9.2 AGRICULTURAL RESEARCH AND EDUCATION

Introduction

Agricultural Research and Education, which have made substantial contribution for the development of the agricultural sector, are the cardinal pillars of agricultural development. Notwithstanding the impressive gains in agricultural production the country has witnessed, vast agricultural potential still remains to be realized. The demand for food would obviously go on increasing till such time the population stabilizes and the people are able to access the optimum volume of food. Agricultural development in a country has to be guided not only by the compulsion of improving the food and nutritional security but also by the concern for environmental protection, sustainability, profitability and even export. Though Tamil Nadu is number one in the productivity of paddy, sugarcane and groundnut, it is yet to become self sufficient in rice, pulses, cotton etc. Comparison of productivity of these crops with that of the other countries clearly brings out the immense scope for improvement. Further, following the WTO agreement and the liberalization process, the consequent globalization of markets would call for competitiveness and efficiency of agricultural production. The major factors in agricultural and allied sectors are farm size, workforce, backward and forward farm linkages and management efficiency. In order to achieve the true potential of agriculture, the challenges ahead are to increase not only production but also productivity per unit of land and animal as well from the available resources. The process of development could be accelerated and sustained only through more and more investments on research and education. In this transformation process, the role of research institutions like Tamil Nadu Agricultural University (TNAU) and Tamil Nadu Veterinary and Animal Science University (TANUVAS) is pivotal.

Review of Ninth Five Year Plan

During the Ninth Five Year Plan period, TNAU / TANUVAS were engaged in various education and research activities in Agricultural, Veterinary and allied sectors. The expenditure under research and education was as follows:

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Ninth Five Year Plan (Rs. in crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outlay</td>
</tr>
<tr>
<td>TNAU</td>
<td>106.85</td>
</tr>
<tr>
<td>TANUVAS</td>
<td>93.65</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0.50</td>
</tr>
<tr>
<td>Others</td>
<td>4.00</td>
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<tr>
<td><strong>Total</strong></td>
<td>205.00</td>
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The `Agricultural Human Resources Development Project’ with the World Bank assistance involving inter alia the training of 1200 staff members
in India and various foreign countries was implemented during the Ninth Plan period.

**Tamil Nadu Agricultural University**

**A. Education**

Twelve colleges and three institutions offering Diploma Course in Agriculture are functioning under the control of TNAU. Under-graduate, Master’s degree programme and Ph.D programme are offered by TNAU. During the Ninth Five Year Plan, 2261 students in under graduate, 1348 students in Master degree, and 572 students in Ph.D., have passed out of the institution.

The UG students are exposed to the real world of farming situations by placement in the villages for a period of 3 months under Rural Agricultural Works Experience (RAWE) programme. To acquaint themselves with the business environment, the students are also placed in-groups of 4 or 5 each, in different agro-industries and agri-business for 2 weeks under Agro-industrial tie-up programme.

**B. Agricultural Research**

During the Ninth Plan, 57 new varieties have been developed in rice, sorghum, cumbu, maize, and other small millets, pulses and horticultural crops and released by TNAU for the benefit of the farming community. Twenty-seven low cost farm machineries have been developed, 165 new technologies in crop improvement, management and protection have been passed on to the department and they are widely adopted by the farming community.

**C. Extension**

Transfer of Technology (TOT) - Under extension, TNAU disseminates the findings through the mass media like radio, dailies, farm magazines, publications, video programme and Doordharshan. It also conducts distance-learning programme like Farm School on AIR. Under Integrated Village Development Programme, all College campuses, Research Stations and Transfer of Technology centres have adopted two villages each for holistic development by adoption of latest technologies in agriculture as a system approach.

**Tamil Nadu Veterinary and Animal Science University**

**A. Education**

The University has Veterinary Colleges at Chennai, Namakkal, and a Fisheries College and Research Institute at Thoothukudi offering Undergraduate and Post Graduate degree programmes and a PG Diploma in Business Management in Animal Science and Fisheries Sciences. During the Ninth Plan, 1,122 students in under graduate programmes, 393 students in post graduate programmes, 89 students in Ph.D. programmes and 13 students in PG. Diploma got qualified in Animal husbandry and fisheries.
B. Research

In addition to three colleges, TANUVAS has a strong net work of five Research Stations, Institute of Animal Nutrition, Institute of Food and Dairy Technology, 16 Veterinary University Training and Research Centres and various laboratories to carry out research. The research programmes are focused on animal and fish production, animal and fish health and animal and fish products. Improvement of germ plasm through genetic engineering, integrated farming approach with fish production in paddy fields, development of third generation vaccines and multi component vaccines, strengthening of the animal quarantine laboratory for conducting tests to regulate the import and export of livestock products.

C. Extension

The transfer of technology programmes are devoted to first line extension such as demonstrating promptly the latest technologies to the farmers and getting first hand feedback to reorient education and research programmes. Training programmes on livestock and fish farming were organised in all the districts for training officers of Animal Husbandry Department and farm radio school programmes were conducted through AIR and Doordarshan.

Agriculture Department

Production of bio-fertiliser and distribution increased several fold from 200 MT during 1990-91 to 1400 MT during Ninth Plan period. Production of Blue Green Algae (BGA) increased from 390MT to 500 MT during Ninth Plan period. Annually 50 MT of green manure seed is produced and distributed to the farmers to increase the humus content of the soil.

Tenth Five Year Plan

Objectives and Thrust Areas

Tamil Nadu Agricultural University (TNAU)

Education - The environment of liberalized market and more regional and international agricultural trading, need for increased productivity and production and ensuring sustainability etc. underscore the requirement of a different profile of graduates for addressing the needs of future agriculture. It is also necessary to adopt a different mode of conducting the educational programmes in order to improve the effectiveness and efficiency of the programmes. A greater focus is required in agricultural curriculum for areas like biotechnology, biodiversity, environmental science, organic farming, integrated crop nutrient and pest management, dryland/rainfed agriculture and wasteland development, bioenergy, etc. It would be worthwhile to offer flexibility to students in terms of more options in learning. In this background, the TNAU has envisioned to expand its educational activities and to introduce new degree B.Tech, Horticulture and Ag. Bio-Tech and M.Sc. (Industrial Microbiology and Agricultural Meteorology) and diploma programmes (in Mushroom Production and Processing, Bio-pesticides production, Biofertiliser production, Vegetable Seed production, and Nursery management,
Production of tissue culture plants, Manufacturing technology for agro-based machinery).

Research - Vision on agricultural research in TNAU is built on the issues of shrinking land and water base for agriculture in Tamil Nadu, increasing demand for agricultural commodities, growing agro-based industrialization, emerging scenario of vast potential necessitating attention on post-harvest processing, growing demand for mechanization, gender discrimination, food and nutritional security and poverty, small scale nature of agriculture and natural resources management.

Research has to be focused more on society's needs and oriented to addressing basic issues of human life such as poverty, food security and better livelihood. It has also to take note of changes due to globalization, technological development, and growing emphasis on value addition. At the same time, time and resource limitations necessitate prioritizing and optimizing research activities. The areas identified for research for immediate future are:

- Increasing the productivity of Crops: More focus on development of hybrids, development of TGMS lines and hybrids under two-line system, developing new CMS and restorer lines.
- Forage Production: To identify the right combination of grains-legume species suitable for various Agro climatic regions.
- Sustainable Agriculture: Developing integrated farming system model for various farming conditions. Developing bio-fertilizers and integrated nutrient management.
- Dry land Agriculture: Developing optimal cropping systems in accordance with resource base.
- Growing demand for organic farm products: More research on organic farming.
- Wasteland Development: Region specific research on agro-forestry, agri-horticulture, silvipasture, in situ soil moisture conservation and technologies for problem soils.
- Environmental Pollution due to indiscriminate use of chemicals: Evolving ecofriendly, low cost technologies including bio-pesticides and bio control agents.
- Quality Seed: Production of quality seeds of agricultural and horticultural crops, including hybrid seeds. Fingerprints of released crop varieties to ensure seed quality and purity monitoring.
- Minimising post harvest losses: Strengthening post harvest research and protected cultivation.
- To manage labour scarcity in farm operation: Developing suitable and relevant farm machineries and tools.
- To manage water scarcity: Strengthening research on new irrigation methods, developing drought tolerant Crop varieties.
• Value addition to agricultural and horticultural commodities: Developing low cost packing and processing technologies.

Some of the other thrust areas contemplated in the Tenth Plan period are:

• Dry land horticulture
• Bio resource Technology
• Non-conventional energy resources
• Micro propagation of agriculture and horticulture plants through tissue culture technique.
• Isolation of stress tolerance genes.
• Development new plant type in rice.
• Diagnostic methods for detection of nutritional and physiological disorders.
• Forest bio technology

Transfer of Technology (TOT) - one of the important objectives of TNAU has been to undertake dissemination of scientific findings in agriculture and allied sectors to the farming community. The Directorate of Extension Education and the various technology centres of TNAU are engaged in transfer of technology emerging from the research programmes of the University for the benefit of the farming community. It will be the objective to hasten this process and to reach a larger number of beneficiaries and to enable farmers / rural youth / farm women take up self-employment.

**Tamil Nadu Veterinary and Animal Sciences University**

The gross value of output from livestock sectors forms more than 25% of agricultural output. However, this output is disproportionate to the available population of livestock in the country which has been attributed to a number of causes like low genetic potential, inadequate feed and fodder resources, unorganized breeding programme and emergence of diseases. These have to be addressed urgently.

The Indian livestock industry is facing a new threat of serious dimensions in the post GATT era. Most of the developing countries have liberalized foreign trade in food and agriculture commodities and the developed countries are interested in capturing the market in developing countries. The developed countries have not matched this with reciprocal liberalization effort and have been reluctant to open up their market to imports from developing countries of high value commodities like beef and dairy products. This asymmetry has made conditions unviable for the Indian livestock industry.

In order, therefore, to cope with the new WTO regime, it has become imperative to enhance livestock productivity, profitability and sustainability coupled with quality to compete in the international market. In order to improve the quality of production, reforms are needed from grass-root level to laboratory level, such as hygienic production, handling, harvesting and
processing to ensure certification of quality through laboratories that have international recognition such as ISO 9000. In order to achieve this, the new research paradigm will revolve around sustainability of biophysical resources, conservation of bio-diversity, strengthening infrastructure, production of novel products of international standard and perfect bio-security measures to curb diseases.

In the field of education, the thrust will be on specialization, multi-disciplinary teaching, problem solving assignments, computer aided lesson and video-interactive programmes.

Extension will be strengthened by establishment of Farmers’ Training Centres in districts not covered so far, and Veterinary Information centres in a few districts, initiation of distance education programme in dairy, goat and poultry farming for school drop-outs, training of farm women on livestock and fisheries products and organizing training programmes (on line) for staff.

Agriculture Department

The extension service in close association with the research system should study local problems and potentials and make available a basket of technologies and assist the farmers in selecting and adopting technologies appropriate to their resource base. Institutional training to farmers and farm women need to be co-coordinated, strengthened and its quality improved. Soil health care, nutrient management and co-ordination with irrigation, livestock and forestry departments must receive the continued attention of the extension service.

Outlay

The outlay for Research and Education will be Rs. 350 crores out of which Rs. 185 crores will be for TNAU and Rs. 159.50 crores for TANUVAS during the Tenth Five Year Plan.

Schemes/ Programmes

Tamil Nadu Agricultural University

Education

TNAU has proposed to start the following new courses during the Tenth Plan period to enable students to find employment in horticultural industries, horticultural estates/plantations, input industries, business and exports, to augment food production through bio-technology, to develop manpower required to handle all aspects of development in genetically engineered organisms, industrial production of vaccines, antibiotics, drug delivery system, and food processing and to provide for knowledge in meteorology and its link with agriculture.

1) B.Tech (Horti) Degree
2) B.Tech (Bio-tech) Degree
3) M.Sc. programme in Industrial Microbiology
4) M.Sc. (Ag) in Agricultural Meteorology
To provide employment opportunities for the farm graduates and to impart training in the field of mushroom production and processing, production and use of bio-pesticides, bio-fertilizers and commercial vegetable seeds, production of tissue culture plants and in manufacturing technology for agro-based machineries, the following PG. Diploma courses are proposed during the Tenth Five Year Plan:

1) PG Dip. in Mushroom Production and Processing
2) PG Dip. Biopesticides
3) PG Dip. Bio-fertilizer Technology
4) PG Dip. Vegetable Seed Production and Nursery Management.
5) PG Dip. Production of Tissue Culture plants
6) PG Dip. Manufacturing technology for agro-based machineries

For conducting new educational programmes an amount of Rs. 7.65 crores is provided for TNAU.

**Research**

1. *Centre for Excellence in Bio-Technology*

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**Biotechnology**

Biotechnology is the application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services. It also covers utilization of microbe and microbial technology for the large-scale production of useful products of food and pharmaceuticals. Modern biotechnology stands on the understanding of molecular basis of biological functions of cell to make it produce products required by society. The new biotechnology holds potential for developing products and process in various sectors of agriculture, animal husbandry, aquatic life forms, health care, energy and environmental protection.

To effectively serve the human society in future, the Centre for Plant Molecular Biology is to be upgraded to the Centre for Excellence in Biotechnology with main focus of research and training on DNA finger printing, cloning antiviral protein gene from Bougainvillea spectabilis, production of secondary metabolites from Datura stramonium, Catharanthus roseus, and Coleus blumei using cell culture, Transgenic crop for insect/ pathogen resistance, post harvest biotechnology, Cloning genes for abiotic stress tolerance and isolation of agronomically important genes.
2. Centre for Excellence in Bioremediation

**Bioremediation**

Industrial renovation due to advances in Science and technology has increasingly enabled human beings to exploit natural resources. However, this has generated unprecedented disturbances in global elemental cycles. Indiscriminate release of industrial wastewater has resulted in the contamination of land and aquifers. As a result, Tamil Nadu has lost most of the fertile river basins, as most of the industries are located on the banks of the rivers. The sudden introduction of xenobiotics often overwhelms the self-cleaning capacity of recipient soil-water-air plant ecosystems and thus results in the accumulation of pollutants to problematic or even harmful levels.

The problem of toxic waste disposal is enormous and bioremediation offers a chance to mitigate this problem. Bioremediation is a process, which exploits the catalytic abilities of living organisms (microorganisms and macrophytes) to enhance the rate of extent of pollutant degradation and distribution.

To overcome the problem of toxic waste, it is proposed to undertake research on microorganisms and macrophytes for remediation of selected polluted habitats, evaluating the bio scavenging and bio accumulation efficiency of crops and tree species as phyto remediators, designing and development of suitable bioreactors for specific pollutant and training scientific personnel in the area of bioremediation.

3. Integrated soil use for sustainable agriculture

The scheme envisages formulation of an agro-ecological framework for effective land use and soil management, evolve effective land use policy, evolve and promote effective Integrated Nutrient Management (INM) strategies to conserve natural resources. It will also advocate waste utilization / recycling technologies to ensure effective transfer/recycling of nutrients into agricultural systems.
4. Integrated Farming System

A judicious mix of poultry, fishery, goat rearing, pigeon rearing activities with crop production will certainly help in efficient recycling of various by-products, gainful employment, better utilization of the available resources and ultimately higher income to the farmers especially the small and marginal category.

5. Establishment of Directorate for Dry land Agriculture at Regional Research Station, Aruppukottai

Establishment of a separate Directorate of Dry land Agriculture at the Regional Research Station Aruppukottai to serve as the lead centre for dryland agriculture in the State with four dry land research stations located at Aruppukottai, Kovilpatti, Ramanathapuram and Paramakudi is proposed. This will help in development of technologies for overall improvement of the different agricultural ecosystem particularly in dry land agriculture and eventually enable the vast tracts of waste/dry land in the Southern Zone to be converted as productive lands.

6. Management of problem soils

The soil problems due to salt accumulation (salinity and sodicity), physical constraints (soil crusting, sub soil hardening, soil compaction, fluffiness, excessive permeability), improper drainage and nutrient iron toxicity reduce the crop production considerably. To make this type of degraded soil more productive, proper management with careful planning and execution is needed. Hence, these soil problems need to be studied in depth for evolving alleviating measures for restoration.
7. Strengthening bio fertilizer production and quality control studies

It is proposed to establish a large-scale production centre along with a quality control laboratory for producing and supplying bacterial inoculants viz., Rhizobium, Azospirillum and Phosphobacteria and to encourage utilization of bio-fertilizers for all crops to reduce the gap between nutrient demand and supply.

8. Bio Resources Technology

Bio-resources

Bio-resources imply the precious living organisms that can be used as the resources for the betterment of mankind. These include a variety of flora and fauna that can be used so as to augment the agricultural productivity.

The project aims at evaluation and screening of microorganisms that can be used as potential bio fertilizers and bio pesticides (bio herbicides, bio insecticides, bio fungicides), intensification and improvement of native plant genotypes for better productivity, transfer of bioresources technology through on-farm and off-farms trials.

9. Strengthening of Department of Agricultural Meteorology

It is proposed to strengthen the infrastructure facility of Agricultural Meteorology department and to provide advance instrumentation facilities for students and scientists.

10. Organic farming

As a remedy to cure the ill effects of modern chemicals on agriculture by weakening of the ecological base besides degradation of soil and water resources, organic farming is adopted. Organic farming aims at harmony with nature and production without destruction of the environment. The objective of the scheme is to develop and evaluate improved organic farming practices through intensive agronomic research.

11. Strengthening of Wasteland Development in Tamil Nadu

Wasteland

Wastelands, defined as degraded, under-utilized land, deteriorating for lack of appropriate water or soil management practices or on account of natural causes, occupy about 129.574 million ha in India and nearly 2.41 million ha in Tamil Nadu. Out of this area in the State, 36% of the area under upland with scrub or without scrubs and 11.85% under those affected by salinity/alkalinity _ coastal / inlands, offer more promise for development. Yield levels in irrigated agriculture have now reached a plateau and the future thrust should be on successful agricultural development in rain fed areas and conversion of existing wastelands into suitable alternate uses.
It has been proposed to identify the apt varieties of fruit crops, vegetable, medicinal plants suitable for wasteland system, identifying the appropriate cropping system integrating fruit crops, tree crops, forage crops, developing suitable post-harvest technology including value addition to produce and training to extension personnel, farming community for development of wastelands.

12. Strengthening research in dry land horticulture

It is proposed to evolve suitable cropping system, and management technologies and to formulate indigenous and low cost post harvest techniques for dry land situations involving fruit crops as major component.

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**Dry land horticulture**

The current annual fruit and vegetable production in India is 27.8 and 70 million tonnes respectively. Considering the per capita dietary need of 85g fruits and 250g vegetables, we are already in short of the requirement by 6.7 and 28 million tonnes, respectively. By 2020 AD, the fruit and vegetable production will have to be nearly doubled to meet the future domestic need of 48.5 million tonnes fruits and 143 million tonnes vegetables. In addition, horticultural production would have to be intensified to meet the fast growing export requirements. It has now become evident that there is only a limited scope for a quantum jump in fruit and vegetable production in the traditional farming areas necessitating a shift in the thrust for production from conventional areas to unutilized dry lands spread over more than half of the geographical area of the country. In Tamil Nadu, a sizeable area especially in southern districts is available under dry land. Many fruit crops such as mango, Jamun, sapota, ber, amla, annon, etc., have the capacity to grow in dry land conditions, provided soil conservation measures are adequately taken. They also respond well if meagre quantities of water are supplied through drip system during critical stages of growth. As the yield potential from dry land is generally less, growing of a pure fruit crop tree is not advisable and hence they need to be grown with other fruit crops / medicinal plants / forage crops so that a viable cropping system for dry land situation can be evolved.

13. Strengthening of research in Medicinal Plants in Tamil Nadu

The full potential of the medicinal plants has not been realized. Lack of basic information different parameters of crop productivity is a limiting factor. It is high time to take up intensive research for genetic improvement and cultivation methods of medicinal and aromatic plants.

The project will undertake research on crop improvement, production, protection and processing of selected high value medicinal plants.
Medicinal Plants

Plants constitute the major raw materials for treating various ailments of human being although there has been significant development in the field of synthetic drug chemistry and antibiotics. Recently the World Health Organization (WHO) has compiled a list of 20,000 medicinal plants used in different parts of the globe. However only about 10000 plants are used for Phytotherapy in Indian system of medicine of which nearly 2000 plants are from India. Among them over one hundred botanicals are reported to have been consistently in large demand and utilized in major drug markets in the world. This indicates that full potential of these groups of plants has not been scientifically explored. Moreover many of these valuable and useful groups of plants are threatened with extinction because of over exploitation and habitat destruction. India is a leading exporter of medicinal plants in the world trade. Apart from the medicinal plant parts, India exports large quantity of phyto-chemicals, but its share of exports compared to the overall world trade is very meagre. In India, the herbal drug market is less than 10 per cent of the European countries and less than three per cent of the world market.

The natural resources of medicinal and aromatic plants, howsoever large, are bound to get depleted due to over exploitation from the wild growth. Therefore, time has come to bring these plants under plough to meet the rising demand.

14. Hybrid crops improvement

To meet the growing demand for slender and superfine rice in the international market, emphasis will be given for the development of three line and two line hybrids in rice with good cooking quality coupled with pest and disease resistance. It is also proposed to develop suitable hybrids in Sorghum, Pearl Millet and Maize, and Cytoplasmic Male Sterile (CMS) based hybrids in redgram to increase the productivity with low cost of cultivation. To step up the production and to continue the efforts in heterosis breeding, the project for evolving a high yielding variety in sunflower has been proposed which will be helpful to the farmers for getting high returns.
Hybrid Crops

A. Rice- At the present rate of population growth, rice production needs to be increased annually by almost 2 million tons to maintain the self-sufficiency achieved in 1980’s. Among the various genetic options available, development and large scale adoption of hybrid rice appears to be the most feasible and readily adoptable one. In the international market there is heavy demand for long slender and super fine rice. Apart from yield and quality more emphasis should be given to biotic constraints particularly pest and diseases. Hence importance should be given for the development of three line and two line hybrids with good cooking qualities coupled with pest and diseases resistance.

B. Millets- Sorghum, Pearl Millet and Maize are the important cereal crops cultivated in Tamil Nadu next to Rice. So far the breeding efforts were concentrated on development of high grain yielding hybrids suitable for human consumption. With changing food habits, the demand for millets has got drastically reduced and the industrial value for these crops is gaining importance due to greater demand for poultry, animal and processing industries. Hence there is a need for development of hybrids suitable for industrial use and processing.

C. Pulses- Redgram is being cultivated intensively next to blackgram in Tamil Nadu. The average productivity is around 700 kg /ha. In order to increase the productivity, exploitation of hybrid vigor is necessary. The first redgram hybrid ICPH 8 (ms Prabhat DT xICPL 161) was released in the year 1990 by ICRISAT. Later on COPH1 (ms T21 x ICPL 87109) was released in 1994 by TNAU. But there was a problem of asynchrony of flowering between the parents. This problem was taken care of by the release of another high yielding hybrid COPH2 (ms CO5 x ICPL 83027) which, gave an increased yield over COPH1 and as well as CO5. All these hybrids were based on genetic male sterility, which involves lot of labour for roguing the male fertile plants in female rows of hybrid seed production plots. Hence development of CMS based red gram hybrids is to be attempted.

D. Oilseeds- The area of sunflower in Tamil Nadu has increased steadily from 2100 hectare with 13300 tonnes during 1991-92 to 73000 ha with 39000 tonnes 1993-94. It was programmed to increase the area to 1 to 1.2 lakh ha. The cultivation of sunflower in traditional areas of India increased after the introduction of hybrids utilising CMS source and hybrid vigor. The oil has got good qualities with high amounts of PUFA. Because of the introduction of hybrids the average productivity has increased from 570 to 780 kg/ha. This is possible because of the availability of cytoplasmic generic male sterile system (CMS) coupled with high cross-pollination nature of the crop. The production of commercial hybrids is easy in the crop.
15. Improving production and productivity of Pulses

Several biotic and abiotic constraints reduce the production and productivity of pulses. It has been therefore proposed to develop MYMV resistant genotypes in green gram and black gram, develop drought tolerant cowpea and horse gram genotypes for wasteland.

**Pulses Production and Productivity**

The total area under pulses in Tamil Nadu is 9.61 lakh hectares. A wide array of pulse crops is cultivated in the State, which includes Blackgram, Redgram, Greengram, Cowpea, Horsegram and Bengalgram. Among them, blackgram occupies the major area of 3.67 lakh ha followed by greengram (1.63 lakh ha) and redgram (1.41 lakh ha.). Redgram tops the productivity with 864 Kg/ha followed by bengalgram with 527 Kg/ha and greengram with 480 Kg/ha. Even though the blackgram is cultivated in a larger extent the average productivity is only 390 Kg/ha.

16. Improving production and productivity of Oilseeds

To improve the production and productivity of oilseeds, the production of quality seeds of sesame and sunflower, development of groundnut varieties with tolerance to biotic and abiotic stresses and export quality, and development of CMS lines and high yielding varieties in sesame will be taken up.

**Oil Seeds Production**

Tamil Nadu ranks sixth in the production of annual oilseed crops accounting for 8.5 per cent of the country’s production. It is the second largest producer of groundnut and coconut and ranks third in sesame, fifth and sixth in castor and sunflower production respectively. In Tamil Nadu, groundnut, sesame and sunflower are the three major oilseed crops. The area under oilseeds has remained around 12 lakh hectares for the past 20 years. As far as the oilseeds crops are concerned, groundnut occupies a major area followed by gingelly, sunflower and castor.

The per capita consumption of oils and fats is continuously increasing and was 6 per cent per annum in the last 13 years. There has been a continuous increase in imports, which reached a staggering figure of 45 lakh tonnes during 1998-99. This would only show that there is an urgent need to step-up the oil seeds production on a sustainable basis. Substantial scope for harnessing the potential of oilseeds exists both in terms of increase in cropped area and productivity.
17. *Enhancement of Genetic potential of cotton varieties and hybrids for increasing cotton production*

**Cotton Production**

Cotton is an important crop of commercial importance particularly during the post WTO period. As high as Rs. 35,000 crores of foreign exchange is realized every year in our country. It occupies an area of 9.0 m ha in India, which ranks first among the world cotton countries. However it occupies only 6th rank in production and its productivity of 315 kg/ha is very low compared to many countries. Although the low productivity is due to predominant rain fed cultivation, there is scope for increasing the production.

Tamil Nadu produces 5.0 lakh bales of cotton against its requirement of 50 lakh bales and this State is one of the important cotton consumers. The area is showing a declining trend and the production remaining more or less stable, increase in production can be brought about only by increase in productivity.

Development of intra-specific and hirsutum-barbadense hybrids, developing Bt cotton variety and hybrids using indigenous Bt genes will be taken up to increase the production and productivity of cotton crop.

18. *Stress Breeding and Management in Rice*

It is proposed develop drought tolerant and salt tolerant genotypes of rice coupled with resistance to pests and disease.

About 26 per cent of the world's total cultivable land comes under arid and semiarid areas where water is the major limiting factor. The one crop harvest in a year is also threatened by serious droughts and farmers harvest much less than the potential yield of the crop. Breeding crops tolerant to drought is very much essential.

Screening more number of entries for their drought resistance is to be done by giving importance to desirable traits like earliness, plant heights, delay in heading, percentage of grain filling on the panicle, 100 seed weight and yield.

Salt tolerance refers to the ability of the plants to prevent, reduce or overcome the injurious effects of soluble salts present in their root zone. About 4.5 lakhs hectares are salt affected in Tamil Nadu. There are two ways to overcome the problem of salinity. One is to reclaim the salt affected soil, which is very costly, time consuming and short lived. Moreover it is not possible to reclaim entire salt affected areas. The second method is to develop salt tolerant genotypes. Genetic differences exist among cultivars for their salt tolerance capacity. These can be exploited for the development of a new variety.
19. Conservation and preservation of germplasm

The Centre for Plant Breeding and Genetics, TNAU has more than 30,000 accessions of various crops including rice, sorghum, bajra, maize, minor millets, redgram, blackgram, greemgram, cowpea, chickpea, groundnut, sesame, sunflower, cotton and forage crops. Apart from this, the Crop Breeding Research stations under TNAU have their own collections of agricultural and horticultural crops.

Germplasm

Conservation and sustainable use of plant genetic resources is essential to ecologically sustainable development and food security. There are approximately 75000 species of edible plants globally (Wilson, 1988) but over the course of human civilization only about 7000 plant varieties have been used for food (Juma, 1989). Out of 7000, only 150 are commercially important. There is a growing concern over the loss of genetic resources of plants due to genetic erosion, genetic vulnerability and genetic wipe out and future progress in crop improvement to increase productivity and create food security largely depends on immediate conservation of gene resources and their effective utilisation. Conservation of plant genetic resources deals with wide spectrum of germplasm and will involve all elements starting from collection to utilization of PGR for economic gain.

To conserve the plant genetic resources and explore the possibilities of adding more to the gene bank, the project for conservation and preservation of germplasm and establishment of a genetic resource data base has been proposed.

20. Quality seed production

TNAU is taking up breeder seed production in as much as 172 varieties in 26 centres of the University to meet the requirement of the public and private sectors for which manpower and infrastructure are needed.
21. Agro forestry

Agro forestry is a holistic approach to land use in which woody perennials are integrated on the same land management unit with herbaceous crops and animal either in some form of spatial arrangement or temporal sequences. The charm of agro forestry approach to land development lies in the potential role of trees/shrubs to mitigate some of the major physical and economical constraints facing farmers and pastrealists in many parts of the tropical world. While agriculture collects solar energy two dimensionally, silvi-agriculture collects its three dimensionally. The most apparent ecological potential exists in areas where soil fertility is low and depends mainly on soil organic matter, where erosion potential is high. On such marginal lands the deliberate use of woody perennials may if properly integrated in the land use systems enhances both the land productivity and sustainability.

Shelterbelts can help to increase and sustain the expansion of agricultural production in to semi arid environments subject to desiccating winds. In Tamil Nadu, areas like Kangayam, Dharapuram, Kambam, Bodinayakanur, Nanguneri and Srivaikundam are exposed to high velocity winds during the months of July-August. Shelterbelt designs need to be evolved for these areas. Alley cropping is an agro forestry system that holds promise for arresting the soil erosion on sloppy lands and restitution soil fertility. The expansion of conventional arable crop production into steep slopes is prone to severe erosion hazards but this has not discouraged farmers from bringing very steep slopes into cultivation.

Alley cropping system is ideally suited for such sloppy lands. Erosive rains, organic matter dependent soil fertility, an increasing fuel wood scarcity and a lack of cash and infrastructure among the vast majority of tropical land users are some of the most relevant ecological and socio-economic arguments for tree integration into farming and pastoral areas. Afforestation of wastelands is another area that demands prioritized research efforts. Wastelands account for 53.28 million ha in the country, which works out of 16.2 per cent of the total geographical area. Wastelands in Tamil Nadu occur over an area of 1.01 million ha accounting for 7.7 per cent of the total land area. Wastelands are broadly classified into culturable and uncultivable wastelands. Culturable wastelands are those that have the potential to sustain a vegetative mantle, but are not being used due to various constraints. Unculturable lands are area incapable of supporting a vegetative cover.
Under this scheme focus will be on selection and improvement of multi-purpose tree germplasm, improvement and development of prototype agroforestry systems, and action research on agroforestry.

22. Food product development and processing

**Food Processing**

India is world's second largest producer of fruits and vegetables and has the potential to become number one is due course of time with sustained efforts. The growth potential of this sector is enormous and it is expected that the food production will double in the next ten years and the consumption of value added food products would grow at a faster rate. However post harvest losses of food produces range between 8 and 37%. Food processing Industry is of enormous significance for India's development because of vital linkages and synergies that it promotes between the two pillars of the economy, namely industry and agriculture. The marketing structure of fresh produces is very traditional and consists of a long chain of intermediaries. The problem is further complicated due to the fact that there are no storage facilities at the farm level and the farmers are forced to dispose off the entire produce immediately after harvesting. This creates a glut situation in the market. This growth of the food processing industry will bring immense benefits to the economy, raising agricultural yields, meeting productivity, creating employment and raising the life quality of the people throughout the country especially in rural areas and farm sector.

Food processing industry has been identified as a thrust area. At present, India processes only less than 2% of our farm produce and converts only 7% of them as value added products. In India, there are currently relatively few large or medium sized companies in the organized sector and a very large number of small units. Moreover Indian brands are yet to develop a good image in the international markets. The density of markets especially of fruits and vegetables is low and facilities for storage godowns and cold chains in urban and rural areas are extremely inadequate.

It is proposed to develop hi-tech procedures for increasing the shelf life of agricultural and horticultural products, processing of value added products for commercialization etc.

23. Economic Evaluation of Rural Development programmes

The overall objective of the study is to evaluate the impact of development of women in rural areas in terms of nutrition, education, employment opportunities and income before and after implementation of the various Rural Development programmes.
24. Impact of WTO on the functioning of rural markets and marketing for selected agricultural commodities

To study the pattern of demand and supply and the functioning of market and marketing for selected agricultural commodities since the implementation of the WTO agreement and to study the price behaviour of selected agricultural commodities before and after the agreement.

25. Establishment of Agricultural Market Intelligence Cell

The scheme envisages creation and maintenance of database on price of agricultural commodities, forecast of price, supply and demand for different agricultural commodities and dissemination of market information to farmers.

26. Agricultural and Rural Management Centre

The role of the proposed centre will be to identify suitable agribusiness opportunities, including crop choice and value added products for domestic and international markets, train farmers and other entrepreneurs in managing agribusiness leading to increase in agricultural production, value addition, income and employment generation for the people in the rural areas.

27. Mass production of Bio pesticides and quality control

The increasing demand for the usage of bio-control agents which are harmless and cheaper than pesticides, in agricultural and horticultural crops, warrants that bio-pesticides be made available for the farming community without compromising the quality. It is proposed to undertake mass production of bio-pesticides viz., Trichoderma viride and Pseudomonas fluorescence.

28. Watershed Development and Management

The aim of the project is to take up watershed development and management and develop appropriate models for watershed and watershed programmes in selected regions. The benefits of watershed development are that water availability both surface and ground water is increased and in terms of both quantity and duration, soil and soil fertility is conserved and higher level of production results.

29. Environmental Engineering Centre

The State has been suffering from problems related to growing urbanization and industrialization resulting in contamination of surface water and underground aquifers. To assess the extent of maladies caused by different environmental degradation process and to suggest remedial measures, it is proposed to start the Centre.

30. Establishment of Institute of Post Harvest Technology

It is estimated that about 15-25% of the total production amounting to Rs. 2000 crores gets lost in post harvesting phase especially during handling, storage, transport, processing and distribution. Though there have been continuous research activities aiming at the minimization of post harvest losses, still there exists a technology gap. Therefore, it has been proposed to establish an Institute of Post Harvest Technology during the Tenth Plan period to develop crop specific post harvest technologies and equipments.
31. **Strengthening of Department of Soil and Water Conservation Engineering**

The department at present run courses for B.E.(Ag), B.Sc(Ag), M.E.(Ag), M.Sc.(Ag), and Ph.D. It is proposed to extend the departmental activities during the Tenth Five Year Plan period by establishing a Remote Sensing and GIS Laboratory for watershed management, water resources development and command area studies, rainfall simulation and irrigation automation research.

32. **Fabrication of Cost effective Farm machinery**

The major constraints to productivity apart from seed, fertilizers, irrigation, are untimeliness in sowing, weeding and harvesting and threshing due to shortage of farm labour, farm power and high capacity matching implements. All these constraints can be eliminated by the development of cost effective farm machinery and implements. The non-availability of these implements for different farming operations to the farmers adds to the worry of the farming community. Training to the rural unemployed youth and encouraging small entrepreneurs to set up agro based industry for the fabrication of cost effective farm machinery is proposed in the Plan period.

33. **Establishment of Bio Energy Centre**

The Centre will design and develop renewable energy gadgets for supplementing commercial energy sources presently used in various agro-industrial and industrial operations. It will also impart training for different stakeholders on new and renewable energy technologies.

**Extension**

**Transfer of Technology**

For revamping and increasing the activities of the Directorate of Extension Education and various TOT centres of TNAU, the following new programmes are suggested.

1. Popularizing of Agricultural Implements
2. Establishment of Regional Communication centres
3. Establishment of Training Centre at TNAU
4. Establishment of Video-production Centre at TNAU
5. Establishment of Agricultural Radio (A.R) - (Separate radio broadcast for agriculture)

**Tamil Nadu Veterinary and Animal Science University**

**Education**

1. **Strengthening of Teaching Hospital**

Tamil Nadu Veterinary and Animal Sciences University has three hospitals viz., at Chennai, Namakkal and a University Peripheral Veterinary Teaching Hospital. The available space for the various units of the hospitals is not sufficient due to which the hospital facilities could not be branched out in the specialized areas. Further, various units of the hospitals are not
interconnected properly resulting in inconvenience to the staff and the public. Therefore it has been proposed to provide more facilities and to create specialized units in all the clinical faculties to enable the students to equip themselves on par with international standards and to handle and treat the sick animals with confidence.

2. **Strengthening Instructional Farm facilities**

   Both under graduate and post graduate degree programmes of the veterinary university require multi-species institutional farm facility for the purpose of demonstration, hands on training and research. The nearest instructional livestock farm is at Kattuppakkam which is 45 Km. away. Indian Veterinary Council syllabi makes it compulsory on the part of the college offering BVSc degree programme to have an instructional farm for the undergraduate students to assist in effective learning. There are restrictions not to keep and maintain Livestock inside the Municipal Limits of Chennai. It is proposed to start a multispecies instructional farm for the benefit of UG and PG students at Madhavaram Veterinary Campus.

3. **Strengthening of New Post Graduate Diploma Courses for Veterinarians/ Pure Science Graduates /Predegree students**

   Post Graduate Diploma courses are being offered at present only at the Indian Veterinary Research Institute, Bareilly in Uttar Pradesh. Around 227 BVSc graduates and 25 BFSc graduates are passing out every year from TANUVAS. These are not in a position to go in for higher studies.

   It is proposed to start the following Post Graduate Diploma courses for Veterinarians as indicated in the recommendations of the Indian Veterinary Council:
   - PG.Dip. in Animal Reproduction Technology
   - PG.Dip. in Veterinary Laboratory Diagnostics
   - PG.Dip. in Veterinary Clinics
   - PG.Dip. in Feed Quality Analysis
   - PG.Dip. in livestock products technology
   - PG.Dip. in Dairy Technology

   The aim of the above courses is to increase the efficiency and update the skills in reproductive technology, to teach the basic laboratory techniques for control of disease in livestock and poultry, to teach the skills in livestock surgery and therapeutics, feed quality analysis, to develop and utilize animal by products for self-employment and to teach preservation and processing of liquid milk.

4. **Starting of Para Veterinary Course**

   Livestock and Poultry enterprise is expanding day by day resulting is generation of more employment opportunities. The sector requires skill-oriented technicians to handle the farm produce and to assess reproduction and administration of medicines etc. There is a need for developing suitable manpower to handle different activities. Therefore, it is proposed to start the following self-employment programmes:
a) Certificate course on Laboratory Technician

b) Certificate course on Artificial Insemination

The objective of the course is to teach the basics in collection of specimens, quality analysis and the basic reproductive physiology of livestock and to train in artificial insemination techniques.

**Research**

1. *State Quality Control Laboratory on Livestock and its product*

   It is proposed to establish State Central Laboratory in the University Main Campus at Chennai with four regional laboratories viz., at Namakkal, Thanjavur, Tirunelveli and Erode with diagnostic facilities for viruses, bacteria, feed quality assessment and xenobiotics. The central lab will focus on diseases of all major species of livestock, while the regional lab will focus on species pertaining to that area. It will also impart training programme to veterinarians and academicians on diagnostic approaches and methods.

2. *Production of Multi component Novel Vaccines and Rapid and Simple Immune diagnostics*

   Threats posed by infectious diseases always keep the development in the animal and poultry sector unsteady. Hence it is imperative to develop modern vaccine and diagnostics on which the society can rely upon to control infectious diseases of animals and poultry.

3. *Containment of zoonotic disease by strengthening the Veterinary Public health and Food Hygiene*

   Strengthening of food hygiene and veterinary public health wings for rapid detection and control of food borne infections and intoxications and zoonotic diseases is the need of the hour. The Tamil Nadu Veterinary and Animal Sciences University has facilities for diagnosis of Leptospirosis in animals and man and has proposed to expand its diagnostic facilities to include Zoonotic diseases such as Rabies, toxoplasmosis, brucellosis, etc. Hence it is proposed to study the prevalence of existing and emerging zoonosis, surveillance and monitoring of food borne pathogens etc. during the Plan period.

4. *Herd accreditation for quality livestock and poultry production*

   To improve the productivity of livestock and poultry, diseases prevention strategies play a key role. Accreditation is an important step by which a stamp of quality is given to products of livestock and poultry. The value of accredited herds increases manifold due to freedom from diseases, environmental contamination etc. Therefore, the University will embark upon the accreditation process for major livestock and poultry diseases that are endemic. It also aims to introduce quality livestock and poultry products and safeguard human health.
5. Participatory sheep development programme

Sheep development

Sheep can be profitably raised with low investment under intensive and most extensive forms of nomadic grazing. The growth of sheep population has been stagnant and there is even a negative trend over the past four decades. Steps are needed for increasing the population of sheep. This naturally requires development of grazing lands, improved health cover and management practices.

The strategy for optimum sheep production is: Selective breeding of sheep in their native tract through network programme or open nucleus breeding, improving the grazing land and increasing the biomass production through appropriate agroforestry models, more thrust on containment of emerging diseases such as PPR, Bluetongue and reducing the morbidity, thereby preventing huge production loss, micro level monitoring of proper deworming and vaccination to improve production. This can be achieved through open nucleus breeding of sheep with farmers' participation.

The scheme is proposed to survey the demographical and geographical distribution of various native breeds of sheep, characterization of the native breeds, genetic and management improvement of different breeds of sheep in their native tract etc.

6. Health assessment and care of wild animals (captive and free range) and migratory birds

There is paucity of technical information on wildlife health of captive and free ranging wild animals and in migratory birds. This scheme aims to reveal technical inputs that are helpful for diagnosis and treatment of clinical conditions in wild animals, to carry out epidemiological and pathological studies in wild animals and migratory birds, to reveal scientific information related with feeding, breeding and behaviour of wild animals etc.

7. Somatic Cell cloning for cell therapy and genetic improvement for livestock

The aim of the project is to produce genetically identical farm animals, to do cell therapy using fetal cells. Somatic cell cloning will be more efficient, faster and more useful way of making cloned fetuses for cell therapies, adult animals for protein production and organs for xenon-transplantation.

8. Diversified research on avian species

Scientific chicken production is a major capital intensive integrated Agro Industry and beyond the reach of poor rural farmers. Hence, many farmers are showing interest in rearing ducks, turkeys, guinea fowls and geese. For this, sufficient breeding stock, day-old commercial birds, feed and rearing/processing technology have to be made available. It is proposed to undertake diversified research to develop on the production abilities of the
above four species and design improved selective breeding and management and establish specialized hatcheries to produce sufficient stock for distribution to the rural farm units.

9. Creation of Centre for Advanced Studies in Animal Nutrition

The objective of the scheme is to study the ruminant and non-ruminant nutrition and companion animal nutrition, nutrition of captive animals, nutrition discipline of the non-domesticated avian/game birds and to take up research on feed and fodder technology, study of Veterinary dietics, establishment of farmer counseling centre and studies on eco-friendly feeding practice to reduce environmental pollution etc.

10. Intensification of teaching and research in animal genetics and breeding for the genetic improvement of local cattle and indigenous germplasm conservation

For advanced learning of students and to pursue research in frontier technologies on par with international standards, the key areas of education and research in animal genetics and breeding need to be strengthened. Gene mapping for disease resistance in buffaloes and study of Marker –QTL association to improve productivity of livestock etc., will be undertaken. It will also impart advanced training in livestock breeding methods, cryopreservation technologies of gametes and laboratory techniques for the assessment of fertility aim bulls and quality control of frozen semen.

Extension

1. Establishment of Farmers Training Centres

The University has its training and research centres in 24 districts of Tamil Nadu and is not having any centre to serve the districts of Thiruvannamalai, Villupuram, Perambalur, Nagapattinam and Ramnad. The aim of the establishment of farmers training centres is to impart training to farmers/farm women and rural youth and to conduct mass contact programme and seminar, to provide consultancy and advice to farmers and to carryout field trials for technologies generated at the research stations.

2. Establishment of Distance Education Programme

It is estimated that around 5 lakhs students drop out from school between 8th standard and 12th standard. Most of them do not get suitable jobs, hence a distance education programme on dairy, goat and poultry farming has been proposed to impart training to school drop-outs on animal husbandry and poultry for self employment avenues.

3. Empowerment of women through training on livestock and fisheries products technology

Training the farmwomen in preparation and sale of livestock and fisheries products will help them in starting their own units in their house itself besides supplementing their family income. It is proposed to train the women through Farmers Training Centres, Veterinary Training Centres on livestock and fisheries products for self-employment.
4. Establishment of Veterinary Information Centres

Farmers need information on production, marketing and other aspects of poultry and dairy farming. It has been proposed to establish Veterinary Information Centres in 10 districts to enable the farmers to adopt sustainable farming practices.

5. Online continuing education for officers

The deputation of staff of line departments for training in the University entails a lot of expenditure to the Government. To offset this, facilities are to be created for distance learning through Internet by way of two-way interaction. TANUVAS has an Internet site and required courses can be hosted and field officers can learn the technical skill at their workplace itself.

Fisheries

Education

6. Establishment of an Instructional farm for fish culture and Breeding

To impart practical knowledge to the students in fish culture and breeding, it has been proposed to establish an instructional farm, which will also serve as a model farm for farmers and entrepreneurs. It will enable the students in self-employment by starting their own fish farms after their graduation.

7. Starting of Ph.D programme in Fisheries Environment

At present there is no Ph.D. programme in the Department of Fisheries Environment for the M.F.Sc. graduates. To develop technical manpower and provide specialized programme in fisheries environment, it has been proposed to start a Ph.D. programme in the Tenth Plan period.

8. Establishment of Department of Fisheries Biotechnology

To increase fish production using biotechnology requires skilled manpower in the field of fisheries biotechnology. Therefore, it is proposed to establish a Department of Fisheries Bio-technology in the Fisheries College and Research Institute at Thoothukudi.

Research

9. Establishment of State Level Fish Quality Control Centre

Though the State has 48 registered fish processing industries, it does not have a quality control centre for testing the quality of their products. Hence it is proposed to establish a state level Fish Quality Control Centre in Fisheries College and Research Institute at Thoothukudi to meet the needs of fish processing industries located in the State.

10. Hygienic handling, quality control and distribution/marketing of fish for consumption

The landing centres and fish markets in Tamil Nadu are in a poor hygienic condition. In order to improve the hygienic status of the fish landing centres and markets, it is essential to do research for devising ways and
means of improving the hygienic status, and to impart training to the personnel involved in the handling of fish and fishery products.

11. Identification of new fishing grounds in offshore regions of Tamil Nadu coast and monitoring of coastal pollution in Gulf of Mannar

To estimate fishery resources along the coastal zone of Gulf of Mannar by trial fishing, to utilize intermediary fishing vessels with cold chain facilities for fishing on cooperative basis in the offshore region involving groups of fishermen, to assess water quality and level of pollution in Tamil Nadu coast including Gulf of Mannar, by pollution monitoring studies, the scheme is proposed.

12. Establishment of fish disease diagnostic centre

The scheme is programmed to study the aetiology and epidemiology diseases inflicting huge losses in the aquaculture industries. It is also proposed to create awareness among the farmers, entrepreneurs and all those who are involved in fish and shellfish farming about the menace of diseases and train them to take appropriate measures to fight the affliction.

13. Development of Bio feed for farmers and entrepreneurs

Bio-feeds are helpful in ensuring a good survival of hatchlings produced from hatcheries. Separate bio-feed production units for different live food organisms such as microalgae, rotifers, cladocerans and Artemia will be

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**Marine Fish Production**

Tamil Nadu ranks 4th in the total marine fish production of the country with a total production of 3,93,000 tonnes (Tamil Nadu Fisheries Statistics 1999 - 2000). It has a coastline of 1000 km with the continental shelf area of 34,320 square kilometers. Fishing is carried out mainly in the narrow coastal belt with the depth ranging from 10 to 50 m. There are about 43,000 traditional crafts and 10,000 mechanized boats engaged in fishing. The coastal fishery resources of Tamil Nadu coast in general and Gulf on Mannar in particular are facing heavy fishing pressure owing to the over capitalization of fishing vessels in these areas. The Gulf of Mannar, which is located in the south east coast of Tamil Nadu, is known for its rich and diversified fishery resources including pearl oyster, coral reefs, turtles and sea cow. The Gulf of Mannar stretches from Kanyakumari to Pamban with the coastal length of 320 km. It is the need of the hour to assess the coastal fishery resources and its present condition by conducting experimental fishing besides introducing eco-friendly fishing nets. Looking into the recent industrialization along the coast of Gulf of Mannar, there is a threat of coastal pollution, which is to be assessed and monitored. Besides this, the offshore region of Tamil Nadu coast is not utilized for fishing. Hence, potential fishing grounds in the far off seas need to be identified for fishing to increase total marine fish production and give rewarding catch to fishermen.
useful and the scheme envisages establishment of methodologies for mass production of different live food organisms in the laboratory.

**Extension**

**14. Programme for the safety of fishermen and fishing vessels in the sea**

**Safety of Fishermen**

Tamil Nadu has a long coastline of 1000 km and its total fishermen population is about four lakhs. Fishing has been considered as one of the dangerous ventures. The fishermen are involved in fishing with traditional knowledge on navigation gained from their forefathers. Their knowledge on navigation, first-aid and other safety aspects of sea are primitive and needs to be improved to cope up with the recent developments in fishing technology.

In the country during the period of 1996-2001, 1942 deaths or disabilities of fishermen at sea have been reported (BOBP, 2000). It is the need of the hour to educate the fishermen on various aspects of life and vessels during their sea voyage. Though, the Government has formulated rules, the fishermen are unaware of the rules to be followed during voyages; for example, they often fail to exhibit signals even at the time of distress.

The scheme aims at creating awareness among the fishermen on their safety and fishing vessels at sea by organizing on campus and off-campus training programme.

**15. Creation of awareness for Fish consumption among the people of Tamil Nadu**

**Nutritive and Medicinal value of Fish**

Fish is a protein rich food. The protein content of the fish ranges from 15 to 20%. It also contains all essential amino acids, especially lysine, and methionine, which are deficient in other plant and food materials. The vitamin A and D content of fish prevents eye and bone disorders. Fish is the richest source of Iodine and it reduces the risk of goiter among fish eating people. The bones of fish contain lot of calcium, magnesium and phosphorous which prevent bone disorders. Further, a number of fish species contain low fat and hence, they can be used for the formulation of low fat diets. The polyunsaturated fatty acids present in fish lower blood cholesterol; thereby the incidence of heart ailments has been reduced among fish eaters. Fishery products such as fish protein concentrate and deodorized fish meat without odour are now available in markets. Fish can be consumed as food in the form of fresh, frozen, processed and finalized products. Fish is easily digestible and hence it can be given to children and convalescing adults.
The scheme envisages creating awareness among the public about the nutritive and medicinal value of fish and to popularize the benefit of fish eating through on campus and off-campus awareness campaigns, posters, exhibitions, pamphlets, and mass media.

16. Empowering coastal fisher folk in the production technologies of value added fishery products for their socio economic upliftment

The low valued fishes constitute more than 40% of the total marine fish production, which are either discarded at the land centres or utilized for the production of fish meal and fish manure. By this way, large quantity of fish protein is being wasted due to the lack of technology or strategy to utilize the same. Hence it is essential to utilize the low value fishes and seasonally available fishes for the production of value added fishery products. The scheme aims to standardize the production technologies on the preparation of value added fishery products, find out the shelf life of the selected value added fisheries products and organize training programmes for fishermen.

Agriculture Department

Ongoing Schemes

1. Preparation and Distribution of Micro-Nutrient mixture

The Department of Agriculture is having a production unit at Kudumianmalai to produce and supply 1250 MT of micronutrient mixture annually. It is programmed to continue the scheme during the Tenth Five Year Plan also.

2. Production and Distribution of Blue Green Algae

The department of Agriculture is encouraging the production of Blue Green Algae and Azolla by farmers themselves in the field, which is a good supplementary source of nitrogen. Annually 500 MT of BGA inoculum and 500MT of Azolla are supplied to the farmers. It is programmed to continue the scheme during the Tenth Five Year Plan also.

3. Remote sensing unit

The objective of the scheme is to forecast correct acreage of crop cultivated and yield for Samba rice and khariff groundnut, based on the remotely sensed satellite data obtained from Indian Space Research Organization Hyderabad. The provision of the scheme is towards meeting the cost of staff and contingencies.

New Scheme

1. Establishment of bio-fertiliser production units

To overcome the depletion of soil fertility, soaring prices of inorganic fertilizers and increasing environmental pollution, the State Agricultural Department is proposing the establishment of 2 Bio-fertiliser Production Units so as to ensure the supply of cheaper, renewable inputs to the farming community and aiming for sustainable agriculture in the long run. Agriculture
Department has 6 Bio-fertiliser Production Units with production capacity of 1400 MT. In addition to the 1400 MT in the year 2002-2003, a total of 250 MT is required for Wasteland Development Scheme in 50,000 Ha. The requirement of Bio-fertiliser product is bound to swell when more areas are taken up under Wasteland Development. Hence 2 Bio-fertiliser Production Units are proposed for producing additionally 300 MT of Bio-fertiliser per year during the Tenth Plan period which can be a core component in Integrated Plant Nutrition System.

Agri-Clinic and Agri Business Centres

Agri / Veterinary Clinic and Business Centres

Agri-Clinic and Agri Business Centres, proposed by NABARD, are to provide expert service and advice to farmers on cropping practices, technology dissemination, crop protection from pest and diseases, market trends of various crops in the markets and also clinical services for manual health which would enhance productivity of crops-animals and to provide input supply, farm equipments on hire and other services. The scheme is open to graduates in agriculture and allied activities.

The courses/ training by Tamil Nadu Agricultural University will enable its graduates to set up Agri-Clinic / Agri-Business Centres and that by TANUVAS will enable its graduates to set up Veterinary Clinic and Veterinary Business Centres.

Agricultural Marketing and Agri-Business Department is the coordinating agency with NABARD in establishing of agri clinic / veterinary clinic and agri business centres and veterinary business centres.

Role of TNAU / TANUVAS in Agri / Vet Clinic and Business Centres

To understand the rural environment including the crop production and agri-business activities in villages, the U.G. students are given Rural Agricultural Work Experience (RAWE) training in which the students are positioned in villages for a period of three months. This would be continued in Tenth Plan also with additional budgetary provision.

A course on Agricultural Management for U.G. students is being offered and this will be continued during Tenth Plan period to expose the students to the business management environment.

Commercial courses such as Mushroom production, Nursery Technology, Production of bio control agents, Non-timber forest produce, Seed Production have been offered to UG students. These courses would be continued during Tenth Plan period. In addition, some new courses have also been proposed for the Tenth Plan period.

To expose the students to the real world business environment the U.G. students are given agro industrial tie up training programme for 10 days. It will be continued during Tenth Plan period with more finance support.
In collaboration with Small Farmers Agri Business Consortium, New Delhi and MANAGE, Hyderabad, the Department of Agricultural and Rural Management of Tamil Nadu Agricultural University is organizing eight weeks' training to the graduates in agriculture for establishing agri-clinics and agri-business centres. One such training programme was completed in April-May 2002. Another programme will be taken up shortly. Similar training programs will be continued during the Tenth Plan period as well.

The Department of Agricultural and Rural Management would also organize many more entrepreneurial development programmes to start agri-clinic and agri-Business centres.

An agri clinic and an agri business centre in each block would be ideal to form an effective network. They should be started in an accessible area in order to attract visit of farmers in larger numbers and considering this, the Department of Agricultural Marketing and Agri-business may allot land and building subject to the availability in regulated markets for setting up agri-clinic and agri-business centres on rental basis. Setting up of agriclinic and agri-business may be encouraged in the following areas:

- Soil, Water Quality, and Input laboratory service centre
- Plant protection service centre
- Horticulture clinic and business centre
- Agro-service centre- farm machinery
- Agro-service centre- primary processing

These agri-clinic and agri-business centre would supplement the efforts of the Government in disseminating the latest technology in agricultural production and marketing among the farmers effectively to have the desired impact.

**Veterinary Clinic and Veterinary Business Centres**

*Urban areas*- Establishment of “Livestock Business Centres” to advise the entrepreneurs to promote livestock industry with project based remuneration for the unemployed veterinary graduates is proposed.

*Semi Urban areas*- Establishment of “Professional Veterinary Polyclinic” (PVP) with special approach in giving veterinary aid to pet animals – consultancy and veterinary aid to be charged by the Veterinary graduates.

*Rural areas*- Creation of “Mobile Veterinary Service” comprising of team of veterinarians, who with their facilities for mobility can attend on population medicine like vaccination, deworming and individual attention on artificial insemination and also offering veterinary aid at the farmers’ door step. The infrastructure for this high quality semen, quality vaccine and drugs may be obtained either from the Department of Veterinary Services / authorized agencies / Non Governmental Organizations or Public Sector undertakings. Alternatively a mobile van with built in facilities may be obtained with the assistance of financial institutions. Thus “Team Care” may be rendered to the rural poor.
Land for Housing Veterinary Business Centres / Veterinary Polyclinics and Stationery “Rural Veterinary Centres” may be provided by the local civic authorities either free of cost or at nominal rent.

The purpose of the above proposal is to offer “Team Care to rural poor” thus eliminating unemployment among veterinary graduates and benefiting the entrepreneurs / pet owners / livestock farmers.

The cost of medicine and professional charges may have to be arrived at by understanding between the veterinarian and the beneficiary.

**Tenth Five Year Plan – Outlay**

(Rs. in crores)

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