for Classical Swan Fever, Newcastle, Anthrax, Black Quarter and Hemorrhagic Septicemia
- Diagnosis of common diseases and parasites of animals
- Production of traditional medicines from Medicinal & Aromatic Plants (MAP)
- Collection and preservation of Mithun semen for Artificial Insemination

8. RECENT BIOTECHNOLOGY PRODUCTS/PROCESSES DEVELOPED/READY FOR TRANSFER

- a. Mithun semen for Artificial Insemination (AI)
- b. Veterinary Vaccines for Classical Swan Fever, Newcastle, Anthrax, Black Quarter and Hemorrhagic Septicemia.
- c. Pre-basic and certified seed potatoes

9. ISSUES AND CHALLENGES

- Biotechnology techniques are applied in various departments/organizations
- There is no biotechnology coordinating body in the country
