

6.0 Strategy and Framework

The University has a glorious record of outstanding research and technology development during the last ten years. It has also been a pioneer in undergraduate and post-graduate education as well as in transfer of technology.

Considering the priorities of the nation/state the following programmes and sub-programmes have been identified:

Crop Production and Improvement :

Rice :

- To earmark most prospective and export potential rice growing areas.
- To identify and select suitable varieties and maintain their germ-plasms to ensure quality.
- To develop site specific crop husbandry management and its dissemination.
- To provide information by using Cyber-space facilities (GIS, Remote Sensing, etc.).
- To introduce concept of e-Marketing facilities.

Wheat :

- To popularize cultivation by diversification.
- To identify and select demand-driven suitable varieties and maintain their germ-plasms to ensure quality.
- To make liaison with growers and food processing sectors.
- To innovate low cost irrigation facilities.

Maize :

- To find prospective areas for remunerative crop and encourage for investment diversification.
- To identify and select suitable varieties and maintain their germ-plasms to ensure quality.
- To facilitate growers with decision support system.
- To make liaison with growers food processing sectors and exporters.
- Exploiting cyberspace.

Potato :

- Validation of existing package of practices for potential varieties and evolving new package of practices.

- To introduce export oriented varieties.
- To identify and popularize varieties for food processing or value addition.
- To disseminate information and make liaison with growers and warehouse owners for assured price.
- Exploiting cyberspace.

Jute :

- To ensure quality of fibre by introducing low cost technology.
- To make liaison with industry for producing jute diversified products.
- Exploiting cyberspace.

Germplasm collection, conservation and evaluation in mandate crops :

- Identification of traits governing yield, quality, adaptability and resistance to major biotic and abiotic stresses.
- Cataloguing of promising genetic stalks

Plant Breeding :

- Breeding for improved pure lines, open pollinated varieties, composites, etc. of major crops for different agro-ecosystems in cereals, pulses, oilseeds, vegetables, sugarcane, flowers and fruits to continue.
- Isolation, cloning and characterization of important plant genes leading to improvement of major crops for different agro-ecosystems
- Breeding for quality in selected crops
- Development of hybrids for high productivity and grain quality to accelerate the export
- Development of hybrids for high productivity.
- Development of short-duration single-cross hybrids.
- Evolving superior quality hybrids with high yield and pest/disease resistance.
- Breeding for abiotic stresses like drought, salinity, temperature and waterlogging.
- Identification and development of promising genotypes for higher water-use efficiency
- Improvement of hybrid seed technology in field crops particularly in rice and single cross maize.
- Increased availability of seeds of hybrids.
- Improvement of seed production/ propagation technology of horticultural/ vegetable crops. Seed quality evaluation, maintenance and enhancement for improved germination, vigour and genetic purity.

- Seed treatment including coating and plating for enhanced field emergence and crop vigour.
- Revolutionizing the concept of seed village.
- Advanced studies on plant growth regulation in relation to crop productivity

Resource Management :

- Generation of data base and assessment of soil, water, climate and crop resources using remote sensing and GIS techniques.
- Crop production forecasting for policy planning.
- Studies on nutrient dynamics in soil and plant for efficient utilization of plant nutrients and development of nutrient uptake models.
- Development of diagnostic tools for monitoring organic matter turnover.
- Identification and characterization of genotypes for efficient nutrient uptake, utilization and enhanced soil nutrient availability.
- Management of degraded lands.
- Eco-friendly integrated plant nutrient management systems for sustainable crop yield in different crops and cropping systems
- Development of appropriate cropping system under resource constraints. Management of rice–wheat cropping system.
- Impact of global climatic change on agro-ecosystem
- On-farm water management.
- Development of improved technology for rain water management.
- Crop management technology under limited water supply.
- Determination of water requirements of horticultural crops under micro-irrigation system.
- Developing appropriate technology for watersheds

Plant Protection :

- Refinement and adoption of bio-intensive IPM
- Host–pathogen interaction studies.
- Studies on weather–disease–pest dynamics and forecasting.
- Development of diagnostic technique for efficient disease management.

- Development of integrated disease management modules and strategy involving genetic resistance, cultural and chemical practices and use of biocontrol.
- Development of forecasting modules for major diseases.
- Development of residue free IPM in vegetable production.
- Integrated weed management.
- Management of weed.
- Studies on residue management of agro-chemicals.
- Establishment of mobile plant disease clinic.
- Identification of new high-yielding mushroom strains.
- Development of improved mushroom production and management techniques.
- Role assessment of honey bees in hybrid seed production.
- Utilization of honey production potential.
- Enhancing production potential of Mulberry silk worm.
- Introduction of silk worm in newer areas

Horticulture :

- Standardization and development of appropriate root stalks of mango/citrus/guava and stone fruits for better adopted root system and high density orcharding.
- Plant growth hormones and their use in horticultural crops. Crop improvement and rapid propagation techniques.
- Preservation of fruits and vegetables by food additives and fermentation.
- Physiological changes during handling, packing and storage of fresh horticultural produce
- Screening and development of appropriate protected environment and structures. Disease control including IPM under protected environment.
- Development of package of practices for protected horticulture.
- Development of suitable environmental control systems for polyhouses.
- Development of export-quality roses/bulbous plants and other flowers.
- Quality retention and increased shelf-life of flowers.
- Management of agroforestry systems
- Preservation of fruits and vegetable slices and juices by adding food additives and fermentation.
- Dehydration, packaging and storage of food products and horticultural produce.

- Development of fruit products having medicinal value.
- Fruits and vegetable product development to suit the requirement of domestic and export markets.
- To develop low-cost technologies for value addition.
- Specific research for introduction of new varieties of different crops and evaluate their performance in various agro-climatic situations.
 - Lakshan Bhog has been identified as most suitable mango variety for export.
 - Shahi evaluated to be promising litchi cultivar for export.
 - Introduction of banana cultivars like Kunnan, Karpoorvalli, Lalkela was found to be very promising.
 - Pusa Giant and Pusa Delicious papaya was found suitable for introduction in this region.
- Development of pineapple variety for specific use through clonal selection may be undertaken.
- Large scale multiplication of important varieties for distribution among farmers would be undertaken. Mass scale propagation of banana through micro propagation has already been standardized.
- Rejuvenation techniques for old mango orchard would be standardized.
- Proper canopy management and pruning techniques for litchi would be developed.
- Introduction of new crops like passion fruit, kiwifruit, strawberry, etc. would be evaluated.
- Citrus being home to this region, a vast genetic variation is observed. Screening of citrus germplasm would be taken up.
- Specific management practice to be developed for obtaining pineapple fruit with minimum nitrate content.
- Suitable strategies to be developed to manage die-back problem in mandarin, heart rot in pineapple, fruit and shoot borer in mango.
- Suitable means to be found out to minimize production cost of various fruits.
- Techniques to be developed for extraction of fibre from pineapple and banana.
- Specific research for utilization of biomass from various crop wastes through composting would be undertaken.
- Formulation of new fruit product like frozen fruits, non-thermal preservation including osmotic dehydration of pineapple, mango, litchi, orange, peas, carrot for

export market should be undertaken.

- Formulation of deacidified fruit juice beverages from lime and lemon.
- Formulation of suitable techniques for preparation of jackfruit RTS beverages.
- Development of techniques for efficient extraction of pectin from jackfruit waste.
- Development of postharvest protocol for different fruits and vegetables to be undertaken. Specific research based on 1-MCP treatment, Storage, Packaging etc need to be standardized. For effective utilization of these technological developments, facilities like precooling and packing house are to be established with participation of unemployed youth under P-P-P model. Market based cultivation practice like selection of cultivar, growing season needs to be evaluated and rationalized.
- Extraction and short term preservation techniques of pulp/juice suitable at farmer level from different horticultural commodity like tomato, pineapple, mango, litchi, orange need to be developed. This pulp/juice may be supplied to big entrepreneur engaged in fruit juice business. A district level quality checking facility may be developed to address food safety issue. This activity may be proposed to lift up the processing level of fruits and vegetables and thereby reducing postharvest loss.
- Small entrepreneurs at farm level may be encouraged into the business of dry turmeric, turmeric powder, ginger paste, dry chilli powder, chilli/turmeric/ginger oleoresin, ginger pickle etc for which technology are already available

Agricultural Engineering :

- Reduced and precision tillage
- Rice cultivation machinery
- Development of cultivation machinery for subsoil cultivation and management
- Development of biogas technology for low temperature conditions
- Mechanization of horticultural and vegetable crops
- Mechanization of floriculture
- Development of high crop, orchard and tall trees sprayer especially for application of bio- pesticides
- Development of alternate sources of energy
- Development of equipment for injection of slurry and deep placements of fertilizers
- Agricultural residue and waste management
- Ergonomics and safety in agriculture especially for women farmers

- Development and use of alternate fuels for use in engines
- Collection, analysis and interpretation of hydrometeorological data
- Design of water lifting devices and various types of pumps
- Conjunctive use and pollution studies of surface and ground waters
- Water resource planning and development
- Application of physical, mathematical and computer stipulated techniques in irrigation drainage and ground water
- Micro-irrigation and sprinkler irrigation studies
- Application of remote sensing and GIS in water resources planning
- Watershed management through remote sensing techniques
- Techniques for evaluation of effects of soil conservation measures on watersheds
- Pollution problems of water resources of a watershed
- Reclamation of waste lands
- Inexpensive, people-friendly soil and water conservation measures and structures
- Development, evaluation and adoption of farm machineries befitting small size farms.

Livestock Production and Management :

- Optimized nutrition for healthy and improved livestock production.
- Manpower planning and improving HRD competence
- Strengthening of digitalization of information for prompt and effective exchange and dissemination of information amongst the end users.
- Develop and implement strategy of e-connectivity and cyber extension to drive full advantage of the available human and material sources for their best utilization within a short time.
- Test and popularize organic livestock husbandry based farming system.
- Develop mass media programmes for better health and production
- Creating self employment through livestock entrepreneurship development

Fishery :

- Development of sustainable aquaculture systems
- Designing of efficient hatcheries and improving farm engineering
- Development of cheap and efficient fish feed
- Captive broodstock development and production of quality fish seed

- Development of innovative aquaculture
- Development of catfish and freshwater prawn culture technologies
- Capture fisheries resources and management
- Aquatic biodiversity and environmental impact assessment
- Nutrient dynamics, productivity management of major aquatic ecosystem
- Pollution control and waste management

Human Resource Development :

The University will continue to perform the important role in the development of trained manpower in various fields of agricultural sciences. New courses and advanced training programmes will be launched in order to develop the required manpower to meet the fast expanding private industry and also for promotion of entrepreneurship.

Specific strategy:

- Establishment of the Centres of Advanced Studies.
- Collaboration with advanced educational and research centres at national and international level.
- Post doctoral training.
- Production of teaching aids including video technology.
- Facilitation of study tour for faculty members.
- Training in latest methodologies of teaching communication skills and production of text books, lab-manuals and audio visual aids including video tapes, slides and computer programmes
- Developing instructional farms for pigs, goats, sheep, rabbits, equines for practical training of students and farmers.
- Strengthening of laboratories
- Strengthening of college library with need based facilities, books, periodicals etc

Extension Education :

- Socio-economic and cultural dynamics in socialisation of technology.
- Participatory technology generation and management.
- Media production and information packages for diversification of agriculture.
- Integrated development of village through inter-sectorial micro-level planning.
- Organizational strategy for commercialization of agriculture.

- Multi-media and computer aided information technology in agriculture. Development of rural entrepreneurship.
- Training needs of women engaged in agriculture.
- Feasibility of internet and websites in agriculture.
- Yield gap analysis
- Strategy for enhancing resource productivity
- Strategy for export promotion.
- Promotion of agricultural diversification.
- Economic evaluation of prospective technology
- Short and long-term demand projections of commodities.
- Institutional reforms and micro-planning for resource poor areas
- Identification of potential markets for agricultural export.
- Policies for development of agribusiness
- Documentation of traditional agriculture and indigenous technologies through establishment of Agricultural museum
- Establishment of modern printing laboratory
- Establishment of effective linkage between electronic media and University
- Establishment of more Krishi Vigyan Kendras to ensure one for each district with requisite infrastructure and facilities.
- Establishment of Trainers Training Centre for training and orientation of all Krishi Vigyan Kendra trainers, field staff of technical departments, banks, Non Government Organisations and other trainers including university scientists.
- Adoption of model village concept for integrated rural development.
- Preparation of technical bulletins, manuals, Compact disks, News letters for vocational education and training.
- Farmer scientist interaction programme will be intensified and will be made open through mass media for greater participation.
- Development of women cooperatives network for benefit of small farms and resource-poor women folk.
- Technology assessment and refinement through participatory approach will be extended to all the commodities and all the districts in the hill region.
- Linking on-farm activities with off-farm activities to provide more income and employment.

- Coordination with state extension agencies will be strengthened with accountability for utilization of funds and resources in various research and extension activities.
- Close involvement of non government organisations and farm communities/bodies through staff exchange, seminars, conferences, interaction visits, etc.
- Emphasis on income generating avenues like local handicrafts, value added products, sericulture, apiculture, poultry, rabbitary, etc for more income and employment.
- Promotion of indigenous knowledge system in farm sector as well as in non-farm sector areas.
- Development of distance education programme for rural youth and practicing farmers. Popularizing agricultural and development messages through mass media like radio, newspapers and television, internet and helpline services.
- Organizing mass education of farmers, farm women and others through mobile exhibitions, district level and state level exhibitions and fairs.
- Promoting computer aided internet information dissemination through headquarters and krishi vigyan kendras to remote cases. The tele-text and video-text would be available to the farmers to provide day to day information.

The rapid dynamic changes in agriculture need to ensure equally dynamic continuous growth and development of the University to meet the challenges as witnessed due to structural changes in Indian Agriculture. This needs to pay emphasis on some specific issues of relevance, listed below :

Short Term

- Updating education programme to meet the challenges in sustainability in agriculture and thereby food security through providing required skills to the students and to expose them in new frontier areas of knowledge in building up professional competence, enhancing self-confidence and developing managerial capabilities;
- Introduction of courses in emerging areas such as biotechnology, nanotechnology, molecular biology, food technology, post-harvest physiology, stress response of crop plants, climate change and its impact, biosecurity, natural resource management, trade related intellectual property rights, indigenous knowledge systems, nutrient modeling in crop plants, Gender issues in agriculture and allied sectors;
- Establishment of Department of Agri-business Management which will enrich the students about the market access, supply chain operations and management linking

production eco-region with the consumers in the promising and domestic and global market;

- To foster research of the cultivation of high value commodities efficiently to meet their growing demand resulting from increased per capita income and unharmonisation and unfolding globalization. Post harvest preservation of these perishable crops would also comprise a major area of research;
- Establishment of Centres of Excellence on Conservation Agriculture; IPM and Organic Farming;
- Development of interdisciplinary approach in research to derive solution in comprehensive manner in the area of through utilization of diverse expertise available with the University by creating provision of **Centre of Advanced Studies on Plant Health Management, Certificate course on Bio-inputs in Agriculture**;
- Introduction of **Diploma Courses on Fruit processing and on Sericulture** in collaboration with Gani Khan Institute of Technology, Govt. of India, at Malda and Regional Research Sub Station, Old Alluvial Zone, Manickchawk, Malda;
- Establishment of **College of Agriculture/ Horticulture** at Regional Research Sub Station, Hill Zone, Pedong, Darjeeling ;
- Establishment of **College of Agriculture** at Regional Research Station, Old Alluvial Zone, Majhian, Dakshin Dinajpur;
- Remodeling and reorientation of infrastructural facilities to bring about qualitative changes in extension services through setting up technology parks, seed villages, mobile plant health clinics, adoption of new information and communication technologies;
- Improvement of academic environment through providing modern facilities to the students and staff residing in the campus;
- Human resource development through short term training in India and abroad

Long Term

1. Establishment of a centre for collection, characterization and conservation of agrobiodiversity of North-Eastern Origin.

Northern parts of West Bengal consist of six districts which constitutes an extremely important zone both for its biological and cultural diversities. The Himalayan, Sub-

Himalayan Terai and Alluvial Plains of North Bengal are currently considered as hot spots for biodiversity due to various forces of change. It is worth to mention that a large number of plants have centre of origin in these areas representing North-Eastern Region. The University feels it to be the responsibility to develop a centre for collection, characterization and conservation of agro-biodiversity and farmers/ field level gene/ seed banks to conserve local traditional varieties of agricultural and horticultural crops particularly those of North Eastern origin. The gene pool of these indigenous crops will be of considerable value to mitigate disaster that may occur in the future.

2. Establishment of Research Centre on Medicinal and Aromatic Plants at Regional Research Station, Kalimpong, Darjeeling.

The northern tracts of West Bengal possesses three distinct agro-climatic conditions and full of plant genetic resources due to presence of dense natural forest over a considerable proportion of geographical area. A major section of the biodiversity comes under medicinal plant species. The properties of most of these species are yet unexplored and hence unutilized. An AICRP on Medicinal Plants is being operated in this University. The centre can be further strengthen to create a research centre of medicinal and aromatic plants at Regional Research Station, Darjeeling to develop this sector to meet the domestic and foreign demand to some extent under the present national and global perspective.

3. Establishment of Advanced Knowledge Centre on Traditional Knowledge

With the advent of modern technology disseminations and with their declared hegemony, some of the local knowledge bases have gone extinct or dwindled down and also the shrinkage of the bio-resources rich areas under indigenous communities and vanishing of traditional knowledge, there is urgent need for application and integration of traditional knowledge for the sustainable development of the local people and local ecological resource management. Traditional knowledge on the flora of northern West Bengal and adjacent region is as old as ancient scriptures, bio-geographical niche, cultural history, natural resource on which the aborigines are dependent upon in this area.

In such a situation, the University wants to establish an Advanced Knowledge Centre on Traditional Knowledge to provide a range of opportunities to promote the recognition of the value of traditional knowledge systems. University has perceived that the traditional knowledge originates from people and is transmitted to people by recognizable and experienced actors. It is systemic (inter-sectorial and holistic), experimental (empirical and

practical), handed down from generation to generation and culturally enhanced. Traditional knowledge shows how to intervene in perfect agreement with the environment, highlighting its potential without exhausting it. It is fragile and subject to unwise transformations, nevertheless it is the means of subsistence for two thirds of humanity and constitutes an indigenous reserve of solutions and devices for producing energy, recycling resources and keeping microclimate under control. Using traditional Knowledge does not mean directly reapplying the techniques from the past but understanding the logical reasoning underlying the knowledge system and reapplying it in a creative way which is today's appropriate innovations constitute tomorrow's traditional knowledge.

The Advance Knowledge Centre will focus on research and training in many aspects of the traditional knowledge of Indigenous communities from a global perspective with a special emphasis on local situation, develop the capacity of Indigenous communities, and provide significant and direct benefits. In particular the Advance Knowledge Centre will:

- Promote the use of traditional knowledge in national and local education systems
- Promote respect and use of traditional knowledge in mainstream science and technology
- Promote greater self-reliance for Indigenous people
- Develop greater resilience of traditional knowledge
- Develop the capacity of Indigenous communities to use their knowledge in a globalised economy.

This initiative will specially design to address the needs of northern disadvantaged districts of West Bengal, and in particular the least developed amongst them, which cannot allot adequate financial resources in using environmental-friendly practice and technology.

4. Establishment of Centre for Information Communication Technology

At the advent of rainbow revolution era, the knowledge intensive development plays a pivotal role in delineating the sustainable development of rural people and acts as a prime mover of rural areas. Today's economy is said to be 'knowledge driven economy'. This emergence of 'knowledge driven economy' and 'knowledge driven society' in this millennium market place has placed greater demand for a broader base of population to have broader knowledge and current information in the concerned field. This is very much true in the agricultural field. Information and Communication Technology (ICT) is now the key enabler and a vital component of the new knowledge based economy because it has

revolutionized the process of dissemination of knowledge and information. It is a major factor in economic growth and increasing productivity. There is a need to ensure that the benefit of the ICT percolates to all the different socio-economic strata and to the grass roots of the rural areas. The requirement of transforming a nation, into a knowledge vibrant e-learning environment is vital. The rural areas in northern West Bengal cannot be compared with its urban areas, where needs and service requirements are at a very different level. With poor existing infrastructure in the rural areas, delivery of services of essential requirements becomes in itself formidable task in its villages spread out in four types of agro-climatic zones. It was found that the farmers leave the vocation of agriculture which they found non-remunerative. One of the main reasons of this is the lack of proper information at the appropriate time. This changing scenario demands people to adapt new ways to update their skills and knowledge for making their identity in this competitive world by using most modern technology, Information and Communication Technology (ICT).

In such a knowledge resilient situation, the University proposes to establish a Centre for Information Communication Technology for research and training on different aspects of Information Communication Technology with the aim

- to provide the up to date agricultural information to the northern districts of West Bengal, to research on latest development of information dissemination and technology socialization with the help of ICT
- to impart the skill on effective use of ICT
- to create a knowledge vibrant agricultural society in Northern districts of West Bengal
- to establish Village Knowledge Hub in every villages at Northern parts of West Bengal

5. University-Industry Collaborative venture to carry out market oriented research for developing products or inputs

In Post-WTO era, Indian Agriculture has been witnessing structural changes into commercialization of various research enterprises where private sector has gained more importance. Liberalization of market directs the University to collaborate industrial or private sector to carry out market oriented research for developing product or inputs. In this regard, the University has identified key sectors within its available expertise to collaborate with industries and accelerate the pace of work.

Areas proposed for collaboration:

- Collaborative studies with agro-industries
- Collaborative researches with pharmaceutical companies
- Collaborative ventures with other Research and Development centres

6. Campus Development - Student and Teachers Facility :

Creation of congenial environment at the academic place is an important prerequisite for academic pursuit. Therefore, continuous improvement basic amenities and modern facilities plays an important role in building up better academic environment which ultimately influences teaching learning process in the University.

The students and staffs residing in the hostel and quarters respectively are provided with meager facilities which can not be comparable with any other agricultural universities. Since the campus is located in rural area with having a little amenities and facilities nearby, therefore, it needs to create additional facilities and remodeling and modernizing the existence ones for their efficient use. Among different requirements to develop at the standard level, important ones are : developing banking system, postal system, gymnasium, modernizing of health unit, dedicated electrical line, remodeling of cafeteria, shopping mall, indoor stadium, sports complex, boundary walling of farms, creating drainage facility etc.

7. Establishment of Digital Library and Information Services

As library is considered to be an asset to the University and to the Community utilizing the University Services, it is of immense importance to establish a modern library with referral systems, digital documentation facilities and document delivery systems. A separate library building for any further improvement in quality and quantity is required by the University.

8. Effective mobilization and use of science and technology for innovation and sustainable development

- Enhance capacities for research priority setting, planning, management, monitoring and evaluation for a more pluralistic agricultural development
- Enhance capacities to increase the reach by engaging with the agribusinesses in the private sector and civil society through partnerships and other linkages

- Enhance capacities for relevance and excellence of research through incorporation of emerging sciences and technologies, increased focus on knowledge of processes, interdisciplinary engagement and coordination with multiple constituencies
- Enhance capacities for strategic management of intellectual property and commercialization of technologies

9. Designing systems for linking knowledge with action: delivery systems for technology, knowledge and services; policy instruments; and institutional frameworks

- Enhance operational, adaptive and generative capacity for research, education and extension management in a market-driven and competitive environment by providing stakeholders with a range of knowledge, attitudes and skills to face the real-world challenges
- Enhance capacities and skills for incorporating emerging information technologies into decision support systems
- Enhance capacities for use of ICTs to provide customized knowledge, skills and solutions to farmers and for social networking
- Enhance capacities for research systems-farmers-agribusiness consumer linkages
- Enhance capacities to engage in catalyzing policy and regulatory frameworks related to agricultural development.