



GOVERNMENT OF KERALA

THIRTEENTH FIVE-YEAR PLAN
(2017-2022)

WORKING GROUP ON

**ANIMAL HUSBANDRY
AND DAIRY DEVELOPMENT
INCLUDING VETERINARY
RESEARCH**

REPORT

AGRICULTURE DIVISION

**STATE PLANNING BOARD
THIRUVANANTHAPURAM
MARCH2017
*PREFACE***

In Kerala, the process of a Five-Year Plan is an exercise in people's participation. At the end of September 2016, the Kerala State Planning Board began an effort to conduct the widest possible consultations before formulating the Plan. The Planning Board formed 43 Working Groups, with a total of more than 700 members – scholars, administrators, social and political activists and other experts. Although the Reports do not represent the official position of the Government of Kerala, their content will help in the formulation of the Thirteenth Five-Year Plan document.

This document is the report of the Working Group on Animal Husbandry and Dairy Development including Veterinary Research. The Chairpersons of the Working Group were Shri X Anil, IAS and Dr K Vijayan. The Member of the Planning Board who coordinated the activities of the Working Group was Professor R Ramakumar. The concerned Chief of Division was Dr P Rajasekharan.

Member Secretary

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CHAPTER 1
BACKGROUND INFORMATION

1. Animal agriculture is emerging as one of the important farming areas which can create more employment and address food security issues in the country. During the last four decades Kerala which forms only 1.18 percent geographical area of the country witnessed quantum jump in livestock production. At a time when growth in Agriculture & Allied sectors in the State is only - 4.67%, the growth rate in livestock sector is 4.3% and shows spectacular growth and provides livelihood security for thousands of farmers and entrepreneurs. Moreover during 2015-16, livestock sector contributed 27.62% of the Agriculture GDP.
2. According to NSSO, 23 percent of population is involved in agriculture in Kerala and 3.89 Million Hectares of land is available for cultivation in the State. Government of India during the Budget 2016-17 announced that farmer's income has to be doubled by 2022. Growth in Agriculture allied sector especially Dairying and Poultry production in India during the last 10 years had increased from 4-12 percent. Of the total income Indians spend 40 percent of daily income for food. Of which there is a marginal increase of 2 percent in both rural and urban centers with regard to consumption of Animal protein sources like milk, meat, egg and their products when compared to vegetables and pulses. As credit flow towards at the National level agriculture increases, 58.8 percent farmers are accessing bank loans of which commercial farmers account for 79 percent. 15.9 Marginal farmers access credit. 85 percent farmers rely on informal credit system. Only 40 percent of the total farmers have no credit access.
3. Capital formation in agriculture is stagnant or reduced. There is a huge yield gap and infrastructure gap in Agriculture. But gross capital formation is high in livestock and fisheries sector. There is a huge opportunity for livestock sector within the high value agriculture. In order prevent protein malnutrition there is huge opportunities for animal protein sources production in the State. Livestock sector can facilitate livelihood, employment, entrepreneurship and protein security in the State. Organic farming is emerging area where consumers are interested to purchase pesticide and antibiotic free food products. Food processing sector shows robust growth of around 18-20 percent per annum in the country. There is immense opportunity for ready to eat ready to cook products in the emerging market. In order to promote all these sectors animal agriculture is an indispensable farming domain in the State. Agro ecological zone based livestock production has immense potential in the State.
4. During the 11th and 12th Plan period, substantial increase in livestock production has been achieved in the State. Per capita consumption of milk, meat and egg increased in the State. But there lies a huge gap between availability and requirement of Animal protein sources in the State. State could achieve 72 and 80 percent sustainability in milk and chicken production. 98 percent egg produced in the State is from backyard sector. But with regard to production of bovine meat and processing huge gap exists in the State. Taking in to account the population dynamics, it is the need of the hour to increase production and productivity of livestock products in the State to support livelihood, employment, entrepreneurship and food security.
5. The Indian dairy production is characterized as a low input/low output system mostly constituting small and marginal farmers and landless laborers owning less than five cows or water buffaloes. The situation, which was prevalent in Kerala too, is gradually shifting to farm based approach with a high percentage of exotic crossbred animals. The productivity of the milch animals in Kerala is thus high

when compared to the Indian average. In fact, the average per day milk yield of animals in Kerala (9.2 liters/day) is second only to the state of Punjab. The requirement of highly nutritious feed concentrates and good quality fodder etc for these high productive animals is thus highlighted. The high percentage of exotic cross bred animals also warrants modern farm management practices including mechanization

Table 1 Milk production and other statistics, India and Kerala

	Kerala	India	Share
Land Area	38,863 km ²	32,870,000 km ²	0.18 %
Population	34.8 million	1250 million	0.78 %
Female Adult Cattle Population	676,000	133,271,000	0.5 %
Milk Production (2014-15)	2,711 million liters	146,314 million liters	1.8 %
Productivity per animal per day	13.4 L	3.8 L	
Average Lactation Yield	4050 L	1200 L	
Per capita availability of Milk/day	213 ml	300 ml	
Growth in Milk Production per year (last 5 years average)	2 %	4.8 %	

Source: NDDDB Statistics, 2015

6. The National Dairy Plan (NDP) implemented by The National Dairy Development Board (NDDDB) hopes to increase milk production India to 200 to 210 million metric tonnes by 2021-22 fiscal, an increase of about 40% from the current status. As per this target Kerala should reach a production of 3800 million Liters in next five years from the current production of 2750 million Liters (warranting a growth of 6.7% every year). Currently Kerala procures 110 (210) million Liters of liquid milk every year from neighboring states which accounts for 4% of the liquid milk demand of the state. The figure is exclusive of milk products reaching Kerala from outside the state (like milk powder, dairy whitener, ghee, butter, ice cream etc.). On considering this fact, the shortage of milk solids in Kerala may rise to about 6-7%. The growing demand for milk and milk products in coming years due to population growth and demographic shifts due to rising incomes, urbanization, and other demographic shifts have to be taken into account.
7. Food safety is an emerging area. The country has Food Safety and Standards Act, 2006. Consumers are concerned about the quality of products. During the 13th five year plan period major focus shall be on Entrepreneurship in dairy, poultry, other livestock and food processing sector. The need of the hour is to improve production, productivity and to reduce cost o production with the use of appropriate technologies. Linkage of different sectors and institutions must be given adequate importance. The concept of organic farming and production of safe to eat products will emerge as potential areas in the coming years. There are huge prospects for ready to eat and ready to cook livestock products in the State. At a time market centered production is acquiring momentum across the country value addition, e marketing, food safety, good production practices, GAP and good retail practices and export play a key role in increasing the profitability through farming. Cost reduction, extension, market intervention, value chain system, infrastructure and R&D are the pre requisites for making livestock production system sustainable.

CHAPTER 2
STAKEHOLDER DEPARTMENTS/INSTITUTIONS

Animal Husbandry Department

8. The department of Animal Husbandry has the following interests:
 1. Providing Veterinary Service
 2. Production of Veterinary Biologicals
 3. Control of Zoonotic Diseases
 4. Cross breeding-Artificial insemination
 5. Propagation of small ruminants
 6. Propagation of backyard poultry
 7. Conservation of indigenous breeds
 8. Extension and Training
 9. Animal Welfare
 10. Research and Development

9. To cater to these objectives, the department has 14 District Veterinary Centers, 50 Veterinary polyclinics, 215 Veterinary Hospitals, 885 Veterinary Dispensaries, 38 regional AH centre, nine mobile veterinary hospitals, Seven Mobile Farm Aid Units, One motor boat veterinary hospital and 1359 Veterinary sub centers. For the veterinary service, it has a three tier system with well equipped district veterinary centers followed by Veterinary poly clinics and Veterinary hospitals/dispensaries.

10. The department has a well established State laboratory the Chief Disease Investigation laboratory, Palode; four regional Disease Diagnostic labs, 14 district clinical labs, 50 Taluk level labs at each Veterinary polyclinic and a State Livestock Marine and Agri products Laboratory (SLMAP).

11. At present emergency night service is provided at 45 blocks, an additional of 20 more blocks would be equipped with emergency night service in the year 2016-17.

12. The institute of Animal Health and Veterinary Biologicals, Palode produces vaccines for viral and bacterial diseases and several diagnostic kits.

13. The AI has been made free of cost the livestock farmers of the state. A total of 1277027 inseminations were carried out in the year 2015-16. The department has introduced goat artificial insemination facilities.

14. In addition, the AHD has 10 poultry farms and five cattle farms, six goat farms/units and six pig farms catering to the need of supplying quality livestock, demonstrations and training, conservation and propagation of local breeds. The department is implementing a Special Livestock Breeding Programme, Govardhini programme and backyard poultry development projects.

Dairy Development Department

15. The department aims at self sufficiency and sustainability in milk production of the state and safe food to the consumers by promoting
 1. Self sufficiency in milk production of the state
 2. Herd induction and mechanization of farms through schemes like MSDP

3. Increase in fodder production
 4. Reduction in milk production cost
 5. Administration & Strengthening of Dairy Co-operatives
 6. Availability of safe and quality milk to the consumers
 7. Fair margin to producers
 8. Socio-economic benefits to dairy farmers
16. There was a hike of 12.67 % in milk production during the period from 2011-12 to 2015-16 in the state. The state produces 80.08 % of the state requirement, with a per capita availability of 231 grams per day.
 17. The state presently has 162 dairy extension service units, 14 quality control units, One state dairy lab which has NABL accreditation for testing milk, milk products, cattle feed and water, three Regional Dairy Labs, Five Dairy Training Centres, One State Fodder Farm, 3683 dairy co-operative societies (including APCOS and NON APCOS) and 2.86 lakh registered dairy farmers. It is estimated that about 20% of the milk produced in the state is collected by dairy co-operatives. During the financial year 2015-16, 5.63 lakh MT of milk was collected by DCS while the estimated milk production in the state is 28.18 lakh MT during the financial year 2015-16. Palakkad, Wayanad and Thiruvananthapuram lead the districts with respect to the milk collected at the DCS.
 18. The department has so far focussed on Herd Induction and other milk production enhancement programmes, Fodder development activities – for which it is the nodal agency, Administrative control and strengthening of Dairy Co-operatives, Activities for ensuring quality control of milk and milk products, Extension and Farmer welfare, Undertaking and implementing State / Central / LSGD funded schemes.

Kerala Co-operative Milk Marketing Federation

19. Kerala ranks 13th in the state milk production with respect to annual produce. The federation has the mission of “*Farmers’ prosperity through consumer satisfaction*”. The KCMMF popularly known as Milma has a unique business model of aimed at providing 'value for money' products to its consumers, while protecting the interests of the milk-producing farmers who are its suppliers as well as owners. The Federation has three unions viz, at Thiruvananthapuram (864 APCOS of four districts), Ernakulam (883 APCOS of four districts) and Malabar (1114 APCOS of six districts).
20. The federation has 28000 Sales Outlets, 2800 Employees, 8 lakh producer members 13 modern dairy plants handling 14 lakh litres per day, 10 milk chilling plants, 2 cattle feed plants with 600 MTPD, one milk powder plant with 10 MTPD, one training centre and more than 2500 crores annual turnover. 99% of the milk collected is through bulk milk coolers (355 Nos.).
21. The KCMMF was able to sustain Farmers’ confidence in dairying through assured market & stable price for their produce, enrich economy by passing on more than Rs.100 crores every month as milk value to the farmers. Nearly Rs.86 crores passed on as incentive to farmers in 2015-16. The federation pay the highest milk procurement price paid in India and highest farmer share on consumer rupee. The federation has built up village level chilling facility to handle 99% of the milk procured ensuring better bacteriological quality. It has been accepted as one of the most reputed Milk Federations in India by the Govt. of India and NDDB.

Kerala Livestock Development Board

22. The Kerala Livestock Development Board has the following objectives:
 1. Provide inputs required for cattle breeding in line with the breeding policy of the state
 2. Promote fodder production under field condition for economic milk production
 3. Offer hands-on training programmes in the field of Animal husbandry and fodder production
 4. Develop *Malabari* goats through production and supply of selected breeding stock
 5. Produce and supply superior quality piglets for breeding and fattening
23. The board has three bull stations, four bull mother farms and one each of indigenous cattle goat and pig farms. It has regional semen banks one each for two districts.
24. The bulls used for semen production are screened for genetic and disease screening as per Minimum Standard Protocols advocated by the Government of India for production of frozen semen production.
25. All the three semen stations under KLDB have been ISO 9001:2008 certified and have HACCP certification with strict bio security measures in force. All the three semen stations have been graded as “A” by the Central Monitoring Unit of the Ministry of Agriculture & Farmers Welfare, Government of India.
26. The state has a total of 2979 AI centres with an average of once centre for 300 breedable cattle. 88 % of these AI centres belong to the Animal Husbandry department. The breeding policy of the state recommends reducing the AI centres in a phased manner to improve efficiency and quality of semen distribution system and reduce the expenditure on AI delivery.
27. The board has instituted a centre for applied livestock genomics at Kudappanakunnu. The board also provides training in frozen semen. In fact Mattupetty is the only training centre in the country for frozen semen production. Off late the KLDB has initiated production and supply of goat semen to the state livestock holders through the AHD. The board also undertakes supply of breeding stock of pigs to Govt. agencies inside and outside state.
28. The board is undertaking Kudumbasree linked forage programme and establishment of fodder demonstration units and conservation and dissemination of indigenous germplasm. It has taken up genetic up gradation of cattle through field performance recording programme and Assisting Selection of bulls through genomic selection.

Kerala State Poultry Development Corporation

29. The growth in the poultry industry is 6-8% in layers and 10-12% in broilers per year against the growth of agriculture as a whole which is around 2.5%. In the year 1970 Kerala used to export eggs while off late the state brings in 225 crore eggs from neighbouring states. The KSPDC was established in the year 1989 for providing impetus for the promotion and development of Poultry sector in the state by modernization of the poultry sector as well as promoting backyard poultry production.
30. The institution which was a loss making entity in the year 2005-06 has now turned a new leaf and become a profit making entity, wiping out all the losses and earning profits from the year 2012-13.

The turnaround came with diversification of activities, sound planning and efficient implementation of the planned proposals.

31. KSPDC has introduced artificial insemination of birds, scientific waste disposal and bio security, brought in technological advancement and stressed on market promotion and penetration. It has introduced a new feed plant with a capacity of 6-8 tonnes of feed per hour. The corporation has also started a unique study centre in Kerala under IGNOUs approval issuing certificate courses in poultry farming and diploma in Meat Technology.

Kerala Veterinary and Animal Sciences University

32. The Kerala Veterinary and Animal Sciences University was established under the year 2010 with a vision to create quality professionals catering to the needs of the state and country, develop and identify newer technologies and interventions serving to the Animal husbandry sector of the state and supporting the entrepreneurial activities in the animal husbandry and allied sectors.
33. The University since its inception has strived to improve the support to the animal husbandry and allied sectors by introducing skill enhancing courses such as, masters, diploma, PG diploma and technology enabled courses like Quality systems in dairy processing, feed technology, Dairy science, Poultry production, Climate services in Animal Agriculture, Dairy cattle production and management, entrepreneurship and one health etc.
34. After the institution of the University, the student strength was enhanced from 930 to 2271, academic programmes from 4 to 40 programmes, a new faculty of poultry sciences was established. The constituent colleges were enhanced from three to seven. To stress on quality research, the University has established five schools of research and five centres. The university has introduced Residency Programme in M.V.Sc. and M.Tech. Five of the laboratories under the University have been accredited with NABL certification. The university has introduced e-governance initiative through establishing an Integrated University Management Software (IUMS) for catering to the academic and university management systems.
35. The Kerala Veterinary and Animal Sciences University has entered into collaborations with national and international institutions and Universities to improve the proficiency and efficiency of the academicians and students.
36. The University established an Entrepreneurship wing to support the entrepreneurial aspirations in the livestock sector which provides training and brings about publications. The farms of the University cater to providing quality livestock and fodder slips to the farmers in addition to imparting training to the farmers.

Kerala Feeds

37. Setup in 1995, Kerala Feeds Ltd was incorporated under the Companies act — 1956 with a production capacity of 500 TPD. The production was enhanced to 650 TPD in June 2006. Kerala Feeds Limited is a Public Sector Undertaking under the control of Government of Kerala. The unit is located in Kallettumkara Village in Mukundapuram Taluk of Thrissur District. The plant is situated in 27 acres of land and has sufficient scope for further expansion. The Company is committed to produce and sell good quality compounded cattle feed and feed supplements to dairy

farmers at affordable rates. The Company is headed by Chairmanship of the Secretary to Government (Animal Husbandry & Dairy Development), Government of Kerala. Some of the machineries installed in this plant are imported and these machines have helped the company to produce quality pellets and capture the market, which was hitherto in the hands of the private sector companies. Kerala Feeds has been instrumental in not only increasing the quality of the feed available in the market but also has been able to stall the spiraling tendency of the feed prices. The raw material is checked for its quality, stored in the godown, filled into the bins, drawn in fixed proportions, ground to fine particular size, mixed homogeneity, cooked for better digestibility and pelletized keeping the need of the cattle in mind.

Meat Products of India

38. Meat Products of India Ltd (MPI) is a Public Sector undertaking of Government of Kerala. Established in the year 1973, the company holds a category A FSSAI license for the manufacture and marketing of meat and meat products. The products of MPI are derived from young and healthy livestock and are processed by the help of sophisticated technology to ensure high standards of hygiene, longer storage time and more nutritive value.
39. Products of MPI range from beef, buffalo, pork, mutton and poultry. The processed and semi-cooked products include corn beef, meat loaf, sausages, curries, bacon, ham, cutlet-mix, chicken-n-ham and salami. Sausages, one of the most popular of the MPI products range come in varieties such as cocktail sausage, pork sausage, chicken pepperoni sausage and *masala* sausage.
40. In tune with the varied demands of the market, the above range of products is available in different weights and quantity in poly packs and cans.
41. Meat Products of India Ltd. is a Kerala Government owned company engaged in production and marketing of various meat and meat products derived from pork, beef, chicken and mutton. The products are manufactured under strict Veterinary Supervision from selected animals free from zoonotic disease. MPI products are available with all leading supermarkets and cold storages throughout Kerala and other states.
42. Some of the projects and programmes of Meat Products of India include:
 1. Pig rearing and buy back scheme in MPI under RashtriyaKrishiVikasYojana (RKVY)
 2. Training Programmes for students in meat processing and farm management
 3. Joint Venture Pig Farm with Kerala Livestock Development Board Ltd.

CHAPTER 3
THE WORKING GROUP

43. The first Working Group meeting on Animal Husbandry and Dairy Development including Veterinary Research was held at 3.00 PM on 04.10.2016 at the Aiswaryam Conference Hall of State Planning Board. Hon'ble Vice Chairman of State Planning Board-Kerala, Dr V K Ramachandran presided over the meeting. Co- Chairpersons of the Working Group were Sri Anil Xavier IAS, Secretary, Animal Husbandry & Dr R Vijayan, Professor (Retired), College of Agriculture, Vellayani attended the meeting. In his introductory remarks, Hon. Vice Chairman stated that Kerala is the first state in the country which started the formulation of the 13th Five Year Plan. He has given a time frame to schedule the subsequent sittings of the Working Group before finalizing the Draft Report. It was also decided that the Draft Report of the Working Group on Animal Husbandry and Dairy Development including Veterinary Research shall be submitted to State Planning Board by 1st of December, 2016. With regard to the terms of reference of the Working Group, Co-Chairpersons were permitted to make necessary modifications as required and they were allowed to co-opt other members in the Working Group.
44. As requested by the Hon. Vice Chairman a Committee with the following sub-groups and topics was formed to write the report.
1. *Milk and Milk products including Marketing, Processing and Value addition*
Dr P SudheerBabu- **Convener**
Members
Dr G Girish Varma
Sri George Kutty Jacob
Sri K T Thomas
Dr Jose James
Sri Koshy K Alex
Dr Madhu G S
 2. *Poultry Production with special reference to Egg production*
Dr K N Noushad Ali- **Convener**
Members
Dr Sunil Kumar
Dr Jalaludheen
Dr AjithBabu
 3. *Meat including Small Ruminants*
Dr B Sunil - **Convener**
Members
Sri P Krishna Prasad
Dr Sajeew Kumar
Dr SajiEasow
 4. *Veterinary Services*
Dr N N Sasi - **Convener**
Members
Dr Devanand
Dr K K Jayaraj

Dr Anil Kumar V.A
Dr Shajil

5. *Veterinary Extension*

Dr T P Sethumadhavan - **Convener**

Members

Dr S Ramkumar

Dr Anil Kumar V S

Sri Thampi Mathew

Sri ShyamSuraj S R

6. *Veterinary Education and Research*

Dr K Devada - **Convener**

Members

Dr Joseph Mathew

Dr Sisilamma George

Dr S Maya

Dr Anil Kumar

Dr Hiron M Harshan

Sri G R Jayadevan

Sri Sunil Kumar M

45. It was also decided that the above sub-groups can discuss separately to prepare the sub-group reports. The sub-group reports shall be then compiled to prepare the Draft Report of the Working Group. Sub-group Conveners were permitted to co-opt additional experts if necessary in their group for preparing the sectoral reports.

46. The second meeting of the Working Group on Animal Husbandry and Dairy Development including Veterinary Research held on 4th of November, 2016 at the *Aiswaryam* Hall of State Planning Board. There were presentations and detailed discussions on the sub-group topics and it was decided to form a Drafting Committee with the following members for preparing the Draft Report of Working Group:

1. Dr P SudheerBabu (Convener)
2. Sri G R Jayadevan
3. Dr Jose James
4. Sri Koshy K Alex
5. Dr Vinayaraj Stephen
6. Dr Hiron M Harshan

CHAPTER 4
ANIMAL HUSBANDRY AND VETERINARY SERVICES

Introduction

47. The Animal Husbandry sector plays a pivotal role in the socio economic development of Kerala and has an immense potential, substantially contributing to regional economy. This sector is an essential component of sustainable production systems and directly or indirectly influences lives of every human being. This sector contributes to approximately 4% of the state's gross domestic product and has ample scope for development, impacting rural and urban lives. The sector is primarily responsible for the wellbeing of animals of the state, however is vested with enormous multifaceted tasks of employment generation, poverty alleviation, ensuring food security, women empowerment, wealth creation besides being an avocation for sustenance. The sector ensures the nutritional requirement of a nation by meeting the ever growing demand for quality food like milk, meat and egg. The Animal Husbandry Department over the years has protected animal wealth, rendered veterinary services, enriched the genetic pool, produces food for human consumption besides a multitude of activities benefitting farmers, animals and general public. Maintaining a healthy productive livestock resource holds the key for sustaining production and achieving the self sufficiency in milk, meat and egg production. A healthy productive animal resource requires constant upkeep by scientific management involving disease control, nutrition and other strategies. Among these management strategies, veterinary service becomes the most prominent intervention given the fact that loss due to diseases substantially impacts the economy of livestock industry.

Economy of the Sector over the Years

48. Animal husbandry sector existed as an allied sub sector of agriculture 2 to 3 decades back, often sidelined in terms of budgetary support, schemes and overall economic development. The economic growth the state witnessed in tandem with the national economy propelled this sector as a major player now. Urbanization and income growth had positive influence on the consumption of livestock products viz milk, egg and meat. The consumption growth rates of these commodities are very high in the last decade and the same will be the trend in future. This will help not only to maintain nutritional security of the people but also to increase income growth of the rural poor.
49. Limited budgetary support is thing of the past and now this sector is burgeoning with financial influx from all possible sources. In the early nineties the sector was actively involved in milk, meat and egg production and has thrived well catering to the people's demand. However the exploding population and urbanization pushed the sector's limits and things started falling apart. This sector which flourished well during the last three five year plans, showed signs of declining during the X plan period. When compared to 1996 livestock census, the census conducted during 2007 and 2012 showed drastic reduction in different categories of livestock. Kerala's cattle population which accounted for 1.75% of the total cattle population in the country during 1987 declined to 1.61 % by 1996 and 1.13 % by 2003 and has now reached a staggering 14 lakh. The crossbred cattle population which stood at 22.87 lakhs (67%) as per 1996 Census decreased to 17.35 lakh numbers and in percentage terms increased to 82% by 2003. It further declined to 14 lakh numbers and in percentage terms increased to 94% in 2012. Estimates of milk and egg production reveal a declining trend in milk production after 2001-02 and in egg production after 1999-00 and during 12th plan period, production of both the products showed a slight increase. The total milk production of the State is showed a declining trend from 27.18 lakh tonnes in 2001-02 to 21.11 lakh tonnes in 2004-05.

The milk production then began to increase in the subsequent years. It increased to 25.37 lakh tonnes in 2009-10. However the gap between the production and requirement of egg is widening at an alarming rate. Meat production alone is increased over the years to keep in pace with the demand. The egg production of Kerala, which recorded a growth rate of 4.89 per cent during 1980 – 90 period, declined subsequently and by ninth plan period it reached a negative growth rate of 0.22 per cent and declined further to 9.75% during 10th plan period. Even then the gap between requirement and production continues to remain unfavorable. Concerted efforts of the State to increase the egg production have begun to show signs of improvement. Egg production which was 137.9 crore in 2007-08 increased to 163.3 crore in 2009-10 and to 168.56 crore in 2010-11; an increase of 3.22 percent over the previous year. The egg production is now 244.24 crore. Though meat production is increasing over the years, it cannot cater to the demand fully. Poultry meat production increased from 15482 tonnes in 2009-10 to 16153 tonnes in 2010-11 and meat other than poultry meat from 102026 tonnes in 2009-10 to 108398 tonnes in 2010-11 registering an increase of 4.33 percent and 6.24 percent respectively over the previous year. However the negative trends in milk, meat and egg production until 11th plan has compelled the sector to put things in place to reduce the demand and supply gap. We are slowly showing signs of positive trends in the 12th plan period.

Assessment of Sectoral Performance

50. In spite of the compelling prevailing conditions, this sector has witnessed spectacular and impressive progress owing to meticulous planning, comprehensive efforts and result oriented interventions in 12th plan period. The progress has constantly evolved from sustenance to full-fledged commercial ventures. Despite a decline in cattle population in the recent years, the internal milk production has increased and also the productivity. The goat and poultry population has increased over the years in the 12th plan period. The domestic market for livestock and poultry products also showed prospective growth during this period. The Animal Husbandry sector of Kerala is quite unique in the country that we were successful in establishing minimum one veterinary institution in a panchayath and now veterinary institutions are spread across the entire state. As a result of an effective cross breeding policy, 94% of our cattle population is crossbreds with an average milk production of 9.03 litres per day. The advent of an Animal Disease Control Project has curtailed the occurrences of economically devastating diseases like foot and mouth disease and efficiently created a disease controlled zone in the state which is congenial for export of livestock products like meat and egg. Scientific and professional intervention, research and development, knowledge updation and most profoundly uplifting the farmers of this sector and ensuring food security through self reliance is inevitable to become a developed India. It is with this insight the Kerala Veterinary and Animal Sciences University was formed for the development and furthering advancement of learning and prosecution of research in Veterinary and Animal sciences and to enrich the human resource in this sector. Profound importance have been given to assist livestock and poultry farmers, increase the animal population, commercialize and mechanize dairy sector, strengthen government farms and augment infrastructure of veterinary institutions.

Benchmark of Animal Husbandry Sector against Other States

51. In spite of India's position as highest producer of milk, productivity per animal is very poor. At the national level it is only 987 Kg/lactation as compared to the world average of 2038 Kg/lactation. This is mainly due to poor level of nutrition as well as low genetic potential for milk production and productivity of cows and buffaloes. As per the available estimates milk yield/day of exotic cows were highest in Punjab (8.431 Kg), followed by Gujarat (8.057kg) Kerala (7.508 kg) and Andhra Pradesh (7.385 kg). At the same time the yield/day of exotic breeds in Karnataka is 6.312 kg and Tamil Nadu

is only 5.890 kg. Among these states highest yield of non-descript cow is of Gujarat (3.401 kg) followed by Tamil Nadu (2.762 kg), Kerala (2.629 kg), Punjab (2.505 kg), Karnataka (2.240 kg) and Andhra Pradesh (1.813 kg). The average yield/day of buffaloes is highest in Punjab (7.425 kg) followed by Kerala (6.242 kg), Tamil Nadu (4.222 kg) and Karnataka (2.481 kg). In general the milk yield of both cows and buffaloes were lowest in Assam. As per estimates available, the per capita availability of egg is very low at 47 eggs/year and poultry meat is 0.9 kg/year against the world average of 147 eggs and 11 kg poultry meat /year. Regarding breeding infrastructure, India is among the countries having the largest breeding infrastructure in the world with 159 bull stations, 152 frozen banks and more than 50000 AI centers. Kerala has 2900 AI stations, 7 regional semen banks and uses about 1.5 million doses of semen annually.

Critical Evaluation of Data Sources

52. The department's relentless efforts in the production sector has created an increase in milk, meat and egg production from 21.02 lakh tone in 2006-07 to 26.49 lakh tonne of milk in 2015-16, 119.39 crore in 2006-07 to 244.42 crore of eggs in 2015-16 and 1.9 lakh tonne in 2006-07 to 4.66 lakh tone of meat in 2015-16 and increasing constantly. As a result of an effective cross breeding policy, 94 % of our cattle population is crossbreds with an average milk production of 9.03 litres per day well above the national average. The State has two ISO certified state of the art semen stations which cater to the artificial insemination network of the State. With a view to promulgate the veterinary profession and ethics in the state, the Kerala State Veterinary Council was formed as per provisions of section 32 of the Indian Veterinary Council Act 1984. The Kerala Veterinary and Animal Sciences University was formed for the development and furthering the advancement of learning and prosecution of research in Veterinary and Animal sciences. Various special packages were implemented to mitigate agrarian distress in Kuttanad, Idukki, Wyanad, Palakkad and Kasargod. Apart from plan schemes and special packages a scheme called RashtriyaKrishiVikasYojana was introduced in the year 2007 with a view to increase agricultural production by 4% and fill existing gap of state budget. The RKVY in the state is a success saga and thousands of farmers are already reaping its benefits. In recent years the country faced a serious issue of food security and major thrust has been in central and state budgets to address this concern. Food security schemes have therefore been given profound importance in the 11th plan period. With a view to control economically devastating diseases, massive immunization programmes against diseases like Foot & Mouth disease were undertaken which could reduce the incidence of major outbreaks of diseases in the state. Backyard poultry has been popularised in the state to promote production of eggs by masses. Many new egger nurseries were started and existing was strengthened. School poultry clubs were established to create awareness in children. The number of institutions also has grown from 68 in 1956 to 2698 in 2015. Extension activities were given top priority in the past few years and the department was successful in creating awareness among farmers, disseminating information through camps, touch screen kiosks, seminars, publications, television programmes and multitude of allied extension activities. Farms schools have been established, farmers were given awards and farmers were taken for tours in and outside the state.

Evolving Challenges in Animal Husbandry Sector

1. Shortage of Milk, Meat and Egg in meeting internal demand
2. Drastic decline in livestock & poultry population.
3. Decline in availability of pasture lands.
4. High cost of production
5. Urbanization and change in eating habits creating huge demand for animal food

6. Old and traditional farmers leaving the sector.
7. Non availability of good quality feed & fodder.
8. Lack of adequate financial support for entrepreneurship.
9. Poor protection to farmers against risks.
10. Heavy inflow of livestock, poultry and products from neighboring states.
11. Lack of industries based on livestock products and byproducts like bone, hide etc.
12. Unauthorized, unscientific & unhygienic slaughtering practices.
13. Inadequate border check mechanisms.
14. No adequate regulatory mechanisms for animal transportation, trade including animal meat sales.
15. Unable to exploit the full production potential of animals due to poor management.
16. Inadequacy of training on advancements to all categories of technical staff.
17. Lack of facilities to diagnose new & emerging diseases such as PPR, Hog Cholera, Avian influenza.
18. Adequate level of awareness to be created among farmers about scientific farming.
19. Lack of multi specialty clinics.
20. Lack of ambulatory service.
21. Non availability of marketing facilities under cooperative sector for meat and egg
22. Inadequate R&D activities

Veterinary Service in Kerala

53. Kerala is quite unique in veterinary services sector that except for one, all panchayaths have at least one veterinary institution manned by a veterinarian. The AH department has a three tier system of veterinary health care service delivery comprising of District Veterinary Centers (DVC) at district level, veterinary poly clinics (VPC) at Taluk level and veterinary hospitals or dispensaries at panchayath level. DVCs and VPCs act as referral centers to local institutions and are equipped with state of the art diagnostic equipments.
54. They have a special wing for disease control viz. Animal Disease Control Project (ADCP) which performs routine prophylactic vaccinations against diseases of national and economic importance. Currently mass campaign vaccination programs like Foot and Mouth Disease Control program, Rabies Free Kerala vaccination program and ASCAD poultry vaccinations are being conducted regularly.
55. At Palode, the department has an Institute of Animal Health and Veterinary Biologicals (IAH&VB) which manufactures animal vaccines intended for use in the State. Most of the poultry and livestock vaccines produced here are distributed to all the veterinary institutions year round.
56. A Chief Disease Investigation Office (CDIO) is situated at Palode which acts as the major diagnostic centre for the entire state. Besides the department have regional disease diagnostic centers at Thiruvalla, Palakkad and Kannur. An efficient disease diagnosing, reporting, monitoring and forecasting systems is in place through these institutions. However these institutes require upgradation to meet newer certification requirements owing to emerging disease outbreaks like Avian Flu.

Achievements in 12th Five-Year Plan

1. Laboratory network upgraded with state of the art equipments and Chief Disease Investigation Office (CDIO) with Bio Safety Level 2 (BSL-2) laboratory to diagnose emerging diseases
2. Widened the product portfolio of Biological Production complex to produce diagnostic antigens, diluents apart from vaccines
3. Introduced and expanded emergency night veterinary service in 65 blocks
4. Rabies diagnostic facilities established at CDIO Palode, DVC Kollam, ADDL Thiruvalla and DVC Kannur
5. Lateral flow kits for field level disease diagnosis in the final stages of production
6. Standardized disease diagnostic PCR protocols for 28 diseases
7. CDIO received award from Government of India for best collaborating unit for PD-ADMAS and best 2nd AICRP unit on FMD unit in India
8. Established a well equipped mobile disease diagnosis laboratory at CDIO and Avian Disease Diagnostic Laboratory Thiruvalla.
9. A mobile tele-veterinary unit established at Kollam with satellite uplink to national and international labs
10. A GIS based disease mapping system developed for disease monitoring and epidemiological studies
11. Upgraded 4 Veterinary hospitals to Veterinary Polyclinics, 2 Veterinary Dispensaries to Veterinary Hospitals and established 7 new Veterinary Dispensaries
12. Ambulatory clinical facility established in all districts.
13. Established New buildings for District Veterinary Centres in Kannur, Kasargode, Pathanamthitta, Alappuzha, Thiruvananthapuram, Kollam
14. Vaccinated 80% (12.37 lakh animals per round) of livestock population twice a year against Foot and Mouth Disease, conducted Anthrax vaccinations 7500 animals per year, Hemorrhagic Septicemia vaccination 1.5 lakh animals per year, Classical swine fever 45000 per year and Black quarter 2500 animals per year

Strategies for 13th Five-Year Plan

1. District Veterinary Centers, Veterinary Poly Clinics and all Veterinary institutions will be developed with local self government support to meet prescribed standards and certification
2. Availability of quality medicines to meet complete requirement of Veterinary Institutions of the State, throughout the year will be ensured.
3. Veterinary and emergency round the clock services at the door step of farmers
4. District Veterinary Centers to function round the clock and Veterinary Poly Clinics to function from 8AM to 8PM in two shifts
5. Block level veterinary institutions will be established under Animal Husbandry Department and will be designated as “Veterinary Public Health Centre (VPHC)” headed by an officer not below the rank of Assistant Director with sufficient supporting staff. Human health is inextricably linked to animal health and production. This link between human and animal populations, and with the surrounding environment, is particularly close in developing regions where animals provide meat, egg and milk. In Kerala, however, this can lead to a serious risk to public health with severe economic consequences. A number of communicable diseases (known as zoo noses) are transmitted from animals to humans like Rabies, Brucella, Leptospirosis, Anthrax, Avian Influenza etc. Veterinary Public health is also relevant in ensuring clean meat for human consumption by providing veterinary health inspection.
6. Emergency night veterinary service facility will be established in all blocks of the State.
7. State specific disease control strategies for mastitis and infertility management

8. Comprehensive online management and monitoring system for veterinary services, as part of strengthening E-Governance programme.
9. Strategies will be evolved for effective monitoring of Interstate animal movement. As part of this border check posts under Animal Husbandry Department will be strengthened with sufficient infrastructure facilities and man power. Border check posts to have mobile/pre fabricated state of the art facilities.
10. Comprehensive insurance package for livestock population especially for cattle, buffalo and ducks.
11. Emphasis will be provided for Animal Resource Development in tune with Government policy to attain self sufficiency in milk, egg and meat production. Support will be provided to farmers for ventures in animal husbandry sector especially in the areas such as piggery, goatery etc so that more farmers will be attracted and also existing farmers will remain in the sector.
12. Strategies will be evolved for declaring Rabies free Kerala by 2030
13. Rabies diagnostic facility to be established in all districts
14. NABL accreditation for all Regional Disease Diagnostic Laboratories
15. Production of Rabies Vaccine for human and animal use at IAH&VB Palode
16. Mastitis control through vaccination protocols
17. New Oncology wing and Centre for wildlife studies at CDIO Palode
18. Establishment of a new Research & Development wing at CDIO Palode
19. Feed analytical laboratory at CDIO, Palode
20. Biosafety Level (BSL)-2 facilities already established at Chief Disease Investigation laboratory, Palode. This will be upgraded to Bio-safety level 4 facilities. Apart from this the BSL-4 facility will also be established at Avian Disease Diagnostic Lab at Thiruvalla for making it recognized bird flu diagnosis centre.
21. Modification of production laboratory at IAH & VB Palode to achieve cGMP status.
22. A new Training Center for laboratory management training at CDIO Palode

CHAPTER 5
LIVESTOCK BREEDING INCLUDING SMALL RUMINANTS

Introduction

57. Kerala is home to a range of livestock species. The livestock in Kerala are raised both in backyards and commercial farms. Cattle, buffaloes, goats, pigs, ducks and fowl, rabbits, etc., are the main livestock categories raised for milk and meat. The sustainable livestock strategy will aim at reducing the environmental footprint of farms, while improving milk, meat and eggs production, farm profitability, and the well-being of people and animals involved. Integrated farming is the recommended solution for Kerala. Sustainable practices and technological skills will be adopted or adapted along with branding and marketing skills to promote the products of Kerala.

Importance of the Sector

58. Livestock is a major source of livelihood for the World's poor. It is an integral part of India's agricultural economy and plays a multifaceted role in providing livelihood support to the rural population. Livestock sector apart from contributing to national economy in general and to agricultural economy in particular also provides employment opportunities, asset creation, coping mechanism against crop failure and social and financial security. Livestock is the main source of animal protein for the population. Small and marginal farmers and landless labourers own majority of the livestock resources. Hence sustainable development of the livestock sector would lead to more inclusive development and empowerment of women. Livestock sector contributed 27.62% of the Agriculture GDP of the State during 2014-15 (at constant price with base year 2011-12), while in 2013-14 the share was 25.25 per cent. Thus in 2014-15 the share of the sector in Agriculture GDP has increased, the sector as a whole recording a positive growth rate of 4.3% over 2013-14.

Present Scenario

59. **Milk:** India ranks first among the world's milk producing nations. At the national level milk production has increased from 1026 lakh MT in 2006-07 to 1463.1 lakh MT in 2014-15. Kerala ranks 14th position with 27.1 lakh MT in 2014-15. The per capita availability of milk at national level is around 307 grams per day in 2013-14 which is more than the world average of 294 gm per day.
60. Milk production in the State increased from 21.19 lakh MT at the end of the tenth plan (2006-07) to 27.16 lakh MT at the end of the eleventh plan (2011-12). Milk production during 2013-14 and 2014-15 was 26.55 lakh and 27.11 lakh MT respectively, the percentage change being 4.83 per cent and 2.11 per cent respectively. Growth of milk production during 2014-15 in the State is far below that at the national level. During 2014-15, Kerala contributed only 1.85% to the annual milk production of the country.

Table 2 Milk production, Kerala, during 10th and 11th Plans in lakh tonnes

Year	Milk production (Kerala)	Milk Production (India)
2006-07 (X Plan)	21.19	1026.00
2011-12(XI Plan)	27.16	1279.04
2012-13	27.91	1324.30
2013-14	26.55	1376.86
2014-15	27.11	1463.13

Source: NDDDB Statistics, 2015.

61. The annual milk production in Kerala would have to be increased from 27.11 lakh tonnes in 2014-15 to 35.8 lakh tonnes over the next 10 years. (*Assuming an anticipated human population of 35 million and a projected per capita milk consumption of 280 g per day*). Anticipating a decline in crossbred milch animal population by around 10%, the average productivity of crossbred animals in Kerala would have to be enhanced from the present level of around 10 litres per day which is the second highest in the country, to 12 or 13 litres per day to achieve the projected requirement of milk. The very fact that the average daily production of crossbred cattle population in Kerala is the 2nd best in the country despite the meagre fodder resources available corroborates the fact that the current breeding programme is in the right direction. For enhancing the average productivity to 13 litres per day, a growth rate of 3.7% would be required.
62. The projections suggest that if the current growth trend in the number of in-milk animals and milk yield continues to be the same in the future, total milk production would decline. The main reason for this would be the declining number of animals in all the categories, the pace of which would mask the prospective improvement in milk-yield. By countering the reduction in animal population and maintaining the yield dividends through various institutional and technological improvements, milk supply in the state can be elevated to a considerable extent.

Cattle and Buffalo population

63. The State had according to the 2012 livestock census estimates, 13.286 lakh cattle and 1.02 lakh buffaloes. Of the total cattle, 12.51 lakh are crossbred cattle. Crossbreeding of cattle with exotic breeds was introduced in the State during 1956. The crossbred cattle formed 67.3 per cent of total cattle in 1996 and 81.75% during 2003. The percentage of crossbreds increased to 94 during 2012. However, in relation to the corresponding figures in 2007, total cattle population in Kerala suffered a drop of more than 23 per cent. The percentage decline was higher in indigenous breeds (-35.25%) than in crossbred (-22.76 %) cattle. However, during the last decade, only the buffalo population has increased by 5% per annum from 0.6 lakh in 2003 to 1.00 lakh on 2012.

Table 3 Trends in cattle & buffalo population in Kerala

Animal	Type	Number in thousands		Per cent change (%)
		2007	2012	
Cattle	Crossbred	1,621	1,252	-22.76
	Indigenous	119	77	-35.25
	Total	1,740	1,329	-23.62
Buffalo	All	58	102	+75.86

64. Speculation is rife about the probable causes of this decline: the most probable ones talked about are: increased slaughter removal of meat animals and to an extent culled crossbred cattle, mounting prices of feed and other inputs, widening gap in the demand – supply of fodder and diseases leading to mortality / permanent disability of milch stock. The homestead settlement pattern, the relatively high level of literacy particularly among women, the highly favourable agro climatic conditions conducive for bio mass production, and the long tradition in livestock rearing are the inherent strengths which the Kerala economy possesses in favor of livestock rearing. However, the sharp and continuous decline in the area under livestock supporting seasonal crops especially paddy, marginalization of agricultural holdings, declining trend in the family participation particularly among youth and high cost of production as a result of increasing reliance on externally sourced purchased inputs are some of the recent developments in the Kerala farm front posing serious threat for sustaining the activity on a firm footing.
65. The average herd size is less than one milking animal per household. There is a heavy shortage of fodder especially due to meager land availability for fodder production. The heavy rainfall leading to mineral depletion is also thought to be hostile to dairying. Being a consumer state, Kerala depends on the neighboring states for the supply of the raw materials for dairying. This system of cattle production had resulted in the increased cost of production of milk. Recently it has also been noted that the cattle have started migrating to more productive areas, especially in the high ranges.
66. The average milk yield per animal per day is estimated to be around 10 litres. This is against the estimated potential of 12-13 litres per crossbred animal per day. In spite of the decrease in the number of animals, the per animal productivity has gone up.

Table 4 Availability, Requirement and Surplus/Deficit of Dry Matter in thousand MT

Year	Availability	Requirement	Surplus/Deficit
1997	2711.9	8405.9	(-)5694.0
2003	2766.1	7150.2	(-)4384.1
2007	2686.4	6317.0	(-)3630.6
2008	2544.7	6421.0	(-)3876.3
2009	2634.7	6602.0	(-)3967.3
2010	2651.1	6856.0	(-)4204.9
2011	1857.0	7189.0	(-)5332.0

Source: Dairying in Kerala – A Statistical Profile 2016, NDDB.

Key Constraints to Improving Productivity and Profitability of Milk Production

1. Feed availability
2. Shortage/Decline of improved stock
3. Insufficient knowledge of raising management skills
4. Access to affordable credit.

Strategies and Programmes to Achieve the Objectives

67. The following are the strategies envisaged for the achieving the project objectives are as follows:

1. Increasing the number of female bovines reasonably
2. Improve genetic potential so as to increase per animal productivity.
3. Improve quality of the breeding bulls and ensure quality of the product viz. frozen semen
4. Maximal utilization of the existing herd by better management

Suggestions

1. Integrating the schemes implemented by different agencies and concentrating them more on the milk producing zones of the state. About two-third of the dairy animals are available in seven districts of Palakkad, Thrissur, Ernakulum, Kozhikode, Kollam, Thiruvananthapuram and Kannur.
2. Averting further decrease in crossbred population and Increasing the number of female bovines reasonably
3. Sustaining rate of increase in productivity of crossbred population
4. Increasing contribution of local cows, buffaloes and goats to total milk production
5. Increase the productivity of the existing stock in the state, through breed improvement and production through better management ultimately leading to increase in milk production in the state.
6. Continued genetic up gradation of cattle through Field Performance Recording Programme
7. Application of modern technologies like use of sex sorted semen, invitro fertilization, etc to produce more number of quality females within the state so as to ensure a minimum number of females to achieve the targeted milk production.
8. Systematic research to improve the genetic makeup of the animals and the utilization efficiency of the feeds available and to identify location specific management systems for immediate application at the farmers' level.
9. Assisting bull selection through Genome Mapping.
10. Support and strengthen the farms under Government and public sector to be showcased as replicable models for prospective entrepreneurs.
11. Promote mechanization in this sector, which ensures higher productivity and better production environment.
12. *Enterprise-driven approach to development of the livestock sector.* The sector has been perceived in policy circles as a source of rural livelihood and not as a source of generating economic value. That perception poses risks around attracting talent and introducing new practices and innovations. It is therefore important to change the way this sector is looked upon. Recognizing the market opportunities associated with this sector, the perception will be to modernize the sector and upgrade its status.
13. In order to achieve this, the input generation part viz., the production and selection of bulls including the Progeny Testing Programme for bull selection, production of frozen semen ensuring quality standards and its timely distribution and production/purchase and distribution of liquid nitrogen, are to be strengthened / expanded.
14. Strengthening the feed and feed resources in the state, with all out efforts for popularizing fodder cultivation.
15. Maximal utilization of the genetic potential (productivity) of existing herd by better management (nutrition, fertility, diseases) should be ensured.
16. Increasing the volume of locally produced fodder through increase in field fodder production and improvement in fodder ratio.

17. Promoting fodder production utilizing the service of Self Help Groups like Kudumbashree.
18. Introducing mechanisms to promote efficient use of pastures, and ensuring technical assistance to lessees and owners of pastures for the improvement of vegetation cover, rehabilitation of ecological balance and provision of watering points for animals.
19. Raising fodder production through large scale, dairy co-operative society-based, fodder development projects and by encouraging intercropping.
20. Enhancing cattle feed production capacity, both by setting up new plants and by raising capacity of existing plants.
21. Trying out locally available unconventional feeding materials as fodder.
22. State Government should formulate a Feed and Fodder Policy
23. Feed Act to be enforced to maintain quality standards of the compounded feed being produced both in Government /co-operative sector and also private sector in the State.
24. *Training of Personnel.* Training and retraining of the personnel engaged in implementing the programmes, by updating their knowledge and developing communication skills so as to ensure that the developed technology reaches the end users without any hindrance. Information Centres for Farmers for better dissemination of knowledge from Lab to Land need to be established.

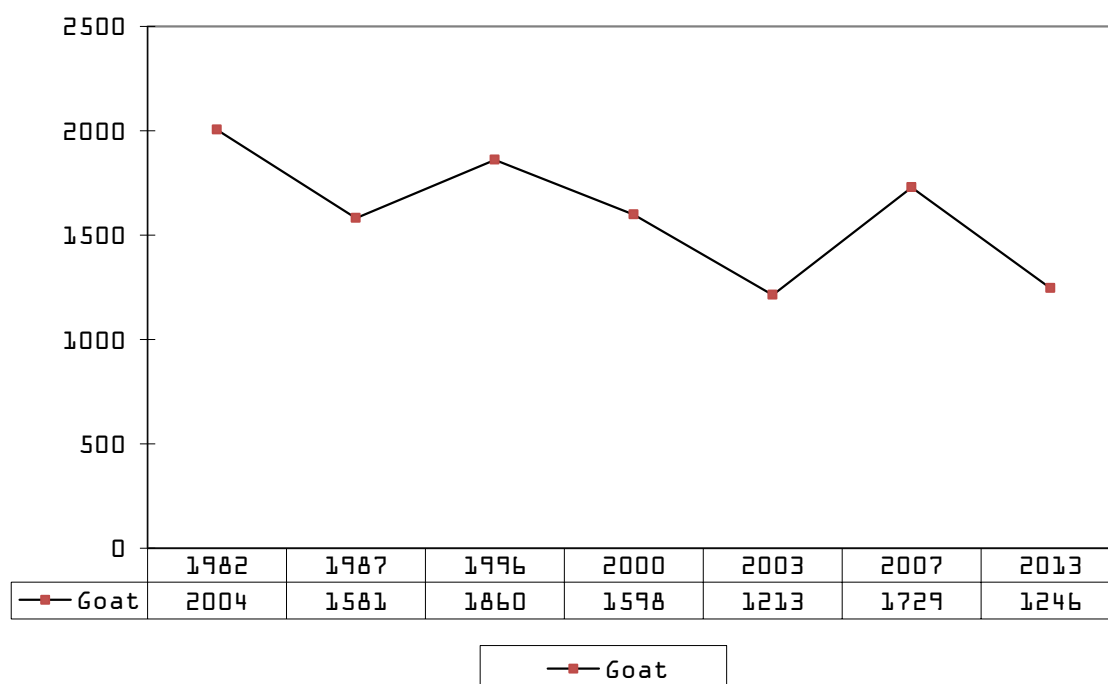
Development of Small Ruminants with Special Reference to Goats

Status of Goat Rearing in India and Kerala

68. Goat keeping in India is closely interwoven with agriculture and plays an important complimentary role in the rural economy. It provides high quality human food (milk and meat) and bio fertilizer (manure), in addition to gainful employment and supplementary income to the vast majority of rural population. The country is rich in its goat wealth. As per the 2012 livestock census, the country has 135.17 million goats which is the highest in the world. Of the 102 breeds of goats recognized worldwide, 20 are in India and the country accounts for the largest number of goats (18%) in the world. Goat as a source of supplementing household income is getting increasing attention, especially among the landless agricultural labourers and small and marginal farmers. Women are increasingly finding it as a potential source of earning cash income to meet their families' livelihood. The landless, small and marginal farmers are gradually recognizing the potential of goat as a low cost solution to 'resourcelessness'. The large animals do not fit well into their household and infrastructural paradigms and as a result, the goat is getting popular with advancing times.
69. India has rich diversity of goat breeds with varying capacities to produce meat, milk, fibre and skin. These breeds have been developed by way of natural selection, isolation and adaptation to diverse agro-climatic conditions. People who cannot afford to keep cows and buffaloes for milk keep goats. The cost of their maintenance is considerably lesser. Most Indians prefer goat meat over other meat, although it is comparatively higher in price. Goat's milk, being highly nourishing, is popular among many. Goat skin is in great demand in the leather industry. Goat hair is used for rope making.
70. The ultimate objective of goat production is to maximize profit with the available resources. Goats are opportunistic foragers and can be maintained on variety of diets under diverse conditions. In India, goats are mainly reared by the people with fewer resources on a zero input basis. The important role of these species (*Capra hircus*) in tropical agriculture is inadequately understood and exploration of the potential benefits from it has never been close to the attainable.

71. Development assistance and national interventions designed to achieve improved and sustained production and economic efficiency of goat enterprises within the range of farming systems are likely to make a significant contribution towards poverty alleviation, as this animal is considered as 'poor man's cow' requiring lesser area and feed as compared to bovines .
72. Goat husbandry has advantages such as short reproductive cycle, less investment and a comparatively higher financial return against the investment. Goat has a high reproductive rate and as such the population can be increased in a short span thereby increasing the production of milk at a faster pace in order to meet the fast growing demand for goat milk, milk products and quality meat. Goat husbandry can also contribute significantly to the agricultural sector in the form of manure, thereby reducing the utilization of chemical fertilizers and improving the soil quality so as to sustain agricultural production.
73. Analysis of the previous three Livestock Census reports reveals that in spite of high demand for goat meat the population of goat in the state of Kerala is on the decline which can probably be due to early slaughter of the animals (to meet the ever increasing demand for goat meat), low availability of the replacement breeding stock, shrinking of grazing lands and urbanization. Also, serious attempts to organize structured and scientific breeding of goats in the state have not happened so far.
74. Though goat population showed a significant increase from 2003 to 2007, it has declined by 28.45% as per the 2012 census, reducing the population to only 12.46 lakh. Goat production in the state has been mainly confined to the back yards where the animals are maintained semi-intensively. The average holding size in the state is only two. Kerala has a goat population of 12.46 lakh and a majority of them do not fall under any specific category.
75. About 83.74 % of the urban households and 97.01 % rural households in Kerala have been found to be non- vegetarians according to the study conducted on "the Meat Sector in Kerala (1998)", by the Swiss Agency for Development and Co-operation (SDC). Among the red meat available, all the religious groups relish chevon. Breeding activity in goats in Kerala is taking place without any proper guidelines. This has led to deterioration in the genetic quality of the goats. One reason that could be attributed to this is that the service bucks were not the progeny obtained through a scientific breeding programme. Moreover, they are being retained in the same locality for a long time, leading to inbreeding.

Figure 1 Goat population over the years, Kerala in thousands



76. In fact, as the size of landholdings in the state decreases further and resources get more stretched, it should be expected that this valuable breed of goat with unique genetic characteristics and highly adapted to the extreme climatic conditions may get extinct in the near future. The high cost of chevon in the market has inspired many farmers to go in for goat farming. As a result of which indiscriminate crossbreeding is happening. Very little efforts are being made to select and use superior Malabari bucks for breeding. The numbers of Malabari goats are coming down at a much higher pace and if this trend persists, the consequences will be disastrous.
77. The role of farmers and other agencies in this sector (Governmental/non Governmental) is also crucial for the conservation of this valuable germ-plasm. Programmes towards creating awareness among farmers and providing them with assistance in the form of know-how and funds could well be worth the effort. Those who raise goats in the state do not have the resources to increase output through additional investments. They sustain themselves on a 'low input, low output' mode of production.

Developmental Suggestions for the 13th Plan Period

1. Goat Breeding Centers in the state should be strengthened in terms of infrastructure and also good breeding stock to be maintained
2. Adequate support for maintenance of a superior breeding stock – both males and females
3. Systematic selection of bucks for economic traits like prolificacy and weight gain
4. Maintaining superior bucks and strengthening frozen semen production from quality bucks - The methodology for deep-freezing of Malabari buck semen has been standardized by KLDB and semen collection and processing is being done to meet the breeding requirements for the farm and that of the state, though to a limited extent. The Infrastructure facilities available in the GBC for housing of goats, paddocks for grazing, etc. can be used for maintaining more stock
5. Interventions in the breeding tract of Malabari breed – formation of Goat Breeders Forum, Satellite breeding units, etc.

6. Dissemination of superior germplasm in the State is to be intensified for goat development - More than 500 AI centers in the state belonging to AH Department are already performing AI in goats. These centers are all manned by Veterinary Officers who have been trained specifically for performing AI in goats. These centers are supplied with frozen semen from selected superior Malabari goats by KLD Board along with the routine supply of frozen semen of cattle. All these centers are also provided with trevis for restraining the goats by lifting the hind quarters during AI, headlamp for locating the cervix for AI and vaginal speculum for the process of AI. The conception rates obtained in the field are encouraging and results between 40-50% are being obtained, which by normal standards are satisfactory. The AI facility should be expanded to cover all AI centres in the state during the 13th Plan period. This will help in making available superior germplasm in the State as a result of which the genetic makeup and potential of the future generation of goats in the state is expected get better.

CHAPTER 6
DAIRY FARMING, MILK INDUSTRY AND
PRIMARY DAIRY CO-OPERATIVES

Introduction

78. The Dairy production sector has shown a promising improvement in recent times, with the milk production increasing from 21.19 lakh metric tonnes in 2006-07 to 27.11 in 2014-15. While it is a welcome improvement, it must be noted that in spite of improvement in the production of milk, the state is still not self sufficient in terms of requirement and in house market availability of the item. This when seen in the context of changing socio-economic aspects of the populace in Kerala, warrants urgent planned and sustained interventions to improve the animal origin food and bring about livelihood security to the concerned stakeholders.

Importance of Dairy Sector

79. Livestock is a major source of livelihood for the World's poor. It is an integral part of India's agricultural economy and plays a multifaceted role in providing livelihood support to the rural population. Livestock sector apart from contributing to national economy in general and to agricultural economy in particular also provides employment opportunities, asset creation, coping mechanism against crop failure and social and financial security. Livestock is the main source of animal protein for the population. Small and marginal farmers and landless labourers own majority of the livestock resources. Hence sustainable development of the livestock sector would lead to more inclusive development and empowerment of women. Livestock sector contributed 27.62% of the Agriculture GDP of the State during 2014-15 (at constant price with base year 2011-12), while in 2013-14 the share was 25.25 per cent. Thus in 2014-15 the share of the sector in Agriculture GDP has increased, the sector as a whole recording a positive growth rate of 4.3 percent over 2013-14.
80. India ranks first among the world's milk producing nations. At the national level milk production has increased from 1026 lakh MT in 2006-07 to 1279 lakh MT in 2011-12. Milk production during 2013-14 & 2014-15 was 1376.8 lakh MT and 1463.1 lakh MT respectively with an annual growth rate of 3.96% and 6.27% respectively. Among the major milk producing States in India Uttar Pradesh (252 lakh MT) followed by Rajasthan (169.3 lakh MT) Gujarat (116.9 lakh MT) and Madhya Pradesh (107.8 lakh MT) are at the top. Kerala is in the 14th place in the list with annual milk production of 27.1 lakh MT during 2014-15. The per capita availability of milk at national level is around 307 grams per day in 2013-14 which is more than the world average of 294 gm per day. Milk production in the State increased from 21.19 lakh MT at the end of the tenth plan (2006-07) to 27.16 lakh MT at the end of the eleventh plan (2011-12). Milk production during 2013-14 and 2014-15 was 26.55 lakh and 27.11 lakh MT respectively, the percentage change being 4.83 per cent and 2.11 per cent respectively. Growth of milk production during 2014-15 in the State is far below that at the national level. During 2014-15, Kerala contributed only 1.85% to the annual milk production of the country (*Source: Economic Review 2015, Govt. of Kerala*).
81. According to the State Poverty Eradication Mission, through Kudumbasree in Kerala, 5 lakh out of 70 lakh families are dependent solely on livestock for their livelihood, while another 5 lakh depend on livestock as a subsidiary means for supporting their livelihood. More than 55 per cent of bovine keepers maintain 2-3 cow units, while about 32 per cent maintain one-cow units. More than 60 per cent of livelihood enterprises set up by Kudumbasree are in the Animal Husbandry sector. Out of 37

lakh women in the suburbs of the poverty line, 70 per cent opted for enterprises in the animal husbandry sector, as the major basis of livelihood. It indicates that further progress in the livestock sector would directly be reflected in the balanced development and upliftment of the rural economy.

82. Livestock development sector of Kerala has made significant contributions to the state's economy during the last three decades by equipping the farmers to accept and adopt modern technological methods combining with their traditional skills. The benefits of the livestock development must provide a sustainable income to the producer facilitating a steep hike in his returns. Productivity hike should be combined with product diversification, value addition and by-product utilization. Livestock development programmes should not be seen as a simple attempt aimed for poverty elevation. It should also be built up as a development vehicle by modernization, product development and marketing including exports. The policy should be molded with this in view. At the same time the time tested indigenous methods of livestock development must be preserved, encouraged and empowered with technology and funding upgradation so that our indigenous livestock wealth and different models of rearing them using the by-products of the farm adding a supplementary income to the rural force and helping the elevation of the nutritional status of their diet. This too must be given a place of importance in our future policy programmes since we hold 66.56 lakhs tiny land holdings which also form the home of our livestock population.
83. The basic necessity required for implementing any modern day livestock development is the availability of the livestock data and performance control mechanism. Many in Kerala is unaware of the fact Kerala is ripe for introducing such a sophisticated animal husbandry technique into our social system. Though it is sophisticated the information communication system developed in our state is a boon for the collection and transformation of the data generated. Quality up gradation of animals is a must for improving the productivity as well as profit from the minimum quantity of feed that we provide. One such a system induction of hi-techs like quality up gradation of animals, breeding performance, evaluation of returns and disease control measures could be made available at the door step of the farmer. Livestock sector like all sectors are experiencing very keen competition not from the organized producers alone. World over marketing of livestock produce are becoming more and more sensitive and dear. India is seen by several countries as a potential exporter meat, egg and even milk products. So there is every possibility of the present suppliers of animal products of the state may prefer export rather than internal trade. Kerala has to take very special care of this situation and so any investment done on this sector will be doubly beneficial to us. It will help us to provide a safe internal market and in the same time entire excess could be exported. The expenses required for the launching of such a programme covering the entire state should be viewed not as a state development programme by doing this we are creating a model for not only India but all developing countries. Hence this programme should be considered as an area deserving high policy priority.

Present Scenario

84. The Indian dairy production is characterized as a low input/low output system mostly constituting small and marginal farmers and landless labourers owning less than five cows or water buffaloes. The situation, which was prevalent in Kerala too, is gradually shifting to farm based approach with a high percentage of exotic crossbred animals. The productivity of the milch animals in Kerala is thus high when compared to the Indian average. In fact, the average per day milk yield of animals in Kerala (9.2 litres/day) is second only to the state of Punjab. The requirement of highly nutritious feed concentrates and good quality fodder etc for these high productive animals is thus highlighted.

The high percentage of exotic cross bred animals also warrants modern farm management practices including mechanization.

85. In the year 2015, State Pollution Control Board has enhanced the number of cows to a maximum of 20 in the green category and above 20 in the orange category while categorizing livestock farms based on the intensity of pollution. This decision of the Pollution Control Board was a great support to the dairy farmers in the State.
86. *Milk Marketing:* During 2014-15, a total of 5568.77 lakh litres of milk was procured by the dairy co-operative societies in the State of which 3535.14 lakh litres were sent to the dairies and 2033.63 lakh litres were marketed locally by the societies. The average milk procured per day by APCOS during the year 2014-15 was 1026 MT against the previous year average of 942 MT. The procurement/day/society during 2014-15 was 348 litres and during 2013-14 it was 335 litres. The procurement of milk by Kerala Co-operative Milk Marketing Federation (KCMMF) increased to 3636.81 lakh litres against the sale of 4487.02 lakh litres during 2014-15 which shows a wide gap between procurement and supply. The shortfall between milk procurement and sales was met by arranging milk mostly from State milk federations of Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra and purchase of skimmed milk powder (*Source: Economic Review 2015, Govt. of Kerala*).
87. Currently Kerala procures 110 (210) million litres of liquid milk every year from neighbouring states which accounts for 4% of the liquid milk demand of the state. The figure is exclusive of milk products reaching Kerala from outside the state (like milk powder, dairy whitener, ghee, butter, ice cream etc.). On considering this fact, the shortage of milk solids in Kerala may rise to about 6-7%. The growing demand for milk and milk products in coming years due to population growth and demographic shifts due to rising incomes, urbanization, and other demographic shifts have to be taken into account.
88. *Weak feed and fodder base.* Special focus has been given to fodder and feed production in Kerala to support development of the livestock sector considering the wide gap in the availability of these two critical inputs. The Dairy Development Department is the nodal agency for fodder development activities in the State. During the year 2014-15, the Department could add 3174 Ha to the existing cultivated area resulting in 5.55 lakh MT more of green fodder to the existing stock. Assistance was provided to farmers for Azolla cultivation, mechanization of fodder cultivation and harvesting, irrigation facilities etc., Fodder exhibitions and workshop etc. were also included in the fodder development activities. Innovative fodder development programs under Integrated Dairy Development Program were implemented in the districts of Kannur and Thrissur. To overcome shortage of raw materials for cattle feed production, maize was cultivated in 318 Ha of land producing 1100 tons of maize grain. The total production of cattle feed during 2014-15 was 3.61 lakh MT as against 3.92 lakh MT during 2013-14 (*Source: Economic Review 2015, Govt. of Kerala*).

Development of this Sector during the Previous Plan Period

Milk Production

89. The milk procurement through the Dairy Co-operatives has shown a positive inclination during the last 4 years *i.e.* during the period from 2012-13 to 2015-16.

Table 5 Milk procurement through dairy cooperatives, Kerala 2012-13 to 2015-16

Year	DCS Collection (Lakh metric tonne per annum)	DCS Collection (Lakh litre per day)
2012-13	4.89	13.39
2013-14	5.27	14.43
2014-15	5.57	15.26
2015-16	5.63	16.24

90. As detailed above, the average milk procurement through DCS has increased from 13.39 lakh litres per day (2012-13) to 16.24 lakh litres per day (2015-16).

91. The total milk production of the state was 27.92 LMT per annum during the year 2012-13 and the same has decreased to 26.49 LMT during 2015-16

Table 6 Total milk production in Kerala in LMT

Year	Milk Production in Kerala (LMT)
2012-13	27.92
2013-14	26.55
2014-15	27.11
2015-16	26.49

Number of Registered DCS

92. The number of registered Dairy Co-operatives under the Department of Dairy Development has increased from 2781 to 3683 during the year from 2000-01 to 2015-16 (*Source: NDDB Annual Report*). The increase in registered DCS has brought an additional 35,000 farmers under the Co-operative Umbrella and hence an assured economic and social security for the member farmers.

Fodder Development

93. The Dairy Development Department is the Nodal Agency for undertaking fodder development activities in the State. During the period from 2012-12 to 2015-16, a sum of Rs 30.07 crores under the State Plan schemes has been expended for the fodder development of the state. The additional area brought under fodder cultivation in the state is stated in the table shown below:

Table 7 Additional area brought under hybrid Napier cultivation in hectares

Year	Fodder Cultivation
2012-13	2756
2013-14	2816
2014-15	3727
2015-16	2665

94. Around 21.53 LMT fodder was additionally produced during the above period. Apart from hybrid Napier cultivation, an area of 1797.5 Ha has been assisted for cultivation of short term crops like Maize, Cow pea, sorghum etc. 24,805 units of azolla cultivation were promoted during the period from 2012-13 to 2015-16. The Dairy Development department has also assisted over 70,000 farmers

for mechanization and irrigation of fodder plots. 137 SHG Women Groups (GOPALIKA GROUPS) were formed for the cultivation and marketing of fodder. These groups are presently working in a viable and feasible manner under the aegis of the Dairy development department. As a part of the Integrated Dairy Development Programme (IDDP), during the year 2014-15 and 2015-16 farmers from Kannur, Thrissur, Ernakulam, Idukki districts were provided technical as well as financial assistance for undertaking fodder development activities. It is worth to mention that during the last plan period, many hi-tech fodder development programmes were also taken up in the state. During the year 2014-15, assistance was given to 3 DCS, one each under each regional milk union to establish Hydroponic Fodder Systems. Assistance was also provided for silage making, vermi-compost making, integrated fodder cultivation of Hybrid Napier with *Muringa*, fodder cultivation with bio fencing etc.

Herd Induction and Mechanisation through Milk Shed Development Programme

95. The Milk Shed Development Programme (MSDP) carried out during the previous plan period has helped to improve the milch animal strength and also heifer strength of the state. It has helped to stabilize the milk production of the state. The number of milch animal and heifer inducted to the state as a part of MSDP programme is as shown below:

Table 8 Number of milch animals and heifers inducted during 12th Plan

Year	Milch Animals Inducted	Heifers Inducted	Estimated hike In Milk Production	
			Lakh Litre per Annum	
2012-13	3507	1000	85	
2013-14	4717	1175	115	
2014-15	6339	1770	150	
2015-16	7215	2145	175	
TOTAL	28548	8330	525	

96. As a part of Integrated Dairy Development Programme (2014-15 & 2015-16) special herd induction programmes were implemented in the districts of Kannur, Thrissur, Ernakulam and Idukki. About 28,000 farmers were assisted for herd induction programmes.

Assistance for Dairy Co-operatives

97. During the period from 2012-13 to 2015-16 in the twelfth plan period, Rs 5780.15 lakhs were extended as plan assistance for the strengthening of dairy co-operatives in the state. 3641 dairy co-operatives were assisted for the implementation of FSSA standards. 532 DCS were given assistance for establishing Automatic Milk Collection Centres. An excess of 1500 DCS personnel, Board members including elite farmers coming under the DCS were given specialised training as a part of FSSA. Information Kiosks were established at 150 DCS. Information Centre with modern building and infrastructure facility were established at 152 Dairy Co-operatives throughout the state. Assistance was given to Wayanad consortium for establishing Unified Accounting Software for DCS and replicating the same to other districts of the state. The best Anand Pattern dairy co-operative (APCOS) and Non-APCOS of the state were awarded Dr. V. Kurien Award (Rs 1 lakh each). 57 dairy co-operative societies were assisted for infrastructure development, construction of chilling

plants / processing units, establishment of cold chain, purchase of transportation vehicles, installation of BMCC, Packing units etc so as to meet the FSSA norms.

Quality Control Activities on Milk and Milk Products in the State undertaken by the Dairy Development Department

98. As a part of various Quality Control activities undertaken by the Dairy Development department, all the district level Milk Quality Control laboratories were strengthened, Mobile Quality Control Units were established at four districts and a NABL accredited State Dairy Laboratory was set up at Trivandrum. This lab is equipped with highly sophisticated testing equipments like HPLC, GLC, GC, Atomic absorption spectrometer, facility for testing of radioactivity in water, facilities for testing of aflatoxin in cattle feed samples etc. Almost 70 parameters can be tested for milk, milk products, cattle feed and water. It is the only one of its kind in the state, which is equipped to test this much extended parameters. During the last plan period, the department could establish regional milk quality control labs at Kasargod and Kottayam and has started functioning in its full potential. As a part of the Quality Control Programme, special milk testing drives were conducted at 5 check posts during the Onam festival season. Special quality checks at District Head quarters were also carried out during the festival seasons. The department is equipped with an online quality control software module of automated evaluation and reporting of the milk samples analysed.

Cattle Feed Subsidy Programme

99. During the twelfth plan period (2012-13 to 2015-16), by utilizing the state plan schemes, the Dairy Development department in association with the dairy co-operatives in the state has disbursed cattle feed subsidy to dairy farmers who pour milk at DCS at the rate of Rs 1 per litre of milk poured in the DCS.

Table 9 Amount of cattle feed subsidy provided and number of beneficiary farmers

Year	Cattle Feed Subsidy (Rs. in Lakhs)	No. of Beneficiary Farmers (in lakhs)
2012-13	839.84	1.33
2013-14	753.42	1.39
2014-15	1050	1.42
2015-16	1350	1.52

100. From the year 2013-14, the subsidy was given as production incentive and was disbursed in Direct Benefit Transfer (DBT) Mode through the bank accounts of beneficiary farmers. Assistance was also given for purchase of cattle feed supplement by dairy farmers.

Critical Evaluation of Data Sources

1. Considering a population of 348 lakhs, the demand for milk in Kerala is 36.07 LMT per annum. But the total milk production for the state, as per Economic Review, is calculated to be only 26.49LMT per annum. The state is 21.87 percent deficient as far as self sufficiency in the sector is concerned. Thus there is a gap of 22 lakh litre per day or 7. 89 LMT per annum.
2. For Kerala the cost of milk production is on the higher side when compared to other states of India. Though many factors contribute to the cost of production, one important factor is the

low availability/shortage of fresh fodder. Too much dependency on concentrates by the farmers increases the cost of production and hence a reduced profitability. As per latest Census, the female cattle population is to the tune of 12 lakhs. The annual fodder requirement is about 87 LMT/annum.(Average area of 49,000Ha is required for the same) whereas the availability is only around 31 LMT. Fodder availability is estimated to be only 36 percentage of the requirement. Thus there is a gap of 56 LMT /annum. Additionally 31,500 Ha of area has to be brought under fodder cultivation. More funding has to be provided for mechanization/ Hi-Tech fodder cultivation practices like Hydroponics.

3. There are 3683 registered Co-operatives in the State. The strong existence of the Dairy Co-operatives is the backbone of the Dairy Sector in Kerala. Almost 3 lakh farmers are presently pouring milk to Dairy Co-operative Societies of the State. The Dairy Co-operatives are under the strict administrative control of the Dairy Development Department. The Dairy Co-operatives not only ensures an assured price to the produce of the farmers' but also takes up activities that caters to the Socio- Economic benefit of the farmers. It is estimated that only 20% of the milk produced in the state is procured from the Co-operative Sector. Hence to assure a steady growth of the dairy sector, the Co-operative Sector has to be strengthened and more farmers have to be brought under the Co-operative umbrella.
4. The dairy sector in Kerala is substantive in nature with farmers who rear 1-2 milch animals in the household. For making the sector viable, feasible and profitable, there should be a gradual shift from substantive type of dairy farming to entrepreneurship / commercial farming with minimum herd strength of 10 animals. More skill development and extension activities have to be taken up in this regard.
5. Skill development and entrepreneurship training programme have to be taken up by the department especially for the youth and women to take up dairying as a major activity in a profitable and feasible manner by adopting new technologies in this sector and also integrating mechanization in dairying farming. The Department is presently having 5 Dairy Training Centres and one satellite Dairy Training Centre. The infrastructure facility of the DTC need to be improved and nurtured so as to take up quality training programme for the trainees.
6. The quality of raw milk at farm level is of great concern for the dairy sector of Kerala. This area needs attention. The cold chain maintenance from farm to fork level/consumer level has to be ensured. The milk procured at farm level has to be cooled in the short span of time so as to reduce the bacterial load. This needs more financial support to ensure the cold chain maintenance. At present there are 329 nos. of Bulk Milk Chilling Centres (BMCC) installed in DCS of the state. More BMCC suiting the milk procurement capacity of the DCS or cluster BMCC's with linkages to max of 5-6 DCS has to be promoted. Assistance is needed for the installation of around 150 number of BMCC throughout the state with an average installed capacity of 2000 LPD.
7. There is a need to strengthen the quality control activity of the Dairy Development department with qualified technical workforce. During the festive seasons, a significant quantity of milk is flowing from outside the state. Testing of the milk samples have revealed that the quality of milk transported through tankers and other means is being compromised and there have been instances where the milk samples were tested positive for adulteration. To safe guard the health of the common man, strict measures have to be taken to monitor and make corrective actions in regard to the quality of milk being transported from neighbouring states. For the same, permanent quality control units have to be established at 6 major check posts of the state viz. Walayar, Meenakshipuram, Kumili, Thenmala and Parassala.

8. Recently many issues have been raised up regarding the pollution control related to Dairy Farms and Dairy Co-operatives especially those co-operatives which are equipped with BMCC. Low cost Effluent Treatment Plants (ETP) has to be encouraged, financially assisted and popularized.
9. In order to make the sector more profitable and feasible, mechanization of dairying activity is very much necessary. Additional fund is required for assisting more farmers for construction of modern/scientific cattle shed, purchase of milking machines, small capacity chilling units, coolers etc
10. ICT activities need to be strengthened. Information should be available for all stakeholders. Ensuring e-governance through ICT will be a thrust area for the department in coming years. Integration of different department activities, filling of hardware gaps, software solutions, Internet connectivity, Mobile App for primary dairy farmers etc
11. The infrastructure facilities of the Dairy Co-operatives need to be improved. More assistance is needed for improving the hygienic milk collection systems, storage facilities, cold chain maintenance facilities, processing / packing and marketing facilities especially to meet FSSA norms.

Problems in this Sector

Identification and registration of all animals:

101. The identification of animals is a major constraint towards assimilation of accurate population and demographic data of animal husbandry and allied sectors in the state. The lack of accurate data is a major bottleneck towards implementation of developmental projects, and towards traceability of animal units, thus warranting the need for identification of the animals.

Purchase of animals from outside the state:

102. Local availability of cows is a concern for farmers and hence cows were purchased from outside state under MSDP programme. The concept of purchasing animals from outside the state to improve state animal population needs a review as off late it has been argued that the animals brought from outside the state have contributed to an increase the disease incidence in the state (including *haemoparasites* and viral diseases). At the same time the benefits incurred to the state from the import of animals from outside the state cannot be ignored.

Feeds and Fodder

103. 60-70% of cost of rearing livestock is constituted by the feed and fodder costs. The lack of available land for fodder cultivation presents a major difficulty in supporting the fodder requirements of the livestock sector. Kerala produces only 50-60% of the roughages required for cattle in Kerala. Marginal and small farmers who are the major cattle owners of the state have limited space for fodder development. Whatever space available, the whole of which is mostly devoted to producing cash crops. Since fodder is not directly yielding any benefit, fodder cultivation takes a back seat.
104. The situation is worsened in the light of lack of quality concentrate feed and feed ingredients in the state. Dairy Farmers in the state are highly depended on concentrate feeds as the animals are highly productive. A major portion of the milk production cost is that of concentrate feeds (Concentrate Feeds costing around Rs20/ kg). The returns are not at par with the resources invested by the

farmer, which forced them to quit the field. A mere increase in the selling price of market milk would not be a permanent solution for the long pending demands of milk producers to provide a relief from the ever increasing cost of milk production. Policy intervention on the part of Government to provide direct incentive to the pouring members of dairy co-operative society draws prime attention at this juncture.

Parity of Dairy Farming with other Agricultural activities:

105. Dairying should be treated at par with other agricultural activities and the sops that the Central and State Governments offer especially on matters of agricultural credit to the agriculture sector shall be extended to dairying as well. The sector is facing acute credit crunch. Moreover, dairy loans are sanctioned at around 13-14 % interest rates, on contrary to agricultural loans disbursed at 5-6%. This would be a huge burden to the poor dairy farmer. Immediate attention of the Government is therefore requested on above matter.

Regulatory Framework

106. Many of the existing regulations under the Kerala Municipal Building Rules 1999 to set up big dairy units (6 animals and above) hinder dairy entrepreneurs in taking up such ventures. Hence necessary steps may be taken to deregulate the same so as to encourage dairy farming on a major scale in the state.

Developmental Suggestions

107. Parity for Animal Husbandry activities with Agriculture in case of ;

1. Bank interest rate for credit: Capital investments for start-up and maintenance of animal husbandry related ventures require huge input which has to be supplemented with credit from banks. The present interest rates are prohibitively high for the farmers to seek financial assistance from banking institutions. In agriculture sector the prevailing interest rates are much lower, promoting entrepreneurship in the sector. Thus interest rates in animal husbandry sector may be made on par with the interest rates prevalent in agriculture sector.
2. Subsidy for electricity charges for animal husbandry related activities (animal sheds, Motors, milking machines, cooling devices etc.): Presently the electrical charges for animal husbandry related activities are being allocated under commercial category. This may be reallocated to either agriculture or industrial tariff. At present bulk milk cooler units set up under the aegis of DCS are charged at commercial tariff for electricity. Steps to be taken to provide electricity to BMC units at industrial tariff.

108. *Feeds and fodder resources in the state.* The following measures are proposed to ensure quality feed and fodder resources for dairy cattle in the state:

1. Promoting commercial fodder production by assuring market through dairy co-operative societies and linking fodder cultivation with NREGS. The incentives should be provided through dairy co-operative societies which assure market price to the fodder producers. This ensures accountability through the society and subsidized supply to the dairy farmer.
2. Promoting fodder cultivation in waste lands in public domain through SHGs/entrepreneurs. Successful commercial fodder cultivation units shall be rolled out across the state on a large scale. Fodder marketing units shall also be encouraged.

3. Women Groups linked to Dairy Co-operatives (e.g. GOPALIKA MODEL of Dairy Development Department) shall be identified for undertaking fodder development and marketing activities
4. Hydroponics and Azolla cultivation schemes implemented through allied departments may be reviewed by a high level technical committee with experts from DDD, AHD and KVASU.
5. MRDF (Malabar Rural Dairy Foundation) may be entrusted with collection, bailing, transport and distribution of straw from intensive paddy cultivation areas to needy farmers.
6. Since the price of milk cannot be increased, subsidy for cattle feed shall be provided as production incentive to dairy farmers. The Cattle Feed Subsidy Scheme currently implemented by the Dairy Development Department through Direct Benefit Transfer (DBT) as a 'Production Incentive' should be continued with a minimum allocation of Rs. 200 crores. Also possibility of linking the state department schemes (DBT linked Cattle Feeding Subsidy Scheme) with LSGD schemes (like SLPB Scheme of the AH Department) shall be explored so that cattle feeding subsidy is extended to Dairy Farmers who pour milk to DCS @ min Rs 3 per litre of milk poured in DCS throughout the year
7. Steps for synchronizing the activities of various agencies promoting fodder cultivation like Dairy Department (Nodal Agency), AH Department, KLDB, Milmaetc

109. *Accuracy in cattle census and yearly milk production statistics of the state.* The present cattle census figures and projected milk production figures are contradictory and are disputed by various stake holders. Hence, cattle census has to be carried out under the supervision of a consortium comprising of departments/agencies (AHD, DDD, MILMA, KLDB and KVASU). If extra funds are required (over and above the central funds) for this purpose, it should be shared by the stakeholder departments. A midterm evaluation should be conducted to review the process. The milk production statistics as declared by the government shall be after finalization with the AH and Dairy Department figures. The milk collection through DCS shall also be considered as a criterion for the same.

110. *Revamping of State Level Breeding Programme (SLBP) and linking calf adoption with SLBP.* The mode of implementation (including beneficiary selection) of SLBP scheme may be revisited to ensure supply of quality calf feed to calves having high dairy potential. It is suggested that healthy female calves born in the state shall be registered with the Dairy Development Department through the dairy co-operative societies' network. A calf adoption scheme shall be implemented by the DDD for the better feeding and scientific management of these calves before they are considered for selection to the ambit of SLBP scheme (of AHD) at the age of 6 months. This would ensure better stock of calves for the SLBP. Such a scheme would ensure better integration of line departments as well. SLBP scheme should to be restructured with thrust on selection of calves with optimum body conditions in addition to the existing selection parameters of beneficiary. The quality of feed supplied under SLBP should be ensured periodically and price of the feed should be revised in tune with market price revision.

111. *Phasing out of existing scheme to purchase cows from outside the state.* It is proposed to phase out the purchase of cows from outside the state in two years. Under the circumstances a technical committee with experts from AHD, DDD, KVASU and beneficiaries of already implemented projects may be constituted to analyze the strengths and weakness of the existing Government schemes involving purchase of animals from outside the state. The report and recommendations of such a committee may be looked into for purchase of the animals from outside the state. Alternatively, entrepreneur

based Heifer Nursery units shall be promoted as a source of future milch cow herd. In similar lines, male calf rearing units may also to be promoted as a source of good quality meat.

Dissemination of knowledge in dairy sector.

1. A centre of excellence to be developed involving all stakeholder departments and institutions to train resource persons to have uniformity in disseminating knowledge. The infrastructure facilities of the existing training centers must be enhanced.
2. In order to inculcate a farming culture that has been eroding since a long time, topics imparting insights to dairying should be included in the school level curriculum.

112. *E-platforms for sale of livestock and livestock products.* Lack of information about availability of cattle and allied inputs is a problem faced by farmers. Replication of “*Pasukkada*” portal to provide handy information related to cows, farm produce, farm mechanization equipments and milk products may be considered.

113. Strengthening of dairy co-operative sector.

1. Consider scaling up of operation of DCS to ensure the viability with minimum of 200 litres, by amalgamation of adjacent DCS wherever possible.
2. DCS may be empowered as Farmer Support Centers in addition to being mere milk collection areas. Farm support materials like milking machine, rubber mats, pressure washers, automatic drinking bowls etc. to be made available through DCS at competitive rates.
3. Co-operatives were given land in public places to set up sale outlets in earlier days. This was helpful in ensuring the availability of milk and milk products to consumers. Off late, it has become difficult to set up outlets at such places. Steps may be taken to ensure that co-operatives do not face many obstacles to set up sales outlets. Additionally, co-operatives may be given land on lease at public places to open sale outlets.
4. Kerala Dairy Farmers’ Welfare Fund Board need to be empowered to effectively use the reserve fund of DCS in a micro financing mode to extend credit facility to needy dairy farmers.
5. Co-operative brand need to be strengthened to prevent the threat from invasion of cheaper milk from outside. Marketing strategy shall be modified within a period of six months. A portion of margin from sale of other inputs through DCS may be given to DCS staff.
6. Assistance shall be extended for installation of low cost effluent treatment system in Dairy Co-operative Societies handling more than 1000 litre milk or DCS with Bulk Milk Chilling Systems.
7. More Government support shall be channelized for Infrastructure Development activities of Regional Milk Unions, so that profit from operations can be transferred to farmers.
8. Backyard poultry farmers are facing acute problem in marketing eggs. Collection of eggs through Dairy Co-operative Societies and sale of the same through DCS and MILMA sales outlets may be promoted. In addition to supporting the backyard poultry farmers, this will also help to increase the profitability of DCS. The same model can be replicated for honey also.

114. Other supports.

1. Licensing of dairy farms having more than 10 animals shall be made mandatory. Necessary amendments in this regard shall be made.
2. The Dairy Development Department shall extend its reach by starting Dairy Extension Service Units in all the village panchayaths of the state in the similar pattern of Agriculture

and Animal Husbandry departments. Such a proposition would greatly enhance the effectiveness in the departments' service delivery and would benefit more dairy farmers of the state. Out of 941 village panchayaths in Kerala, a minimum of 25 village panchayaths with surplus milk production and having potential for further production enhancement may be identified in the initial stage as Dairy Villages or *KsheeraGramams*. Tailor made projects according to the need of these village panchayaths shall be proposed within a time frame by the Dairy Development Department.

3. Manure disposal- Financial assistance as well as number of beneficiaries shall be increased for biogas units, dung pits, aerobic composting, sheds for stocking of dry dung etc. to increase the availability of organic manure and avoid environment related issues.
4. Considering the technical expertise available with the Dairy Development Department, steps shall be taken to set up permanent milk testing facilities at the six check-posts in the state.
5. At present there is no availability of good quality calf starter, which is essential to ensure proper growth rate at younger age. Due to this reason the actual production potential of the animal is not realized. Steady supply of good quality calf starter to be ensured with a reasonable subsidy component.

Plan Implementation

115. The projects shall be crafted based on the developmental suggestions detailed above by the field departments with the support of Local Self Government agencies, Milk Co-operatives, Public Sector Undertakings like Kerala Livestock Development Board, Kerala feeds, Meat Products of India and Universities like Kerala Veterinary and Animal Sciences University and Kerala Agricultural University. Appropriate location specific programmes can be prioritized. The projects/schemes implemented shall be strictly need based. The department shall also take up field level studies joining hands with the KVASU.

Thrust Areas Identified – Pivotal Schemes for the Plan Period

1. Establishing Distinct Dairy Zones in the State
2. Commercial and Massive Fodder Production in barren lands and Wastelands
3. Comprehensive cattle feeding subsidy scheme in convergence with LSGD institutions
4. Assistance for infrastructure Development of State Dairy Lab, Regional Dairy Labs , District Level Dairy Labs and Mobile Dairy Labs
5. Establishing Permanent Milk Quality Testing Facility at Check Posts of Kerala
6. Implementation of Unified Accounting Software for Dairy Co-operatives (Selected Districts)
7. Comprehensive Health Insurance Programme covering cattle and cattle owners
8. Implementation of e-governance and ISO certification activity in Dairy Development Department Offices
9. Geo Mapping of all the offices of Dairy Development and all the Dairy Co-operatives of the state
10. Establishing Dairy Extension Service Units at 20 selected Village Panchayaths based on milk production potential.
11. Handholding Support for Dairy Entrepreneurs in starting business units in the areas of Dairy Production, Processing and Marketing.

Output and Outcome

116. The combined outcome of the above listed initiatives should result in significant increase in dairy farmers' incomes and in milk production both in terms of quantity, quality and range. In the backdrop of the price trends in the national and international dairy markets, it would be prudent to plan not only for self-sufficiency in milk production, but also to maintain a surplus. In the case of milk, eggs and meat, there is a need to ensure that output grows at a rate significantly faster than that of cereals so as to service the expanded demand in these areas.
117. The sector has been perceived in policy circles as a source of rural livelihood and not as a source of generating economic value. That perception poses risks around attracting talent and introducing new practices and innovations. It is therefore important to change the way this sector is looked upon. Recognizing the market opportunities associated with this sector, the perception will be to modernize the sector and upgrade its status. This will require transformation of small livelihood family farms in Kerala into highly competitive market-oriented small to medium sized family farms.
118. The expanded output of the rural sector is expected to impact rural livelihoods in the following way.
1. Higher productivity in farming
 2. Higher value for farming especially in horticulture, dairying and animal husbandry
 3. Major expansion of post-harvest activities, including storage and processing
 4. Encouraging the establishment of small and medium sized agro-based industries
 5. At another level, the output should be reflected in greatly improved health and nutritional outcome. This would not only be a result of higher rural incomes, but also the availability of more locally produced nutrition, as well as intensive monitoring and effective intervention through government programmes.
119. Finally, the result of these initiatives should be seen in improved schooling outcomes, as well as much greater dissemination of employment related skills. In order to provide all the inputs that have been discussed above, the instruments for public intervention must be both comprehensive in terms of touching all available institutional arrangements and also participatory.
120. Demand for protein food is forecasted to increase over the next twenty years. Kerala's strategic way forward involves changes which would improve the productivity while maintaining environmentally sustainability. Marketing its products to both within the state and outside the state is crucial. This involves heavy investment in physical infrastructure so that the state can improve the value-added of its products. At the smaller scale, people need to be trained to increase productivity and to learn sustainable practices. Again they need to be linked to marketing networks so that they can reap increased benefits of their efforts. Standard codes, integration farming techniques and waste management techniques are critical for the development of this sector. This will raise the demand for food: "Made in Kerala".
121. At present, the classical co-operative model is dominating the organizational structure of the sector. But many of the developing countries (even Anand co-operatives) have now moved beyond the classical co-operative models to introduce commercial and competitive elements. The co-operative sector now faces stiff competition and is starting to lose ground to more nimble competitors that are more professionally managed. The co-operative sector is responding by adapting its business model and legislation to the New Generation models. In India, co-operative forms of enterprises can now be registered as producer companies under the Company law. Many co-operative societies (including Anand) have been in the transitional phase. There is need to promote producer companies in the

livestock sector in Kerala also. Graduation from subsistence, smallholder milk producers to small, commercial dairy farmers will be fundamental to put the strategy in action.

CHAPTER 7 MEAT PRODUCTION

Introduction

122. The potential of the meat sector has hitherto not been fully tapped in the state of Kerala. The Kerala population is predominantly non-vegetarian. Meat consumption in Kerala has seen a steady raise from around 4, 01,000 metric tonnes in 2012-13 to 4, 16,000 metric tonnes in 2013-14 to 4, 45,000 metric tonnes in 2014-15, which is expected to steadily increase in the coming years. This is despite the fact that the cattle population of the state has been on a steady decline. The requirement of meat especially beef for Kerala is met from animals brought for slaughter from outside Kerala, i.e., states of Andhra Pradesh, Karnataka and Tamil Nadu. With only a handful of slaughter houses in operation and a large percentage of slaughter being carried out illegally (around 60 % of the units are unregistered), and without any veterinary inspection, the meat which the public is offered is largely unclean. It has also resulted in large scale pollution in the surrounding areas. Animals are slaughtered in most unclean surroundings, by butchers with little expertise in hygienic meat production and many times on roadsides and carcasses taken to meat stalls for sale. Meat stalls are also open stalls where in the carcasses are hung in full view of public in most unhygienic settings. The entire chain of operations leads to breach of public health, with serious consequences on animal welfare, food safety, occupational health, and environmental hygiene.

Present Scenario/ Problems in the Sector

123. The current focus of Livestock sector is leaning heavily towards attaining self-sufficiency in milk production by increasing milch animals. Hence, animals at the end of production life are slaughtered for meat. So, substantial portion of animals are brought in from outside the state to meet the state's meat requirement. Slaughter houses both at the panchayath and corporation levels continue to be unscientific and unhygienic as they are manned by butchers themselves. Though some of the slaughter houses have been modernized, due to lack of skilled manpower in managing the modernized slaughter houses, slaughter operations continue to be carried out in the primitive manner leading to unhygienic meat and polluted environment. The mandatory ante mortem and post mortem veterinary inspection is a rarity. Waste and effluent management is practically nonexistent. In several places biogas plants have been installed for waste management, but are dysfunctional due to lack of skilled supervision.

124. For processed meat the demand- drivers are hygiene, quality and food safety. However, significant investment is required to achieve high standards. Rising per capita consumption in domestic market and increase in global demand open us new opportunities to meat and poultry industry to adopt modern technologies in production, preservation, processing, value addition and consumer packaging, apart from more investments in this sector. Value addition in meat sector is non-existent. Livestock markets and abattoirs are mostly in unorganized sector. For the meat sector to be more vibrant, profitable and provider of safe meat, it is necessary that a perceptible shift from unorganized to organized sector takes place. The Food Safety and Standards Act (FSSA) is also pertinent on complete modernization of the meat sector to ensure quality and safe meat. This calls for a strategic plan to develop the meat sector for the production of clean and wholesome meat through a Clean, Green and Ethical (CGE) farming and production system.

Developmental Suggestions

125. *Considering the growing demand and market for meat and meat products in the state, a Meat Sector Strategic Plan (MSSP) shall be developed.* The objective of MSSP shall be to frame an overall strategic plan for the meat sector in Kerala, comprising production, processing and marketing of meat and meat products in Kerala. This would include separate plans for cattle/buffalo meat, chevon, pork and chicken.

Some of the challenges of such a plan would be as follows:

1. Policy for meat animal production and traceability especially buffalo and cattle, goat and pigs
2. Backward integration for rearing of animals ensuring veterinary health coverage and concentrated feed. Backward integration at the Primary Production level with individual identification and traceability would be a requirement. Forward integration of the products with the markets through establishing supply contracts with domestic retail chains, restaurants, hotels, etc., and market facilitation measures.
3. Infrastructure for meat processing plants in Kerala to cater to northern, central and southern districts (to be set up in border districts to avoid transport of live animals across the state)
4. Investment to produce high quality, safe, sustainable production of livestock and meat (Clean, Green and Ethical). Stress could be on sustainable primary production of small animals for meat like pigs and goats. In case of large animals, salvaging male buffalo calves for meat proposes could be an option. Rest of the cattle requirement for meat purpose could be sourced from outside state from identified and certified sources with regard to diseases status and management.
5. Providing and packaging information and training to support informed and business-oriented decision-making by all the stakeholders, especially in the production and processing sectors .Skilled and technical manpower for slaughtering, processing and packaging etc. of meat. (Capacity building).
6. Creating an integrated cold supply chain across the state for retailing meat and meat products
7. Ensuring community and consumer support for the programmes
 1. Animal Welfare- farm , transportation and slaughter
 2. Environmental health – minimize impact, sustainability, climate variability
 3. Value addition in meat and meat products through developing entrepreneurs for ready-to-eat and semi-processed meat products in the domestic market. At present, only a small percentage of the meat produced is converted into value added products and most meat is purchased by consumers in the fresh/frozen form for conversion into products at home or restaurants. Satellite processing units- centrally located slaughter house and number of associated centers or processing units is essential.
8. Inedible offal's and animal wastes from the meat plant can be rendered for the preparation of economically useful products. Huge potential exists for processing animal tissues for valuable proteins/materials which have global and domestic market.
9. Subsidies in feed, electricity and related tax exemptions. Presently wet market sales attract no tax but packaged meat is taxed.
10. Farmers/ entrepreneurs to have adequate credits at subsidized rates

Recommended Projects/ Schemes

1. Modernization of select slaughterhouses to continue, with provision for its scientific management using skilled man power. Pilot studies could be carried out at the modernized slaughter house at Thiruvananthapuram
2. Modernization of meat stalls- provision for hygienic handling and chilling facilities

3. Establishment of a Meat Processing Plant in the Mega Food Parks coming up in the state- the park coming up at Palakkad could be an option. The Scheme would have the following provisions-
4. Provision for centralized sourcing of the raw materials (live animals)
5. Provision for veterinary ante mortem inspection at the preliminary centre
6. Provision for processing of meat, veterinary certification, packaging chilling and freezing
7. Provision for transporting and marketing of packed frozen meat
8. Establish supply chains with cold chain facilities for retailing
9. Provision for solid and liquid waste jointly managed at the Mega Food Park
10. Capacity building to develop skilled man power to cater to the needs for hygienic meat production using current technologies in the state (could be implemented by Kerala Veterinary and Animal Sciences University)

126. The proposed projects could be implemented in a phased manner over a period of five years.

Output/ Outcome

127. Once implemented there would be shift from the scattered and localized slaughter presently in operation. The following would be the outcome;
1. Availability of hygienic and safe packaged meat for public (meeting standards as per FSSAI)
 2. Farmers and entrepreneurs to benefit from the backward and forward linkages
 3. Availability of skilled workforce
 4. Substantial reduction in environmental pollution through scientific management of solid and liquid wastes
 5. Impact on public health :Safe meat, clean and healthy surroundings, reduction in stray dogs, pests and rodents with consequent reduction in zoonotic diseases
 6. Improved occupational health of the workers in meat sector

CHAPTER 8 POULTRY PRODUCTION

Brief Introduction

128. Poultry is emerging as the fastest growing sub sector of agriculture contributing sizeable output to the State economy. The Indian poultry sector has been growing at around 8-10 per cent annually over the last decade, with broiler meat volumes growing at more than 10 per cent, while table egg volumes have grown at 5-6 per cent, driven by increased domestic consumption. The Poultry Business in India is a very old practice and this food industry is one of the important contributors to the economy of rural and semi-urban India. India ranks seventeenth in the world poultry production index. The organized sector of poultry industry is contributing nearly 70% of the total output and the rest 30% in the unorganized sector. The broiler industry is well dominated in southern states in our country with nearly 60-70% total output coming from these states. The layer industry represented more in southern states especially, Andhra Pradesh, Tamil Nadu and Maharashtra producing nearly 70% of the country's egg production. India's 75% of egg produced is consumed by the 25% population living in urban and semi-urban areas
129. India is the third largest producer of eggs and ninth largest producer of poultry meat in the world. Farmers in India have moved on from rearing country birds in the past to rearing hybrid varieties that ensure faster growth of chicks, higher eggs per bird, increased hatchability, low mortality rates, improved feed conversion ratio, and consequently more stable profits.

Importance of the Sector

130. Poultry industry which provides cheap source of animal protein has taken a quantum leap in the last three decades evolving from a near backyard practice to a venture of industrial promotion. Poultry is one of the fastest growing segments of the agricultural sector in India today. Rapid growth of world population and economic development raised animal products and made production more efficient the last few decades. Therefore it is crucial that food particularly meat is produced as efficiently and sustainably as possible. Poultry utilizes substantial quantities of non-edible agricultural and industrial bi-products and converts into high quality nutritious protein rich food. It helps to bridge the gap between requirement and availability of high quality protein for the human population in the country. Eggs and poultry meat are the cheapest source of animal protein.
131. For human daily animal protein intake can be supported the most economically by eggs, poultry meat. Poultry is the major source of meat in India. Its share in total meat consumption is 28 percent, as against 14 percent ten years ago. High mutton prices, religious restrictions on beef and pork, and the limited availability of fish outside coastal regions have all helped to make poultry meat the most preferred and most consumed meat in India. Expanding domestic production and increasing integration have pushed poultry meat prices downward and stimulated its consumption. Further, Poultry manure is one of the best alternatives for chemical fertilizers. It is estimated that 1 ton of poultry manure provides 40 kgs of nitrogen, 28 kgs of phosphorus and 23 kgs of potash. The

total availability of nitrogen from poultry manure is equal to more than 3 lakhs tons of urea.

132. The poultry sector in India has undergone a paradigm shift in structure and operation. This transformation has involved sizable investments in breeding, hatching, rearing and processing. Farmers in India have moved from rearing non-descript birds to rearing hybrids which ensures faster growth, good liveability, excellent feed conversion and high profits to the rearers. The industry has grown largely due to the initiative of private enterprise, minimal government intervention, and considerable indigenous poultry genetic capabilities and adequate support from the complementary veterinary health, poultry feed, poultry equipment and poultry processing sectors. The industry has created direct and indirect employment for 3 million people. High quality chicks, equipment, vaccines and medicines are available. Technically and professionally competent guidance is available to the farmers. The management practices have improved and disease and mortality incidences are reduced to a great extent. Considering environmental aspects (pollution, greenhouse effect, eutrofixation, acidification of atmosphere, residue of pesticides and demand for agricultural land) production of poultry and eggs is the most favourable overtaking pork, milk, and beef and sheep meat production.
133. The importance of poultry industry is resulted by the following items:
1. The poultry industry is one of the fastest growing segments of animal husbandry sector;
 2. Worldwide consumption of poultry is increasing;
 3. Poultry products (meat and eggs) are generally accepted in most cultures;
 4. One of the most effective animal protein productions.
 5. Preference of White meat more preferable than red meat
 6. Egg protein is a complete protein with maximum biological value

Present Scenario

134. Economic Review 2013 states that (2.64) the gap between the production and requirement of egg is increasing at an alarming rate. Concerted efforts of the State to increase the egg production have begun to show signs of improvement. The egg production which was 2054 million in 1999-2000 continuously declined till 2005-06, but began to increase in 2006-07 and that trend maintained in succeeding years. Compared to previous year egg production increased to 1705 million numbers during 2011-12.
135. During 1970's Kerala was exporting eggs to other parts of the country with Chengannur and Kottarakkara Railway Stations famous for centres of rail transport of eggs to other states. So we were producing more than demand of the state during those periods, but the situation now is that we are importing about 250 Crores of Hen Eggs and Duck Eggs every year and the drainage of around 800 Crores to the neighbouring states. The per-capita availability of eggs has slide down from 76 to 36 in 2003 and now it has increased to 54.
136. As per the ICMR Recommendations the average per capita egg consumption should be 180 in adults & 90 in children. Taking into consideration those children accounts only 20% of the total population, the required eggs for Kerala is 500 crores and actual requirement, where as our present production is only 250 crores. The shortage is

250crores. At present the requirement is met by importing eggs from other states. This indicates that there is potential market for an excess production of 250 crores in our state.

137. Draft agricultural Policy 2013 states that the market for eggs is estimated to be about Rs 2000 crore. Poultry meat and eggs make for a massive annual demand of Rs 5,400 crore. Lion share of this is going outside the state. The requirement of egg and its production have become wider and only about 45% of the egg required in the state is being produced domestically through backyard/free range system. This system of poultry production is not at all sufficient as the fast urbanization and shrinkage of per capita land availability in the state are concerned. Hence alternative systems of egg production have to be adopted. Empowering the small farmers with micro cage layer system whereby small number of birds can be reared by them in prefabricated metal cages, through intensive rearing and the egg collected, branded and marketed.

Current Scenario of Egg Production in Kerala

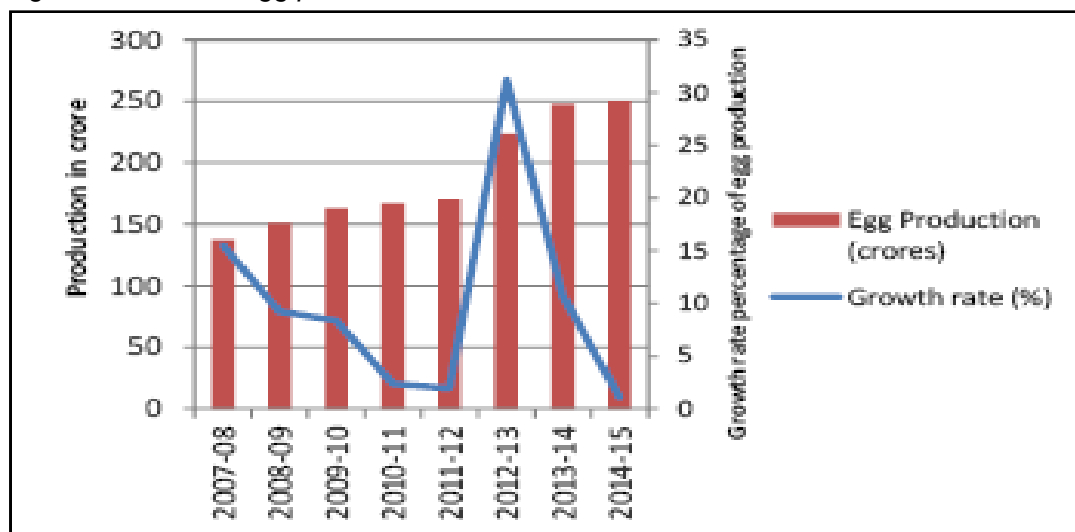
138. It is rather encouraging to us and an indication for the policy planners that if adequate thrust, proper planning and effective implementation is done we can achieve the impossible. This is evident from the following Facts & Figures:

Table 10 *Total egg production in Kerala*

Sl. No.	Year	Fowl Eggs		Duck Eggs		Total Egg Production		Production Difference		Growth in %
		Desi	Improved	Desi	Improved					
1	2000-01	9386	10145	687	126	20,344		--	-	--
2	2001-02	9801	9443	661	113	20,018	↓	326	Lakhs -	1.63
3	2002-03	8274	4201	853	140	13,469	↓	6,549	Lakhs -	48.62
4	2003-04	7174	4531	824	239	12,768	↓	701	Lakhs -	5.49
5	2004-05	6771	4178	793	233	11,974	↓	794	Lakhs -	6.63
6	2005-06	6749	4173	802	232	11,956	↓	18	Lakhs -	0.15
7	2006-07	6596	4434	700	257	11,987	↑	31	Lakhs +	0.26
8	2007-08	7527	5324	622	319	13,792	↑	1,805	Lakhs +	13.09
9	2008-09	8500	5573	597	332	15,100	↑	1,308	Lakhs +	8.66
10	2009-10	8875	6787	559	109	16,330	↑	1,328	Lakhs +	7.53
11	2010-11	7975	8196	617	69	16860	↑	530	Lakhs +	3.14
12	2011-12	7171	8844	1008	26	17050	↑	190	Lakhs +	1.11
13	2012-13	7970	12614	1696	96	22376	↑	5326	Lakhs +	23.80
14	2013-14	8391	14335	1921	122	24769	↑	2393	Lakhs +	9.66
15	2014-15	8718	14527	1459	334	25038	↑	269	Lakhs +	1.07

139. This indicates that due to the active involvement of KSPDC through effective planning and implementation of various central and state sector schemes egg production in the state has increased and the sector has become more vibrant. There were strong apprehensions about enhancing egg production in the state considering fast urbanization and fragmentation of land and such sections were of the opinion that only commercial production is feasible in the state. Now we are fully confident that egg production in the state can be enhanced further through both backyard and commercial poultry production.

Figure 2 Growth in egg production, Kerala, 2007-08 to 2014-15



140. The Per Capita Availability of Eggs also have Gone-up as Shown Below:

Table 11 Per capita availability of eggs, Kerala

Year	[In Lakhs]		Per Capita Availability
	Human Population	Egg Production	
2001 – 02	318.40	20,018	62.80
2002 – 03	321.30	14,369	41.92
2003 – 04	324.20	12,768	39.38
2004 – 05	327.00	11,974	36.62
2005 – 06	329.90	11,956	36.24
2006 – 07	332.70	11,987	36.03
2007 – 08	335.40	13,792	41.12
2008 – 09	330.00	15,002	45.46
2009 – 10	332.00	16,330	49.18
2010 – 11	334.00	16,860	50.48
2011 – 12	333.87	17,050	51.067

Figure 3 Human population, Kerala, 2001-02 to 2011-12 in lakhs

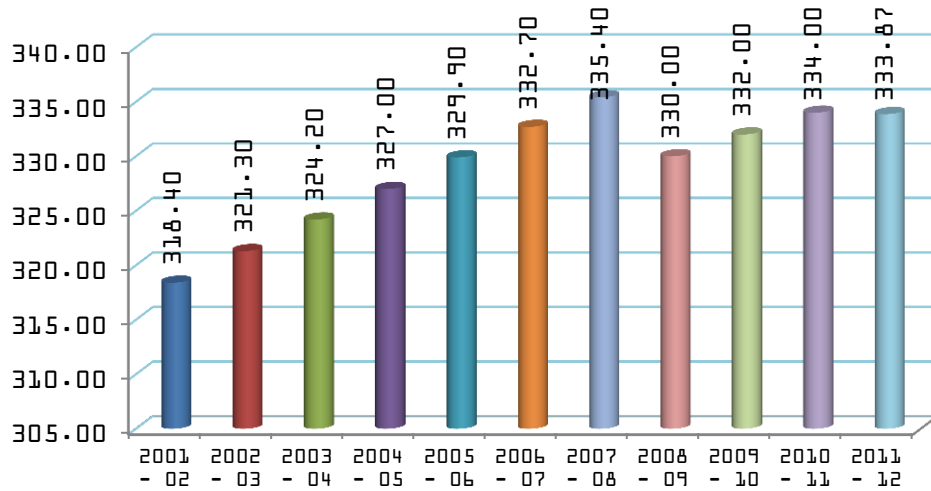


Figure 3 Egg production, Kerala, 2001-02 to 2011-12 in lakhs

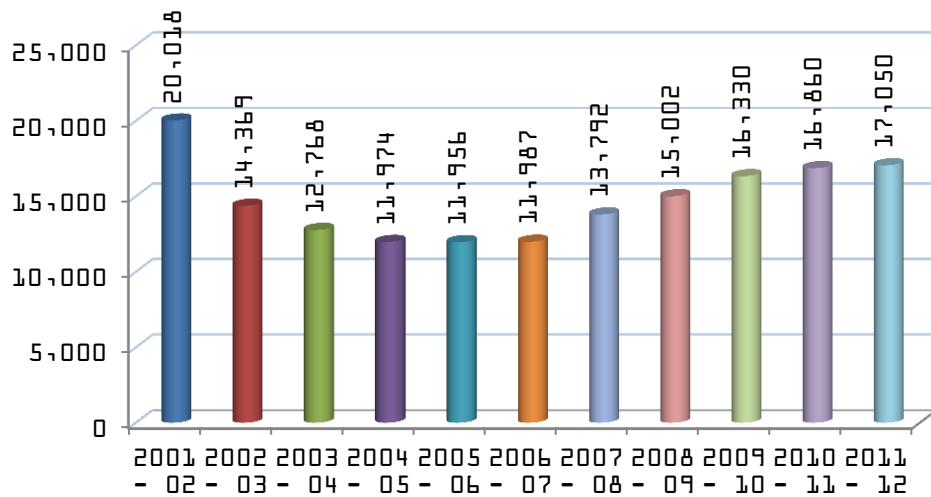
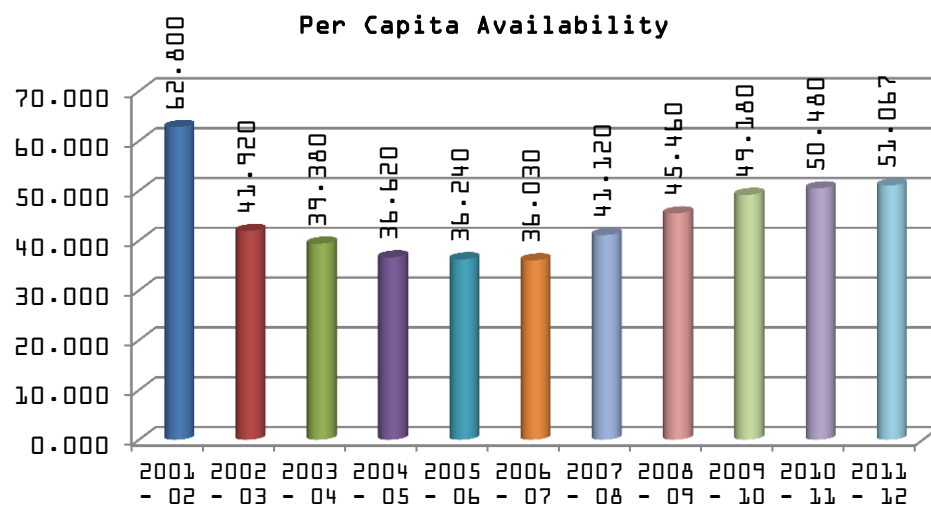


Figure 3 Per capita availability of eggs, Kerala, 2001-02 to 2011-12 in numbers



Egg Production

141. Poultry production in India has taken a quantum leap in the last four decades, emerging from an unscientific farming practice to commercial production system with state-of-the-art technological interventions. Egg production at the end of the Tenth Plan (2006-07) was 50.66 billion numbers as compared to 66.45 billion at the end of the Eleventh Plan (2011-12). Egg production during 2013-14 & 2014-15 was 7475.2 crore and 7848.4 crore respectively with annual growth rate of 7.2% and 4.99% respectively. Total poultry population in our country was 72.921 crore and the per capita availability of egg during 2013-14 was around 61 eggs per year. Tamil Nadu is the largest egg producing State in India (1592.5 crore) followed by Andhra Pradesh (1309.5 crore), Telangana (1061.8 crore) and Maharashtra (507.9 crore). Kerala ranks 9th position with 250.4 crore in 2014-15. At the national level meat production increased from the level of 23 lakh MT (2006-07) to 55 lakh MT during 2011-12. Meat production during 2013-14 and 2014-15 was 62 lakh MT and 66.9 lakh MT respectively with an annual growth rate of 5.08% and 7.9%. The poultry meat production is estimated to be 2.69 million metric tonnes. Exports of poultry products are currently at around R566 crore in 2013-14 as per Agricultural and Processed Food Products Export Development Authority (APEDA).
142. Egg production in the State increased from 119.39 crores at the end of the tenth plan (2006-07) to 170.48 crores during the year 2011-12. The egg production during 2013-14 & 2014-15 was 247.69 crores and 250.36 crores respectively with an annual growth rate of 10.72 % and 1.08% respectively. Meat production in the State increased from the level of 1.98 lakh MT at the end of the tenth plan (2006-07) to 4.26 lakh MT during the year 2011-12. The meat production during 2013-14 & 2014-15 was 4.16 lakh MT and 4.46 lakh MT respectively with annual growth rate of 3.76 % and 7.16% respectively. Growth of egg production during 2014-15 of the State is far below the same at the national level. But for meat, the growth percentage during 2014-15 is almost the same as that at national level. During 2014-15 Kerala contributed 3.19% of the annual egg production and 6.67% of the annual meat production to the country.

Critical Evaluation of Data Sources

143. On critical evaluation of data sources it is seen that egg production in the state has increased to 250.4 crores in 2015 from 119.56 crores in 2005. That means an additional production of nearly 131 crore eggs during these years. The growth rate was steady and sustained. This is due to the implementation of various backyard poultry production units in the state. If the backyard production can be further strengthened, there is scope for further increase in egg production at lesser cost. The growth rate in egg production in the state is more when compared to the national level. So there is scope for additional production of 250 crore eggs in the state.
144. Regarding poultry meat production the consumption per year in the state is 2.4 Lakh MT. Out of this internal production is only 40% of the requirement. There is scope for production of remaining quantity of poultry meat within the state.

Problems Faced By Poultry Industry in Kerala

1. *Lack of sufficient land for starting poultry farms.* Kerala is a thickly populated state and poultry farms could be started only at sufficient distance from human dwellings.
2. *High cost of labour.* The labour cost is very high in Kerala compared to other states of India.
3. *High feed cost.* Chicken is simple stomached and most of the poultry feed ingredients are human foods too. At present the cost of poultry feed in the state is determined by the private consortium as there are no poultry feed production in the government sector. This naturally increases the feed cost.
4. *Lack of interested farmers.* The people of Kerala are generally highly educated and they prefer white collar jobs even at a lesser monthly income
5. *Underutilized duck population.* Even though many inland water bodies suitable for low cost duck rearing are available in our state, rearing of ducks is not commercially developed.
6. *Reducing numbers of backyard poultry units.* The backyard poultry units which were the strength of poultry production in Kerala are also reducing fast in numbers with the reducing landholdings.
7. *Lack of proper extension activities.* People are not sufficiently aware about the modern methods to rear small numbers of chicken in partial confinement without causing serious damage to the vegetation. Such technologies are not easily accessible at low cost.
8. *Reduced availability of quality cross bred chicks.* Cross bred chicks suitable for profitable backyard rearing are not easily available from reliable sources.

Developmental Suggestions / Projects Recommended For 13th Plan Period

1. Implementation of more Backyard poultry production units
2. Area specific approach according to the land availability
3. Strengthening of Layer breeder farms
4. Starting new Layer breeder farms and Hatcheries
5. 70% Egg production through Backyard and 30% through commercial farming
6. Since large scale commercial farming is not that viable, small unit in micro cages with commercial layer breeds like BV-300, BV- 380, Athulya etc. may be done.
7. Supply of poultry feed at lesser rate than the market rate.
8. Small scale farmers can be assisted with poultry feed at subsidised rate
9. Conservation of native breeds
10. Marketing net works for egg and meat
11. Insurance coverage for the birds above 100 numbers
12. Implementation of duck rearing units
13. Duck insurance
14. Strengthening of broiler breeder farm
15. Starting new broiler breeder farms
16. Starting new poultry meat processing plants
17. Marketing outlets for processed meat
18. Maintenance of cold chain mechanism
19. Value addition catering to the need of people

20. Waste disposal and by-product utilization
21. Utilising poultry bio manure in agriculture
22. Considering the poultry production sector in line with agriculture

Plan Implementation

145. Plan implementation may be done through AHD, KSPDC and KVASU. The various schemes and activities should be dovetailed between the different agencies for the expected result/ outcome

Output and Outcome

1. By implementing the above said proposals the egg production in the state can be doubled
2. poultry meat production to 80% of the requirement
3. The income of the poor rural women can be increased
4. The purchasing power of the rural folk can be increased
5. Health of the people can be improved
6. Ensure food security and food safety
7. Out flow of nearly 2000 crores to other states can be retained in our state
8. By novel projects like **Asraya** the disabled and marginalized people can be brought forward to the mainstream
9. The economy can be made more vibrant.

CHAPTER 9
VETERINARY EXTENSION AND ENTREPRENEURSHIP

Brief Introduction

146. Veterinary Extension and Advisory services are transitioning from technology transfer to a focus on facilitating a range of interventions in complex contexts. It is a connecting link in complex agricultural innovation systems. Entrepreneurship, innovation, skill development and capacity building are emerging as potential areas of focus in Veterinary extension. At a time when the growth in services sector supersedes primary and secondary sectors veterinary services sector require more attention. Obviously promotion of appropriate extension can facilitate 40 percent increase in production. Knowledge can be considered as production. Percolating appropriate knowledge among the potential stake holders is the need of the hour. Provision of effective extension deliveries in addition to appropriate technologies are the key areas for enhancing the production

Present Scenario

147. Largely resource poor farmers with small landholdings are involved in dairying owning 2-3 cows in a household. Dairying is an important livelihood option in which women have a better control over men. More than 90 percent livestock farmers in the State are working under subsistence level. More entrepreneurs are turning out to take up commercial farming like NRIs, Gulf returnees and youth. Meeting the demand of the State for milk (which is approx 28% deficit now) by increasing production from the existing cows (over a period of three years). Increasing production need to be based on improving productivity from the existing cross bred cows. Different Institutions exist for the development of this sector: (like AHD, TRCMPU, ERCMPU, MRCMPU, DDD, KVASU, KSPDC and KLDB) and all of them have credits to undertaking novel programmes. However it is important that the successful programmes are shared and learnt by other institutions. Only such an effort can address the concepts of “Farmer First” or Entrepreneurship. A platform for the above institutions to share their experiences, ideas and problems should operate with at least two meetings in a year. Though much have talked on the importance of the fodder grass for the cross bred cattle not enough has been done in an emphatic manner. Though all the above departments have fodder grass cultivation in their agenda that usually accrues the last priority. This needs to change. More than the technology on new varieties of fodder, State requires innovation processes and institutional mechanisms that make fodder available to the farmers. This would mean promoting fodder entrepreneurs also.

Development of Livestock Sector during 11th and 12th Plan Period

148. During 11th and 12th Five year plan period, livestock sector witnessed spectacular growth in the State. In tune with the increase in per capita consumption of milk, meat and egg substantial increase in production have been achieved in milk, meat and egg production. Kerala could achieve 60 percent sustainability in milk production during 11th Plan. But it could enhance it up to 72 percent during 12th Plan period. With regard to egg production it was 40 and 60 percent respectively. During the 11th and 12th Plan period number of Broiler chicken farms increased to more than one lakh in the State. Kerala could produce 80 percent of the required quantity of Chicken from the State. But with regard to production of bovine meat and processing huge gap exists in the State.

Critical Evaluation of Data Sources

149. Comprehensive Extension and Entrepreneurship development programmes are required to tackle the critical production and skill gap in livestock sector in the State. Veterinary Extension and advisory services are transitioning from a focus on technology transfer to a focus on facilitating a range of interventions in complex contexts. It is a connecting link in complex agricultural innovation systems. Entrepreneurship, innovation, skill development and capacity building are emerging as potential areas of focus in Veterinary extension. At a time when the growth in services sector supersedes primary and secondary sectors veterinary services sector require more attention. Obviously promotion of appropriate extension can facilitate 40 percent increase in production. Knowledge can be considered as production. Percolating appropriate knowledge among the potential stake holders is the need of the hour. The entire alternate extension paradigm like print and electronic media, information and communication technologies, social media and mobile connectivity can be very effectively used for this purpose. It has been projected that by 2020 number of internet users will reach 70 Crores in India. Of which 75 percent may be from rural areas. So appropriate knowledge transfer through mobile, social, cloud and analytics platforms will facilitate better livestock production in the state. Comprehensive entrepreneurial portal and Package of Practices Recommendations Kerala Veterinary and Animal Sciences University shall provide appropriate database for Animal Husbandry & Dairy sectors in the state. To reduce cost of production, increase income and to reduce risk created resilience are the three mantras for promotion of livestock sector in the State.

Problems in the Livestock Sector

150. Increasing density of population, small and fragmented land, increasing cost of production, decreasing productivity, monsoon and climatic issues, lack of mechanization, poor use of online marketing and e platform for livestock products are some of the challenges existing in this sector. Other challenges include land and soil degradation, inefficient use of water, availability of quality inputs, stagnation in productivity, slow diversification process, inadequate R&D and integration, inadequate extension, non adoption of special methods, regional imbalances, huge investments, poor co-ordination among stakeholders and institutions, remunerative price for farm produce, critical gap between pre and post harvest infrastructure, post harvest losses, natural disasters, vagaries of monsoon and drought, low insurance coverage, supply demand mismatch of livestock products, inadequate small industries and farm oriented agro and food processing industries and weak linkage between appropriate stakeholders and institutions.
151. In order to address these problems the 13th plan need to focus on diversification of agriculture, Promotion of allied sectors, inter-sectoral linkages, technical and extension support, measures to attain self sufficiency, precision farming, promotion of safe to eat products, credit, capital & infrastructure, markets, branding, standardization and processing, insurance and risk management, enabling institutional and organizational forms, climate, natural resource management issues and policy, advisory services, 24X7 Veterinary and Consultancy services, promotion of innovation and Entrepreneurship, food safety issues with regard to milk, meat, egg and other products.

Developmental Suggestions / Projects Recommended For the 13th Plan Period

152. Precision farming, eco-farming based on agro ecological zones and production of safe to eat products need more attention during the 13th plan period.

Focus Areas

1. Livestock production can be oriented towards different agro ecological zones in the State. Strategies for attaining milk production within two years, Measures for increasing production and productivity at the farm level, Precision farming is an important tool for enhancing production and productivity, Productivity enhancement programme through transfer of technologies, Self-sufficiency in fodder to attain profitable Dairy farming after taking in to account the soil fertility, irrigation and soil health cards
2. Promotion of livestock, dairy and Poultry entrepreneurship programmes for the NRIs, unemployed youth and women for establishing commercial livestock ventures, Promotion of market centered production, Promotion of entrepreneurship, innovation, skill development and Capacity building
3. Startup Village- integrating agriculture, Livestock & floriculture& Fisheries- a model to replicate to promote safe to eat products.
4. Food processing is an emerging area. The huge resource of unemployed women can be tapped in this area.
5. Facilities for providing 24X7 Veterinary Services and advisory and consultancy services
6. Strengthening of Co-operative sector, Strengthening the Livestock extension System in tune with the stakeholders demand
7. Reduce the supply demand mismatch of livestock products, Promotion of value addition
8. E-governance and automation programme for better service, Promotion of mechanization in farming, procurement and processing sectors
9. Promotion of e commerce in trade of livestock products and services
10. Conservation of local breeds of cattle and poultry, Provision for inter disciplinary research, Institutional linkages,
11. Promotion of meat production under fattening scheme for male calves
12. Use of print, electronic, ICT and social media for effective knowledge transfer as an alternate extension paradigm.
13. *Productivity enhancement programmes.* This programme involves increasing production and productivity from livestock with the use of appropriate technologies. Animal Husbandry Department, Department of Dairy Development, Milk Unions and other Public sector under takings and Kerala Veterinary and Animal Sciences University will jointly implement the programme at the GramaPanchayath and Block level across the State. Customized productivity enhancement programmes based on appropriate commodities like milk, meat and egg can be implemented.
14. *Start up village in livestock production based on agro-ecological zones.* This project envisages integrating agriculture, livestock and fisheries sector so as to produce safe to eat products with less than permissible level of pesticide and antibiotic residues. 13th five year plan envisages establishment of 200 units in the State @one unit per Assembly Constituency per year (40x5=200)
15. *Agri smart villages in different agro ecological zones.* High value agriculture like Dairying, poultry, goat production and piggery at different Agro-ecological zones shall be promoted across the State. This involves promotion of commercial ventures, high-tech farming, processing and value addition, e marketing and export oriented products.

16. *Precision farming in dairying.* Precision farming in dairying will be implemented across the block. Fodder cultivation based on soil fertility, soil health cards and efficient use of water. Existing dairy farmers can also be included under this project so as to increase productivity at the farm level.
17. *Entrepreneurship development programmes.* In order to attract youth in the Agri allied sectors, separate Dairy and Poultry entrepreneurship programmes for unemployed youth and Women can be proposed.
18. *Veterinary public health centers at the block panchayath level.* This will ensure Veterinary public health programmes under the block level with the duties of meat inspection, rabies control and Animal birth control programmes.
19. *Residue testing laboratories.* There should be provision for testing chemical and antibiotic residues in livestock products
20. *24X7 veterinary services.* In order to provide 24X 7 Veterinary services, advisory and consultancy services, block level veterinary night service of AHD and e Vet connect of KVASU can be integrated so as to provide knowledge and Veterinary services at Block level across the State.
21. *Consultancy services.* In order to promote establishment of commercial dairy, poultry and processing units, consultancy services can be established with the support of Dairy development, Animal Husbandry, PSUs and KVASU in the State under electronic and mobile platform.
22. *Fodder development promotion programme.* This will be implemented at the Block and GramaPanchayath level by the nodal agency across the State
23. *Skill development programmes.* Skill development programmes and value added programmes in appropriate livestock ventures
24. *Awareness programmes.* Gramapanchayath level awareness programmes to promote scientific practices among the farmers, women Self help group members and NGOs.
25. *Capacity building.* Capacity building programme for the farmers, Entrepreneurs and Women SHS in good agricultural practices and profitable farming
26. *Demonstration of good practices.* Exposure visits to see successful models in livestock farming at the district and State level
27. *Promotion of agri-innovation/incubation centers.* Promotion of agriculture based innovation among students, farmers and other entrepreneurs
28. *Milk-o- bike.* In order to meet the increasing demand of milkers, unemployed youth can be identified and a project milk-o-bike can be implemented. During the 13th Five year plan 200 units can be implemented per year so as to have 1000 units during the entire plan period. Milking machine can be connected to a motor bike and unemployed youth can be selected as an entrepreneur and he has to visit 20 houses per day to milk the animals.
29. *Promotion of ICT in knowledge transfer.* Information technology, internet, social media and mobile connectivity can be effectively use for knowledge transfer among potential stakeholders as an alternated extension paradigm. This can include social media, Mobile App and farm portals.
30. *Use of farm media.* Print, Electronic (Telecast and Broadcast) media can be very effectively used for disseminating good agriculture practices, success stories and demonstrations. A separate livestock information Bureau can be established for this purpose.
31. *Trainers training programmes.* Trainers training programmes for extension professionals in advancements, use of social media use and recent trends in knowledge transfer among the potential stakeholders.
32. *Farmers contact programme.* This can be implemented at the Block level which will help to identify farmer's problems and can be corrected through scientific measures.

33. *Quality awareness programmes at the gramapanchayath level.* This will help to create awareness on quality norms in tune with FSSA 2006 Act. Consumer interface programme can also be linked with this programme
34. *District/state/national level seminars.* District/State/National level seminars on Dairying and Livestock production can be organized
35. *Exhibition at the district level.* To create awareness on the developments and opportunities exhibitions can be planned
36. *Publications.* Books, Booklets, leaflets and brochures on scientific farming practices can be published
37. *Exposure visits.* Exposure visits will help to create awareness on Successful model
38. *Promotion of School Poultry, livestock and Dairy Clubs:* This will create awareness among school children about the farming activities.
39. *Farmer awards.* This will motivate the farmers to improve production and productivity
40. Documentation of Successful models
41. *Research on field level issues, climate resilience.* Universities can conduct studies based on inputs from field level officers
42. *Training on marketing.* Advanced training on e commerce and digital marketing can be imparted to extension professionals.
43. *Livestock knowledge/information centers.* Veterinary and Dairy institutions, *Krishibhavans* and Milk co-operatives need to function as knowledge or resource centre for percolating appropriate knowledge among the potential stakeholders.
44. *Comprehensive insurance programme.* In the wake of increasing incidence of climatic issues and disasters including disease outbreak a comprehensive insurance programme covering cost of treatment are essential.

Plan Implementation

153. Proposed projects can be implemented in the State with the support of Local self Governments, Department of Animal husbandry, Dairy Development, Public sector undertakings like Milk Unions, Kerala Livestock Development Board, Kerala feeds, Meat Products of India and Universities like Kerala Veterinary and Animal Sciences University and Kerala Agricultural University. Kudumbashree mission and farmer producer organizations and producer companies can also associate with the proposed programmes.
154. Animal husbandry department and Dairy Development department with the support of public sector undertakings and Universities can implement appropriate projects. University needs to provide appropriate technologies and sustainable practices including location specific and market centered projects. Appropriate location specific programmes can be prioritized. Veterinary University can take lead role in Skill development, Capacity building, precision farming, eco friendly farming under startup village project to produce safe to eat products and technology transfer programmes. Animal husbandry and Dairy development department can implement extension programmes across the State. Fodder development programmes can be implemented with the support of Dairy development department and Milk Unions.

Output and Outcome

155. Agro ecological zone based livestock production would help to achieve sustainability in milk production within two years, Measures for increasing production and productivity at the farm level

and Precision farming will enhance production and productivity. Productivity enhancement programme through transfer of technologies will help to improve production from livestock. Self sufficiency in fodder to attain profitable Dairy farming after taking in to account the soil fertility, irrigation and soil health cards will facilitate to attain sustainability in dairying.

156. Livestock, dairy and Poultry entrepreneurship programmes for the NRIs, unemployed youth and women for establishing commercial livestock ventures, Promotion of market centred production, Promotion of entrepreneurship, innovation, skill development and Capacity building will improve production and facilitate employment in livestock sector. Start up Village project through integrating agriculture, Livestock & floriculture& Fisheries will promote safe to eat products.
157. Huge resource of unemployed women can be tapped in food processing sector in the State. Facilities for providing 24X7 Veterinary Services, advisory and consultancy services will facilitate effective knowledge transfer. Co-operative sector can strengthen the Livestock extension System in tune with the stakeholders demand. It can reduce the supply demand mismatch of livestock products, E-governance and automation programme will facilitate better service. Promotion of mechanization in farming, procurement, value addition/ processing will improve profitability through livestock production System. Promotion of e commerce will promote trade of livestock products and services. Conservation of local breeds of cattle and poultry, Provision for inter disciplinary research and Institutional linkages will help to maintain biodiversity and to solve conservation issues. Fattening scheme for male calves will improve meat production in the State. Print, electronic, ICT and social media can be used for effective knowledge transfer as an alternate extension paradigm. Abilities in market-decision making and social entrepreneurship among the extension professionals can be improved during the plan period.

CHAPTER 10
VETERINARY EDUCATION AND RESEARCH

Introduction

158. The highly specialized livestock sector, including dairy, poultry and fisheries, involve multifarious tasks for the professionals in veterinary and animal sciences and Dairy in the broad areas of health care, breeding, feeding and management of animals for sustained livestock production, value addition and quality assurance of livestock products for internal consumption and to boost export potential from livestock. Public health concerns, food and nutritional security, sanitary and phyto-sanitary (SPS) concerns, environmental issues, animal welfare and ethics, and addressing the concerns of trans-boundary diseases are also part of other major responsibilities of a veterinarian. Adequate and competent scientific cadre possessing requisite knowledge, skill and attitude (KSA) to manage teaching, research and transfer of technological practices are basic necessities to develop human resource for the delivery of effective and efficient services.

Importance of the Sector

159. India has the distinction of having very large livestock population in the world (512.05 million as per 2012 census). According to the 2012-13 report of the department of animal husbandry, dairying & fisheries (DAHD&F), GoI, a sum of Rs. 5, 37,535 Crores accounting for 4.11% of the national GDP and 25.63% of the value of output from agriculture and allied sectors at current prices are generated through animal husbandry practices. Milk alone contributes 66% of the total output and the rest comes from meat, eggs, wool and other products. The progressive increase in the output of milk, meat, eggs, and fish has resulted into improvisation of per-capita consumption of these commodities thereby exhibiting a positive sign for ensuring nutritional security of masses.
160. Through India stands first in milk production (134 million tons during 2012-13) in the world and there has been quantum increase of 6-7 times in the last 4 decades, yet low average productivity of our livestock is a cause of concern. Growth in livestock production is demand driven and is rising at a steady pace. Increased livestock production has helped in raising the income of middle class rural households. There has been greater awareness towards consumption of quality animal origin proteins leading to the steadily changing food habits of people both in rural and urban populations. Thus, with increased availability, utilization of food from animal origin is on the rise. However, in India, there is still a wide gap between the availability of quality food and feed and the biological needs of the same for man and animals, respectively. Livestock sector is and shall continue to be an important segment for augmenting our agriculture growth.
161. Hence it becomes necessary to orient Veterinary research to supplement the need of the livestock sector and in order to streamline such research, it is essential to expand the Veterinary education programmes so as to obtain maximum benefits from livestock sector.

Present Scenario

Agriculture Scenario

162. Of the total Agriculture GDP in the country, livestock sector's contribution is 24.7 percent. For every one percent growth in agriculture the livestock sector requires a growth of around 2.6

percent. It is envisaged that in order to augment agriculture GDP in the country, this sector needs to be strengthened. In the era where food security and food safety issues are emerging, the need of the hour is to fill the gap between availability and requirement of animal protein sources like milk, egg and meat. Per capita consumption of milk per day in the State is 241 grams, whereas the requirement as per Indian Council of Medical Research is 280 grams; With regard to meat per capita availability per day is nearly 5.6 grams where as requirement is 15 grams. Even though an adult individual requires half an egg per day availability of egg in Kerala is less than one fourth. In order to improve production and productivity from livestock, Government of Kerala is implementing novel programmes in the Animal husbandry and dairying sector of the State. Major challenges are increasing cost of production and decreasing productivity of livestock. Scientists of the University are destined to take utmost care to address these issues.

Human Resource Scenario

163. The role of veterinarians and animal scientists is becoming more and more challenging owing to diversification in livestock sector; higher expectations of industry, farmers and entrepreneurs; diminishing land under fodder production and for pasture, besides the challenges posed by climate change threat. In the present scenario, we need to produce more with fewer resources. It is hard fact that in order to be sustainable in agriculture, livestock sector is considered to be the most dependable avocation for rural households. This sector needs to expand exponentially so that it is better equipped to share the burden in societal built up through veterinary and animal husbandry enterprise and practices. Creation of more institutions with modern infrastructure facilities matching global standards to expeditiously produce competent human capital with appropriate knowledge, skill and attitude to effectively manage different activities is need of the time. Human capital is the most crucial component of growth and thus requires appropriate strategies for human resource development (HRD) and human management (HRM) programs.
164. Considering the large livestock population of the country vis a vis number of veterinarians in service sector (around 34,500) for health coverage, the country is not having sufficient manpower for managing animal health effectively. The veterinarian: animal ratio comes to around 1:10-15 thousands. This is the ratio when poultry as well as wild, zoo and laboratory animals are not accounted for. The National commission on agriculture (NCA, 1976) recommends one veterinarian for every 5,000 adult cattle units. However, with substantial increase in production potentials of livestock and intensive need for health coverage for cross bred cattle, the ratio between the existing animal population and available veterinarian need to be narrowed down so that one veterinarian is available per 2,500-3,000 cattle units for better health care and management practices for accomplishing higher LS production, productivity and profits. This recommendation also meets the norms set by the world organization of animal health (OIE).
165. *HR requirements in dairy processing sector.* With expected rise in milk production, more new processing units will come into operation. It is estimated that the processed dairy segment will grow at around 15% during the next five years. There has been consistent rise in demand for value added products such as yoghurt, dairy beverages, ice creams & cheeses thereby encouraging the organized dairy industry to go for diversification of product profile. The situation in the state of Kerala is also not contradictory. The demand for milk and milk products will grow in the coming years due to population growth and demographic shifts arising from increasing incomes, urbanization, and other demographic shifts in the state.

166. The growth and maintenance of the dairy system in India have been attributed largely to the skilled human resources and effective service delivery to the dairy farming community. With expected rise in the number of new dairy units and capacity expansion of the existing units more human resources would be needed.
167. It is estimated that the demand for qualified Dairy Technologists would be around 25000 by 2020. It is therefore envisaged that the colleges offering Dairy Technology courses under the Indian Council of Agricultural Research-National Agricultural Research System need to be strengthened to offer the best quality dairy education and research opportunities to the budding Dairy Technocrats. ICAR has recently framed Minimum Standards of Higher Agricultural Education in the field of Dairy Technology which will trigger the much needed improvement in the quality of Dairy Technology education and set in motion realization of set objectives of ensuring nutritional security and rural prosperity in the country. Effective intervention in the dairy education and research is essential to meet the ever-changing needs of the dairy industry. There is also a huge demand for Diploma holders to the tune of 6.5 lakhs mainly to cater to the needs of milk procurement.

Development of This Sector during 11th and 12th Plan Period

168. In the present context, the science is also changing rapidly with the emergence of new tools, methods, techniques and approaches that promise technological breakthroughs to accomplish the mission.

Potential of Genetic-Resource Enhancement

169. Much of the gains in the productivity of animals in the past have been attributed to the genetic alterations of animals. We possess a vast variety of genetic resources of animals. Much research has been facilitated through (i) characterization, (ii) genetic enhancement (iii) functional genomics, proteomics, etc., (v) molecular breeding through tools like marker-aided selection and gene stacking etc.

Power of Biotechnology

170. Biotechnological tools have been used widely for the diagnoses of various diseases, its surveillance, preventive measures against specific diseases and characterization of organisms that will help in the preparation of vaccine candidates suitable to the locations.

Management of Energy and Agricultural Waste

171. New sources of renewable energy need to be explored. Research targeted to develop bio-fuels effectively utilizing huge agri-waste (animal residues) was undertaken. It was also taken up to process high-quality animal feeds from crop residues and waste from food-processing industries. New forms of machinery and equipment have been developed for efficient use of renewable sources of energy.

Veterinary Education

172. During the past ten years, seven Veterinary universities have come into existence. This has opened up new vistas in Veterinary teaching and research. It is to bridge the wide gap between the currently available faculty in teaching educations and the required manpower for imparting pragmatic research in the field. Besides the Veterinary Council of India implemented the modification of Veterinary syllabus in 2006 as well as in 2016 so as to suit the teaching and knowledge dissemination to students to mold them to possess day one competencies upon graduation. The Fourth Deans' and Fifth Deans committee of the ICAR also revised the syllabi and curricula during this period applying stress on entrepreneurship and industry oriented programmes.

Problems in the Sector

1. Lack of man power-Hence there should be an approach to fill the human resource gap
2. Creation of additional facilities-Government should play a proactive role in creating Institutes and Universities of Global order
3. There is need to encourage International linkages for better exposure and wide vision.
4. Thrust areas identified by the vision documents published by statutory bodies governing the Academic Institutions may be followed in strict sense in undertaking research activities.

Developmental Plans Suggestions/Projects Recommended For the 13th Plan Period

Education

1. Formulation of day one skill requirement under the Kerala situation:
 2. Problem based Learning:
 3. Alternative teaching aids:
 4. Aptitude promotion
 5. Student participatory programmes:
 6. National /International linkages
 7. Personality development
173. All the above parameters shall be undertaken for the benefit of the students who get admitted to Veterinary and Dairy Technology colleges so as to mould them into competent candidates and to imbibe in them the value of agriculture, Animal husbandry and Dairying.

Research

174. State has a good repository of Livestock and poultry. But the output from this resource is not encouraging hence a deficit in the products and we are not able to meet the demand of the state. Kerala's research policy needs to concentrate on overcoming many of the challenges and threats we currently face. Ever increasing human population, global climate change, depleting land availability, and declining ground water table makes it extremely difficult for the livestock to gain access to feed and water resources that they have traditionally been able to access. Research to bring animal densities in line with the absorptive capacity of land and water, through quota systems, as already imposed in many parts of the world needs to practice in Kerala. We also need to focus on developing newer unconventional feeds including herbal and microbial feed additives, organic mineral supplements including nano-particles for better bioavailability and improved

health. We need to develop gene tailored functional, climate resilient feed particles for improving the yield and to improve nutritional quality and safety of animal-derived foods.

Indigenous Technologies

175. New and appropriate technologies are essential to ensure the supply of stable and sufficient food to the expanding population. Traditional foods are a treasure box of resources in terms of material and knowledge. To achieve and maintain competitive advantage, innovation in product design and delivery are increasingly essential. With the diverse traditional food culture in the state, there is a great potential for the development of rich and high-quality food resources within a region. Emerging technologies such as functional foods, nutraceuticals and dietary supplements offer a great scope for pursuing advanced research in dairy/food technology.

University–Department/Industry Linkages

176. The academic and research community should strengthen linkages with field departments and dairy/poultry/meat processing industry through reciprocal relationships. The industry can work as a catalyst for furthering the better cause of education system. It is the combined responsibility of academic institutions and field departments/industry to introspect and find the gaps between the field/ industry requirements and quality of manpower supplied to it.
1. A system should be created as to have a collaborative environment for the field departments like Dairy Development department, AHD, Milmaetc and the Veterinary Science/Dairy Technology/Poultry Science Colleges under KVASU to work together for the livestock farmers in the state who are the main stay of this sector and for their sustainable livelihood.
 2. The KVASU shall join hands with the field departments/industrial units to devise appropriate research projects/schemes addressing the field level problems/market issues (*Problem Based Learning*). In the same way, the field departments can devise and implement projects with the active involvement of subject experts from the University.
 3. The University shall also extend *Technology Incubation Facility* to support dairy/poultry entrepreneurs in the state in association with the field departments.
 4. The analytical labs of field departments and University laboratories shall be linked through online platform so that test results (laboratory tests) of samples collected from the field/market can be shared and used appropriately.

Research Schemes/Projects Recommended For the 13th Plan Period

Genetic Selection of Cattle for Kerala with Increased Productivity and Climatic Adaptation Traits

177. It is high time to take up in detail studies on interactions between weather factors in surrounding environment of animal agriculture, for which fundamental. Basic studies need to be carried out in Livestock Meteorology to cope up with climate variability/climate change adaptation and mitigation. Breeding goals may have to be adjusted to account for higher temperatures, lower quality diets and greater disease challenge. Species and breeds that are well adapted to such conditions may become more widely used.
178. Dairy cattle must be selected in such a way that they should produce well in thermal stress conditions and also under lower levels of feeding. Genotype environment interactions are so strong that they can even change the ranking of bulls based on their estimated breeding values

obtained from daughters belonging to different agro climatic zones. Thus there exists great genetic variation in milk production potential of dairy cattle under varying climatic conditions and it would be highly beneficial if the better producing ones under restricted conditions could be identified and bred for future use. An attempt can be made to identify such genetic markers, by combining milk production parameters and physiological data of different genetic groups under different agro-climatic zones, with single nucleotide polymorphism (SNP) data made available by various genetic procedures. The causative mutations underlying these associations should be unraveled and carefully studied to reach definite conclusions. Such studies may help to develop methods for characterizing adaptive traits relevant to climate-change adaptation (heat tolerance, disease resistance, adaptation to poor diets, etc.) and for comprehensive evaluation of performance and use of animals in specific production environments and describing these production environments in a standard way.

179. Cattle with good milk production potential under thermal stress conditions and low feeding resources can be identified. Genetic architecture of such cattle may be identified using different genetic tools. Those Identified genetic markers can be utilized for selection of productive climate adapted cattle. Finally a State Breeding policy can be formulated by giving due weightage to climate adaptation.

Development of Vaccine for Control of Bovine Mastitis

180. Mastitis is a major cause for the demand -supply gap of quality milk in India. Though various organisms cause mastitis, the preliminary studies done in the University have shown that there are certain common organisms that are responsible for mastitis. The same study also attempted to develop a vaccine based on the commonest isolate causing mastitis and satisfactory immune response was obtained in a rabbit model. This holds promise for development of a potential vaccine for control of bovine mastitis in the state. This study is envisaged to identify various candidate vaccine isolates based on virulence factors possessed. It will help to develop a suitable preventive measure for control of environment and contagious mastitis in Kerala after clinical and field trials.

Developing Non-Surgical Methods for Control of Stray Dog Population in Kerala

181. The menace of stray dogs has been on the rise and has been the focal point of discussion in the general public. The incidence of dog bites has increased from an average of 88,178 incidents per year to more than one lakh a year. The state Government spends more than Rs. 10.0 crore on vaccine expenses each year. The Global Alliance for Rabies Control reported that India accounted for 35% of human rabies deaths worldwide. While surgical castration and spaying are the widely practiced methods to control the dog population, the labour, cost and the time taken for the methods are a limitation. Non-surgical procedures to control the reproduction in dogs offer a hope in this regard. Various methods being tried involve chemical castration and immune-sterilization. The project would involve research about potential non-surgical sterilization or contraceptive techniques, which could be of use under Kerala conditions.
182. The present work is directed at developing a multipronged non invasive strategy for the control of dog population. This would involve comparing chemical and immunological strategies for control of dog population. Chemical castration using GnRH agonists has proven to be an effective method of rendering dogs infertile as a reversible alternative to these surgeries. The treatment with GnRH

agonists resulted in a decrease in gonadal volume, consistency, inhibit ovulation and reproductive behavior. Hence these implants would be effective for long-term, reversible fertility control in dogs.

183. With respect to immunological methods, the objectives of the first year would be to identify potential macro molecules for use as immunological control of dog populace. The project would be continued in the subsequent years to finally result in development of multi pronged strategies of animal birth control.
- 184.
185. Development of vaccine targeted on sperm or oocyte antigens for contraception holds promise. Both the sperm and oocyte antigens would be having tissue specificity and are potentially unique in their role in fertility and ability in generating antibody titres specific to the reproductive tract. Several sperm antigens like lactate dehydrogenase C4, PH-20, sperm protein (SP)-10, fertilization antigen (FA)-1, FA-2, cleavage signal (CS)-1, NZ-1, and NZ-2 have been identified as probable candidates for the vaccine development. Many of these antigens have been tried in human reproduction and some for control of canine reproduction. Studies on sperm-specific lactate dehydrogenase (LDHC4), a protein present only in testis and spermatozoa of mammalian and avian species, have indicated its potential use as an immune contraceptive vaccine.
186. The evaluation of chemical contraceptives and the validation of effective potential macro molecules as immunogenic contraceptives and the analysis of the economic viability of the suitable treatment protocol will be delivered. The study will help in exploring a multipronged strategy for non-surgical control of dog population.

Developing Area Specific Mineral Mixture to Promote Precision Livestock Farming in Kerala

187. Precision livestock farming encompasses optimizing the input like feed, water, fertilizer and energy and improving the production, profit and productivity of the farm. This would focus on balanced and cost effective feeding of animals which forms the major determinant of sustainability of the farming. The concept of supplementation of minerals as per the requirement is ambiguous in feeding dairy cattle in Kerala. This is mainly due to varied feed stuff fed, availability pattern and supply from other states
188. A preliminary study was conducted at Chittoor, Palakkad District of Kerala is the highest milk producing block of the state. The mineral status of soil feed, fodder were analysed using AAS technique found that the ration fed was adequate in Calcium, Phosphorus, Sulphur but deficient in Copper and Zinc for the current level of production. . Based on the levels of minerals in rations fed and blood mineral status, an Area Specific Mineral Mixture was developed for the dairy cows in Chittoor area with 44% addition of copper and 39% addition of zinc along with required additions of cobalt, Iodine and Manganese. Based on the deficiency, an area specific mineral mix was prepared .It is also reported that the incidence of mastitis and other reproductive issues have reduced and the skin condition was improved during the trial period in cows supplemented with ASM
189. Hence such a work can be extended to all parts of the State to Identify and map areas which require strategic supplementation of minerals, Quantify the mineral status in different components of the dairy ecosystem, Develop areas specific mineral mixtures for the discrete deficient areas and assessment the health and production status in strategic supplemented animals.

190. The study would help to identify the vulnerable areas of mineral deficiency or excess and future strategies can be planned accordingly. The issues of productivity including reproductive inefficiency and other health issues of animals and welfare can be addressed. The mineral supplementation is a cheaper alternative. There will be reduction in stress related production loss through better adaptability. It paves way for Development of area specific minerals for different areas addressing the issues of farming community at large. The result would also pay way for the assessing mineral status in human population in the area and open the scope for research in respective avenues.

Plan Implementation

(Research projects are attached separately.)

Output and Outcome

191. Unlike the Changing scenario of rising demands for livestock products and climate change threat, an innovative holistic approach is needed to bring transformation in Veterinary and animal science education for boosting livestock production and productivity. We need to have a vibrant and dynamic system, for producing competent and self reliant professional human resource, possessing the capabilities to adapt to the changing needs and environment. Both the Central and state Government are required to accord higher priority to livestock sector including poultry and fishery, and make substantial funding on sustainable basis for ensuring faster development for achieving the needed excellence.
192. The output of the above projects broadly covers:
1. Graduates with day one competencies
 2. A State Breeding policy can be formulated by giving due weightage to climate adaptation. Characterization of adaptive traits relevant to climate-change adaptation (heat tolerance, disease resistance, adaptation to poor diets, etc.) and evaluation of their performance will help to identify cattle with good milk production potential under thermal stress conditions. Genetic architecture of such cattle may be identified and those identified genetic markers can be utilized for selection of productive climate adapted cattle
 3. Developing a suitable mastitis vaccine will address the alarming occurrence of mastitis in the State and an answer to production efficiency.
 4. The evaluation of chemical contraceptives and immunogenic contraceptives will help to explore a multipronged strategy for non surgical control of dog population.
 5. Development of area specific minerals for different areas addressing the issues of farming community at large and assessment of mineral status in human population in the area which will open the scope for research in respective avenues.

CHAPTER 11
END NOTE

193. Effective interaction and collaboration among the stakeholder departments in Livestock Sector of the state is the need of the hour. Some additional suggestions and recommendations made for the 13th plan period are as follows:
1. Promoting interaction between field departments and the University for Identification and conveying of field problems to the researchers for conduct of field oriented research.
 2. Benchmarking system in livestock farming activities may be carried out to serve as yardsticks for future development.
 3. SWOT analysis of sectors should be carried out.
 4. Disaster management and One health approach has to be stressed.
 5. Modernization and strengthening of check posts to effectively monitor and control the livestock and livestock products movement through the check posts.
 6. Investors meet should be conducted involving all the stake holders.
 7. Posting of personnel with expertise (Master degree and Doctorate holders) in relevant posts of the allied departments should be ensured to improve specialization and efficiency.
 8. Exposure visits for professionals to experience and learn and analyze the SWOTs of the livestock sector in other states.
 9. Higher officials of the concerned departments may be involved in subsequent stages to improve the implementation of the proposals.
 10. The concept may be implemented on a mission mode to stress and implementation of the proposals.

ANNEXURE 1

**PROCEEDINGS OF THE MEMBER SECRETARY
STATE PLANNING BOARD
(Present: Shri VS Senthil, IAS)**

Sub: Formulation of 13th Five Year Plan – Constitution of Working Groups – reg.

Ref: Note No. 260/2016/PCD/SPB dated 06.09.2016 of the Chief (i/c), Plan
Co-ordination Division, State Planning Board

Order No. 300/2016/AGRI(W3)/SPB dated 19.09.2016

As per the reference cited, State Planning Board has constituted Working Group on ‘Animal Husbandry and Dairy Development including Veterinary Research’ to formulate the draft proposals in the sector for inclusion in the Thirteenth Five Year Plan.

The Working Group on ‘**Animal Husbandry and Dairy Development including Veterinary Research**’ is hereby constituted with the following members.

Co-Chairperson

Sri Anil Xavier, IAS, Principal Secretary, Animal Husbandry

Co-Chairperson

Dr K Vijayan, Retired Professor, College of Agriculture, Vellayani, Thiruvananthapuram

Members

1. Dr NN Sasi, Director of Animal Husbandry
2. Sri Georgekutty, Director of Dairy Development
3. Dr Jose James, Managing Director, KLDB, Thiruvananthapuram
4. Sri U V Jose IAS, Managing Director, MILMA, Thiruvananthapuram
5. Sri K T Thomas, Managing Director, Malabar Regional Co-operative Milk Producers Union, MILMA, Kozhikkode
6. Dr S Ramkumar, Professor & Head, Veterinary & Animal Husbandry Extension Education, Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry.
7. Dr K Devada, Director of Research, KVASU, Pookode, Wayanad
8. Dr Joseph Mathew, Registrar, KVASU, Pookode, Wayanad
9. Dr Raghavan, Professor, KVASU, Wayanad
10. Dr T P Sethumadhavan, Director of Entrepreneurship, KVASU, Pookode, Wayanad
11. Dr G Giriesh Varma, Dean, College of Dairy Science and Technology, KVASU, Mannuthy, Trissur
12. Dr Sisilamma George, Dean, College of Veterinary and Animal Sciences, KVASU, Mannuthy, Trissur
13. Dr Sunilkumar, Managing Director, KSPDC, Thiruvananthapuram
14. Dr SudheerBabu (Dairy Technology), College of Veterinary and Animal Sciences, Mannuthy, Trissur

15. Dr Biju (Animal Husbandry), College of Veterinary and Animal Sciences, Mannuthy, Trissur
16. Sri P Krishnaprasad, *Brahmagiri* Development Society, Wayanad

Convenor

Dr P Rajasekharan, Chief(Agriculture), State Planning Board

Co-Convenor

Smt Sabeena N, Deputy Director, State Planning Board

Terms of reference

1. To review the development of the sector with emphasis as to progress, achievements, present status and problems under its jurisdiction during the 11th and 12th Five Year Plan periods.
2. To evaluate achievements with regard to the plan projects launched in the sector, both by the State Government and by the Central Government in the State during these plan periods.
3. To list the different sources of data in each sector and provide a critical evaluation of these data sources, including measures for improvement.
4. To identify and formulate a set of output and outcome indicators (preferably measurable) for each sector and base the analysis of the previous plans on these indicators.
5. The committee will examine the status, problems and potential of different types of animal resources in the State with a view to increasing farmers' incomes. The Group will take into consideration locality specific issues with regards to suitable forms of animal husbandry and provision of feed ,fodder and veterinary services and research in this regard.
6. To suggest, in particular, a set of projects that can be undertaken during the 13th Plan period in the sector.
7. The Co-Chairperson is authorised to modify terms of reference with approval of State Planning Board. The Co-Chairperson is authorised to invite, on behalf of the Working Group, experts to advise the Group on its subject matter. The non-official members of the Working Group will be entitled to travelling allowances as are applicable to class I officers of the Govt. of Kerala. The class I officers of GoI will be entitled to travelling allowances as per rules if reimbursement is not allowed from Departments.
8. The working group will submit its draft report by 1st December 2016 to the State Planning Board.

Sd/-

Member Secretary

To

The Person concerned
The Sub treasury Officer, Vellayambalam

Copy to:-

The Accountant General, Kerala (A&E) with C/L
All Divisions, State Planning Board
PS to VC
PA to Member Secretary
Stock file

Forwarded by order
Chief (Agriculture)

**PROCEEDINGS OF THE MEMBER SECRETARY
STATE PLANNING BOARD
(Present: Shri VS Senthil, IAS)**

Sub: Formulation of 13th Five Year Plan – Constitution of Working Groups – reg.

Ref: Order No. 300/2016/AGRI(W3)/SPB dated 19.09.2016

Order No. 300/2016/AGRI(W3-R)/SPB dated .09.2016

As per the reference cited, Working Group on '**Animal Husbandry and Dairy Development including Veterinary Research**' has been constituted with Dr K Vijayan, Retired Professor , College of Agriculture, Vellayani as one of the Co-Chairperson.

Revised order is hereby issued by changing the name of the Co-Chairperson as Dr R Vijayan instead of Dr K Vijayan as given in the earlier proceedings

The earlier proceedings stands modified to this extend

Member Secretary

To

The Person concerned
The Sub treasury Officer, Vellayambalam

Copy to:-

The Accountant General, Kerala (A&E) with C/L
All Divisions, State Planning Board
PS to VC
PA to Member Secretary
Stock file

ANNEXURE 2
LIVESTOCK BREEDING PROGRAMME
PERSPECTIVE AND OBJECTIVES FOR THE 13TH FIVE YEAR PLAN

The Background

Kerala State was formed during 1956. The state is located in the southernmost tip of the country. Its area of 38,855 sq. km is only 1.2 % of the total area of India. Physical features demarcate the state into three natural divisions: the low land adjoining the sea, the midland consisting of undulating country east of the lowlands and the forest clad highland on the extreme east. The diversity of the climate ranges from biting cold in the mountain peaks to warmth in plains. Most part of Kerala gets reasonably heavy rain with annual average of 2900 mm.

Agriculture can no longer be ascribed as the main source of livelihood in Kerala. Still it is one of the important occupations with about 40 % of the people engaged in it either as cultivators or as agricultural labourers. Agriculture continues to be the single largest employment source with at least 30 % of the total work force engaged in it. Pressure on land, rapid fragmentation of land and adverse economic pressure on seasonal crop production have all resulted in large areas of paddy land being put to other use. The area under rice has been declining consistently since the last three decades. Today rice occupies only third position in area under cultivation way behind rubber and coconut. There are a total of 6.831 million operational holdings (2010-11), 96% of them in the size group- "below 1.0 hectare". Only 53 % of the total geographical landmass of the state constitutes the net sown area, however with cultivation intensity of 1.34, 28% of the land in the state is under forest cover.

Like land ownership, the pattern of livestock possession in Kerala is also highly skewed, but skewed towards marginal farmers who own less than one hectare (ha) of land. Marginal farmers in the state owned nearly 87.7 per cent of total cattle in the state, followed by small farmers (8.4%). The other three holding categories owned the balance four per cent of cattle (Table 1.1). A very close similarity in ownership pattern was observed in the case of buffaloes as well. Goats, as is the case elsewhere, were found to be the property of small and marginal farmers in Kerala too. Marginal farmers owned a substantial majority (92.6%) of goats in the state. While marginal farmers possessed 57.5 per cent of the pigs, the rest was more or less equally divided among other categories of farmers, excepting large farmers. Marginal farmers also predominantly owned poultry (93.5%), followed by small farmers (4.55%).

Table 1 *Farm size category-wise ownership of livestock in Kerala, 2006-07 (%)*

Farm category	Cattle	Buffalo	Goats	Pigs	Poultry
Marginal (below 1.0 ha)	87.70	86.57	92.62	57.48	93.54
Small (1.0 – 1.99 ha)	8.41	8.35	4.99	17.63	4.55
Semi-medium (2.0 – 3.99 ha)	3.09	3.95	1.85	10.28	1.54
Medium (4.0 – 9.99 ha)	0.72	1.02	0.47	14.60	0.34
Large (10 ha and above)	0.08	0.11	0.07	0.00	0.03
All groups	100.00	100.00	100.00	100.00	100.00

Source: Input Survey, 2006-07

Kerala has none of the natural attributes to make it an ideal dairy state. The year round hot and humid climate, the relentless pressure on land for human needs, acute scarcity of fodder both dry and green, the high rainfall and the consequent mineral depletion from the soils, are all factors hostile to classical dairy farming. Yet Kerala did go through with a thoroughly successful cattle development programme, transforming about 94% of the total cattle population into medium to high producing crossbred in a comparatively short span of 50 years, pushing up average yield per cow per day from less than a litre to around 10 liters and milk production in the state to 27.11 lakh MT in 2014-15.

In recent years, the development of dairying and milk production has offered considerable scope both for employment and income generation in the farming sector and improving the nutritional status of the population. With the steady increase noticed in the population size of the state, the milk requirement in the state will have to increase fast to meet the demand @ 280 g per day. Simultaneously attempts should be made for reducing the cost of production, by enhancing the productivity of the animal.

Cattle Breeding in the Past

Kerala never had a cattle breed of its own. The cattle were non-descript and low producers. The State has never been recognized as an area suitable for dairying. With a view to improve the productivity of non-descript cattle, the Agriculture Department brought Ongole, Kangayam and Mahals from neighboring states. The results were not satisfactory. As such bulls from the North Indian breeds like Red Sindhi as well as some English breeds were imported and tested. Red Sindhi breed was found to adapt well to local conditions. Efforts were, therefore, made to popularize this breed. Herds of selected bulls and cows were imported from Karachi and maintained at the Government farms. Calves born to them were distributed (in pairs) to individuals and institutions interested in cattle breeding. The impact of such a programme being trivial, it was thought that better results could be obtained quickly and cost-effectively, though less perfectly, by grading up the local cows with bulls of superior 'strain'.

However, no national policy for cattle development was in vogue prior to 1951, but individual and isolated efforts were made in programmes like distribution of bulls, castration of scrub bulls etc. The need for co-ordination and proper guidance of State's activities in cattle development on all India basis was first suggested by the Royal Commission on Agriculture in India in 1928.

Genetic improvement of cattle was attempted as early as 1950 by using Red Sindhi as the donor breed in Key Village centers of the Animal Husbandry Department. During 1952-53, Key Village Blocks were started using AI facility. The policies for development of cattle and dairy enterprises laid down on an all India basis were adopted in designing the cattle development programmes in the State. Kerala State being an area of non-descript cattle with low productivity, the breeding policy adopted was grading up of local cattle with recognized cattle breeds of India. The objective was to improve both milk and draught qualities. Keeping this objective in view, Red Sindhi breed was considered suitable for high rainfall and

humid conditions of the State. In areas where demand for bullocks was high, Kangayam breed was also approved. In buffaloes, the objective was to increase milk yield and as such buffalo bulls of the Murrah breed were used for breeding.

Crossbreeding of Cattle

The introduction of exotic breed was done with the implementation of crossbreeding scheme in 1955-56 using Jersey as the donor breed. The establishment of the Indo-Swiss Project in Kerala (ISPK) paved the way for expanding crossbreeding programme on large scale throughout the state. In the beginning Brown Swiss was used as the donor breed. With the introduction of cross breeding on a large scale, a breeding policy was formulated in the State with an intention of developing a new breed having exotic inheritance between 50% and 75%. The programme was to develop a gene pool with a theoretical average of 62.5% exotic inheritance. It was also envisaged to adopt intensive selection within the crossbreds to build up an economically viable stock in natural balance with the local ecology.

A committee of experts appointed by the State Government reviewed the breeding policy in 1979 and recommended to limit the level of exotic inheritance to around 50% and practice intensive selection within the crossbred population, especially of sires through progeny testing.

Another committee of experts again reviewed the breeding policy during 1992 and recommended to continue the breeding policy and to use Jersey, Brown Swiss and Holstein Friesian as donor breeds. A high level committee again reviewed the breeding policy during 1997 and submitted its report. The Government approved the recommendations in toto and was implemented as the state breeding policy.

Subsequently, the Government constituted an Expert Committee during 2005 to review the then existed Breeding Policy in the state and suggest changes thereto. The committee after detailed study of all aspects of the Livestock Breeding Programmes and policies and after having held discussions with all the stakeholders including dairy farmers and Government Departments, formulated the final report which was approved the Cattle Breeding Policy of the State 2008. That is being reviewed at periodic intervals and being implemented as the state breeding policy.

A midterm review of the Breeding Policy of the State was conducted during April 2013 and the recommendations were as follows:

The National Workshop held on 24th April 2013 at Thiruvananthapuram after detailed discussions gave the following recommendations.

1. An annual growth rate of 3.7% would be achievable (considering the growth rate of 3.49% in overall milk production in the state over the last 10 years) for which **immediate measures should be taken for strengthening the current genetic improvement programme and improving dairy animal management including feeding and fodder situations.**
2. Declining trend in cattle population – **Government should formulate Mission Mode Action Plan** in consultation with farmers and various Government Departments/Agencies to tide over the situation. Macro-economic issues resulting in extremely high cost of production like scarcity and high and unaffordable cost of feed and fodder, high labour costs, scarcity of land for fodder cultivation, water resources, etc have to be addressed. **A group of experts has to be set up to study the current situation of dairy production in the state and to set out the pathway for future growth and development.**
3. **State Government should formulate a Feed and Fodder policy.**

4. More parameters like milk constituents and somatic cell count are to be included in the bull selection process.
5. Efforts should be made to reduce the Age at First Calving and Intercalving Period of animals in the farmers premises, which in turn would help the state in achieving milk self sufficiency.
6. The breeding programmes to be oriented for creation of separate lines of HF crossbred, Jersey crossbred and Sunandini line through planned breeding between animals of the corresponding phenotypic group in the field. For this purpose, intensive training has to be provided to all the AI technicians to equip them to determine the phenotype of the cows as correctly as possible and to inseminate them with the right type of semen so that the animals receiving frozen semen and the breed of the bull whose semen is used for AI matches to the maximum possible extent. KLDB shall make necessary changes in the bull production and semen distribution programme to make available the right types of frozen semen in all the AI centres. This programme shall be closely and correctly monitored by the concerned departments/agencies.
7. The present F1 bull production programme shall be strengthened by using pure Jersey and pure HF bulls on selected cows of famous indigenous breeds of cattle like Sahiwal and Gir.
8. KLDB shall initiate actions for genomic selection of breeding bulls used for AI. It may be noted that of all the states in the country, only Kerala (KLDB) possess both the germplasm (long storage semen of test bulls since years) and its phenotypic performance in the form of authentic records of its daughters.
9. KLDB has to continue its efforts to implement Semen Sexing Technology, despite the practical problems in purchasing the semen sexing equipment, since it is patented.
10. 20% of the available exotic donor bulls to be culled annually, for which Kerala should emphasise on import of animals from unrelated sources, as far as possible. Import of embryos and semen has to be continued and priority of supply has to be given to the major milk producing districts in the state.
11. The dairy farmers in Kerala believe that the crossbred cattle in Kerala had reached a genetic plateau for milk production. Continued application of 'Young Bull Program' instead of 'Classical PT and Breeding Program' followed elsewhere in the world and the resultant realized genetic gain among the crossbred population over generations is a debatable subject. Hence, a review of the ongoing cattle breeding program in the state is inevitable. An expert group of Animal Geneticists and Breeders, preferably headed by an eminent geneticist may be constituted to review the breeding policy and program and make modifications if any required.
12. Strengthening of the Premium Bull Semen programme by increasing the availability of proven bull semen shall be considered. For this purpose, the number of doses of semen kept in long storage per bull is to be increased from the present 3000 doses to 5000 doses in the first phase and gradually increased to 10000 doses based on demand.
13. Government should provide financial support to strengthen the infrastructure and procurement of consumables for additional storage of proven bull semen.
14. Government should formulate a scheme for culling and removing about
 1. 2% of the crossbred population in the state for poor milk production and
 2. 1% for delayed first calving age annually
15. Efforts for conservation of native breeds like Vechur, Kasargodu Dwarf and Kuttanad buffalo should be continued.
16. Conservation and breed improvement programmes of Malabari Goat and conservation of Attappady Black goat should continue.

17. The existing grading up programme for buffaloes with Murrah is to be continued using superior bulls procured from the native tract of Murrah.
18. The R&D programmes as suggested in the earlier/existing policy shall be taken up by the Veterinary University on priority basis.

The recommendations have been forwarded to the Government for further discussion and orders but, nothing had progressed in this direction thereafter.

Cattle & Buffalo Population

Livestock sector provides opportunities for augmenting income and employment in the rural households of Kerala particularly among the small and marginal farmers. In view of its suitability for combining with crop sector and sustainability as a household enterprise with the active involvement of the farmwomen, it has emerged as a very popular supplementary avocation in the small farm segment. But the rural setting of Kerala are facing new challenges as a result of the fast changes that are taking place in the farm front replacing livestock friendly seasonal crops by perennial cash crops. Consequently the cattle owners are not in a position to keep as much heads of cattle as their forefathers could do. With the change in cropping pattern there is a drastic reduction in draught cattle in favor of milch cattle. However cattle continue to be the most important transferable rural asset.

The State had according to the 2012 livestock census estimates, 13.286 lakh cattle and 1.02 lakh buffaloes. Of the total cattle, 12.51 lakh are crossbred cattle.

Crossbreeding of cattle with exotic breeds was introduced in the State during 1956. The crossbred cattle formed 67.3 per cent of total cattle in 1996 and 81.75% during 2003. The percentage of crossbreds increased to 94 during 2012.

Table 2 Trends in cattle & buffalo population in Kerala

Animal	Type	Number in thousands		Per cent change (%)
		2007	2012	
Cattle	Crossbred	1,621	1,252	-22.76
	Indigenous	119	77.05	-35.25
	Total	1,740	1,329	-23.62
Buffalo	All	58	102	+75.86

Table 3 *Bovine population over the years in thousands*

Category	1956	1961	1966	1972	1977	1982	1987	1996	2003	2007	2012
Crossbreds					1355	1453	1702	2287	1735	1621	1252
Indigenous					1651	1644	1722	1109	387	119	77
Total cattle	2510	2753	2857	2856	3006	3097	3424	3396	2122	1740	1329
% increase/ decrease		9.68	3.78	-0.04	5.25	3.03	10.56	-0.82	- 37.51	- 18.00	- 23.62
Buffaloes	488	485	471	472	454	409	329	165	65	58	102
% increase		-0.61	-2.89	0.21	-3.81	-9.91	- 19.56	-49.85	- 60.60	- 10.76	+ 75.86
Total bovines	2998	3238	3328	3328	3460	3506	3753	3561	2187	1798	1431
% increase decrease		8.01	2.78	0.00	3.97	1.33	7.05	-5.12	- 38.58	- 17.78	- 20.41

Speculation is rife about the probable causes of this decline: the most probable ones talked about are: increased slaughter removal of meat animals and to an extent culled crossbred cattle, mounting prices of feed and other inputs, widening gap in the demand – supply of fodder and diseases leading to mortality / permanent disability of milch stock. The homestead settlement pattern, the relatively high level of literacy particularly among women, the highly favorable agro climatic conditions conducive for bio mass production, and the long tradition in livestock rearing are the inherent strengths which the Kerala economy possesses in favor of livestock rearing. However, the sharp and continuous decline in the area under livestock supporting seasonal crops especially paddy, marginalization of agricultural holdings, declining trend in the family participation particularly among youth and high cost of production as a result of increasing reliance on externally sourced purchased inputs are some of the recent developments in the Kerala farm front posing serious threat for sustaining the activity on a firm footing.

The average herd size is less than one milking animal per household. There is a heavy shortage of fodder especially due to meager land availability for fodder production. The heavy rainfall leading to mineral depletion is also thought to be hostile to dairying. Being a consumer state, Kerala depends on the neighboring states for the supply of the raw materials for dairying. This system of cattle production had resulted in the increased cost of production of milk. Recently it has also been noted that the cattle have started migrating to more productive areas, especially in the high ranges.

The average milk yield per animal per day is estimated to be 9.11 liters. This is against the estimated potential of 11-12 liters per crossbred animal per day. In spite of the decrease in the number of animals, the per animal productivity has gone up.

Progeny Testing Programme of KLDB

KLDB in collaboration with the state AH Department is implementing a Field Recording Programme. In the milk-recorded population, the overall average first standard lactation milk yield has been increasing at an annual rate of 3.9 %. This steady progress is mainly the result of a well-organized selection programme coupled with improvements in the management offered to the animals.

The difference noted in the average production of the animals in the milk recorded areas and the state as a whole could be attributed to the extension activities being undertaken in the milk recorded areas by KLDB. The production of animals in the milk-recorded area for all practical purposes could be considered as the potential of crossbreds of the state under the prevailing environmental conditions.

Table 4 *First lactation yield of crossbred cows in the milk recorded areas*

Year of calving	Number of animals	Mean (Kg.)	Standard deviation
1985	1865	1669	511
1986	1943	1691	570
1987	1987	1726	530
1988	2196	1749	546
1989	1988	1796	564
1990	2039	1796	569
1991	3017	1833	560
1992	1700	1960	621
1993	1823	1985	598
1994	1897	2046	618
1995	1827	2134	604
1996	2012	2220	612
1997	1698	2235	614
1998	1599	2372	677
1999	1789	2424	657
2000	1823	2502	712
2001	1904	2515	763
2002	1995	2570	701
2003	1790	2434	748
2004	1877	2518	737
2005	2012	2654	756
2006	1781	2781	810
2007	1719	2770	827
2008	1948	2863	822
2009	2011	2873	833
2010	1904	2933	854
2011	1064	3022	820
2012	2055	3144	910
2013	2785	3084	853
2014	2679	3240	867

Table 5 Milk production in Kerala (lakh tones)

Year	Milk production
1997-98	23.43
1998-99	24.20
1999-00	25.25
2000-01	26.08
2001-02	27.18
2002-03	24.19
2003-04	21.11
2004-05	20.25
2005-06	20.63
2006-07	21.19
2007-08	22.48
2008-09	24.51
2009-10	25.37
2010-11	26.43
2011-12	27.16
2012-13	27.91
2013-14	26.55
2014-15	27.11

Milk Production

The annual milk production in Kerala would have to be increased from 27.11 lakh tonnes in 2014-15 to 35.8 lakh tonnes over the next 10 years. (*Assuming an anticipated human population of 35 million and a projected per capita milk consumption of 280 g per day*). Anticipating a decline in crossbred milch animal population by around 10%, the average productivity of crossbred animals in Kerala would have to be enhanced from the present level of around 10 litres per day which is the second highest in the country, to 12 or 13 litres per day to achieve the projected requirement of milk. The very fact that the average daily production of crossbred cattle population in Kerala is the 2nd best in the country despite the meagre fodder resources available corroborates the fact that the current breeding programme is in the right direction. For enhancing the average productivity to 13 litres per day, a growth rate of 3.7% would be required.

The projections suggest that if the current growth trend in the number of in-milk animals and milk yield continues to be the same in the future, total milk production would decline. The main reason for this would be the declining number of animals in all the categories, the pace of which would mask the prospective improvement in milk-yield. By countering the reduction in animal population and maintaining the yield dividends through various institutional and technological improvements, milk supply in the state can be elevated to a considerable extent.

Key constraints to improving productivity and profitability of milk production

1. Feed availability
2. Shortage/Decline of improved stock
3. Insufficient knowledge of raising management skills
4. Access to affordable credit.

Strategies and programmes to achieve the objectives

The State had organized a workshop to study the issues in detail and to formulate a vision document for the animal husbandry and allied sectors with the purpose of ensuring food security and safety with respect to the sector for the general population of Kerala. The following were the strategies envisaged for the achieving the project objectives are as follows:

1. Increasing the number of female bovines reasonably
2. Improve genetic potential so as to increase per animal productivity.
3. Improve quality of the breeding bulls and ensure quality of the product viz. frozen semen
4. Maximal utilization of the existing herd by better management

Strategy Framework

Vision

“The livestock sector will be efficient, safe, and sustainable—ensuring better lives through livestock rearing. It will be competitive not only nationally but also on the international stage.”

Mission

1. Improving the sector’s competitive position, including profitability and efficiency of the farm and enhanced competitiveness in dairy product markets, both formal and informal.
2. Developing, adapting and promoting science-based practices.
3. Supporting the smallholder sector to become more productive and more profitable.
4. Incentivizing the actors through the supply chain for ensuring the safety and quality of the product.
5. Ensuring that the dairy sector develops in a socially and environmentally responsible manner.

Targets

1. Self-sufficiency in supply to the local market, with fresh milk, dairy products, and meat.

The strategic framework: Sustainable Dairy Farming

The new strategic framework will depart from the current policy framework, which treats this sector as a means of addressing rural livelihood. It will continue to place strong emphasis on people and communities, but within the wider context of farm production and productivity. While re-shaping the industry strategy, it must be clear that dairy farming’s first priority must be to remain competitive. This means, producing safe and high quality dairy products at a competitive cost. At the same time, it must also take responsibility for the wider goals of environment protection, animal welfare, and people related outcomes. In a nutshell, sustainable livestock strategy aims at reducing the environmental footprint of farms, while improving milk production, farm profitability, and the well-being of people and animals involved.

The sector has been perceived in policy circles as a source of rural livelihood and not as a source of generating economic value. That perception poses risks around attracting talent and introducing new practices and innovations. It is therefore important to change the way this sector is looked upon. Recognizing the market opportunities associated with this sector, the perception will be to modernize the sector and upgrade its status. This will require transformation of small livelihood family farms in Kerala

into highly competitive market-oriented small to medium sized family farms. At the same time, encouragement will be given to the establishment of large commercial farms.

At present, the classical co-operative model is dominating the organizational structure of the sector. But many of the developing countries (even Anand co-operatives) have now moved beyond the classical co-operative models to introduce commercial and competitive elements. The co-operative sector now faces stiff competition and is starting to lose ground to more nimble competitors that are more professionally managed. The co-operative sector is responding by adapting its business model and legislation to the New Generation models. In India, co-operative forms of enterprises can now be registered as producer companies under the Company law. Many co-operative societies (including Anand) have been in the transitional phase. There is need to promote producer companies in the livestock sector in Kerala also.

How to go about?

Cattle and Buffalo Development

1. Averting further decrease in crossbred population and Increasing the number of female bovines reasonably
2. Sustaining rate of increase in productivity of crossbred population
3. Increasing contribution of local cows, buffaloes and goats to total milk production
4. Increase the productivity of the existing stock in the state, through breed improvement and production through better management ultimately leading to increase in milk production in the state.
5. Continued genetic up gradation of cattle through Field Performance Recording Programme
6. Application of modern technologies like use of sex sorted semen, invitro fertilization, etc to produce more number of quality females within the state so as to ensure a minimum number of females to achieve the targeted milk production.
7. Systematic research to improve the genetic makeup of the animals and the utilization efficiency of the feeds available and to identify location specific management systems for immediate application at the farmers' level.
8. Assisting bull selection through Genome Mapping.
9. Support and strengthen the farms under Government and public sector to be showcased as replicable models for prospective entrepreneurs.
10. Promote mechanization in this sector, which ensures higher productivity and better production environment.
11. Enterprise-driven approach to development of the livestock sector - The sector has been perceived in policy circles as a source of rural livelihood and not as a source of generating economic value. That perception poses risks around attracting talent and introducing new practices and innovations. It is therefore important to change the way this sector is looked upon. Recognizing the market opportunities associated with this sector, the perception will be to modernize the sector and upgrade its status.

In order to achieve this, the input generation part viz., the production and selection of bulls including the Progeny Testing Programme for bull selection, production of frozen semen ensuring quality standards and its timely distribution and production/purchase and distribution of liquid nitrogen, are to be strengthened / expanded.

Strengthening the feed and feed resources in the state, with all out efforts for popularizing fodder cultivation.

Maximal utilization of the genetic potential (productivity) of existing herd by better management (nutrition, fertility, diseases) should be ensured.

1. Increasing the volume of locally produced fodder through increase in field fodder production and improvement in fodder ratio.
2. Promoting fodder production utilizing the service of Self Help Groups like Kudumbashree.
3. Introducing mechanisms to promote efficient use of pastures, and ensuring technical assistance to lessees and owners of pastures for the improvement of vegetation cover, rehabilitation of ecological balance and provision of watering points for animals.
4. Raising fodder production through large scale, dairy co-operative society-based, fodder development projects and by encouraging intercropping.
5. Enhancing cattle feed production capacity, both by setting up new plants and by raising capacity of existing plants.
6. Trying out locally available unconventional feeding materials as fodder.
7. State Government should formulate a Feed and Fodder Policy
8. Feed Act to be enforced to maintain quality standards of the compounded feed being produced both in Government /co-operative sector and also private sector in the State.

Training of personnel

1. Training and retraining of the personnel engaged in implementing the programmes, by updating their knowledge and developing communication skills so as to ensure that the developed technology reaches the end users without any hindrance.
2. Establishment of Information Centres for Farmers for better dissemination of knowledge from Lab to Land.

ANNEXURE 3

1. Title of the project : Genetic selection of cattle for Kerala with increased productivity and climatic adaptation traits

2. Department / Station: Centre for Animal Adaptation to Environment and Climate Change Studies (CAADECCS), Mannuthy and Centre for Advanced Studies in Animal Genetics And Breeding

3. Introduction: Climate model indicate that the global warming is real and rise in temperature is likely to be around 2-3°C by the end of the century with the regional uncertainties in rainfall. Decline in rainfall and increase in temperature are observed in the last 50-60 years across the state of Kerala. Other climate change related issues over Kerala are decline in land, ocean and wetlands biodiversity, increase in sea level, increase in landslides, groundwater depletion, saline water intrusion, decline in forest area, frequent forest fires and rate of increase in temperature across the High Ranges. Life cycles of animals, reptiles and birds are likely to be adversely affected due to rising mercury in addition to mortality due to heat stress. Animal raids in farmsteads and attacks in peripherals have not become uncommon due to deforestation. Climate change also influences animal diseases and their dynamics. Interactions of animal insect and diseases are likely among various life species and thus scenario of major and minor animal pest and diseases is likely to change. Vulnerability to extreme events generally is higher than vulnerability to changing average climatic conditions. The economy is likely to hit badly during the years of weather abnormalities. Prolonged summer drought, followed by heavy floods during the monsoon season as noticed in 2013 across the State of Kerala was detrimental to dairy, pig, goat and poultry farming directly or indirectly to a considerable extent. Of course, flood damage is not uncommon during both the monsoon seasons in high rainfall zones. All over Kerala, a 33% reduction in rainfall has been recorded during the monsoon of 2016. Such weather aberrations are likely to be more frequent under the projected climate change scenario.

It is high time to take up in detail studies on interactions between weather factors in surrounding environment of animal agriculture, for which fundamental and basic studies need to be carried out in Livestock Meteorology to cope up with climate variability/climate change adaptation and mitigation. Breeding goals may have to be adjusted to account for higher temperatures, lower quality diets and greater disease challenge. Species and breeds that are well adapted to such conditions may become more widely used. Climate change mitigation strategies, in combination with ever increasing demand for food, may also have an impact on breed and species utilization, driving a shift towards monogastrics and breeds that are efficient converters of feed into meat, milk and eggs. This may lead to the neglect of the adaptation potential of local breeds in developing countries. Given the potential for significant future changes in production conditions and in the objectives of livestock production, it is essential that the option value provided by animal genetic diversity be secured. This requires better characterization of breeds, production environments and associated knowledge; the compilation of more complete breed inventories; improved mechanisms to monitor and respond to threats to genetic diversity; more effective *in situ* and *ex situ* conservation measures; genetic improvement programmes targeting adaptive traits in high-output and performance traits in locally adapted breeds; increased support for management of animal.

Dairy cattle must be selected in such a way that they should produce well in thermal stress conditions and also under lower levels of feeding. Genotype environment interactions are so strong that they can even change the ranking of bulls based on their estimated breeding values obtained from daughters belonging to different agro climatic zones. Thus there exists great genetic variation in milk production potential of dairy cattle under varying climatic conditions and it would be highly beneficial if the better producing ones under restricted conditions could be identified and bred for future use. Genetic markers for selecting such cattle with low sensitivity to heat stress and low feeding level, is the need of the hour. An attempt can be made to identify

such genetic markers, by combining milk production parameters and physiological data of different genetic groups under different agroclimatic zones, with single nucleotide polymorphism (SNP) data made available by various genetic procedures. The causative mutations underlying these associations should be unraveled and carefully studied to reach definite conclusions.

4. Practical Utility – This study may help to develop methods for characterizing adaptive traits relevant to climate-change adaptation (heat tolerance, disease resistance, adaptation to poor diets, etc.) and for comprehensive evaluation of performance and use of animals in specific production environments and describing these production environments in a standard way. It will provide a basic information for exploring the possibility of modelling the future distribution and characteristics of production environments, to support the assessment of threats and the identification of areas that may be suitable for particular breeds in the future. the study will be helpful for improving knowledge of breeds’ current geographical distributions to support the above actions and to facilitate planning of climate-change adaptation measures and genetic group conservation strategies. Identifying the factors that make livestock breeds vulnerable to the effects of climate change (or other threats) may be a valuable means of identifying preventive steps that can be taken to reduce the risk of extinction. Selecting for production traits and production efficiency decreases (other things being equal) the quantity of greenhouse gases produced per unit of output. Selection that promotes longevity, fertility or early maturity can also contribute to this effect. It is unclear whether and to what extent the climate change will change the survivability status of animals in the future and whether this will have any implications for related policy and legal frameworks. So the present study will provide the basic information about the impact of climate change breed wise which will be of great help in formulating the breeding policy of the state.

4. Duration: 2017- 21

5. Objectives

- a. Characterizing Cattle Genetic Resources in different production environments and assessing its genetic diversity.
- b. Collection of detailed complementary data including climate, soil, vegetation and other resources
- c. Information on production and adaptation performance of different cattle genetic groups
- d. Association studies with suitable genetic tools to identify the best adapted animals

6. Whether it is continuation of project: No

- a. Year of start: 2017-18
- b. Duration: 5years
- c. Budget with split up and expenditure made.

I. 2017-2018

Sl No.	Head	Amount (Lakhs)
a.	Wages/Salary/consultation charges	3.0
I	RECURRING EXPENSES	3.0
a	Infrastructure development including major repair, fixing of solar panel, lab development, water facilities etc	20.0
b.	Consumables / Contingencies	2.00
c.	Other items	2.0
II	NON RECURRING EXPENSES	24.0

III.	Travelling allowance	1.0
	Total	28.0

2018-2019

SI No.	Head	Amount (Lakhs)
a.	Wages/Salary/consultation charges	5.0
I	RECURRING EXPENSES	5.0
a.	Purchase of meteorological equipments/ lab equipments	10.0
b.	Consumables / Contingencies	2.00
c.	Other items	2.0
II	NON RECURRING EXPENSES	14.0
III.	Travelling allowance	1.0
	Total	20.0

III.2019-2020

SI No.	Head	Amount (Lakhs)
a.	Wages/Salary/consultation charges	5.0
I	RECURRING EXPENSES	5.0
b.	Consumables / Contingencies	12.00
c.	Other items	2.0
II	NON RECURRING EXPENSES	14.0
III.	Travelling allowance	1.0
	Total	20.0

IV.2020-2021

SI No.	Head	Amount (Lakhs)
a.	Wages/Salary/consultation charges	5.0
I	RECURRING EXPENSES	5.0
b.	Consumables / Contingencies	10.00
c.	Other items	2.0
II	NON RECURRING EXPENSES	12.0
III.	Travelling allowance	1.0
	Total	18.0

V.2021-2022

SI No.	Head	Amount (Lakhs)
a.	Wages/Salary/consultation charges	5.0
I	RECURRING EXPENSES	5.0
b.	Consumables / Contingencies	10.00

c.	Other items	2.0
II	NON RECURRING EXPENSES	12.0
III.	Travelling allowance	1.0
	Total	18.0

d. Brief results – Indemnification of genetic groups of cattle which can withstand climatic variability without compromising production potentials. Analysis of the result would give tips for preparing breeding policy for the state

e. Reasons for continuation –A long term study is needed for identifying the genetic group of cattle withstanding the climatic variability of Kerala.

7. Tech-programme: Different genetic groups of cattle will be identified based on phenotypic data, production environment, level of exotic inheritance and preliminary data available on genetic diversity studies conducted among native Vechur breed and crossbred cattle of Kerala. First lactation test day milk yield records of cows belonging to different genetic groups will be collected. Average daily milk yield of each herd will also be calculated to identify better performing ones under each environment. Data on feeding, management practices and socio economic status of farmer will also be gathered. Temperature and humidity data will be evaluated to get an estimate of daily weather variables at that particular ecological zone. These data will be utilized to calculate the temperature humidity index (THI) to be used as a measure of heat stress. Physiological parameters including VPRC, antioxidant status and thyroid hormone levels will be estimated. Soil, feed and fodder samples will be subjected to proximate analysis and micromineral evaluation. Gene expression studies will be carried out *Nrf2* and *HSP70* genes. Animals performing in a better manner under thermal stress and low feeding conditions will be identified and their genetic architecture will be studied using modern genetic tools to identify responsible SNPs. The obtained data will be validated using wet lab genetic association studies and further utilized for selection of climate adapted productive cattle.

8. Deliverables:

Cattle with good milk production potential under thermal stress conditions and low feeding resources identified

Genetic architecture of such cattle identified using different genetic tools

Identified genetic markers utilized for selection of productive climate adapted cattle .

Breeding policy can be formulated by giving due weight age to climate adaptation

9. Budget:- Already given above.

ANNEXURE 4

PROFORMA FOR THE PROJECT PROPOSAL plan 2017-18			
1. Project No (to be allotted by the office)			
2. Title of the Project:		Development of vaccine for control of bovine mastitis	
3. Station/School/College/Centre		Dept. of Veterinary Epidemiology and Preventive Medicine, CVAS, Mannuthy Dept. of Veterinary Epidemiology and Preventive Medicine, CVAS, Pookode	
4. Introduction/Practical Utility		Mastitis is a major cause for the demand -supply gap of quality milk in India. Though various organisms cause mastitis, the preliminary studies done in this department has shown that there are certain common organisms that are responsible for a lion's share of infections. The same study also attempted to develop a vaccine based on the commonest isolate causing mastitis and satisfactory immune response was also obtained in a rabbit model. This holds a potential promise for development of a vaccine based method for control of bovine mastitis in the state.	
5. Objectives		1. Identification of candidate vaccine isolates based on virulence factors possessed 2. Development of candidate vaccines for control of environment and contagious mastitis in Kerala 3. Field/clinical trial of the vaccine developed	
6. If it is a continuation programme brief report of the results obtained and the reasons for continuation		No	
a.Objectives		Not Applicable	
b.Budget with split up and expenditure made.			
c.Brief results			
d.Reasons for continuation			
7. If it is a coordinated project		Yes	
a. Leadcentre		Department of Veterinary Epidemiology and Preventive Medicine, College of Veterinary and Animal Sciences, Mannuthy	
b.Collaborating departments/centres. (Separate programmes should be given for each centre)		Department of Veterinary Epidemiology and Preventive Medicine, College of Veterinary and Animal Sciences, Pookode	
8. Technical Programme		Attached separately	
9. Deliverables(Quantify the output preferably in quantifiable terms)		1. Vaccine(s) will be developed against bovine mastitis 2. Transfer of technology to biologicals institute/ industry 3. Mastitis in the state can be controlled to a great extend	
10. Budget under the following heads			
	Sl.No	Head	Amount
	1	Wages/Salary*(Appendix	

	I) Research Associates (2 Nos) Lab Assistant (2 Nos)	Rs. 30, 000 x 60months x2 = 36,00,000 Rs. 15,000x 60 monthsx 2= 18,00,000
2	TA	50, 000 x 5 years= 2,50,000
4	Consumables	10,00,000 x 5 years = 50,00,000
5	Farm Development	Nil
6	Minor repairs	20,000 x 5 years= 100,000
7	Others(Documentation, Publication, Miscellaneous)	100,000 x 5 = 5,00,000
	Total	1,12,50,000

* The details to be given separately

Appendix I

List of Temporary staff required with qualification (It should be as per the approved norms of the University)

Sl.No	Category	Qualification
1	Research Associate	M.V.Sc. (Prev. Medicine/Clinical Medicine/ Microbiology/Biotechnology/ Biochemistry/ Genetics) or M.Sc (Biotechnology/ Microbiology)
2.	Lab Assistant	Skilled labour

Technical Programme

Year	Dept. Veterinary Epidemiology and Preventive Medicine, CVAS, Mannuthy (Lead Center)	Dept. Veterinary Epidemiology and Preventive Medicine, CVAS, Mannuthy (Collaborating Center)
I	<p>1. Milk drawn aseptically from cows suffering from mastitis in Thrissur district will be subjected to bacteriological isolation and biochemical identification. Samples submitted by various veterinary hospitals of South and Central Kerala will also be studied.</p> <p>2. Samples will be subjected to antibiotic sensitivity test to assess the sensitivity to commonly used antibacterials</p> <p>3. Identity of the bacterial isolates will be confirmed by PCR based techniques. Presence of various virulence factors and genes for survival within hosts in these isolates will be detected by PCR based techniques.</p>	<p>1. Milk drawn aseptically from cows suffering from mastitis in Wayanad and Kozhikkode district will be subjected to bacteriological isolation and biochemical identification. Samples submitted by various veterinary hospitals of North Kerala will also be studied</p> <p>2. Samples will be subjected to antibiotic sensitivity test to assess the sensitivity to commonly used antibacterials</p> <p>3. Identity of the bacterial isolates will be confirmed by PCR based techniques. Presence of various virulence factors and genes for survival within hosts in these isolates will be detected by PCR based techniques.</p>
II	<p>1. Coliform isolates with most virulence genes will be selected as candidate isolates and bacterin will be prepared</p> <p>2. Hyperimmune sera will be raised in rats against these isolates.</p> <p>3. Bacterial lysate of the isolates will be extracted and Western blotting will be done to identify the immunodominant proteins.</p> <p>4. Based on the above result, isolates/ group of isolates will be selected as vaccine candidate.</p>	<p>1. Staphylococcal/ streptococcal isolates with most virulence genes will be selected as candidate isolates and bacterin will be prepared</p> <p>2. Hyperimmune sera will be raised in rats against these isolates.</p> <p>3. Bacterial lysate of the isolates will be extracted and Western blotting will be done to identify the immunodominant proteins.</p> <p>4. Based on the above result, isolates/ group of isolates will be selected as vaccine candidate.</p>
III	<p>Pregnant rabbits will be vaccinated with the candidate vaccines and boosters will be given every week for three weeks.</p> <p>ELISA will be standardized to assess the immune response in rabbits and compared with a control group.</p> <p>All the rabbits will be challenged on 10th day of lactation intramammary.</p> <p>Severity of clinical signs developed will be scored and somatic cell count of the milk will be done after 24 hours of challenge up to six days at 24 hour interval. Results will be statistically analysed.</p> <p>Based on the result of above work, the most efficient vaccine will be tested on a goat model.</p>	<p>Pregnant rabbits will be vaccinated with the candidate vaccines and boosters will be given every week for three weeks.</p> <p>ELISA will be standardized to assess the immune response in rabbits and compared with a control group. All the rabbits will be challenged on 10th day of lactation intramammary.</p> <p>Severity of clinical signs developed will be scored and somatic cell count of the milk will be done after 24 hours of challenge up to six days at 24 hour interval. Results will be statistically analysed.</p> <p>Based on the result of above work, the most efficient vaccine will be tested on a goat model.</p>
IV	<p>The selected vaccine will be given intramuscular to pregnant goats and immune response will be</p>	<p>The selected vaccine will be given intramuscular to pregnant goats and immune response will be assessed.</p>

	<p>assessed.</p> <p>Goats will be challenged 10th day post partum with homologous and heterologous isolates. Severity of clinical signs developed will be scored and somatic cell count of the milk will be done after 24 hours of challenge up to six days at 24 hour interval. Results will be statistically analysed.</p>	<p>Goats will be challenged 10th day post partum with homologous and heterologous isolates. Severity of clinical signs developed will be scored and somatic cell count of the milk will be done after 24 hours of challenge up to six days at 24 hour interval. Results will be statistically analysed.</p>
V	<p>Clinical trial on bovines</p> <p>Pregnant cows will be subjected to clinical trials. Somatic cell count and bacteriological quality prior to vaccination will be assessed by standard tests.</p> <p>Vaccination will be done at 8th month of pregnancy and boosters will be given.</p> <p>Post partum milk quality of the vaccinated animals will be assessed on a weekly basis for the entire lactation period and compared with prevaccination values as well as risk factor for occurrence of mastitis will be assessed by comparing with unvaccinated herd mates.</p>	<p>Clinical trial on bovines</p> <p>Pregnant cows will be subjected to clinical trials. Somatic cell count and bacteriological quality prior to vaccination will be assessed by standard tests.</p> <p>Vaccination will be done at 8th month of pregnancy and boosters will be given.</p> <p>Post partum milk quality of the vaccinated animals will be assessed on a weekly basis for the entire lactation period and compared with prevaccination values as well as risk factor for occurrence of mastitis will be assessed by comparing with unvaccinated herd mates.</p>