MAFSU Vision 2025

8. PERSPECTIVE:

8.1 NEW EDUCATIONAL METHODS AND CURRICULUM DEVELOPMENT

The educational system must be able to meet the challenges by accepting newer developments, moulding them into learning forms and devising optimal methods of presentation. There is an ample scope for integration of disciplines and multidisciplinary teaching with inter departmental co-operation, facilitating interest in students towards learning with better understanding of the subject. A basic assembly of facts can be further brought to life by adding problem-solving assignments to prepare the students to face real life situation. It is proposed to assign the education material development to the senior faculty of the University who would coordinate and collaborate with the students in this task.

MAFSU believes that to develop internationally competitive, highly skilled alumni of the University, the University must be able to attract, develop and retain the best and the highest quality of faculty available. It also recognises that the highest quality of research capacity always demands high quality of its faculty. In addition to improving its infrastructure to support high quality research, MAFSU will strive to ensure a faculty of the highest quality by making.

- The University a learning organization.
- Instituting a Faculty Exchange Programme.
- Instituting a scheme for visiting faculty.
- Sponsoring faculty to advanced courses.
- Implementing a scheme that allows national and international sabbatical.
- Enabling national and international collaboration and partnership in its research, education and outreach programs.

8.2 STUDENTS AMENITIES AND DEVELOPMENT OF COMMUNICATION SKILLS

It is generally a neglected area and needs urgent attention. The hostel space, the classroom space needs to be standardized to the level of International Institutes. New facilities, such as, computers, photocopying, e-mail, internet surfing and telecommunication should be provided in the hostels. For education to be a continuous process, computer facilities should also be provided in the hostel premises equipped with learning programs, video interactive modular programs. In order to reap benefit of the expertise available in outstations, facility for real time video interactive classes need to be developed. In this respect the University would establish collaborative programs with international universities.

8.3 GRADUATE TEACHING ASSISTANT PROGRAMS

In order to elevate the standard of post-graduate education, attempts will be made to introduce graduate assistantship to post-graduate students, with the help of the Government of Maharashtra. This will make available teachers to fill the deficit on affordable basis. Additionally, these post-graduates will develop communication skill, and their knowledge level will also increase.

8.4 GENETIC IMPROVEMENT OF LOCAL LIVESTOCK AS AN EFFORT TOWARDS CONSERVATION OF THE NATIVE GERMPLASM

Maharashtra is very much rich in the resource of genetic diversity and possesses some of the best breeds of livestock. The best indigenous germplasm of livestock, milch and dual purpose animals accounts for 25% Indian cattle population.

Further, it is proposed to establish a Center of Excellence in Animal Genetics and Breeding with divisions, such as, molecular genetics, cyto-genetics, transgenic animal production and Embryo Bank. Efforts will also be made to establish ‘Breeders’ Association’ to encourage in situ preservation of germ-plasm and implementation of programs to scientifically raise and multiply elite animals of the indigenous breed. Using ‘BreedCon’ software the University with the help of government and NGOs will create a computerized database of indigenous breeds of animals over a geographic range. This will be upgraded as web-enabled e-market

for animals, so as to provide accessible platform for sale and purchase of quality animals, whose performance and parent and progeny data is available. This will be a major step towards establishing an organized market for dairy and other animals.

1.0 RENEWED THRUST ON IMPROVING THE PRODUCTION AND REPRODUCTION EFFICIENCY OF LIVESTOCK

Quantum jump in milk production in our country has been achieved mainly through improvement of genetic profile of local cattle by cross breeding. For sustaining the gains of the past, more pragmatic breeding program is to be developed. Reproductive disorders in animals from different regions need be identified for taking appropriate remedial measures. It is proposed to popularize the software developed by the university so as to develop an animal resource database. As a first step, efforts will be made to encourage computerization of Frozen Semen Banks and A.I. centers to carry out dynamic progeny testing. The breeding and performance data of animals will enable analysis to identify common source problems in different areas. This will also enable planned breeding of at least elite animals.

1.0 AUGMENTING FEED RESOURCES AND FEED TECHNOLOGY FOR IMPROVED PRODUCTION

Technologies will have to be developed for strategic utilization of unconventional feeds and fodders to sustain high production. Steps will be initiated to avoid micronutrient deficiencies, which predisposes production and reproductive disorders. Feeding standards need to be developed based on metabolic energy, turnover of degradable and non-degradable proteins and provision of quality crude fiber. It is proposed to establish Center of Excellence in Animal Nutrition with separate division for ruminants, non-ruminants, companion and captive animals and avian species.

1.0 STIMULUS TO SMALL RUMINANT PRODUCTION

Rearing of sheep and goat has provided sustenance to rural economy particularly to the small, marginal and landless farmers who constitute nearly 75 percent of rural population besides enriching soil. These small ruminants are their tangible assets which provide them nutrition and means for regular income. A Frozen Semen Bank and an Embryo Transfer Center need to be established. Efforts will be made to develop mutton breeds suitable for Maharashtra. Breeding

plan for crossing local breeds of goat with elite breeds, such as, Boer, will be finalized. A Center of Excellence for small ruminants will be created that can take care of various aspects like nutrition, management, reproduction, health and meat technology.

There is also a scope for swine meat production due to faster fecundity, higher feed conversion rate and added returns per unit cost.

1.0 IMPETUS FOR THE DIVERSIFICATION OF DOMESTICATED POULTRY FOR MORE MEAT AND EGG

Work is in progress to evolve newer broiler and layer strains of chicken and quails for intensive and extensive rearing and commercial exploitation. Efforts will be made to upgrade local breeds of poultry for non-intensive backyard poultry farming. The backyard poultry farming will be developed especially as poverty alleviation and nutritional supplementation programs for underprivileged areas, such as, remote tribal areas. Bio-security measures will be intensified to a threshold of production of specific pathogen free eggs and chicks. More thrust will be given for post-production technology in processing, packaging and products development. Effective recycling of poultry waste through bio-technological means will be probed.

1.0 ZONAL APPROACH TO LIVESTOCK FARMING INCLUDING EXPORT ZONE

In the present scenario, the income through crop production alone is diminishing day-by-day underscoring the need for integration of livestock with other economic activities for sustained returns. This in turn emphasizes identification of specific livestock zones in the State similar to that of agro climatic zones for adoption of optimum livestock rearing. Evolving appropriate livestock farming systems suitable for different socio-economic conditions of the farmers and agro- zones is the key factor to trigger production planning. A study will be conducted to identify zones in the Konkan regions (high rainfall) that can be developed for raising livestock for export purpose. Benefits of integration of livestock models with other farming systems like conventional agriculture, silvi-pasture, pisci-culture etc. need to be propagated after field trials.

1.0 REFORMING ANIMAL HEALTH AND PRODUCTIVITY SERVICES DELIVERY IN MAHARASHTRA

The State of Maharashtra has a wide web of developed infrastructure for animal health services of both State Departments of Animal Husbandry, Dairy Development and Fisheries and MAFSU. But, there are also areas that are not yet covered. The qualities, effectiveness of the services need to be improved and the orientation of the services needs to be changed in line with international requirements. Animal health and productivity management is a major plank for future development. The University will develop strategies to create real-time and dynamic animal recording system, health, production and breeding database and networking system. The University will offer help to the Department of Animal Husbandry in epidemiology analysis of data for planning. The University will also develop road map to reform the animal health and productivity services, especially for regulated privatization. The herd health and productivity management approach (HHPM) is the only plausible way to address the farmers' issues on efficiency, quality and profitability. The University will work closely with the Government and the Cooperatives to set up HHPM center networks.

1.0 PROMOTING DISEASE SURVEILLANCE AND DISEASE CONTROL THROUGH PROPER PROPHYLACTIC MEASURES

Disease surveillance and control are 'pure public services', hence the University will develop a system of disease data collection and analysis which will be helpful in planning. For effective surveillance the University will join hands with industry to develop specific and sensitive animal-side diagnostics. In order to control infectious diseases of national importance, development of potent biologicals and vaccines covering all serotypes must figure at the top of the agenda.

1.0 ESTABLISHMENT OF A CENTER FOR ANIMAL BIOTECHNOLOGY RESEARCH

Biotechnology has immense scope in livestock sector right from production technology to animal health. It is proposed to establish a Center that can focus on newer areas, such as, transgenic animals, animal growth promoters, genetic-engineering derived health products and value-added animal products. A joint-

venture with industry, wherein the University could use land and specialist human resource as its input and inviting financial participation from the industry would be a practical way to establish 'Biotechnology Park' in Mumbai and Nagpur.

1.0 CREATION OF NEW MARKETING CHANNELS FOR ANIMAL PRODUCTS THROUGH NOVEL FABRICATION TECHNOLOGIES

India has reached an impressive growth in milk production with quantum jump over the last two decades. The quantity of liquid milk handled by organized sectors has been increasing day by day, which is a good omen for novel product development. However, the meat industry is yet to receive due recognition. Though the scenario has changed over a decade, production of clean meat is still a paradigm. Since only the meat trade alone has got vast scope for export marketing beyond 2000 A.D., it is mandatory to streamline this unorganized sector with improved working atmosphere, better processing, hygiene and quality control.

The revolution made in mass communication has greatly exposed the consumer population. The growing urbanization also influences the consumption pattern of processed food with the clientele willing to consume with novel products. Nutritional and quality attributes of products are of paramount importance for India to emerge as a major player in world market.

1.0 RESOURCE MOBILIZATION THROUGH INSTITUTE-INDUSTRY LINKAGE

Anticipated growth in all spheres of livestock farming would be achieved only through infusion of latest technical know-how derived from organized research and development programs in animal sciences sector. To evolve more economically viable and vibrant R&D, integration of institutes with various facets of agro-business industry is essential. Importance will be given to applied and industrial research for generating significant proportion of funds from potential industry consumers. This in turn will expand the base for R & D instead of depending exclusively on State funding. Institutional boundaries must be merged to pave way for collaborative approach.

8.15 DAIRY TECHNOLOGY DEVELOPMENT

The demand of milk and milk products in the country is on the rise. The increase in purchasing power and pace of urbanization is leading to a change in the life style and consumption habits of the households. The current trends indicate the fast urbanization of the human population in the country. This will definitely lead to an increase in the consumption of dairy products. The domestic market for butter and ghee and also exotic products like cheese & yoghurt is growing at a healthy rate of over 10% per annum but the same may not be true in case of international market. The situation is now alarming to the industries which are having international market for this product. These companies definitely have to think about other potential products, which are gaining steady growth all over the world.

The production of dried milk and related products has become an increasingly important segment of dairy industry. The concept was started to utilize the surplus milk into the products having good shelf life at room temperature in the flush season. Today, a number of industries are involved in the manufacturing of variety of dried products comparable to their western counterparts. A range of products is very widely accepted for direct consumption or their different applications in various products. The demand of cheese in India is mainly confined to urban centers and armed forces. However, as the awareness towards cheese is spreading, the demand is gathering momentum. The potential for export of cheese has generated interest in the private sectors in setting up larger units. Important by-products from milk are still not manufactured widely in India despite vast potential. The major attention is focussed on the conventional products. The production of casein, lactose, whey protein concentrate etc. is not taking place on commercial scale rapidly. If the corrective measure and action can be taken to popularize the production of these byproducts on commercial scale, the outcome certainly will strengthen the Indian dairy industry.

Major quantity of the total milk produced is converted into varieties of traditional dairy products for regional tastes. These products are produced in large quantities, but on a small scale by unorganized sector using the old processes, which are empirical in nature. Hardly, efforts have been made to capture and capitalize market in this area. For example, the popularity of curd is very much

evident all over India in the daily diet. Still, there is no method to get it ready in no time. This area still requires much attention by scientists, technocrats and entrepreneurs.

8.16 FISHERIES DEVELOPMENT

During the past five decades, the Indian Fisheries (both marine and freshwater) has experienced a phenomenal transformation from a highly traditional and subsistence activity into a developing and diversified economy sector and as an industry. In spite of its speedy growth, the potential resources continue to be under-exploited. In order to harness the resources optimally from the Indian EEZ, our marine fisheries activities need to be enhanced and expanded far beyond the present levels of exploitation, concentrating on far-shore and deep-sea resource exploitation. Opportunities for sea farming also need to be explored and exploited accordingly. On the inland front, the development has been confined mainly to aquaculture, that too with a limited number of candidate species. The food basket of millions of people around the world, to a great extent, depends on protein and other nutritional requirements, which can be derived from marine sources.

Today fish is considered as a healthy food in view of its high protein content, polyunsaturated fatty acids, vitamins and minerals. Fish also plays an important role in economics of the developing countries in the Asia and Pacific regions. In recognition of the significant role that fisheries and aquaculture play for food production and export earning, it is necessary as well as important to develop suitable aquaculture for food security. Keeping in view the National Agriculture Policy Program of the country, the fast growing fisheries sector has put a premium of importance on developing the sector and aiming to double the fish production by enhancing our resources and adopting innovative scientific technologies.

There is at present only one College of Fisheries at Ratnagiri and a National Institute – the Central Institute of Fisheries Education at Mumbai in the state of Maharashtra. A new degree College is in offing at Pench Nagpur under this University. Non-formal training programs for the fishers are lacking. Thirdly, infrastructure for quality standards (HACCP) in terms of antibiotics, pesticides etc. are lacking, which needs to be developed to a great extent. It is also essential that quality literacy movement is launched in order to ensure that the fish products conform to high standard of food safety and quality.

HARNESSING THE FISHERIES WEALTH FOR BETTER PRODUCTION USING MODERN TECHNOLOGIES

The key areas of research are to include biotechnological innovations in induced breeding of fin-fishes and shellfishes, genetic manipulations for developing improved strains of cultivable organisms and disease resistant stocks, development of rapid and sensitive immunodiagnostic kits, disease diagnosis services, development of vaccines, formulation of aqua-feeds using locally available feed ingredients, diversification of culture practices using alternate species, drugs from the marine organisms, management and utilization of marine living resources and the inland resources in the country and developing technological aids for harnessing the resources etc.

8.17 TECHNOLOGY INTEGRATION AND OUT REACHING FOR IMPROVING LIVESTOCK AND FISHERY PRODUCTION.

Technology integration i.e. on-farm-testing, assessment, refinement, documentation and dissemination of technologies is the major mandate of the Extension Education. The document of the proposed National Agricultural Technology Project (NATP) has stressed the need to view the 'technology' from the holistic approach under the farming systems perspective through on-farm-testing particularly with the small production units involving farmers' participatory approaches. Finally the technology assessment, refinement and dissemination will be conducted by the different extension agencies, involving NGO's in a larger scale. Also introduction of modern financial management practices to the farmers is being contemplated to keep abreast of changes in the present day context. Agro-eco system analysis of specific areas following Participatory Rural Appraisal/Rapid Rural Appraisal techniques, Technology assessment and refinement through On-Farm-Testing, On-Farm Research and Demonstrations involving farmers and livestock owners, identification of the problems and need assessment in veterinary science, animal husbandry and fisheries at different levels including farmers live-stock holders and fisher folks and technology dissemination through demonstrations and training for integration under different farming system/production systems are future areas of action.

9. ISSUES AND STRATEGIES

Issues	Strategies
1. Improvement of Education methods and course contents relevant to generate self-employment.	By advocating active teaching sessions with problems solving assignments, multi disciplinary teaching, and computer aided learning programs with improved facilities for in-service training. The expertise of staff trained under AHRD programme in Advanced Teaching methods will be utilized. MAFSU shall ensure generation in adequate quantity and of the highest quality of alumni that meets Maharashtra's developmental goals in animal and fisheries production sectors. The University shall introduce suitably the entrepreneurship development course component in the University syllabi so as to empower its graduates to face real life situation. The emphasis shall be more on professional building rather than teaching in ivory tower subjects.
2. Faculty improvement	The State Govt. shall be moved to adequately strengthen the existing feebly staffed faculty with the necessary support measures by taking an intensive review of the present staff position and the requirements as per the VCI and ICAR etc. norms as in place. Administrative reforms to make the faculty target-oriented and of 'benchmark quality'. Efforts will be made to develop faculty exchange programs with renowned international universities. The staff will be encouraged to go for post-doctoral training in institutions of International repute. The system of IPR filing and protection of rights of the researcher will be worked out. As provided in the University Statute 4(6), the university is committed to introduce and implement rigorously the system of effective performance appraisal of faculty members on the basis of reward and punishment, appropriately.
3. Improving the fertility of farm animals	By genetic upgradation of livestock, improving the quality of artificial insemination program, improving the dry preservation protocol for preservation of gametes and embryos of all domesticated livestock and prevention of metabolic and nutritional diseases.
4. Production of transgenic animals	To develop disease resistant animals and animals expressing specific genes like transgenic rabbit expressing bovine growth, hormone gene and transgenic goat expressing bovine beta-casein gene.

5. Production of elite farm animals **1. Cattle and Buffalo** • To establish elite herd of crossbred cows capable of reaching higher level of production. • To establish elite herd of Murrah buffaloes.	Purebred animals will be introduced in the breeding program to achieve improvement of quantitative traits and breeding vigor in crossbred population. Establishment of Murrah buffalo herd and selective breeding.
1. Sheep and Goat • Developing crossbred goat suitable for agro-climatic conditions of Maharashtra.	By applying selection pressure on different economic traits over generation. Selective breeding and introduction of superior germplasm from field. Standardization of intensive and semi-intensive production system.
• Strengthening the population of Large White Yorkshire and develop desi pigs.	By intensive breeding and crossing with local and assess the performance of exotic local and their crosses and ultimately to develop a breed with specific quantitative and qualitative characteristics.
3. Poultry • Developing a dual purpose bird for backyard keeping • Evolving new broiler strain. • Evolving a new layer strain • Evolving a new quail strain for meat and egg separately.	The present population of Rhode Island Red will be segregated into inbred lines and in-crossed and out-crossed with new germplasm with more persistence of production traits. By four way of crossing of sire and dam pure lines segregated from available strains for more than 10 years. By way crossing (single way crossed sire x 2 way crossed dam line) of inbred strains over a period of 10 years. For this purpose the synthetic egg line of Poultry Research Station and 2 hybrid strains from other source will be utilized. Meat type: More importance will be given to environmental interaction and nutritional status thereby evolving a new strain with high yield under low plane of nutrition and management. Egg type: More selection pressure will be applied on traits like egg mass, egg number, shell thickness, white colored shell as preferred by most of the consumers.

• Propagation and popularization of other domesticated poultry.	Standardization of nutritional management practices of rearing pigeon, ducks, geese and turkey and other domesticated avian species like emus and ostrich. Dissemination of proven package of practices to interested entrepreneurs. Assessing relative economics of the same.
• Intensify bio-security measures.	Absolute bio-security can be achieved by environmentally controlled housing system. Suitable short term projects will be formulated to control emerging diseases. Production of specific pathogen free eggs and chicks.
6. Conservation and Improvement of Native Livestock	Evaluation and characterization of native breeds. Exploitation of desirable traits.
1. Feed and fodder development • Identification of suitable grass and legume for fodder production in different agro-climatic conditions.	Introduction of high yielding varieties to increase biomass production and study their bio-value in different species for effective utilization. Development of Agro-forestry models for wasteland utilization. Development and popularization of fodder preservation techniques.
2. Mapping the mineral status of Maharashtra	A coordinated investigation initiative will be undertaken to map regional mineral deficiency in livestock and create a data base for the State.
3. Control of emerging diseases	Strengthening of disease reporting system and diagnostic laboratories in collaboration with Department of Animal Husbandry. There is a need to enact suitable legislation to provide tool to the Department to handle disease outbreaks of public-health importance. Promulgation of the Animal disease control Act.
4. Sensitive diagnostic methods	Development of specific diagnostic kits for existing and emerging diseases will be taken up. The focus will be to develop animal-side tests. This will be undertaken in collaboration with industry.
5. Development in vaccinology and immunology	Standardization of existing bacterial and viral vaccines as per criteria of British Veterinary Codex 1985 and OIE norms 1992. Assessment of antigenecity and pathogenicity of field viral isolates. Development of specific pathogen-free flock of

	immuno-compromised lab animals. Application of biotechnological tools like recombinant DNA, hybridoma technology etc. for development of novel vaccines – multicomponent vaccines.
6. Awareness on zoonotic diseases	Development of reference center for zoonotic disease diagnosis under veterinary public health wing. Health education programs on zoonotic disease. Studies on impact of leptospirosis in man and animals.
7. Exploration of indigenous drugs in veterinary practice	A survey of herbs and medicinal plants will be carried out. Exploitation of local herbal resources for preparation of safe indigenous drugs and evaluation of their efficacy before commercialization.
8. Improvement of animal products technology	By evolving standards for fresh and preserved meat. Fixing standards for meat products, evolving newer techniques of merchandising meat and meat products, production of commercial test kits to check malpractices in meat trade. Enhancement of keeping quality of dairy products. Preparation of dairy products for low fat and low caloric diets. Membrane processing for concentration and fractionation of milk and byproducts. Setting up of eco-friendly diary and meat processing plants.
9. Create awareness to livestock farmers on developing technological transformation	Enhancing the three-way Lab-Field-Industry interaction. Intensive and extensive use of modern communication and mass media for dissemination of technology and feedback for refinement and commercialization of the same. Application of Development communication tools.
10. Fisheries strategies	Produce Subject-specialised Professionals in fisheries. Undertake research in frontier areas of fisheries science especially in biotechnology, aqua-feed technology, post-harvest technology, disease diagnostics etc. Serve as a facility for collaborative R&D effort in fisheries. Develop user friendly technology packages for the farmers, entrepreneurs and private industries.

11. MAFSU Virtual Campus-establishment of WTO Cell	Enable life long learning amongst its clients which include its alumni, field officers, farming communities, etc. through flexible learning approaches. MAFSU will embark on creating Virtual Campus through virtual Private Networking using broadband Internet connectivity. The University shall open a WTO cell on providing information and advice through IT technology, on issues related to emerging markets trader and product standard.
12. Reforms and Structural Changes in the University	In order to achieve the set goals, it will be necessary to bring about reforms in University administration and its structure: a. Regulations will be developed to effectively take quality feed back through 'student evaluation', and 'external evaluation' of the contribution of the staff. The incremental and promotional benefits would be based on the evaluation. b. Currently, the 'tenure' provision is only up to Head of the Department, which will be further extended to cover all the academic and administrative posts. The principle of 'contribution and continuation' will be implemented in consultation with the state government. c. It will be crucial to have a competent Vice-Chancellor to head the University. The Act needs to be amended to ensure that best competent person technocrat is appointed. The provision of advertising the position nationally and internationally and searching the best persons available need to be introduced. d. Instead the present Executive Council, the Board of Management consisting of persons whose high merit and excellence have been widely recognised and to be appointed by the Chancellor of the University on lines of IITs and IIMs, and as envisaged in ICAR MODEL ACT. e. The present standing committee for 'Finance, Budget Development and Planning', constituted under Statute 20 shall be restructured and called as Standing Committee for Finance, Planning and Assessment, which shall take periodic reviews of this VISION Document 2025 every year as provided for in Rule No.6 of Statute 21 of the University. A Professor of the University shall be assigned the duties of University Planning Officer for the purpose in view.

10. PROGRAMMES

10. 1 EDUCATION:

10.1.1 Establishment of International Diploma Course:

There is an urgent need to develop an international diploma course in farm management (Dairy, Small Ruminants and 'Poultry) Clinical and Paraclinical Science with a target to attract candidates from SAARC, Middle East, South East Asia and Africa. This will provide much needed funds and will enable MAFSU to get international image. Similarly, short-term courses for international students will also be designed.

10.1.2 Opening up the University courses to foreign and NRI students:

With globalization it is expected that foreign universities would start their activities in the state. They have target to attract students from neighboring countries. In order to earn much needed funds, the University need to evolve system of opening up U.G. and P.G. courses to foreign students, without having to go through VCI entrance (since they will not be practicing in India). Similarly, quota for private students other than Maharashtra students on differential fee structure needs to be evolved in consultation and approval of the state government, as part of resource mobilization.

10.1.3 IT-enabled Continuing Education in veterinary, animal sciences, fishery and dairy technology:

MAFSU will hasten up its efforts to establish 'virtual campus' to encourage among other things, continuing education facilities to a large number of students. Courses in various disciplines will be designed and offered.

Concept of employment generation through 'education for entrepreneurship development' shall be suitably introduced at under graduate level courses.

10.1.4 Lower Education : Diploma, Certificate, Short term trainings in Dairy, Fisheries

As part of trained manpower development programmes (HRD), the University has encouraged private education institutions to conduct the two-year diploma and one-year certificate courses under the Lower Education Scheme of the University mainly with a view to foster vocations in rearing of domestic animals for milk and meat purposes and fisheries. The curricular of these courses needs revision which should include the component like entrepreneurship development including project drafting, venture capital loans for small scale enterprises by the banks, processing and marketing of farm produce and products, at village clusters in view of PURA Model and practical training in farm accounting and finances. (Modern financial management practices).

10.2 RESEARCH:

10.2 ANIMAL PRODUCTION

10.2.1. ESTABLISHMENT OF REGIONAL RESEARCH STATIONS :

Maharashtra is very rich in resource of genetic diversity and possesses some of the best breeds of livestock. The best indigenous germplasm of livestock, milch and dual purpose animals accounts for 25% of Indian cattle population.

Most of the indigenous breeds of cattle and buffalo exceed in draft capacity according to the climatic conditions and geographical location of the region. The native indigenous livestock breeds exhibit distinct superiority in the using poor quality of feed and show a better resistance to tropical diseases.

Today, a need has arisen owing to deterioration in the livestock population due to the inadequate inputs, dilution of breeds due to intermixing and indiscriminate infusion of exotic germplasm for enhancing milk production. Absence of specific strategies and programs for conservation of indigenous breeds, upgrading local breed according to geographical region livestock research stations are required to be established with the following specific objectives in the vicinity of the veterinary colleges of the Maharashtra Animal & Fishery Sciences University, Nagpur.

Objectives :

- Conservation of local breeds of cattle, buffalo, sheep, goat and poultry.
- Genetic improvement through appropriate breeding methods, including bio-technological innovations.
- Research to improve productivity of these animals by developing site specific technological packages and immunodiagnostic kits.

Sr. No.	Location	Breed to be upgraded		
		Cattle	Buffalo	Goat/sheep
1	Livestock Research Station, Igatpuri, Nashik	Dangi		Local
2	Livestock Research Station, Aarey Milk Colony, Mumbai		Murrah	
3	Avian Research Station, Aarey Milk Colony, Mumbai	Layers, Broilers, Quails eMU		
4	K.N.P.V.C. Shirval, Dist. Satara.	Khillar (Tathwade cattle farm Pune to be included)	Pandharpuri	Sangmneri
5	COVAS, Parbhani	Red Kandhari	Marathwadi	
6	Udgir Veterinary College, Udgir	Deoni		Osmanbadi
7	Nagpur Veterinary College, Nagpur	Gaolao	Nagpuri	
8	PGI, Akola			Deccani Sheep

10.2.2. CENTRES/LABORATORIES TO BE CREATED

1. Establishment of Center of Excellence in Animal Genetics and Breeding

It is envisaged to create this Center with divisions for molecular genetics will be established, Facilities will be created for transgenic animal production center, cryo-bank for gametes and embryos and training center for artificial breeding technology. DNA finger printing facility for identification of animals like cattle, sheep, goat and other species will be established.

Further region-wise in-situ and ex-situ conservation and progeny testing in organized farms and field conditions and dissemination of superior germplasm is envisaged.

Activities :

2005-2010	Veterinary College, Nagpur, Mumbai, Udgir	Establishment of Breeders' Association, Create computer database and platform Assessment of bio-chemical parameters of blood and milk for genetic specification; collection of data from various sources on livestock. Project being progress.
2010-2015	Veterinary College/ Nagpur, Parbhani, Akola / Udgir / Mumbai	To establish elite nucleus breed stock; studies on production performance of the breed in the field conditions; characterization of breed by cytogenetic, biochemical and molecular genetic aspects.
2015-2025	Veterinary College/ Parbhani, Akola / Udgir	Dissemination of progeny tested superior germplasm.

2. Establishment of Center of Excellence in Animal Nutrition

The proposed Center of Excellence shall comprise the following divisions and serve he needs of U.G. and P.G. education, research and extension.

Divisions:

✳ **Division of Ruminant Nutrition: (PG Institute, Akola; Nagpur Veterinary College and Bombay Veterinary College)**

This division will have two separate units, one for large and another for small ruminants. The research emphasis will be on unconventional feeds, rumen

microbial manipulation for better fermentation and nutrient utilization, nutrition associated reproductive problems, aiming to find solution to the emerging field problems, which will be of greater use at farmers' level.

✳ **Division of Companion Animal Nutrition (Bombay Veterinary College and College of Vet. Sci. Parbhani)**

With changes in social situations and improvement in the economic status of people in general, pet keeping would become common. In metro cities pet keeping is a trend that has been steadily increasing. Until lat two years pet food market in India is minimal. The pet food market is developing rapidly. Most of the pet foods at present are imported. In order for to develop indigenous industry it is necessary to carry out research on pet food formulation from the ingredients available in the country. Knowledge on the nutritional principles and feeding of dogs, cats, pet birds etc., has been largely neglected. It is right time that this aspect of animal nutrition be given due importance. We therefore propose to establish a division on companion animal nutrition.

✳ **Division of Nutrition of Captive Animals (Nagpur Veterinary College and Bombay Veterinary College):**

Care and welfare of captive animals have been ignored in the past and there is greater awareness among public and animal welfare activist to improve the nutrition, housing and management of these animals. There is definite need to learn more about the nutritional principles and the feeding behavior of these animals and a separate division is fruitful and shall be considered.

✳ **Division of non-domesticated Avian/Game birds Nutrition (Bombay Veterinary College, Nagpur Veterinary College, College of Veterinary Sci., Parbhani and P.G. Institute, Akola)**

There is scope for this part of nutrition discipline to be incorporated in the curriculum and research activities of the nutrition department. Breeding, Feeding and Management of game birds requires serious attention and in another decade or so a separate division for this purpose be established.

✳ **Division of Feed and Fodder Technology (Nagpur Veterinary College, Bombay Veterinary College, P.G. Institute, Akola and College of Vet. Science, Parbhani):**

It is an important aspect of animal nutrition and assumes greater emphasis due to increase use of unconventional feed ingredients, pelletization of feeds and addition of other supplements, fodder evaluation and preservation will be shall be attended to within the next decade. Interdisciplinary approach for studying the problems of feed toxins, feed storage and preservation of food grains is the need of hour. Multi-disciplinary approach for solving problems of toxicology, nutritional pathology, nutritional pharmacology, nutritional biochemistry etc., is necessary. Establishment of Quality Control Laboratory for feed analysis for nutrients, toxicants, pesticides, vitamins and micronutrients anti-nutritional factors with modern high tech equipment.

✳ **Division of Veterinary dietetics (Bombay Veterinary College)**

Feeding of sick animals, formulation of special diets for dogs and cats, problem of nutritional related diseases in pets and production animals needs special attention and establishment of a separate division would justify the demands.

✳ **Division of Database and Nutrition Extension Education (P.G. Institute, Akola)**

A separate division with complete network for compilation and establishment of data bank for outreach programs involving VUTRC/FTC/KVK is a must and need to be established in the next five years.

3. Establishment of Center of Excellence in Animal Husbandry Economics: (P.G. Institute Akola):

This Center will take care of livestock development, planning and policy research with multi dimensional objectives to ensure sustainable livestock development. While the fruits of livestock development are expected to be encouraging in terms of rural welfare, better nutrition and foreign trade, the question of livestock development itself is not without any constraints despite vast livestock wealth. While feed and fodder shortage have been problems since planned breeding has been taken up a few decades ago, lack of rural infrastructure have continued to be an obstacle for further development. Fluctuating prices act as disincentive for the farmers. The strategy would be to address these issues through implementation of appropriately designed research projects, surveys etc. The

proposed center would be able to accomplish this objective by identifying problems, analyzing their implications, suggesting alternative solutions and evaluating their suitability. This center will have multi-disciplinary staff support who are experienced to have multi-faceted ideas to multiply benefits to rural downtrodden.

10.2.3 RESEARCH PROGRAMMES

1. Conservation of vulnerable native livestock breeds

It is necessary to identify and survey the native livestock breeds, locate the breeding tract of the respective breeds, to preserve the germplasm and to study the bio-chemical parameters of the breed for genetic specification of the particular breed such as Karyotyping and DNA profile like Restricted Fragment Length Polymorphism (RFLP) and Random Amplified Polymorphic DNA(RAPD) etc. for conservation of native germplasm. Further region-wise in-situ and ex-situ conservation progeny testing in organized farms and field conditions and dissemination of superior germplasm is envisaged.

Activities :

2000-2005	Veterinary College / Nagpur, Bombay, Udgir and Parbhani	Establishment of Breeder's Association, Create computer database and platform Assessment of bio-chemical parameters of blood and milk for genetic specification; collection of data from various sources on livestock. Project being progress.
2005-2015	Veterinary College / Nagpur, Bombay, Udgir, Parbhani and P.G. Institute, Akola-	To establish elite nucleus breed stock; studies on production performance of the breed in the field conditions; characterization of breed by cytogenetic, biochemical and molecular genetic aspects.
2015-2025	P.G. Institute Akola-	Dissemination of progeny tested superior germplasm.

1. Augmenting reproduction of livestock by enhancing conception rate through improved artificial breeding technology

There are about 600 breeding bulls located in different Semen Banks of Maharashtra being used for Semen production. Though 30 lakhs Artificial Insemination are being carried out annually, the over all conception rate is not too satisfactory. The fertility rate is poor in buffaloes compared to cattle. One of the key factors affecting post thaw survival of sperms is freezing rate adopted in the

conventional freezers. This warrants formulation of ideal freezing protocol for each bull. The bulls need to be periodically screened by in vitro fertility assessment test to ensure good quality semen. Necessary infrastructure will be developed to screen quality. Further cyro banks will be created to conserve the gene pool of livestock of southern region. Further sexing and cryo-preservation of genetically superior embryos will also be undertaken. Apex center for imparting training on various aspects of cryo-preservation and handling of gametes and embryo will be established for the benefit of field veterinarians and students.

Activities :

2000-2005	Veterinary College/ Parbhani, Nagpur and P.G. I. Akola	Enhancing the conception rate of bovine semen by improving the semen freezing protocol.
2000-2010	Veterinary College/ Parbhani, Nagpur and P.G. I. Akola	Periodic evaluation and monitoring of fertility status of bulls used in Maharashtra.
2005-2010	Veterinary College/ Shirval, Udgir and Parbhani	Establishment of Centre for Certified Semen Service (CSS).
2005-2015	Veterinary College, Udgir and Parbhani	Conservation of germplasm of South Indian Breeds of livestock.
2015-2025	Veterinary College/ Bombay/ Nagpur / Parbhani / PGI, Akola	Establishment of training centre for artificial breeding technology.

3. Augmenting reproduction of livestock by enhancing conception rate through improved artificial breeding technology

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aspects of cryopreservation and handling of gametes and embryo will be established for the benefit of field veterinarians and students.

Activities :

2000-2005	Veterinary College / Nagpur, Parbhani, Bombay and P.G. I. Akola	Enhancing the conception rate of bovine semen by improving the semen freezing protocol.
2000-2010	Veterinary College / Nagpur, Parbhani, Bombay and P.G. I. Akola	Periodic evaluation and monitoring of fertility status of bulls used in Maharashtra.
2005-2010	Veterinary College / Nagpur, Parbhani, Bombay and P.G.I.	Establishment of Centre for Certified Semen Service (CSS).
2005-2015	Veterinary College / Nagpur, Parbhani, Bombay and P.G. I. Akola	Conservation of germplasm of South Indian Breeds of livestock.
2015-2025	Veterinary College / Nagpur, Parbhani, Bombay and P.G.I. Akola	Establishment of training centre for artificial breeding technology.

4. Improvement of local goats by cross breeding with exotic germplasm:

The available indigenous goat breeds are tall and lean with a body weight of 12-15 kg at the age of one year. Even through, they are having very good prolificacy, disease resistance and drought resistance quality, only increase in body weight will fulfil the meat requirements in the market. Before introducing new exotic germplasm in the present population, a study on the viability and growth performance of the crossbreds under farm and local field conditions is a necessary condition as it will form the basis for future breeding plans. A study on different blood levels of exotic crossbreds will enlighten the scientists to choose the best combination for good profitability to the farmers especially for meat production.

Activities :

2000-2005	Veterinary College / Udgir, Nagpur and P.G. I., Akola	To study the growth performance, viability, reproductive and economic traits of the 50 percent exotic-local breeds under farm and field conditions. To estimate the carcass characteristics of cross bred.
2005-2010	Veterinary College / Udgir, Nagpur and P.G. I., Akola	Evaluation of economic traits of crossbreds and introduction of the same in farmers flock.

5. Transgenic Animal Production

The development of gene transfer techniques has opened new era in the improvement of farm animals. The production of transgenic animals would be immensely useful for growth promotion, carcass improvement, improved milk production and production of biologicals and pharmaceuticals. The main objective of this program is to produce transgenic rabbit models, over expressing the bovine growth hormone (bGH) gene and transgenic goat incorporating the bovine gene for the milk protein, beta-casein with an attempt to hyper express it.

Activities :

2000-2005	Veterinary College / Nagpur, Parbhani and P.G. I. Akola	Standardization of various techniques involved in production of transgenic animal such as super ovulation, collection of embryos, micro-injections of embryos etc.
2005-2010	Bombay Veterinary College	Development of transgenic rabbit expressing bGH gene- Preparation of embryo donor female rabbit. Preparation of vasectomised rabbits. Preparation of pseudo pregnant female for foster mothers. Isolation of single cell embryos. Preparation of 8 kb genomic clone of rat beta-casein fragment, micro injection of the DNA fragment. Transfer of embryos into pseudo pregnant mothers. Checking the new born for the presence of the insert by polymerase chain reaction and hybridization techniques; Expression studies.
2010-2015	Veterinary College / Nagpur, Parbhani and P.G. I. Akola	Development of Transgenic goat expressing bovine beta-casein gene- Cloning of bovine beta-casein gene. Construction of beta-casein gene with strong promoters. Micro injection of the beta-casein fragment into pro-nucleus. Transfer of injected embryo into suitable recipient. Detection of the transgene in newly born animals.

6. Conservation of native canine germplasm of Maharashtra

Maharashtra has a long canine history where many distinct breeds were evolved, which are known for their valour. However, introduction of some European breeds lead to the gradual decline in the pre-eminence of native breeds. As a result, some of the outstanding breeds petered out of existence. Indigenous dogs share

certain common physical features, making them suitable to life on the dry, tropical plains of Maharashtra.

Activities:

2000-2005	Veterinary College/ Nagpur, Udgir, Parbhani and P.G. I. Akola	To identify, characterize the native breeds of Maharashtra. To maintain pure bred stock of Rajapalayam, Kombai and Chippiparai. To cryopreserve he semen of outstanding males of these breeds.
2005-2015 2015-2020	Veterinary College/ Nagpur, Udgir, Shirval, Parbhani and P.G. I. Akola	Preservation of elite/pure germplasm and propagation by artificial/natural breeding. Popularization of canine A.I. and Genetic services.

7. Development of improved strains of domesticated poultry species for increased production and preservation of elite germplasm for future use

The present population of broilers and layers will be genetically manipulated to improve the qualitative and quantitative characteristics. New broiler strain will be developed by four way crossing of sire and dam pure lines segregated from the available and exotic germplasm for more than 10 generations. New improved layer strain will be evolved by three ways crossing of inbred strains over a period of 10 years and by strict index selection. In the present scenario of quail breeding, there is only silver line demarcation between meat and egger strains. Efforts will be made to widen this gap by evolving separate strains for meat and egg production. The present population of Rhode Island Red will be segregated into inbred lines and subjected to in-crossing and then out-crossed with new germplasm of same genome with more persistence of production traits and acclimatization to adverse nutritional and environmental conditions of backyard avocation.

The poultry germplasm preservation laboratory will be established. The superior germplasm in terms of gametes of all improved strains of domesticated species of poultry can be preserved for future. The cryopreservation protocol for gametes of different species of poultry will be formulated and experimented for this purpose, so that the breeding programs can be handled with precision and ease with determined genetic gain.

Activities :

2000-2005	Veterinary College / Bombay, Nagpur, P.G.I. Akola	Establishment of poultry germplasm preservation laboratory.
2005-2010	Veterinary College / Bombay, Nagpur, P.G.I. Akola	Developing freezing protocol for cryopreservation of gametes of different species of poultry.
2000-2010	Veterinary College / Bombay, Nagpur, P.G.I. Akola, Veterinary College, Udgir and Shirval	Evolving new strains of broilers. Evolving new strains of quails for egg and meat.
2005-2015	Veterinary College / Bombay, Nagpur, P.G.I. Akola, Veterinary College, Udgir and Shirval	Developing new strain of layer Developing a dual purpose strain suitable for backyard rearing.
2010-2025	Veterinary College / College, Udgir and Shirval	Distribution of improved germplasm to the field and study their performance as feedback for refinement.

8. Technological improvement to increase the feeding value of non-conventional feeds for livestock and poultry

Livestock production is hampered by deficiency of feed and fodder. At present the total poultry feed production is 5.3 millions tones and by 2020 the feed requirement will grow five folds, causing wide deficit of main food grains like maize, sorghum, ragi etc. In this context, it is the need of the hour to explore for new sources of ingredients with matching availability and palatability. Most of the unconventional feed resources are either highly fibrous or have anti-nutritional factors. Therefore technologies are to be developed for processing and strategic utilization of unconventional feeds including tree leaves and byproducts of agricultural industry. Further economic feeding standards will be developed incorporating these unconventional feeds for different regions of Maharashtra.

Activities :

2000-2005	Veterinary College / Bombay, Nagpur, Parbhani and P.G. I. Akola	Develop suitable technologies to improve palatability and enhance nutritional value of different unconventional feed and fodder.
2005-2010	Veterinary College / Bombay, Nagpur, Parbhani and P.G. I. Akola	Evaluation of technologies and newer agro-industrial by products for feeding livestock.

2010-2015 2015-2020	Veterinary College / Bombay, Nagpur, Parbhani and P.G. I. Akola	Developing cost effective feeding standards for different livestock incorporating unconventional feed resources. Biotechnological tools to improve fodder and forage varieties.

10.3 ANIMAL HEALTH

10.3.1 CENTRES/LABORATORIES TO BE CREATED

1. Establishment of Center of Excellence in immunology and vaccinology (Mumbai, Nagpur and Parbhani).

- To study the Relationship of infection and Immunity.
- To conduct research on newer immunodiagnostic techniques.
- To isolate and characterize etiological agents to evolve newer vaccines with novel methods using local isolates like Development of rabies vaccine in transgenic potatoes, carrots.
- To create national and international training center in diagnostic virology and immunology for recognition by FAO / IAEA / OIE / WHO.
- To develop referral center for emerging diseases like bluetongue, peste des pestis ruminants, infectious Bovine rhinotracheitis, etc.
- To evolve different cell lines for propagation of different viruses.
- To evolve newer vaccines for parasitic diseases.

2. Establishment of Center of Excellence in Veterinary Epidemiology and Preventive Medicine: (Bombay Veterinary College)

- The Center will establish a central database by using the software 'Herdman' and integrate the same with other softwares, such as, Semen*perfect* and Herdman*com* will enable handling of large data for analytical work. Efforts will be made to standardize herd medicine protocols for health management in large commercial herds. The emphasis will be on computerizing the lifetime data of animals and analytical and interpretative capabilities. Based on the computer software disease reporting systems will be developed.
- There are no centers specialized in animal health planning. Efforts will be made to establish a section in the Department of Preventive Medicine and Epidemiology that can handle the planning needs of the states.

2. Establishment of Center of Excellence in Clinical Studies (Bombay Veterinary College, Nagpur Veterinary College and College of Veterinary and Animal Sciences, Parbhani)

The increase in the cost of animal in terms of high production i.e. milk and meat envisages a better and quick diagnosis in the management of disease of animals.

In the nest millennium, India will be the forerunner in the global livestock industry. Pioneer institutes such as, MAFSU will have a pivotal role in providing the best veterinary care to farm and pet animals. The teaching hospitals of this University will be developed on the line of referral centers, which will provide services ensuring high degree of precision in diagnosis and treatment to benefit the farmers. The proposed Center for Excellence in Veterinary Clinical Sciences will have following units:

4. Center of Excellence in Nuclear Medicine (Bombay Veterinary College):

The University has distinction to establish Country's first Veterinary Nuclear Medicine Center at the Department of Medicine, Bombay Veterinary College. During the next four year attempt will be made to expand the activities and establish following ancillary units:

a) ISO-9000 grade laboratory animals facility
b) Radio-synthesis Laboratory
c) Drug Delivery Research Laboratory
d) Radiotherapy unit
e) International Diploma course in nuclear medicine applications in animal science.

5. Establishment of Center of Excellence in Wild–life: Nagpur Veterinary College):

The Nagpur Veterinary College has been in pioneer in developing disease monitoring and control systems for both free-range as well as captive wild-life. In order to facilitate research in these areas, it is proposed to establish a Center of excellence in wild-life at Department of Medicine, Nagpur Veterinary College. The Center will be involved in disease monitoring and referral Center.

6. Referral Units in Obstetrics and Gynecology (P.G. I. Akola, Nagpur Veterinary College, Bombay Veterinary College and College of Veterinary Science, Parbhani):

Dairy animals provide major contribution to the country's economy. Hence timely augmentation of production in these animals is essential. The following units are proposed to be established in the next 25 years.

- **Infertility Center (P.G.I., Akola):** It will exclusively specialize in the infertility counseling in farm and pet animals. Emphasis must be given to reproduction in farm animals, which has a direct effect on the economy of a farmer.
- **Center for research in neonatal Care (Nagpur Veterinary College and College of Vet. Science, Parbhani):** The unit will do research to standardize protocols to facilitate management of post-parturient dam as well as neonates so as to prevent morbidity and mortality in post parturient dams and neonatal calves.
- **Commercial Embryo-transfer unit (P.G.I., Akola and Bombay Veterinary College)**: The transfer of Embryos in animals owned by small farmers to augment production of quality animals.

7. Referral Units in Surgery and Radio-imaging Techniques :

- **Orthopaedic unit for farm and pet animals**: **(Bombay Veterinary College and Nagpur Veterinary College)**: The increased cost of an animal necessitates all-round efforts save life of the productive animals. Accidents leading to fractures and orthopedic problems are common in farm animals. Orthopedic services to pet animals offers a potential area of revenue generation. Efforts will be made to establish linkages with medical surgical units and industry that are manufacturing surgical implants to offer consultancy and animal trial facilities.
- **Trauma - care center for farm and pet animals (Bombay Veterinary College)**: A separate unit for trauma care is required wherein immediate surgical care is taken to minimize further damage to the affected tissues/bones and to save the life of the animal.
- **Center for research in anesthesiology in farm and pet animals (P.G. I. Akola, College of Vet. Sciences, Parbhani)**: Anesthesiology plays a vital

role in the success of a surgery. Anaesthetic regimen varies with species as well as age and disease condition. A separate unit will keep in proper anaesthetic management.

- **Bio-implant Laboratory (Bombay Veterinary College):** Various bio implants are in use to hasten the healing process as well as facilitate in early bridging of fractured fragments. The department of surgery shall process and prepare various bio-implants required not only in the Veterinary surgery but also for use in Rumen medicine.
- **Ophthalmology unit (Nagpur Veterinary College and College of Vet. Science, Parbhani):** Vision is an important factor for any living being. The unit will cater to the needs of farm and pet animals in IOL and lens implantation to restore vision in farm and pet animals.

10.3.2 RESEARCH PROGRAMMES

1. Development of improved diagnostics and animal-side diagnostic kits

The disease diagnostic techniques currently in practice are conventional, time consuming and at times unreliable as they fail to clearly differentiate between closely related diseases / antigens. Added to this introduction of new germplasm into the population coupled with ever changing genome and environmental interaction lead to the emergence of new variants / pathogens with drastic change in disease manifestation, thus precipitating present disease surveillance and control scenario. Hence it is high time to improve the existing technologies for developing more sensitive, simple and quick diagnostics involving latest technological tools like ELISA and immuno chromatographic techniques. The disease / pathogens to be targeted in this program include Foot and Mouth Disease, Rinderpest, PPR, Bluetongue, Rabies, Parvo virus, Duck plague, chicken anemia, IBD, ND, Avian ascites (Leechi Disease) and Hydatidosis.

Activities:

2000-2005	Improvement of existing technologies using latest Bio-Technologies using latest Bio-Technology tools.
2005-2010	Explore for novel methodologies for disease diagnosis using frontier technologies.
2010-2025	Evaluation of new techniques, methodologies and moulding them into kits.

Validation of diagnostic kits for field use and scaling up the production for wide use at field level.

2. Development of immunosensors, molecular virology and application of molecular epidemiology in control of emerging diseases

In the recent past immunosensors have been developed in number of fields. There are suitable devices for rapid detection of wide range of target molecules. These devises combine the selectivity of antibodies with sensitivity and rapid measurement of immunosensors. Such an immunosensor technique will be the future strategy and guiding force for disease surveillance. CDNA probes and application of frontline technologies like ELISA and PCR will facilitate quick diagnosis. A number of disease like Bovine Spongy form Encephalopathy (BSE) will be a problem during 21st Century. Hence the diagnosis of new diseases will be based on purified antigens and tailor-made antibodies including monoclonals. A panel of monoclonals will be developed and kept ready for accurate diagnosis of such diseases. The sensitivity of ELISA technique will be enhanced, by applying luminescence and chemi-luminescence assays.

Activities :

2000-2005	Bombay Veterinary College	Development of immunosensors.
2005-2010	Bombay Veterinary College	Development of panel of monoclonal antibodies for different emerging diseases.
2010-2020	Bombay Veterinary College	Validation and application of immuno sensors and tailor made antibodies for sero-surveillance control of emerging diseases.

3. Synthesis of Immuno-prophylactics and vaccines using biotechnological tools for prevention, control and eradication of endemic, emerging and exotic diseases

Proven biologicals are paramount importance to improve herd health and ensure better planning for control / containment of infectious diseases and thereby improving productivity and preventing economic losses. Although the vaccines currently in vogue provides satisfactory bio-security with import of exotic germplasm and changes in ecosystem, emergence of new and virulent variants of pathogens are witnessed. The warrants dire measures to change the profile of existing biologicals / vaccines / operation procedures and thereby developing subunit

vaccines / multicomponent vaccines genetic engineered vaccines and bio-synthetic / synthetic vaccines. The diseases / pathogens considered as threat in ensuing millennium that needs advance prophylactic measures are FMD, RD (inactivated), PPR (live attenuated) Rabies, Blue Tongue, Marek's Disease, IBD, ND, Duck plague, Leechi disease, Salmonella, Mycoplasma, and *E.coli*.

Activities:

2000-2005	Veterinary College / Nagpur, Bombay / Parbhani	The existing vaccines will be improved. The mode of application and schedule will be rationalized.
2005-2015	Veterinary College / Nagpur, Bombay / Parbhani	Development of new generation, potential vaccines for emerging diseases using bio-technological tools.
2010-2020	Veterinary College / Nagpur, Bombay / Parbhani, P.G. I, Akola	Validation and field application of biologicals developed.

4. Research on causative agent, pathology and pathogenesis of infectious diseases, their surveillance and creation of data base for forecasting and control

Proper infrastructure network has to be created for identifying outbreaks of disease, immediate reporting to regional diagnostic laboratories to ensure quick diagnosis followed by prompt and effective control measures. As there are high mortality and morbidity rates in some infectious diseases, it is right time to evolve disease preventive and control strategies with missionary zeal. Effort are being made to develop comprehensive data base on diseases of national and regional importance. The disease distribution over the entire state for a decade will be the database for a long term effort to monitor and forecast disease pattern. When fully geared up this data base will be the most sought after material in disease investigation.

Activities:

2000-2005	Veterinary College / Nagpur, Parbhani	Creation of Statewide infrastructure facilities to monitor and report disease outbreaks.
2005-2010	Veterinary College / Nagpur, Parbhani	Disease investigation and creation of database.
2010-2020	Bombay Veterinary College	Disease forecasting and advisory service at national level for diagnosis, control, containment or eradication of important diseases of livestock and poultry.

5. Vector Control Programs:

As vectors play a major role in spread of most dreaded and infectious disease of livestock such as Bluetongue, their control is an important strategy to control major epizootics. Global control programs against vectors are in progress with special emphasis of tropical countries. Generation of data on arthropods and other vectors will be a guiding light for biological, immunological and chemical control of immature stages of muscid flies, Culicoides and ixodid / argasid thick. It is therefore proposed to take up detailed research program for evolving an integrated, safe and cost effective methodology for control of vectors.

Activities:

2000-2005	Veterinary College / Mumbai, Nagpur, Parbhani and P.G. I. Akola	Collection of data on epizootic caused by vectors with relation to agroclimatic conditions and nature of host.
2005-2015	Veterinary College / Mumbai, Nagpur, Parbhani and P.G. I. Akola	Development of novel technologies for biological, immunological and chemical control of vectors.
2010-2020	Veterinary College / Mumbai, Nagpur, Parbhani and P.G. I. Akola	Development of acquired resistance in livestock and poultry to disease causing vectors.

6. Strengthening of biological containment and physical containment facilities for safe handling of hazardous pathogens and recombinant microbes to augment research on novel biologicals to control economically important, emerging and exotic diseases

Remarkable developments have ensured in the last few years in the field of genetic manipulation and the scenario has shifted from the laboratories to the market place elsewhere. In India there is a growing awareness of the commercial potential of bio-technology and efforts are being made to promote large scale use of indigenously relevant bio-technologies. The new capabilities to manipulate the genetic material by recombinant technique present tremendous potential and find use in many novel experiments and applications. The success of indigenous research efforts would soon be translated into commercially viable technologies through clearing houses with major R&D centres, Universities with academic institutions and by the industry at large. The animal pathogens to be handled in

laboratory needs bio-containment facilities. The three elements of containment include laboratory practice and technique, safety equipments and facility designs. These facilities will prevent escape of pathogens into environment outside laboratory.

If proper bio-safety measures are not adopted, some of the animal pathogens being zoonotic in nature may adversely affect human health. Thus the animal pathogens and the unnatural recombinant microbes need to be prevented from escaping into virgin environment and thereby causing biological pollution.

Thus a number of bio-safety levels will be created on priority basis, satisfying the requirements stipulated as per bio-safety guidelines and research will be initiated to develop biologicals for disease like FMD, Bluetongue etc.

Activities :

2000-2010	Bombay Veterinary College	Creation of infrastructure for biological and physical containment facilities
2010-2020	Bombay Veterinary College	Safe transfer of pathogens and recombinant microbes for development of novel immunologicals to control important diseases.

7. Creation of Central Laboratory Animal Facilities and production of Specific Pathogen Free (SPF) animals and birds to cater the needs of Research.

In order to pursue various biological, microbiological and bio-medical studies involving pharmacokinetics, the availability of standard, genetically pre-determined, healthy laboratory animals are most crucial. Specific pathogen free animals and birds are necessary for production of standard biologicals for research and prophylaxis. Research is focused to improve productivity and uniformity of these laboratory animals, since these animals are to be specific with respect to different characters. Through this program, it is proposed to develop SPF animals in various species of livestock to ensure standard research capability and to produce efficient biologicals and other products at this University.

Activities:

2000-2020	Bombay Veterinary College and P.G. I. Akola	Scientific production of standard laboratory animals
2001-2005	Bombay Veterinary College and P.G. I. Akola	Production of SPF animals in different species of livestock
2006-2010	Bombay Veterinary College and P.G. I. Akola	Assessment and standardization of genetic parameters and phenotypic characteristic of SPF animals and birds.

8. Studies on Environmental Production physiology and animal behaviour of different livestock to tap maximum production

The environmental production physiology is the area, which need to be given more importance to draw maximum benefit from livestock enterprise. This can be achieved only if optimum micro-environmental conditions are ascertained and standardized for different livestock at different stages of production. This coupled with animal behavioural studies to attain optimum homeostasis will pave way for more production with optimum comfort to the animal. In poultry and dairy sectors, the animals in optimum level of production deserve better environmental condition to step into higher stages of production. In modern intensive methods of animal production, the animals are inadvertently subjected to limitation of space, nutrition, management and exposure to pathogens and predators resulting in changing pattern of behaviour expressed in varying degrees of frustration, discomfort and suffering. Through this programme it is envisaged to determine optimum requirements in terms of micro and macro environment for maximum production of livestock under normal and stress conditions.

Activities :

2000-2005	Veterinary College / Nagpur, Mumbai, Parbhani, Udgir, Shirval	Preparation of ethogram based on behaviour of important livestock species.
2005-2010	Veterinary College / Nagpur, Mumbai, Parbhani, Udgir, Shirval	Effect of different intensity and variety of behaviors and their interaction on enhancement of animal productivity will be explored. Studies on behavior of animals under stress conditions and adaptive nature of the animals. Determining optimal micro and macro environmental conditions for optimal behavior and production of different livestock.
2010-2020	Veterinary College / Nagpur, Mumbai, Parbhani, Udgir, Shirval	Implementation of results in larger population in holistic approach.

9. Establishment of Veterinary Research Farm Unit

A separate unit of Veterinary Research Farm to carry out animal experimentation on emerging diseases is proposed. This will also serve to create animal models for various diseases and act as field laboratory for educating PG and UG Students. All types of Serum Antibody Negative (SAN) animals and birds will be maintained to raise hyper immune serum to various diseases.

Activities :

2000-2005	Veterinary College / Nagpur, P.G. I. Akola and Parbhani	Establishment of farm for SAN animals and birds.
2005-2010	Veterinary College / Nagpur, P.G. I. Akola and Parbhani	Maintenance and collection of serum.
2010-2020	Veterinary College / Nagpur, P.G. I. Akola and Parbhani	Supply of SAN Serum and conducting of experiments.

Hence establishment of zonal level laboratory under Maharashtra Animal & Fishery Sciences University to cater to the needs of Southern States – Tamilnadu, Kerala, Karnataka and Andhra Pradesh. This will enable the scientist to monitor and diagnose bluetongue disease and also enable serotyping of the virus strains. There efforts will be made to develop vaccine suitable for a particular area.

Activities:

2000-2005	College of Vet. Scince, Parbhani	Establishment of Zonal laboratory for Bluetongue
2005-2010	College of Vet. Science, Parbhani	Typing of BT virus and creation of virus respository.
2010-2020	College of Vet. Science, Parbhani	Production of newer BT Vaccine

10. Establishment of bio-containment facilities for conducting challenge experiments

Various types of research on vaccines are in progress and to test the potency of the vaccine adequate bio-containment facilities are required. Efforts will be taken to establish high security lab for this purpose.

Activities :

2000-2010	Bombay Veterinary College	Establishment of bio-containment facilities.
2010-2020	Bombay Veterinary College	Conducting of challenge experiments and handling of virulent pathogens.

10.4 ANIMAL PRODUCTS

10.4.1 RESEARCH PROGRAMMES

1. Evolve strategies for augmenting meat production with special emphasis to male buffalo calves and small ruminants

Database on type and distribution of food animals available and present status of meat handling, processing of transportation, marketing and consumption pattern need to be generated to arrive at right path for future plan of action. Suitable strategies will be evolved for effective utilization of our enormous animal resource for meat production. Network research projects will be initiated for utilization of unproductive animals specially male buffalo calves for wholesome meat production. The meat export earnings can be boosted by over 1000 crores by the dawn of next millennium. The increasing export of frozen buffalo meat to various Middle East countries confirms the scope for increasing the meat production through systematic rearing of male buffalo calves for meat production. Therefore a national strategy can be evolved by converting liabilities into assets for utilizing surplus livestock in an efficient way.

Activities :

2000-2005	Veterinary College / Mumbai, Nagpur, P.G. I. Akola	Generating data on “Spread of food animals, pattern of meat production, meat product manufactured and consumption pattern”. Development of protocol for food safety, quality control with special emphasis on TQM. HACCP.
2005-2010	Veterinary College / Mumbai, Nagpur, P.G. I. Akola	Identify the bottleneck in meat industry and trade and to find remedial measures for optimum slaughter practice and hygienic meat products.
2005-2015	Veterinary College / Mumbai, Nagpur, P.G. I. Akola	Appropriate network research on community production and utilization of male buffalo calves and non-conventional surplus meat animals.
2010-2020	Veterinary College / Mumbai, Nagpur, P.G. I. Akola	Application of Biotechnological means in processing, product development and preservation and packing technology of fresh and processed meat and meat products.

2. Evolving cutting edge technologies for development of novel value added meat products for domestic and export market

Hygienic meat production is the paradigm to be achieved in near future only by evolving proper strategies to improve the unorganized meat industry of India. The world meat trade scenario is changing in favour of India after economic liberalization and globalization for marketing of livestock products. The growing urbanization and consumers preference for new products has increased the demand for hygienic, value added meat products. Hence research programs will be converged to evolve cost effective technologies for development of nutritional and safe indigenous meat products to meet domestic market and international demand. Further research will be aimed at conversion of slaughterhouse by-products into value-added products in order to ensure complete utilization of food animals and thereby increase the returns per unit cost of investment in livestock production. This in turn will increase the farmers revenue and prevent environmental pollution.

Activities :

2000-2010	Bombay Veterinary College	Evolve strategies for hygienic meat production. Formulate policies for reorganization and reorientation of meat trade to suit global change.
2005-2015	Bombay Veterinary College	Design and fabrication of novel livestock products by employing thermal processes, hurdle technology and other emerging technologies.
2010-2020	Bombay Veterinary College	Utilization of slaughterhouse byproducts, and use of genetic engineering for development of novel fermented food. Development of appropriate packaging technologies including edible and eco-friendly materials.

10.5 DAIRY TECHNOLOGY

The trends in milk production and domestic consumption may give tremendous boost to dairy products in the coming years. But, it certainly requires diverse strategies to boost domestic consumption as well as export: Following programs are suggested so as to reorient the dairy technology discipline.

- **Improving the quality of the product**: In order to reap the fruits of open global markets, it will be necessary that the Indian dairy industry becomes competitive. The only restriction for export would be the quality. A large number of countries would be able to flood their quality dairy products and

the Indian products would need to compete with price and quality. Therefore, it is necessary to make available necessary manufacturing technologies so that the products can meet international standards. There is need for collaborating with Engineering Institutes to develop quality dairy processing machineries of various capacities for Indian farmers.

- **Value-addition:** This is another area, which has to be taken into consideration thoroughly. Products of wide importance and applications should also be focused. Efforts should be made to utilize by products into value added products. In this direction products such as, hyper-immune milk, specific for various enteric infections need to be developed. The cost of liquid milk is not very promising, hence value addition would be necessary. This would also increase milk consumption in the middle class families. There is need to develop value-added, trendy products, directed at 'youth' and children in school. This calls for reviewing the taste, flavor, packaging and advertisement strategy.

- **Building brands and public relation**: Growth in the export market may be seen on a long term by building brands of Indian dairy products. Now, it may be possible due to liberal rules of investing in global markets and the satellite communication. Continuous efforts are required to prevent dissemination of misinformation by other exporting countries regarding Indian brands. Since this tool has been widely used, a preventive measure for dairy products can go a long way in building up brands for Indian products. Considering Mumbai as main hub for milk and milk products industry, there is a need to establish a referral laboratory at Aarey-Goregaon colony, Mumbai and the present Dairy Technology Institute at Aarey Goregaon can be very well converted into a college for the purpose in view, so that ICAR financial aids as well as aids from the milk industry can be attracted herefore.

- **Reducing cost of production by improving productivity**: In the last decade, average growth rate of milk production in India has been reported to be over 5% as against just 1% increase in milk cattle population.

Enhancement in the milk production per animal will contribute in reducing the cost of the production, which will make the dairy industry more competitive in export market.

- **Research and development**: Today, India's status has changed from net importer to a surplus nation with a good export potential. To maintain the status, continuous research and development efforts are very much required in different directions. Research and development in the area of milk productivity, mechanization, conventional and non-conventional products, product development and energy conservation may take the country to a great height in the export market. In this context modern hi-tech laboratories viz Diagnostic laboratories for preventing transmission of genetic disorders through males used through AI and females used as embryo donors, in the line of global scenario is the need of the day as it is very much evident from scientific reports of NDDB that such defects are encountered in breeding bulls in Maharashtra. Other advancements, like, production of transgenic farm animals, hybridoma technology, conservation by cryo preservation of oocytes / sperms/ embryos of extinct breeds of livestock. Such infrastructure development can bring scientific improvement of dairy industry as well as livestock industry of Maharashtra state.

10.6 FISHERIES TEACHING, RESEARCH AND EXTENSION

Production of finfish, shellfish and other commercially important aquatic organisms through farming and from natural aquatic systems could largely help to meet the protein demand. Many nations pay greater attention in developing newer technologies in fisheries keeping their protein requirements in mind as the present yield through capture fisheries is not considerably increasing in the recent years due to man-made pollution threats in natural fish production systems and irresponsible over fishing. In the light of the above, the following are planned for fisheries development during 2000-2020.

10.6.1 CREATION OF NEW DEPARTMENTS

Year 2000 – 2005

- Establishment of Fisheries College at Nagpur
- Department of Fisheries Biotechnology
- Department of Fisheries Microbiology
- Department of Communication and Entrepreneurship

Year 2006 – 2010

- Department of Inland Aquaculture
- Department of Fish Health Management
- Department of Limnobiology

Year 2011 – 2020

- Department of Fisheries Engineering
- Department of Coastal Aquaculture

10.6.2 CREATION OF NEW EDUCATIONAL PROGRAMMES

Year 2006- 2010

- B.F.Sc. in Fisheries
- M.F.Sc. in Fisheries Extension
- Ph.D. in Fisheries Biotechnology

Year 2011 - 2020

- M.F.Sc. in Fisheries Management
- M.F.Sc. in Fisheries Microbiology
- M.F.Sc. in Fisheries Engineering

10.6.3 CENTRE / RESEARCH / EXTENSION PROGRAMMES

a) Center / Laboratories to be created

2000 – 2005	✳ Establishment of a Center for disease diagnosis, vaccine development and treatment for fish and shrimp diseases.
2005-2010	✳ Establishment of a Live food production center Center of Excellence in Aquaculture
2010-2015	✳ Center of Excellence in Fish Processing
2015-2020	✳ Establishment of a Fish/Shrimp Feed Analysis Unit ✳ Establishment of a Mobile Environmental Laboratory ✳ Creation of a Center for Ornamental fish breeding and culture ✳ Establishment of a Breeding and hatchery center for brackish-water finfish / shellfish

b) Research programs:

Year 2000 - 2005

- Development of advanced technologies for large scale culture of live fish food.
- Production of genetically viable disease-resistant strains of cultivable fish and shell fish.
- Development of effective vaccines for specific fish/shrimp diseases.

Year 2006 - 2010

- Development of aquafeed with feed probiotics, immunostimulants and feed antibiotics.
- Development of cost effective technology for the treatment of waste waters for productive use.

Year 2011 - 2020

- Development of breeding technology for oviparous and viviparous freshwater fishes.
- Creation of a marine / sweet water aquarium at Nagpur and Parbhani .
- Technology development for hatchery production of seeds of commercially important brackishwater finfish / shellfish.

10.6.4 FISHERY RESOURCES AND MANAGEMENT

Year 2000 – 2005

✳ **Establishment of a Fisheries Museum**

A full-fledged fisheries museum in spacious building with all lighting and audio – visual facilities is needed to help students in their taxonomical courses. Such a museum would house common, endangered and precious species in glass mountings, preserved / taxidermised forms, mounted skeletons, etc.

✳ **Establishment of a Marine aquarium**

Considering the importance of marine ornamental fishes in export trade and recreation, a marine aquarium with seawater circulation needs to be created in Konkan region.

10.7 VETERINARY EDUCATION

The progress made in the Veterinary Education and Research over the five decades is highly commendable. The Veterinary Education occupies a pivotal position in providing nutritional security, health and livelihood security to millions of rural poor through providing better Animal Production and Veterinary Health care activities. Keeping this in view, the objectives of Veterinary Education in need be reoriented through suitable changes / modifications in the course curriculum and syllabus in the coming years. The course curriculum may require changes so that greater emphasis be given in developing scholars to a career of self employment. This is possible by developing entrepreneurial skills of the veterinary graduates in their course curriculum. Similarly courses aimed to enhance self confidence of Veterinary graduates and to stimulate them a career of self-employment by linking production, post harvest technology in Veterinary care through appropriate means.

In the Veterinary curriculum, courses on International Veterinary Education, highlighting intellectual property rights and computer literacy will be offered. This would help to improve the graduates' perception of Veterinary Education in the economic scenario at International level. Emphasis will be given in areas of biotechnology and information technology through the next couple of decades. There would be greater amount of integrated approach by developing links between farmers, university and industry in solving problems of economic / health importance among animals. Professional postgraduate diploma course in various disciplines of Veterinary Education will be introduced in the coming years to develop second level of professional experts in various disciplines.

Establishment of Entrepreuner Development Cell at all the Colleges of the University :

1. Presently, there has been an increasing demand for professional degree courses, and animal and fisheries sciences can not be exception to it. However, our employment generation system is not in position to absorb the graduates passing out from the universities leading to increase in educated unemployed year after year. It is, therefore, high time that the education in universitie and colleges should highlight the importance of entrepreneurship and prepare the

students right from the college education to get oriented towards setting up of Small Scale enterprises like veterinary clinics and private extension, animal & fisheries farming, mini dairy plants and preparation of milk products and any other ventures in rural area. This will help the unemployed graduates find employment and provide them necessary creativity, freedom and ability to generate wealth using untapped local resources. The University education must help them imbibe the necessary spirit that "we can do it". There is a need to identify marketable products considering enhancement of purchasing power of urban population and the University should provide the know-how in identifying the marketable products as well as their do how through its extension network.

2. In order to inculcate the importance of entrepreunership development in students, on the line of IIT, cell will be created at each college that will provide information support to the students in the area of business identification, set up support and other related services.

3. In order to encourage creativity and investigations, programs such as undergraduate research fellow programs will be initiated so as to turn the students more competent and research oriented.

10.8 EXTENSION EDUCATION IN ANIMAL SCIENCES

1. Integrated approach in extension program for technology transfer pertaining to Agro-ecosystem

One of the major bottlenecks in technology transfer in livestock sector is that the novel technologies developed by higher institutions are not either readily adopted or accepted under field conditions. Of late, it has been realized that, lack of wide vision among scientists about diversified situation in the field is the obvious reason for the generation of unpopular technologies. This can be overcome by on farm testing, assessment, refinement, documentation and dissemination of proven technologies. The National Agricultural Technology Project document emphasizes on handling the technology from the holistic point of view under the perspective of different farming systems with farmers participatory approach especially in small production units. This, in turn, will build up confidence among elite group of farmers

to adopt newer and improved technologies with resultant higher returns per unit cost of investment in livestock sector.

Activities :

2000-2005	Veterinary College / Nagpur, Parbhani, Mumbai , P.G. I. Akola	To carry out analysis of diversified situation in the field based on agro-eco zones and to arrive at area specific technological needs of the farmers.
2005-2020	Veterinary College / Nagpur, Parbhani, Mumbai , P.G. I. Akola	Prioritization of the problems, problem-cause analysis, Transfer of technology, assessment through participatory rural appraisal and refinement through on-farm trials-suggest cost effective eco-friendly adaptable technologies.

2. Strengthening Research and Extension linkages through Trainers training, Distance Education and forging communication with farmers through mass media.

The envisaged program aims at forging close linkage between research systems and clientele. The flow of information between the scientists and farmers could be mediated through trained man power, distance education and direct communication using latest tools of information revolution like video conferencing etc. The specific skill oriented training will be given to field veterinarians and para-veterinary staff for vertical flow of information. The syllabi of distance education will be designed to attract idle rural youths, school dropouts to venture for livestock enterprise and stimulate self-employment. The proposed network of Animal Technological Information Centers envisages direct communication with farmers for dissemination of technology and rendering proper advise on field problems. Apart from this, mass media like Radio and Television will be utilized for effective dissemination of knowledge. As one step ahead, video conferencing can be arranged between the experts and livestock owners to discuss the emerging issues from remote ends, with the help of National Information Center.

Activities (All the Colleges):

2000-2020	All the colleges	• Manpower development in frontier technologies to meet future needs and challenges. • Vertical trainers training from scientist level to the field worker. • Designing course work for distance education based on latest trends in livestock sector with special emphasis to deficit areas in skilled man power. • Establish computer based telecommunication network at Institute level with terminal points at District and Taluka level. • Technology communication through different media and channels including local circuit and cable TV to the ultimate beneficiaries.

3. Monitoring technology dissemination process through efficient feed back and meeting the farmers at their door steps:

The efforts taken in transfer of technology will go futile unless proper feed back mechanism is established. The way of adoption of technologies is obviously not according to the guidelines specified by the scientists. Hence, in case of non-adoption of technology the entire confusion gets compounded in the absence of an effective feed back mechanism. Establishment of Technology Feed Back bank will help in technology refinement as a continuous process for improved performance at field conditions. These banks will be the repository for different information / protocols / parameters related to target technologies in different areas of livestock sector.

The program of meeting the farmers at doorsteps is targeted at women, who are the actual working force in livestock and fisheries enterprises. The extension workers will be deputed to their doorsteps to demonstrate skills and give micro level training for their economic upliftment.

Activities :

2000-2005	All the Constituent Colleges	Development of technology feed back bank with constant flow of information.
2005-2010	All the Constituent Colleges	Problem collection, assessment, solving through economical and eco-friendly methods.
2010-2025	All the Constituent Colleges	Identify trainees' needs and technologies suited for micro level training based on potential and resource knowledge and skills. Impart training at farmers doorstep especially targeting women entrepreneurs.

10.9 INFORMATION TECHNOLOGY

MAFSU has made rapid strides in computerization of its function in the areas of administration, education and research. With the monetary support from Agriculture Human Resource Development project, the University has procured and installed computer systems in every section of the University and constituent colleges. Aptly exploiting the resources made available by this World Bank funded project, all the installed systems have been linked under LAN in each of the campuses. Realizing the electrifying impact of information technology on the knowledge industry, MAFSU plans to keep all its faculty, students and clientele well informed through establishment of WAN, WWW and Internet Kiosk. Attempts are also being made to streamline administrative system with automation and to have a near “Paperless” office. The teachers and students are encouraged to use this technology as information handling may no longer be cumbersome. Although it would be difficult to replace the creative potentials of human beings with machines, efforts are taken to link up reading comprehension and thinking along with technological advancement and involve information technology in education to ‘liberalize’ and ‘liberate’ the learning process.

Having understood the need to make its faculty and staff ‘Computer Literate’, MAFSU has now trained majority of its human resource in computer applications. Besides offering a compulsory course on computer applications to all its PG Students, efforts are also on to bring all the UG students into the computer ambit.

To make the most use of the University's faculty and infrastructure, including the fountainhead of its information and knowledge, the University Library, MAFSU will embark on creating a 'Virtual' Campus through Virtual Private Networking using broadband connectivity.

The Virtual Campus will be a University Intranet with on-line access to the University Library (including full text) clinical epidemiological and research data, research management information and learning materials. It will also enable messaging and communication, both at individual and group levels through e-mail, video conferencing and groupware. The University will be linked to an Extranet which the University will use off its outreach with agricultural communities and the industry. The interest will have an Internet portal to its virtual campus strengthening its cyber-presence.

The University will also develop its virtual information centre integrating its "brick and mortar" libraries at its eight campuses (including College of Fisheries). This virtual information centre will enable access to needed information at the user's desk and classroom.

In order to support the development of high quality learning material for all its education, training and learning programmes, the University will initiate the development of a learning object repository for animals, veterinary and fishery sciences. The learning objects can be custom integrated to meet the needs of individual, groups and communities to meet specific needs.

On University campuses, every classroom, faculty room, hospital, farm and common spaces including hostels will be provided local area University Intranet and Internet access. Most of this would be through wireless connectivity. Every classroom will be equipped with the state of art projection and other communication infrastructure.

10.10 RISK ANALYSIS

As the perspective program envisages mainly, the animal experiments and laboratory based biological trials, the risk involved is quite obvious compared to other sectors. The deviations in genotype and environmental interaction in genetic studies, biological species not behaving as expected necessitate repeated trials and sometimes reorientation of research methodology. Further unforeseen circumstances like adverse weather and natural catastrophes will have immense effect on the program, since it involves livestock component in every segment of the research. The priorities and policies of Government would great determine the focused & have financial support.

10.11 OUTPUT AND EXPECTED SITUATION

The perspective program aims at improvement in methodology and technology in areas of animal production, health and products on par with latest development elsewhere in the developed world. If successfully executed, the fruits of these researches would revolutionalize the existing practice and procedures in augmenting production by way of developing the transgenic models, management of health by way of new generation biologicals like sub-unit, multi component vaccines and sensitive diagnostic kits. A sea change in product fabrication will be witnessed according to the preference of consumers of next millennium. The technologies and products developed will attract international market and possible collaboration with multinationals in health and animal products sector may not be an exaggeration. The institute-industry linkage will be fortified further with due share to the mother institution and the scientists involved in the development of the technology. As a maiden step, an agreement has been signed between the National Research Development Corporation, New Delhi and Maharashtra Animal and Fishery Sciences University for floating of novel technologies on commercial scale with intellectual property rights.

11. PROJECT REVIEW, REPORTING AND EVALUATION ARRANGEMENTS

For successful implementation of the proposed programs, monitoring and evaluation at every stage is critical. The Maharashtra Animal & Fishery Sciences University authorities and committees will scrutinize the on-going research programs. Committees, such as, Research Council, Research Project Approval Committee, Ethics and Bio-safety Committee, Livestock Production Committee etc, will be involved in monitoring and evaluation of the research schemes. Apart from these, review will also be carried out by concerned University Officers and external experts representing funding agencies. Further, all the research programs are periodically reviewed by the Director of Research in the capacity of Chief Liaison Officer for all research schemes of the University and annually reviewed by the Vice-Chancellor. Thus, this University has a strong network of monitoring, reporting and evaluation procedure, which will help in the execution of the programs in the right direction. Efforts will be made to introduce external peer reviewing from such agencies with a focus on social benefits and social audit.

12. RESOURCE MOBILIZATION

As envisaged in the earlier chapters, the vital resources for implementation of perspective plans are appropriate scientific manpower that has excellence, modern infrastructure facilities and liberal financial support from the State Government supplemented by other agencies like ICAR, etc. Besides, the development of trained manpower, resource generation will have bearing on the efficiency of research and extension education programs, which, in turn, will yield the fruits of enhanced research in terms of superior germplasm, disease resistant genomes, efficient and specific biologicals, immunodiagnostic kits and novel value added products and animal bird and fish feed packages In other words, proper research management, appropriate resource mobilization and planning in right direction will result in total metamorphosis of livestock sector as desired in the perspective.

Modern communication, globalization and post GATT era or open marketing for developing countries have opened the gateway to peep into the international trade, with quality projects. There is a need to tap unconventional sources of funding. An important source could be the Alumni Associations. A detailed plan will be chalked out with the Alumni Associations to get NRI alumni involved in fund raising.

Another important source could be establishment of long-term industry collaboration programs. The collaboration with industry will also make the University research relevant and useful and the students will also get an opportunity to get industrial exposure. But, these require some investments on developing infrastructure.

The State Government of Maharashtra in response to their categorical statement of objectives and reasons related to L.A. Bill No. VII of 1998, is expected to come forward to invest initially Rs. 105 crores for the establishment of this University, for, an urgent measure for adequate and continuous flow of finance is a crucial input and is a must.

The constituent colleges and research and demonstration farm units of the University should be forseen **as pace setters** for total metamorphosis of livestock, dairy and fisheries sectors into prosperous industries in Maharashtra State, on the basis of science and technology led growth and development. The University will also forge linkages with the ICAR, private entrepreneurs, industries and multinationals through national and international collaborative research projects, thereby ensuring continuous exchange of information and flow of supplementary funds.

As provided for in the University statute 149 relating to Finance and Accounts, it is mandatory upon the University and for that matter the Comptroller of the University under the guidance of the Vice Chancellor, to establish a creative resource generation and financial management system by going beyond the traditional accounting focus on recording and reporting of financial transactions but focus on financial analysis applications and strategic decision making by implementing computerised accounting system.

The finance and Planning Committee of the University shall analyse financial performance of the University which inter-alia includes all the constituent units, identify ways to use resources efficiently and finding creative ways to use resources to generate additional resources. Keeping in view this statutory provision and considering the fluctuation in the prices/rates of various services, commodities etc. required in the institutional development, MAFSU business plan (budgetary requirements) will be developed by the FPC on the basis of five-year plan period of the State Government and ICAR, New Delhi – major funding agencies.

Thus, MAFSU recognises that financial resources are a core issue to achieve its Vision 2025. MAFSU will develop a sound short (5 years), medium (15 years) and long (25 years) business plans that will provide it with financial resources in a sustainable manner to achieve the goals it sets in this 'Vision Document'.