DIRECTORATE OF VOCATIONAL EDUCATION
GOVERNMENT OF KARNATAKA

VOCATIONAL CURRICULUM FOR +2
DAIRYING

JULY 1992

EDUCATIONAL CONSULTANTS INDIA LIMITED
(A Government of India Enterprise)
C-24, Friends Colony, Mathura Road,
New Delhi - 110 065

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PREAMBLE

Vocational courses as a distinct stream of P.U.C. were introduced in Karnataka in 13 Junior Colleges in 1978. The courses have now been extended to 285 institutions under the centrally sponsored scheme on vocationalisation of secondary education. It was felt expedient to revise the curricula keeping in view:

1. The National Policy on Education 1986 and other supportive documents of Government of India and NCERT (including the revised formulations of 1992).

2. Experiences gained in implementing the courses in actual classroom situation and the feed back obtained from the teachers.

3. The competency based curricula of specific vocational courses developed by NCERT for national adoption/adaptation.

The State Government assigned the work of revising the curricula to Educational Consultants India Limited (Ed.CIL), a Government of India Enterprise. Ed.CIL constituted a core group to execute the activities of the project. The list of persons constituting the core group is given at Appendix I. The revision was conducted in a Workshop held at Bangalore from June 17 to 21, 1992. The subject experts, classrooms teachers and NCERT curriculum development experts contributed their best to the task. The names of experts who attended the workshop are given in Appendix II. Ed.CIL gratefully acknowledges their contributions.

The revised syllabi of P.U.C. vocational courses confirm closely to the national curriculum design recommended by the National Council of Educational Research and Training, New Delhi. A comparison can be made between the two designs which are as follows:

	National		Karnataka (New)	Karnataka (Old)
1.	Language(s)	15-20%	21%	25%
2.	General Foundation Course (including Rural Development, Environmental Education, and Entrepreneurship)	10-15%	12%	-
3.	Vocational Theory & Practice (including OJT)	65-70%	67%	75%

The revised curricula have a fixed format developed in the workshop. The format is as follows:

- Introduction
- Objectives
- Job Opportunities
- Job Description
- Scheme of Studies
- Syllabus
- Scheme of Examination
- Internal Evaluation
- On-The-Job Training
- List of Reference Books
- List of Tools and Equipment
- List of Suppliers of various Items

NAME OF THE COURSE: AG 1.02 DAIRYING

1. INTRODUCTION

Livestock has been a symbol of prosperity for rural families in India. Cattle, buffaloes, goats and sheep are means of economic security, source of nutritious diet and above all, a part of the agricultural family tradition to maintain some of these animals.

India has about 26 breeds of cattle, 7 breeds of buffaloes, 40 breeds of sheep and 18 breeds of goats. A cross breeding programme has been in operation over three and half decades using the superior germ plasm of exotic breeds of bulls on the indigenous cattle for increasing the milk production in the country. Consequently the milk production has considerably increased in the last two decades. Dairies have been established all over the country and the industry is poised for an accelerated growth in the coming decade. Milk and milk products are second largest contributor to the gross output value with a turn-over of Rs.10,000 crores annually, next only to rice. Of the six broad categories of man power required for successful dairying are - Dairy supervisory man-power and Dairy Technicians manpower as well as the miscellaneous category man power could be augmented by the conduct of the vocational course in dairying in all the states of the country. In this context, the vocational education in dairying has been proposed.

The course curricula therefore, developed is aimed at providing an uniform pattern of training both in theory and practicals, in various Farm/Dairy operations, Dairy processing and Dairy product manufacture, Chemical and Bacteriological analysis of milk and milk products. The course also provides the training in Dairy extension & economics and marketing in addition.

The course material will help to equip the standard of training and education with appropriate level of theoretical and practical background in the work which the candidates are expected to undertake after their completion of vocational training.

2. OBJECTIVES:

- To provide knowledge about basic Dairy animal husbandry practices for improving Dairy animal productivity.

- To train man-power for Dairy Farm and Dairy Industry in the country;

- To provide knowledge for developing proficiency on sound management practice in:

  a) raising from calf-hood stage to adult dairy stock

  b) maintaining of milch animals, dry stock calves & bulls.

  c) production of clean milk

  d) production of forage and their conservation

  e) manufacture of dairy products

- To use artificial insemination as a tool for achieving an increased Dairy animal population;

- To develop young entrepreneurs to take up self-employment through Dairying and associated activities;

- To develop organisational capabilities in Dairy husbandry and in diaries for handling milk co-operative societies and associated activities;

- To develop facilities for production and sale of Animal feeds, Fodders, Milk products and other Farm produce;

- To develop Dairy animal husbandry workers as a link between agricultural supporting organisations/institutions and the farming community;

- To develop competence for assisting scientific investigations and laboratory work;

- To develop competence for energy conservation through recycling of farm wastes;

- To train individuals in need-based dairy operations such as surveying, organisation of Melas etc.;

- To prepare Dairy husbandry workers as capable Organiser/Supervisor/Assistant for dairying oriented activities in unorganised rural and organised urban sector.

3. JOB OPPORTUNITIES

Wage Employment

1. Dairy production assistant
2. Milk procurement assistant
3. Artificial insemination assistant/Inseminator
4. Feed Technician
5. Fodder production assistant
6. Laboratory assistant
7. Dairy products manufacture assistant
8. Sales assistant in dairy establishment
9. Farm wastes recycling assistant
10. Secretary,Milk co-operative society

Self Employment

1. Starting of a dairy farm-
   - For animal production and supply of dairy animals.
   - For milk production and marketing of milk.
2. Manufacturing of Dairy products and marketing
3. Starting of a feed compounding unit
4. Starting of a fodder farm and market the fodder
5. Starting of an artificial insemination unit for rendering service on payment
6. Setting up a milk parlor and market of value added milk products.

4. JOB DESCRIPTION

Wage Employment

Dairy Farm Assistant/Field Assistant

- Care of new born calf
- Raising of calves
- Identification of animals
- Raising of heipers
- Restraint of animals
- Maintenance of milch animals
- Dairy animal housing, feeding and management
- Milking and care of udder
- Clean milk production and its handling
- Identification of animals in oestrous
- Management of breeding bulls
- Collection, evaluation and processing of semen
- Artificial insemination
- Pregnancy diagnosis
- Management of parturition
- Management of farm records
- First aid to common ailments and prophylaxis against common diseases.
- Disposal of dead animals
- Assisting in scientific work

Milk Procurement Assistant

- Educating farmers in the concept of organised dairying
- Surveying the milkshed areas and identifying milk producers
- Forming milk producer's co-operative society
- Organising milk collection
- Arranging farm and dairy inputs.
- Arranging finance through (IRDP, SFDA, MFAL), nationalised banks
- Arranging animal insurance.
- Arranging veterinary assistance
- Receiving, evaluating and handling of milk.
- Maintaining of records and arranging payments.

Artificial insemination assistant/Inseminator

- Sterilizing artificial insemination equipment
- Handling of artificial vagina
- Collection, evaluation and processing of semen
- Preservation of semen
- Transport of semen
- Thawing of semen and its evaluation
- Identification of animals in oestrous
- Examination of reproductive organs
- Artificial insemination
- Pregnancy diagnosis
- Management of breeding bulls
- Maintenance of artificial insemination and reproduction records.
- Educating farmers regarding oestrous and artificial insemination.

Feed Technician

- Surveying of feed inputs
- Procurement of feed ingredients
- Maintenance and upkeep of stores
- Sampling and elementary analysis of feed ingredients
- Compounding of feed
- Packaging and forwarding of feed
- Maintenance of records and accounts

Fodder production assistant

- Procurement of seeds and other inputs
- Collection and sending soil and water samples for analysis.
- Preparing land for cultivation
- Application of manure and fertilizers
- Sowing of seeds/planting of root slips
- Organising irrigation
- Harvesting and transportation
- Preservation/conservation of forage
- Enrichment of straw and crop residues
- Seed production, gradation and storage
- Maintenance of records and accounts

Laboratory assistant:

- Maintenance and upkeep of laboratory equipment
- Sampling and processing of the test material
- Preparing needed reagents and their storage
- Analysis of test material
- Cleaning of glassware both for chemical and bacteriological work.

Dairy product manufacturing assistant:

- Operating dairy equipment
- Procurement of ingredients for dairy products
- Manufacturing of dairy products viz. cream, butter, ghee, curds, khoa, chhana, flavoured milk,ice-cream, milk sweets, paneer.
- Packaging of dairy products
- Storage of dairy products
- Transportation of dairy products
- Cleaning and sanitation of equipment

Dairy Sales Assistant:

- Conducting consumer surveys for various dairy products
- Display,advertising and marketing of dairy products
- Maintenance of record of dairy products, their sales and accounts.

Farm waste recycling assistant:

- Ascertain or estimate extent of availability of different farm wastes.
- Planning for utilisation of farm waste for generation of Gobar gas/biogas and as compost, etc.
- Collection and processing of farm wastes
- Distribution of gas and utilisation of recycled matter
- Educating farmers for appropriate utilisation of farm wastes.

Secretary, Milk Co-operative Societies:

- To act as a key functionary of the co-operative society.
- Arranging farm and dairy inputs
- Organising meetings with associated agencies
- Record keeping of the activities including accounts of the society.
- Perform the duties of milk procurement assistant.

Self Employment:

Starting a dairy farm for milk and animal production

- Provide consultancy
- Selection of site and layout of dairy farm
- Arranging the finance through IRDP(SFDA/MFAL), nationalised banks etc.
- Developing the infrastructure
- Organising purchase of animals and other inputs
- Arranging sale of farm produce
- Perform all duties of dairy/dairy farm assistant.

Manufacture of dairy products:

- Conducting the consumer survey for various dairy products
- Provide consultancy
- Arranging the finance through (IRDP,SFDA,MFAL), the nationalised banks etc.
- Developing the infrastructure
- Perform all duties of dairy manufacturing assistant and sales assistant.

Feed manufacture:

- Survey the market demand
- Provide /seek consultancy
- Arranging finance through IRDP (SFDA, MFAL), nationalised banks etc.
- Creating the infrastructure
- Perform all duties of feed technician and sales assistant

Fodder production:

- Undertake a survey of the market demand
- Site selection and layout of the farm
- Perform all duties of fodder production assistant and sales assistant.

Setting up artificial insemination unit:

- Provide/seek consultancy
- Organise the finance through IRDP and nationalised banks etc.
- Developing the infrastructure
- Perform all duties of dairy farm assistant and inseminator.

Setting up milk parlour:

- Developing the infrastructure
- Procurement for milk parlours
- Organising finance through IRDP(SFDA,MFAL) nationalised banks etc.
- Perform all duties of Dairy product manufacturing assistant and Sales assistant.

5. SCHEME OF STUDIES

Part I (Languages)

*Kannada or any other	4 hours/week
*English	4 hours/week

Note: Syllabi and scheme of examination are common for both the academic and vocational stream students during first and second year or four semester of 4 months each of pre-university classes.

Part II: (For Vocational stream)
Four semester of 4 months each

Semester-1	No. of hrs/week		
	Theory	Practical	Total
Paper-1: Dairying in India	3	4	7
Paper-2: Anatomy and Physiology of Dairy Animals	2	4	6
Paper-3: Management of Dairy Animals	3	4	7
Paper-4: General Foundation Course I	3	3	6
	11	15	26

Semester-2			
Paper-5: Reproduction and Breeding	4	6	10
Paper-6: Housing and Management	2	4	6
paper-7: Forage Production and use of Agricultural by Products	4	6	10
	10	16	26

On-the-job training- 200 hrs minimum during the summer vacation.

Semester-3	No.of hrs/week Theory	Practical	Total
Paper-8: General Nutrition	2	4	6
Paper-9: Feeds and Feeding Practices	3	4	7
Paper-10: Common Diseases	3	4	7
Paper-11: General Foundation Course II	3	3	6
	11	15	26
On-the-job training:	100 hrs. minimum during the semester break.		
Semester-4			
Paper-12: Dairy Technology	4	6	10
Paper-13: Quality Control of Milk and Milk Products	2	4	6
Paper-14: Dairy Extension, Economics and Accountancy	4	6	10
	10	16	26

6. SYLLABUS

SEMESTER I

PAPER 1: DAIRYING IN INDIA

Theory: 3 hrs/week

Cattle and Indian culture. Place of cattle in rural socio-economy. Contribution of dairy animals in National economy. Draught cattle and their importance. Population trend and distribution pattern. Importance of milk and milk products in general. Milk consumption at present and target. Development programmes of government, co-operatives private and non government agencies. The present status, rules and regulations concerned with the welfare and management of animals.

Domestication, breed development. Origin, distribution, physical and economical characteristics of milch, dual and draught breeds of cattle, buffalo and goats in India. Exotic breeds used in Indian and their characters.

Practicals 4 hours/week

- Common terms used
- External parts of dairy animals
- Breed characteristics of Indian cattle, milch breeds, dual purpose and draught breeds.
- Breed characteristics of buffaloes, Riverine type and swamp type
- Breed characteristics of goats, Indian goats and exotic goats
- Breed characteristics of exotic cattle
- Characters of breed/upgraded cattle, buffaloes and goats
- Approaching and handling of animals
- Control and restraints of animals
- Identification of animals - Tagging, ear notching, tattooing, branding hot iron/liquid nitrogen
- Livestock sample census and classification
- Study of population trend
- Study of utility of animals and milk.

PAPER 2: ANATOMY AND PHYSIOLOGY OF DAIRY ANIMALS

Theory

2 hours/week

External anatomy. Basic anatomy of internal organs in general and anatomy of digestive, reproductive and mammary system in particular. The development, reproductive mammary and digestive system with reference to man.

Digestive Physiology- Function of digestive tract, digestion absorption and utilisation.

Reproductive physiology- Puberty, gametogenesis, structure of gamuts fertilization, embryogenesis foetus formation, pregnancy and parturition. Biosynthesis of milk- synthesis of components of milk, milk let down. Factors affecting milk yield and composition.

Practicals:

4 hours/week

- Study of external organs of digestion
- Study of internal organs of digestion of cattle, buffaloes and goats.
- Comparative study of calves/adult animals
- Study of reproductive organs of cows, she buffalo and doe.
- Study of reproduction organs of bulls and bucks.
- Study of udder profile of cows, she buffaloes and does.
- Determination of age of animals by dentition
- Judging the milch and draught cattle of various age group.
- Judging of buffalo of various age groups.
- Judging of goats of various age groups.
- Preparation of cattle, buffalo and goats for show and sale.
- Unit of cattle fairs and shandies (weekly bazars).
- Visit to cattle shows.

PAPER 3: MANAGEMENT OF DAIRY ANIMALS

Theory 3 hours/week

Definition and Principles of general management. Management of young stock - prenatal care, care of new born calf, colostrum feeding, weaning, feed schedule, growth rate and breeding age. Management strategies to reduce mortality, to induce early reproduction and to increase milk production.

Management of Adult Stock

Milking pregnant and dry animals. Milking programme - premilking routines, mechanism of milk let down, order and interval milking. Hand milking and machine milking.

Management of Males

For breeding purpose, draught purpose. Transportation of animals by road, air and sea.

Management strategies to be followed in hot climate.

Practicals: 4 hours/week

- Handling of new born calf
- Sealing of navel cord
- Weighing of calf
- Feeding colostrum, milk and calf starters
- Teaching onchling
- Disbudding/dehorning
- Removal of extra teat
- Cud inoculation
- Weaning of calf
- Castration of males
- Grooming
- Washing
- Clipping
- Trimming hooves
- Bedding

- Drying the dairy animal at the end of lactation
- Care during gestation
- Recording the milk and calculation of average daily yield, 305 days yield, service period.
- Milking practise
- Handling and exercise of breeding stock
- Applying the nose rope, nose rings
- Pairing, yoking and training draught animals
- Visit to cattle farms

PAPER 4: GENERAL FOUNDATION COURSE I

Theory 3 hours/week

A. Environmental Education

- Environmental resources (energy, air, water soil, minerals, plants, animals), carrying capacity, effects of exploitation.
- Population explosion and incompatibility between resources and number, demands on environment to meet, thesic its effect on environment.
- Impact of industrialisation on environment, irreversible changes in landscape, encrochment, Degradation of environment and its effects.
- Effect of modern agriculture on environment, use of high-yielding varieties and deprivation of genetic resources-canal irrigation and water-logging-Use of fertilizers and pesticides and its effects on environment-the dangers in manufacturing, storing, transporting and disposing of insecticides.
- Land use, soil degradation, population pressure and depletion of forests, grassland and cropland.
- Environmental pollution of air, water and soil and its effect on the living world.
- Hazardous industrial and agricultural products; safety and health risks connected with their use, impact on environment when used.
- Misuse of medical technology: the drug menace.
- Properties of materials (bio-degradable & non-degradable).

- Typical environmental problems

  - deforestation.
  - desertification
  - landslides
  - silting and drying of water resources
  - pollution of lakes and waterways
  - toxic substances

- Occupational hazards

  - organisational risks
  - equipment related risks
  - process related risks

- Environmental action

  - environmental protection and conservation of resources
  - pollution control, environmental pollution laws and regulations.
  - waste disposal
  - desirable nutrition and sanitation practices
  - recuperation, recycling and substitution
  - community action for sociological restoration, social and agroforestry.
  - economic use of resources material, energy, money, time living in harmony with nature, the environment ethical.

- Occupational safety

  - fire safety

  - safe handling of equipment and materials

  - safety precautions in Lab/Workshop/work site.

  - First aid.

  - Safety management.

B. **Entrepreneurship Development**

a. **Career Orientation**

A general discussion on Career canvas option and compulsion of the career choosen.

Alternative career options under vocational stream-wage employment, self-employment etc.

Dynamics of entrepreneurship.

Importance and relevance of Entrepreneurship career.

Characteristics, role and reward of an entrepreneur.

b. Entrepreneurial Value Orientation

Innovativeness

Independence

Improved performance

Respect for work

c. Concept & Significance of different entrepreneurial attitudes

Use imagination/institution.

Take moderate risk

Enjoy freedom of expression and action.

Look for economic opportunities

Find satisfaction from successful completion of tasks

Believe that they can change the environment

Take initiative

Analyse situation and Plan action

Involve in work

Practical 3 hours/week

A. Environmental Education

- Study of seepage and water logging conditions
- Study of erosion by air and water
- Study of environmental pollution of air, water
- Discussions on
  - Deforestation
  - Desertification
  - Sitting and Drying of water resources
- Study of waste disposal methods
  - Bio gas plant
  - Composting

- Study of effects of pesticides and fungicides
- Handling of first aid kit
- Planting of tree
- Preparation of a report on pollutants of the area

B. **Entrepreneurship Development**

- Construction of attitude statement and measurement of attitude of self
- Field work/project work, Interface with existing entrepreneurs
- Collection of data in a given concept with the help of schedule/scale developed for this purpose.
- Imagination exercise.
- Ring toss exercise
- Analysing Sentence Completion test.
- Analysing who am I (in small groups/individually)
- Block building Exercise
- Achievement planning orientation exercise.
- Exercise to identify sources of help and influence the sources through effective communication, understanding and data processing, convince and crown exercise.
- Individual plan and discussion.
- Simulation based on live cases and experiences. Simulation based on live cases of the group.

PAPER 5: REPRODUCTION AND BREEDING

Theory: 4 hours/week

Principles of inheritance of qualitative and quantitative characters, biological variation, concept of heritability and repeatability. Principles and methods of selection, system of mating - pure breeding, art of breeding, upgrading and cross breeding.

Artificial Insemination

History, advantages and disadvantages. Semen collection. Evaluation of quality of semen. Principle of semen extenders, dilution, preservation and storage of chilled and frozen semen. Dispatch and transportation of semen. Principles and procedures of semen thawing and insemination.

Organisation of A.I Laboratory - basic equipment requirement, sterilization of A.I equipment.

A.I records and fertility evaluations. Factors affecting the fertility.

Practical: 6 hours/week

- Breeding records of dairy animals
- Analysis of breeding records
- Calculation of breeding efficiency
- Preparation of artificial vagina for semen collection
- Collection and conditioning of semen
- Physical evaluation of semen - colour, volume, cloudiness
- Use of microscope
- Washing, cleaning and sterilization of A.I equipment
- Microscopic evaluation of semen - Motility, live and dead, abnormal and total count.
- Chemical examination of semen. pH, methylene blue reduction test, catalase test.
- Preparation of semen extenders
- Extension of semen
- Demonstration of deep freezing
- Dispatching and transport of semen
- Storage of chilled and frozen semen
- Palpation of reproductive organs
- Detection of heat
- Preparation of heat expectency chart
- Thawing and handling of chilled/frozen semen
- Insemination
- Pregnancy diagnosis
- Visit to semen banks
- Visit to A.I centres

PAPER - 6: HOUSING AND MANAGEMENT

Theory: 2 hours/week

Shelter needs of dairy animals, housing system for various age groups and agro-climatic regions of Karnataka.

Location- site selection and layout.

Study of local construction materials.

Internal structure, drainage, ventilation, lighting, animal response to environmental changes and modification required to overcome adverse environmental conditions.

Water resource, hygiene and water supply. Accessory structure, feed store, implement shed, milk recording room, wallowing tank, silo-pits, compost pits and biogas plants.

Animal constraints-trevis, gates, paddocks and fence.

Farm equipments- installation operation and maintenance.

Sanitation of dairy farm and disposal of waste.

Practical: 4 hours/week

- Calculation of space requirement for various age groups of dairy animals.
- Calculation of space for feeding and watering
- Drawing of sketch of floor plans for the different categories of animals.
- Recording of environmental temperature humidity and wind velocity
- Cleaning sheds and use of disinfectants
- Calculation of space requirement for feed store
- Drawing the sketches of acessory buildings
- Study of various types of biogas plants- their capacity, distribution of gas and utilization
- Calculation of size of silo pit, comfort pit, biogas plants for different herd strength.

PAPER 7: FORAGE PRODUCTION AND USE OF AGRICULTURAL BY-PRODUCTS

Theory:

Soil, soil properties, soils of India and Karnataka,

Classification of soils based on physical and chemical properties, soil and water sampling, factors affecting the soil fertility, water and water management. Manures and fertilizers, principles of weeds, pests and disease control.

Important fodder crops, classification and cultivation practices, harvesting the fodder crop-time, method and cost; fodder seed production, certification, cropping pattern, farming systems for increasing fodder production, use of waste land for fodder production,agricultural by-products, storage, enrichment of straw, utilization of freen fodder, unconventional fodder.

Grassland development, grazing practices in grassland and forest. Fodder trees, silvicultural programme, dairy waste management, dung, urine economic value, pollution, health hazards, composition of waste, nutritive value to the plants, storage and composting, recycling the waste as animal feed.

Practical:

- Study of soil texture
- Sampling of soil and water
- Calculation of fertilizer requirement for various crops
- Layout of field
- Identification of improved grass and legume fodder
- Preparation of seed bed
- Identification of seed
- Pre-sowing treatments
- Germination test
- Sowing/planting of root slips
- Irrigation
- Weeding
- Harvesting
- Compost making
- Study of field implements

- Preparation of model scheme for fodder production throughout the year for fixed number livestock unit.
- Visit to fodder farm
- Visit to processing centres
- Visit to meteorological centre.

SEMESTER 3

PAPER 8: GENERAL NUTRITION

Theory 2 hours/week

- Importance of nutrition
- Common terms used for feed stuffs, classification of feed stuffs and their nutrient content. Role of water, feed additives and supplements.
- Role of nutrients, carbohydrates, protein, fats, minerals and vitamins. Utilisation of nutrients. Utilisation of non protein nitrogen by ruminants/dairy animals
- Proximate analysis of feeds. Digestible protein, total digestible nutrients, metabolizable energy. Feeding standards.

Practical 4 hours/week

- Identification of various feeds and fodders
- Acquaintance with various laboratory equipment and apparatus.
- Sampling and labelling of feed, fodders, urine, faeces and blood.
- Preparation of reagents and standard solutions.
- Determination of moisture in the feed sample.
- Determination of crude protein, fibre, ash in feed samples.
- Calculation of D.C.P. and T.D.N of the feeds.

PAPER 9: FEEDS AND FEEDING PRACTICES 3 hours/week

Theory

- Feeds, Feeding formulations
- Forage feeding
- Silage feeding

- Hay feeding

- Combination of legume and non legume feeding, frequency of feeding.concentrate of ingredients,grains/cakes/husk/agroindustrial by-products --physical and chemical characteristics and their processing before use. Compounded concentrate feed formulation of balanced concentrate feed. Feed additives and supplements.

- Package and storage of concentrate feed.

- I.S.I specification for feeds.

- Setting up of feed manufacturing units

Practical 4 hours/week

- Computation of ration for different category of dairy animals.

- Calculation of feed and fodder requirements for growing and milking animals.

- Preparation of mineral mixtures

- Setting up of feed manufacturing unit.

- Feeding of various categories of animals. viz new born, growing and milking dairy animals, bullock and breeding males with special reference to function and climatic conditions.

PAPER 10: COMMON DISEASES

Theory 3 hours/week

Sign of health and ill health, study of infectious diseases like Anthrax, Rindrepest, Black quarter, Haemorrhagic septicaemia, Tuberculosis, Foot & mouth disease, diagnosis and prophylaxis of diseaseses, metabolic diseases, deficiency diseases. Prevention and control of diseases of reproductive organs, and mammary glands. Diseases transmitted to man from dairy animals. Vaccination-schedule, method and mode. First aid, common drugs. Management of sick animals and disposal of carcasses.

Practicals 4 hours/week

Recording temperature, pulse rate, heart beat, rumination, rumen condition, saliva, lacrional secretion, Duny and urine for soundness of animals. Collection, preservation and handling of materials for lab examination.

FIRST AID

- Wound cleaning, dressing and bandaging

- Oral administration of drugs

- Deworming, spraying.
- Cold and warm hydro therapy.
- Control of external parasites.
- Disposal of carcass
- Testing of mastitis.

Paper 11: General Foundation Course II

Theory

A. **Entrepreneurship Development**

- **Project Identification**

  Definitions of Large scale industry (LSI) Medium Scale Industry (MSI) Small Scale (SSI), Tiny Sector, Cottage and Village Industries.

  Classification of projects - Manufacturing Service, Trading, Consumer Goods, Capital Goods and Anciliary Goods (Characteristics and scope of activities of each type.

- Central and the State Government Policies, Programmes and Incentives with regard to SSI, Tiny sector and new entrepreneurs.
- Step in setting up a business enterprise.
- Information about the various institutions providing help to the existing and potential entrepreneurs.

  a) DIC, b) Directorate of Industries, c) Technical Consultancy Organisation, d) SFC, e) SSIDC, f) IDC, g) NSIC, h) SISI, i) Commercial bank, j) Coop. banks, k) KVIC etc.

- Reservation of products for exclusive manufacture in SSI sector; (the product list should be circulated to the students).
- **Market Assessment**

  Need and importance of market assessment.

- Components and techniques of market assessment: a) Nature of the product, b) demand analysis and assessment of consumer needs, c) supply analysis and market conditions, d) marketing practices with reference to storage distribution-packing - credit policy - delivery, after sales service, selecting individual marketing practice.
- Understanding the market, the market segmentation and product analysis.

- Selecting a product and market survey for the selected products.

- **Availing incentives, support procedural requirement**

  Understanding the role and functions of institutional net work set-up for promoting and supporting small entrepreneurs.

  Scope and benefits of assistance and incentive schemes of different institutions.

  Understanding the procedures and formats of applications forms of institutions supporting entrepreneurs.

- **Resource Mobilisation**

  - Finance, raw-material, personnel etc. with specific product requirements.

  - Net work analysis with reference to specific product.

- **Decision Making**

  - Defining the probles, gathering information, analysing information, identifying alternative, selecting alternatives.

  - A case exercise on decision making process.

Operation Management

Purchasing and planning materials: ABC & EOQ analysis.

Issue and accounting of stores and materials.

Flow and control of materials.

Quality control and control of operations.

Discussion on planning and scheduling with a small case example.

Finance Management

- **Accounting & book keeping:**

  Principles of double entry; books of original record; compilation of Final accounts understanding financial statements.

  Cost concepts; direct, indirect and marginal costs; pricing.

  Budgeting and control.

  Preparing a small unit's master budget: as case.

  Problems in obtaining Working Capital Finance.

- **Marketing Management**

  The Marketing Concept:

  The four PC's product, price, promotion, physical distribution.

  Packaging

  Understanding the customer's need, Channels of distribution: sole selling agents, wholesalers, retailers, stockists, distributors.

  Government purchase procedures vis-a-vis small scale suppliers.

  Sales promotion and advertising.

  Salesmanship: Characteristics of a good Salesman and dealing with customers.

- **Industrial Relations and Personnel Management**

  Methods & process of recruitment.

  Wages and incentives.

  Appraisal & training, employer-employee relations.

B. **Rural Development**

- Land use profile in India.
- Causes of economic backwardness: the 'poverty trap'.
- Measures to increase agricultural productivity by improving the inputs.
- Afforestation-social and farm forestry (environmental, social and economic enhancement).
- Rural waste recycling - biogas plant, compost making.
- Provision of basic health services for the community - provision of medical care, improvement of environmental sanitation, control of communicable diseases, mother and child health care, school health services.
- Activization of agencies responsible for rural development (Integrated Rural Development Programme, Small Farmers Development Agency, Marginal Former Agency etc.)
- Innovation and Development of Rural Industries.

Practical 3 hours/week

A. Entrepreneurship Development

Projects Selection

- Project/product identification, generating ideas for selection of a project.
- Procedure for short listing of ideas generated.
- Factors to be considered for final selection of the product-demand competicors-availability of factors of product-Govt. Policy-Profit margin etc.
- SWOT Analysis: S&W - Individual appraisal of the strengths and weaknesses - money market, technical know-how-labour market, technical know-how-labour-material-competencies.
- O&T - Environmental scanning with respect to economic, social and political international aspects supplemented by case studies.

Project Formulation

- Need for a project report.
- Elements (steps) of a project report.
- Determining project size keeping in view the manageability, investment possibilities, production and market aspects.
- Selection of plant and machinery.
- Determining labour and raw-material requirements in the form of the information required in the project report (sample project report).
- Estimating the project cost, production cost concepts, working capital requirement, and profit ratios and the concept of inventory control.
- Break-even analysis and profitability rates,
  - capacity utilisation indicator.
  - sales revenue indicator.
- Time scheduling, project monitoring and review technique (Network analysis)
- Study of typical project reports, namely, consumer goods, capital good, ancilliary good and service.
- The requirements of banks and financial institutions.

- Project appraisal-technical, economic, financial, commercial and managerial aspect.

- Practice Session (Students should practice on the preparation of the project report on the similar products).

Execution and Establising the Unit

- Procedures in setting up an enterprise-Legal requirements.

- Registration of the firm.

- Size, location, layout sanitation insurance etc.

- Case discussion on small business growth from small business to an enterprise.

- Industrial visit and presentation of project report.

B. Rural Development

- Study of cases of economic backwardness.

- Survey of communicable diseases in the area.

- Acquaintance and participation in integrated Child Development programmes.

- Survey of health needs of rural schools.

- Visit to agencies responsible for rural development.

SEMESTER 4

PAPER 12: DAIRY TECHNOLOGY

Theory hours/week

Present status of dairy industry in India and scope. Milk marketing systems in rural and urban area.

Milk collection and preservation, transportation to chilling plant. Equipments used for collection,transportation and storage. Maintenance of milk receipt registers.

Function of chilling centers, milk reception. Different methods of chilling and storage. Modes of transport of chilled milk. Equipment used in reception of chilled milk-vessels, cans and tankers.

Principles of clarification, seperation and pasteurisation of milk. Method of pasteurisation -- LTLT, HTST, UHT preservation of cold milk with lactoperoxidase sulphur.

Manufacture of milk products like cream, butter, ghee, khoa, channa paneer, milk based sweets, curds icecream, etc. Handling losses of milk and milk products. Storage of processed milk and milk products. Maintenance and care of stores.

Practical 6 hours/week

- Study of dairy equipment
- Cream separation of milk
- Standardisation of milk
- Pasteurisation of milk
- Packaging of milk
- Preparation of flavoured milk
- Preparation of sterilized milk, cream, butter, ghee, khoa, chhana, paneer, curds, kalakand and ice cream.
- Handling and cleaning of dairy utensils and equipments such as butter churner, cream seperator, cheese make etc. before and after use.

PAPER 13: QUALITY CONTROL MILK AND MILK PRODUCTS

Theory 2 hours/week

Various definitions of milk, composition of milk- physical and chemical. Nutritive value. Types of micro organisms present in milk and milk products. Milk in relation to public health. Organoleptic tests. Pathogenic and non-pathogenic organisms in milk. Milk contamination and method of control. Testing and grading at production center for quality of milk.

Sampling procedures for milk and milk products and labelling of samples. Testing the samples- platform and routine tests.

Milk standards and legislation regarding the quality and sanitation. Types of detergents, sanitizers and their use. Sanitization of dairy equipments. Preparation of starter and cultures.

Practicals: 4 hours/week

- Clean milk production
- Chilling of milk
- Straining and clarification
- Cleaning and sanitization of dairy equipments
- Sampling of milk and milk products

- Preservation of milk samples and their analysis
- Gerber fat test
- Determination of specific gravity of milk by lactometer reading
- Determining the titrable acidity
- Clot-on-boil (COB) test.
- Methylene blue reduction test (MBR)
- Resazurin test
- Analysis of dairy products to meet the standard.
- Prevention of Food Adulteration (PFA) Act.

PAPER 14: DAIRY EXTENSION ECONOMICS AND ACCOUNTANCY

Theory 4 hrs/week

Philosophy and principles of extension education. Qualities of extension workers. Dairy extension-objectives and role in dairy development. Extension methods and techniques. Handling of audio visual aids and their importance in extension work. Selection of methods for effective teaching and adaptation. Methods to determine the consumers demand and acceptance. Nature and importance of communication. Communication processes and problems. Qualities of salesman and salesmanship.

Dairy economics-starting of dairy business, infrastructure required. Fixed cost, variable cost, depreciation, interest, cost of production and net return. Cattle insurance and coverage. Financial institutions involved. Pricing of milk and milk products. Preparing the project report.

Co-operative movement, principles and organising the milk co-operatives. Functions of secretary milk co-operatives. Milk procurement systems. Technical records in dairying. General principles of accountancy, single and double entry systems. Maintenance of reports and preparation of balance sheets.

Practicals 6 hours/week

- Preparation of extension teaching materials such as posters, charts, bullettins, boards, etc.
- Handling of audio visual aids
- Conducting the discussions in villages
- Organising result and method demonstrations
- Calculation of cost of milk and milk products
- Preparing the project report for various enterprises in dairying
- Assessment and evaluation of enterprises
- Data collection for consumers demand
- Upkeep of reports and records
- Visit to milk co-operatives
- Visit to financial institutions.

7. SCHEME OF EXAMINATION

Sl. No.	Code No.	Subject	Marks for Internal Assessment	Examination		Total Marks
				Duration in Hours	Marks	
1	2	3	4	5	6	7
Semester I						
Part I (Language)						
1.*	01	Kannada or any other etc.	-	-	-	-
2.*	02	English	-	-	-	-
Part II (For Vocational Stream)						
Theory						
1.1	10	Paper-1 Dairying in India	25	3	75	100
1.2	11	Paper-2 Anatomy & Physiology of Dairy animals	25	3	75	100
1.3	12	Paper-3 Management of Dairy Animals	25	3	75	100
1.4	13	Paper-4 General Foundation Course I	15	2	35	50
Practical						
1.5	14	Paper-1 Dairying in India	25	3	75	100
1.6	15	Paper-2 Anotomy & Physiology of Dairy animals	25	3	75	100
1.7	16	Paper-3 Management of Dairy Animals	25	3	75	100
1.8	17	Paper-4 General Foundation Course I	15	2	35	50
Total			180		520	700

1	2	3	4	5	6	7
Semester 2						
Part-1 (Languages						
1.*	01	Kannada or any other	-	3	-	100
2.*	02	English	-	3	-	100
Part II (For Vocational Stream)						
Theory						
2.1	20	Paper-5 Reproduction & Breeding	25	3	75	100
2.2	21	Paper-6 Housing and Management	25	3	75	100
2.3	22	Paper-7 Forage Production and use of Agricultural by Products	25	3	75	100
Practical						
2.4	23	Paper-5 Reproduction & Breeding	25	3	75	100
2.5	24	Paper-6 Housing and Management	25	3	75	100
2.6	25	Paper-7 Forage Production and use of Agricultural by products	25	3	75	100
		Total	200		600	800
		On-the-job Training		100		
Semester 3						
Part 1 (Languages)						
1.*	01	Kannada or any other	-	3	-	100
2.*	02	English	-	3	-	100

1	2	3	4	5	6	7
Part II (For Vocational Stream)						
Theory						
3.1	30	Paper-8 General Nutrition	25	3	75	100
3.2	31	Paper-9 Feed and Feeding Practices	25	3	75	100
3.3	32	Paper-10 Common diseases	25	3	75	100
3.4	33	Paper-11 General Foundation course II	15	2	35	50
Practical						
3.5	34	Paper-8 General Nutrition	25	3	75	100
3.6	35	Paper-9 Feeds and Feeding Practices	25	3	75	100
3.7	36	Paper-10 Common diseases	25	3	75	100
3.8	37	Paper-11 General Foundation course II	15	2	35	50
	Total		180		520	700
		On-the-job Training	----------	100		
Semester 4						
Part I (Languages)						
1.	01	*Kannada or any other	-	3	-	100
2.	02	*English	-	3	-	100
Part II (For Vocational Stream)						
Theory						
4.1	40	Paper-12 Dairy Technology	25	3	75	100
4.2	41	Paper-13 Quality Control of Milk and Milk Products	25	3	75	100
4.3	42	Paper-14 Dairy Extension Economics & Accountancy	25	3	75	100

1	2	3	4	5	6	7
Practical						
4.4	43	Paper-12 Dairy Technology	25	3	75	100
4.5	44	Paper-13 Quality Control of Milk and Milk Products	25	3	75	100
4.6	46	Paper-14 Dairy Extension Economics & Accountancy	25	3	75	100
	Total		200		600	800

Note: 1 and 3 Semester are Internal class Examinations.
2 and 4 Semesters are Public Examinations.

There is no examination in languages in 1 & 3 Semesters. But the examinations in 2 & 4 semesters also include 1 & 3 semesters course, respectively.

Evaluation of on-the-job training is done by the training organiser in consulation with the concerned vocational Teacher.

8. INTERNAL EVALUATION

1. There is no internal evaluation for subjects under Part-I.

2. The Internal evaluation will be a continuous process. The Total marks for internal evaluation for each of theory and practical paper under Part II is 25. However, General Foundation courses has 15 marks only.

3. The internal evaluation in respect of theory papers shall be made up of tests (announced and unannounced), assignments and quizzes. The details are given below:

Sl. No.	Instrument	Duration	Maximum Marks	Remarks
I.	*Announced written test	1 hour	5	After 6 weeks of Instruction.
II.	Assignment/Home work	10 days	5	After 6 weeks of Instruction.
III.	Quiz	15 minutes	2.5	After 8 weeks of Instruction.
IV.	Assignment/Home Work	10 days	5	After 8 weeks of Instruction.
V.	*Un-announced written test	1 hour	5	After 12 weeks of Instruction.
VI.	Quiz	15 minutes	2.5	After 14 weeks of Instruction.
			25	

* Tests shall comprise of objective and essay type questions.

4. The internal evaluation in respect of Practical papers shall be based on the maintenance of records, journals, the actual conduct of experiment, viva-voce and other observations of the teacher concerned. Observation should not be confined to general performance but should include the evaluation of punctuality, sincerity, interest and other effective aspects of student's progress.

Detail of Internal Evaluation are given below:

Sl. No.	Instrument	Duration	Maximum Marks	Remarks
I.	Observations	Continuous	5	-
II.	Actual Practical Work	2 hours	5	After 8 weeks of Instruction.
III.	Actual Practical Work	2 hours	5	After 12 weeks of Instruction.
IV.	Viva-Voce	-	5	Conduct along with actual practicals.
V.	Practical note book/ record book	Continuous	5	-

5. Students are required to be regular in all the tests/quizzes, assignments and Practical work assigned by teacher.

6. The marks scored by the student in internal evaluation shall be added to the marks of respective semester examination.

7. At the end of each saemester the college must send marks obtained by the students as per the scheme of examination to the State Council of Vocational Education.

8. The marks once awarded for internal evaluation shall be final.

9. ON-THE JOB TRAINING

Probable work sites for on-the-job training:

- Dairy farms attached to Universities of Agricultural Sciences at Bangalore and Dharwad
- Dairy farms under the Deptt. of A.H and Vet. Services all over the state.
- Dairy farms and dairies of Karnataka Milk Federation all over the state.
- Dairy farm/fodder farm attached to the Union Ministry of Agriculture at Hesarghatta
- Dairy farm of National Dairy Research Institure, Bangalore.
- Institutional farms and private owned dairy farms

Suggestive content areas for On-the-job training

Phase-1 (in between semester 2 & 3)

Study of breed characters, handling animals, identification of animals, external and internal organs. Judging and selection, routine management practices,semen collection, evaluation, preservation, insemnation, pregnancy diagnosis, housing, water supply, utilization of farm waste. Soil properties, fodder cultivation, conservation and enrichment of agricultural by-products.

Phase-II (in between semester 3 and 4)

Feed ingredients nutritive value. Computation of balanced feed. Compounding of feed. Feed analysis. Diagnosis of common diseases, control and prophylaxis. Properties of milk, milk processing, manufacturing of milk products. Quality control of milk and milk products. Preparation of a project for starting a dairy. Business management, sales and salesmanship. Management of co-op society, milk parlour, feed manufacturing unit.

Evaluation of on-the-Job Training (OJT)

Evalution of the various components of OJT is required to be done by adopting the following techniques:

1. Observation:

Since the major emphasis of the OJT Programme is on the development of performance skills, work habits and attitudes, observation technique is to be adopted for assesssment of the students. The Supervisor in consultation with the Vocational Teacher develops a rating sheet and records his observation on various criteria.

2. **Interview and viva:**

Occassionally either the Supervisor or the Vocational Teacher conducts one to one session with the students to assess his ability to communicate, his maturity, self-confidence, comprehension and his overall disposition.

3. **Report:**

The student should prepare a report to be examined by the Supervisor and Teacher for the Jobs assigned to him by the Supervisor and submit before the termination of the training.

10. LIST OF REFERENCE BOOKS

Suggested reference material

01. Text book of animal husbandry - G.C.Banerjee, I.B.H publications.

02. Farm animal management & poultry production - Shastry, Thomas & Singh, Vikas publications.

03. Approved practices in dairying - Motterson and Juerogons.

04. Definitions of the characteristics of cattle and buffalo breeds of India - I.C.A.R., New Delhi. (1973)

05. Indian breed of cattle and buffalo and their avaliability - Directorate of Extension, Ministry of Agriculture, Government of India, New Delhi. (1978)

06. Handbook of animal husbandry - I.C.A.R, New Delhi. (1978)

07. Domestic animals - Harbans Singh, National book trust of India, New Delhi.(1968)

08. Dairying in India - Sukumar.D.

09. Pashupalan - Haryana Secondary Board, Haryana.

10. Pashupalan Part 1 and 2 - I C A R, New Delhi.

11. Diary farming and milk production - C.P.Ananthkumaran & P.N Padmanabhan, Lakshmi Publications, 42 Harleys road, Kalipank, Madras.

12. Livestock and poutry enterprises - Gopalkrishnan C.A and Lal G.M.M.

13. Arya samskruthiyalli govu matthu gavya vasthugalu - aadhunika vygnanika sameekshe - Murthy Bheemasena Rao, Vedaprakashana, Lakshinivas, 105 4th Jayanagar West, Bangalore.

14. Praacheena hagu arvacheena dhanagala ithihasa - R.S jyothi, Kannada adhyayana krushi vishwavidhyanilaya. B'lore - 24

15. Aadhunika hynodhyama - S.R.Shenoy. Manipal press, Manipal.

16. Goat production in the tropics - C.A.B

17. Goat husbandry - Devid Mackenzie. Faber and Faber, London.

18. Raising milk goats in the modern way - Jerry Belanger, Garden Way Publication company, Charlotte Vermont.

19. Dairying in India - I.C.A.R, New Delhi.

20. Ensmiger, M.E. Stockmans handbook Animal agricultural series

21. Hafezo Reproduction in farm animals

22. Ranjhan S.K. Animal nutrition and feeding practices

23. Banerjee G.C, Feeds and principles of animal nutrition

24. Perry, J.Ed Artificial Insemination of farm animals

25. Hegde V.R. Sakupranigala Sharira Kriya Shastra UAS Bangalore

26. Narasimha Iyengar, Namma danagaul, UAS Bangalore

27. Frandson R.D Anatomy and physiology of farm animals

28. Ensmiger M.E. dairy cattle sciences. Animal agriculture series

29. Ranjhan, S.K. and Pathak, N.K., Management and feeding buffaloes

30. Bath Donald and others, Dairy cattle principles, practice problems, profits.

31. Dairy Handbook, NDRI, ICAR, Karnal 132001.

32. Alur Pashuvaidhyakiya Vignana, U.A.S., Bangalore

33. Hinugarikeyalli hasiru mevina mahatva K.M.F. Bangalore -27

34. Adhunika Hinugarike, UAS, Bangalore

N.C.E.R.T. Publications

35. Animal reproduction and artificial insemination (Reference Book)

36. Dairy animal management

37. Feed and Feeding of dairy animals

38. Forage production conservation and recycling of farm wastes

39. Milk and milk products

40. Milk and its products (Reference book)

11. LIST OF TOOLS AND EQUIPMENT

		Nos.
1.	Curry comb	10
2.	Stiff brushes	10
3.	Floor brushes	10
4.	Tattooing set	1
5.	Branding set	1
6.	Ear tagging punch (Ear Tag Applicator)	1
7.	Ear tags	1-100
8.	Burdizzo castrator	1
9.	Bull nose ring	6
10.	Bull Rope	1
11.	Bull Leader	1
12.	Drenching bottle	1
13.	Drenching bambo	1
14.	Enamel tray	1
15.	Hair clipper	1
16.	Trocar and cannula	2
17.	Balling gun	1
18.	Dehorner	1
19.	Probang tube	2
20.	F rceps	2
21.	Tongs	2
22.	Irrigator	1
23.	Mouth gag	1
24.	Cattle trevis	1
25.	Sanitory Milking Pails	2

26.	Buckets	4
27.	Milk feeding pail with nipple	2
28.	Strip-cup	1
29.	Herd recorder (Spring type)	
30.	Chains for cows	5
31.	Chains for calves	4
32.	Chaff cutter	4
33.	Wheel barrows	2
34.	Grinder (Ele.operated)	1
35.	Strainer	6
36.	Centrifuge	1
37.	Tripod stand	1
38.	Artificial vagina (complete set)	1
39.	Liners for A.V	10
40.	Cones for A.V	10
41.	Refrigerator	1
42.	Speculum with light	1
43.	Insemination kit	1
44.	Insemination guns, French type	4
45.	Haemocytometer	2
46.	Haemoalbinometer	1
47.	Haematometer	1
48.	Haemocrit centrifuge	1
49.	Hot plate	1
50.	Water distillation apparatus	1
51.	Pestle and morter	1
52.	Spirit lamp	1
53.	Insemination catheters with rubber connectors	3

54.	Hot air oven	1
55.	Auto clave	1
56.	Syringe sterilizer	1
57.	Student's microscope	2
58.	Water bath (automatic)	1
59.	Hot plate	1
60.	Semen shippers	2
61.	Garber centrifuge	1
62.	Butyrometer stoppers	50
63.	Butyrometer stoppers key	2
64.	Butyrometer stopper stand	2
65.	Milk plunger	1
66.	Sediment testing equipment	1
67.	Cream separator a) hand operated b) electrically operated	1 1
68.	Butter churn	2
69.	Butter worker	2
70.	Acido meter	1
71.	Sampler	1
72.	Butter scoop	1
73.	Weighing balance	1
74.	Ice cream freezer, hand operated	1
75.	Ice cream spoons	2
76.	Frying pan 2 litres	2
77.	Steel kolaga 5 litres	2
78.	Bottle capper	1
79.	Milk measures - 250 ml - 500 ml - 1000 ml	1 1 1

80.	Resazurin colour comparator	1
81.	Bottle filler	1
82.	Bottle crates	2
83.	Stacking trolly	1
84.	Homogeniser	1
85.	Sachet sealing equipment	1
86.	Trolly lift	1
88.	Fat testing equipment	1
89.	Butter moisture balance	1
90.	Steel tub	1
91.	Showels	2
92.	Pickaxes	2
93.	Spades	2
94.	Measuring tape	2
95.	Khurpi	3
96.	Soil augur	2
97.	Rake	1
98.	Knife	3
99.	Narrow blade trowel	1
100.	Deshi plough	2
101.	Harrow	4
102.	Hand hoes	4
103.	Clod crushers	2
104.	Sprayer	1
105.	Seed drill	1
106.	Mower (hand)	1
107.	Iron pans	5

108.	Threshing equipment	1
109.	Seed germination kit	1
110.	Meteorological equipment	1
111.	Cro-bar	
112.	Mufffle furnace	
113.	p.H. meter	

12. LIST OF CHARTS AND MODELS

1. Breed chart: Indian breeds/cow/buffalo/goats/exotic breeds
2. Models of Indian breeds and Exotic breeds
3. Models of Dairy goats
4. Charts indicating anatomy and physiology of animals
5. Models of organs of the animal
6. Chart idicating dentition of animals and age
7. Chart indicating digestive system in the ruminant
8. Models of rumen, reticulum, omasum and abomasum
9. Models and chart indicating details of structure of udder
10. Soil profile charts of Karnataka
11. Soil pH indicating chart of Karnataka
12 Meteorological chart of Karnataka

13. LIST OF CHEMICALS, DETERGENTS AND PESTICIDES ETC.
(Quantity depends on number of students)

1. Sulphuric acid (c.grade)
2. Sulphuric acid (A.R.)
3. Amyl alcohol
4. Sodium hydroxide (pellets)
5. Litmus paper
6. Filter paper (whatman no.1 & 40)
7. Petroleum ether (40^{o} -60^{o} C)
8. Copper sulphate
9. Sodium sulphate
10. Pottasium dichromate
11. Sodium bicarbonate
12. Oxalic acid
13. Eosin water soluble
14. Nigrosine, water soluble
15. Methyl blue
16. Resazurin
17. Phenolphthalein
18. Petroleum jelly/liquid paraffin
19. Spirit
20. Mastaid solution
21. Sodium citrate
22. Glucose
23. Sulphanilamide
24. Penicillin G sodium
25. Streptomycin sulphate
26. Anatto colour

27. Salt

28. Sodium aliginate

29. Colour for ice cream
(straw berry, rose, coffee)
Flavour for ice cream
(vanilla, pineapple, orange,
banana)

30. W.B.C. diluting fluid

31. R.B.C. diluting fluid

32. Ammonium sulphate

33. Urea

34. Super phosphate

35. Rock phosphate

36. Potassium sulphate

37. Muriate of potash

38. Zinc sulphate

39. Citric acid

40. Rhizobium cultures

41. Azatobacter cultures

42. Malathion

43. Formaldehyde

44. Xylol

45. Liquid paraffin

46. Pot. sulphate

47. Petroleum ether

48. Branding ink

49. Tattooing ink

50. Mustard oil

51. Neem oil

52. Zinc oxide

53. Ammonium hydroxide

54. Castor oil

55. Potassium Permanganate

56. Caustic potash

57. Vaseline

58. Collodion

59. Bleaching powder

60. Washing soda

61. Phenol

62. Quick Lime

63. Bromo thymol blue

64. Sodium lauryl sulphate

65. Mercurochrome

66. Opal blue

67. Indian ink

68. Carbol fuchin

69. Eosin yellow

70. Alcohol

71. Iodine

72. Pot iodide

Detergents

73. Teepol

74. Liquid soap

75. Vim

76. Bleaching powder

Vaccines

77. Foot and mounth

78. Rinder pest

79. Haemorrhagic Septicaemia

80. Black quarter

14. LIST OF GLASSWARES AND OTHER ITEMS

1.	Semen collection vials	5
2.	Insemination cathetors	10
3.	Syringe -2ml	5
4.	Clinical thermometer	5
5.	Dry and wet bulb thermometer	1
6.	Gerber butyrometer	25
7.	Dropping bottles for sulphuric acid	4
8.	Dropping bottles for amyl alcohol	4
9.	Pipette for milk-11.05 ml	10
10.	Lactometer	5
11.	Dairy thermometer	5
12.	Lactometer jars	5
13.	Burettes	10
14.	Pipettes 10ml	10
15.	Porcelain dish 10 ml cap	
16.	Beakers - 100ml	10
	- 250 ml	10
	- 500 ml	10
	- 1000 ml (spout less)	10
17.	Test tubes cap. 15 ml	50
18.	Milk bottles 250 ml	100
19.	Kjeldhal flask 600 ml cap	10
20.	Round bottom flask 1000 ml	10
21.	Conical flask 1000ml cap	10
22.	Funnels	10

23.	Measuring cylinders	100 ml	2
		500 ml	2
		1000 ml	2
24.	Volumetric flask	100 ml	5
		250 ml	2
		1000 ml	2
		2000 ml	2
25.	Reagent bottles	250 ml	10
		500 ml	10
26.	Soxhlet apparatus (complete)		6 sets
27.	Desiccator		1
28.	Wash bottles 500 ml cap		10
29.	Glass rods		1
30.	Glass tubing		1
31.	Spirit lamps		10
32.	Slides and cover slips		100
33.	Indicator bottles		10
34.	Sample bottles		50
35.	Drop bottles		2
36.	Pipette, graduated 10 ml 0.1 ml division		5
37.	Pippette, graduated, 10 ml, 1 ml division		5
38.	Jar with over lapping lid 10 dia 12" high		5
39.	Microscope slides		6 gross
40	Syringe 5ml		2
41.	Rubber bulbs for function		2
42.	Syringe glass with ceramic piston 2ml		5
43.	All glass distillation appparatus		1
44.	Kerosene		1 tin

45.	Muslin cloth	10 metres
46.	Ropes (plastic)	2 Kg
47.	Bottle caps	1000
48.	Burrette stand	10
49.	Test tube stand	10
50.	Jerry can 20 lit cap	5
51.	Rubber tubing	10 mt.
52.	Measuring tape	2
53.	Tags(copper)	1 gross
54.	Gur	1 Kg
55.	Gum boots	2 pairs
56.	Non-absorbent cotton	1 Kg
57.	Alkali detergents	1 Kg
58.	Cotton rope 10 m long 2-3cms thick	2
59.	Aluminium tags (1-100)	1 set
60.	Filter paper (11 cm dia)	2 boxes
61.	Glass marking pencil	
62.	Brushes to clean glassware	6
63.	Wire baskets	2
64.	Plastic funnels	6
65.	Towels	6
66.	Cotton apron	2
67.	Gloves with sleeves	6
68.	Gloves (latex)	6

15. LIST OF SUPPLIERS OF CHEMICALS/GLASSWARE EQUIPMENTS

1. CHANDANMAL & CO (MYSORE)
   14,7 FOURTH CROSS, KALASIPALYAM
   NEW EXTENSION
   BANGALORE - 560 002 Ph - 222913

2. CANARA CHEMICALS CO
   B- 385 - PIE
   BANGALORE - 560 058 Ph - 394576

3. CHEMI TRADE CORPORATION
   93/1, TEMPLE ROAD
   EIGTH CROSS MALLESHWARAM
   BANGALORE -560 003 Ph - 360846

4. A.E.S CHEMICALS PVT LTD
   C-244, FIFTH CROSS, PIE
   BANGALORE - 560 058 Ph - 395984

5. ABC MEHTHA
   12, KASHYAPA LANE
   B.V.K IYENGAR ROAD
   BANGALORE - 5600 053 Ph - 71421

6. AROMAX CHEMICALS
   10 &11, N.S PALYA
   J.P. NAGAR INDUSTRIAL ESTATE
   BANGALORE - 560029 Ph - 641182

7. ARUNA CHEMICALS
   SEVENTH MAIN, MYSORE ROAD
   BANGALORE - 560 039 Ph - 603623

8. THATHADRI CHEMICALS
   6, JAYADEVA HOSTEL BLDGS
   GANDHINAGAR
   BANGALORE - 560 009

9. ARYAN CHEMICALS
   529/A, SECOND STAGE, RAJAJINAGAR
   BANGALORE - 560 010 Ph - 321100

10. BIO CULTURES MFG LABORATORIES
    259, FOURTH PHASE, PIE
    BANGALORE - 560 009 Ph - 394606

11. M.M CHEMICALS
    FIRST CROSS, A.S STREET
    BANGALORE - 560 053 Ph - 77536

12. RAGHU CHEMICALS
    28/2, 20TH CROSS, CUBBONPET
    BANGALORE - 560 002 Ph - 216241

13. UNIVERSAL CHEMICAL INDUSTRIES
    19/2, 7TH MILE MYSORE ROAD
    BANGALORE - 560 039

14. SOLVENTS AND CHEMICALS
    25, SGN LAYOUT
    LALBAG ROAD
    BANGALORE - 560 027 Ph - 224564
    222054
    235756

15. SRINIVASA CHEMICAL INDUSTRIES
    1016/46TH CROSS 4TH BLOCK
    RAJAJINAGAR
    BANGALORE - 560 010 Ph - 350841, 627072

16. APNA SCIENTIFIC SUPPLIES
    44/1, KODAMBAKAM ROAD
    P.B NO 3271
    METTUPALYAM
    MADRAS - 600 033 Ph - 044-440301

17. CENTRAL SCIENTIFIC SUPPLIES CO LTD
    20/A, KV, TGL STREET
    SULTHANPET
    BANGALORE -560 053 Ph - 578134

18. AJIT GLASS WORKS PVT LTD
    99, HAJI AHMED DEVJI BLDG
    2ND FLOOR, MOHAMED ALI ROAD
    BOMBAY - 3

19. ASSOCIATED GLASS INDUSTRIES LTD
    VARADA NAGAR SANAT NAGAR
    HYDERABAD - 500 018

20. DAAPS ASSOCIATED MARKETING (P) LTD
    C-4, VANDHANA - 11
    TOLSTOY MARG
    NEWDELHI - 110 001

21. GUJARATH POLYETHENE INDUSTRIES
    86, SULAR CHEM
    GHIA MANSION
    ZAVERI BAZAAR
    BOMBAY - 400 002

22. HINDUSTHAN RUBBER WORKS
    402, VEER SAVARKAR MARG
    PRABADEVI
    BOMBAY - 400 025

23. INDO-BURMA PETROLEUM CO LTD
GELLANDER HOUSE
N.SUBASH ROAD
CALCUTTA - 700 001

24. TECHNO INSTRUMENTS AND CHEMICALS
KODAVD SAMAJ BLDG,
FIRST MAIN, VASANTHA NAGAR
BANGALORE - 560 052

25. TECHNOLABORATORY PRODUCTS
32, G.S.T. ROAD
MADRAS - 32 Ph - 044-2344965

26. SUPER SCIENTIFIC CO
32, 4TH MAIN MATHIKERE
BANGALORE - 560 054 Ph - 361063

27. C.S MEDICAL PVT LTD
VAJAPEYAM GARDENS
7TH CROSS ROAD, ASHOK NAGAR
BANGALORE - 560 050 Ph - 606066

28. AMBALA INSTRUMENTS COMPANY
KAPALI THEATRE BLDG
S.C ROAD
BANGALORE - Ph - 261453

29. PRECISION SCIENTIFIC INTERNATIONAL
1330, 8TH MAIN 'A' BLOCK
2ND STAGE RAJAJINAGAR
BANGALORE - 560 010 Ph - 321522

30. LABORATOY SUPPLIES CO
KRISHNA BLDG
AVENUE ROAD
BANGALORE - 560 004 Ph - 216 756

31. MAYURA SCIENTIFIC CO
148, LALLBAG ROAD
BANGALORE - 560 004 Ph - 623 974

32. DAIRY UDYOG
GATKOPER INDUSTRIAL ESTATE.
BLOCK - C 2ND FLOOR
229, A-L SHASTHRI MARG
BOMBAY - 400 086

33. DAIRY EQUIPMENT CO,
III WANDALA UDYOG BHARAN
BOMBAY - 400 031

34. BOROSIL GLASS WORKS LTD
44, KHANNA CONSTRUCTION HOUSE
KHAN ABDUL GAFAR KHAN RAOD
WORLI, BOMBAY - 400 018

35. CAN MANUFACTURING CO PVT LTD
PLOT NO 16, BLOCK A
GOVT INDUSTRIAL ESTATE
KANDIVILI, BOMBAY - 400 067

36. MILK CONTAINERS INDUSTRIES
BLOCK - C, UNIT NO 299
GHATKOPER INDUSTRIES ESTATE
72, LALBAHADUR SHASTHRI MARG
GHATKOPER (W) BOMBAY - 86

37. VENUS TRADING CO
P.O BOX NO 17, ANAND
GUJARAT

38. VALCAN LAVAL LTD (BOMBAY)
POONA ROAD, DAPRADI
P.B. NO 53 POONA

39. V.K SELVARAJ & BROTHERS
16-F, STREET,CLEVELAND TOWN
BANGALORE - 560 001

40. ZILL & CO
128, PRINCESS STREET
BOMBAY - 2

41. LAKSHMI MILK TESTING MACHINERY
DAIRY EQUIPMENT ENG. CO
37, RAJINDER MARKET
TISHAZARI
DELHI - 6

42. ALFALAVAL (INDIA) LTD
47/4, PROMENADE ROAD
BANGALORE - 560 005

43. DOSHI AND SONS
SUBASH ROAD
P.B. NO 14
ANAND, GUJARAT - 388 001

44. H.M.T LTD DAIRY MACHINERY UNIT
BRANCH OFFICE - 68
ST. MARKS STREET
BANGALORE - 560 001

45. LARSEN AND TURBO LTD
L&T HOUSE
BALLARD ESTATE
N. MORARJI MARG
P.B. NO 279
BOMBAY - 400 038

46. UNIVERSAL SURGICALS
D4/8, KRISHNA NAGAR
LAL QUARTERS, P.B. NO 9406
DELHI - 110 051

47. HARD CASE ENGINEERING
LALJI MEGHAJI COMPOUND
5-3-325, MAHATMA GANDI ROAD
SECUNDERABAD

48. VACCUFLOW INDUSTRIES
A-42 CHANDRANAGARI
SALISBURY PARK
PUNE - 411 001

49. MEGHA VISION
24/1 MAIN ROAD
O.K. CHANNAPPA GARDENS
MISSION ROAD CROSS
BANGALORE - 560 027

16. LIST OF FEED AND FODDER SUPPLIERS

1. LIPTON
   10/1, PALACE ROAD
   B'LORE - 52

2. BHASKAR BIO-INDUSTRIES
   SIDDHESHWARA MAHAL
   STATION ROAD
   HUBLI - 580 020

3. BRAHMAPPA.T PVT. LTD
   KRISHNARAJA ROAD
   MANDIPET P.B. NO 7
   DAVANAGERE - 577 001

4. EID PARRY LTD
   PARRY HOUSE
   P.B. NO 12
   MADRAS 600 001

5. GODREJ SOAPS PVT. LTD
   FEROJ SHAH NAGAR
   EASTERN EXPRESS HIGHWAY
   VIKROLI BOMBAY - 400 079

6. HULKOTI CO-OP CATTLE FEED SOCIETY
   HULKOTI
   DHARWAR

7. KARNATAKA STATE AGRO CORPORATION PRODUCT
   BELLARY ROAD
   HEBBAL
   B'LORE - 24

8. KOMARLA FEEDS
   P.B.NO 7165
   53 OLD THARAGUPET
   B'LORE - 53

9. MYSORE FEEDS PVT LTD
   283-284 OLD THANAGAPET
   P.B.NO 7884
   B'LORE - 53

10. SUNDAR SHANA FEED
    9150 SHADAMJI BLDG
    NEEKIGIN ROAD
    HUBLI - 580 029

11. TATA OIL MILLS
    16TH MILE TUMKUR ROAD
    NAGASANDRA
    B'LORE - 73

12. YARNA FEEDS
    87 INDUSTRIAL ESTATE
    P.B.NO 2
    HUBLI 580 030

13. KMF FEED
    RAJAKUNTE YELAHANKA
    B'LORE - 560 064

FODDER

1. IGFRI PAHUJ DHAM
   GWALIOR JHANSI ROAD
   JHANSI - 284 003

2. KARNATAKA STATE SEEDS CORPORATION
   BELLARY ROAD
   B'LORE -24

3. DHONI FARM
   DHONI P.O
   PALGHAT - 678 016

4. REGIONAL STATION FOR FORAGE PRODUCTION AND DEMONSTRATION
   PIONEER SEEDS
   8-1-39 TOLICHOWKI
   HYDERABAD - 500 008

17. LIST OF ON THE JOB TRAINING ORGANISATIONS

1. CENTRAL FRIESBIAN FARM
   HESARAGATTA, B'LORE NORTH
   KARNATAKA

2. RED DANE PROJECT
   HESARAGATTA, B'LORE NORTH
   KARNATAKA

3. REGIONAL RESEARCH STATION
   UNIVERSITY OF AGRICULTURAL SCIENCES
   DHARWAR, KARNATAKA

4. COMPOSITE LIVE STOCK RESEARCH STATION
   DEPARTPMENT OF A.H & VET.SERVICES
   GOVT. OF KARNATAKA
   HESARAGATTA, B'LORE NORTH
   KARNATAKA

5. SOUTHERN REGIONAL STATION
   N.D.R.I B,LORE - 560 030

6. DAIRY FARM, DAIRY SCIENCE COLLEGE
   UNIVERSITY OF AGRICULTURAL SCIENCES
   B'LORE

7. BUFFALO BREEDING FARM
   TEGUR DHARWAR

8. CATTLE BREEDING STATION
   BANKAPUR, DHARWAR

9. RED DANE SUBSTATION
   DHARWAR

10. RED DANE SUBSTATION
    KUDIGE, COORG

11. RED DANE SUBSTATION
    MUNIRABAD, BELLARY

12. CATTLE FARM
    KURIKUPPE, BELLARY

13. CATTLE BREEDING STATION
    AJJAMPUR, CHICKMAGALUR

14. DISTRICT LIVESTOCK FARM
    KOILA, PUTTHUR TALUK
    D.K

15. COMPOSITE LIVESTOCK FARM
ULVARTHY, CHITRADURGA

16. ANIMAL RESEARCH STATION
BIDARAMMANAGUDI
KONEHALLI, TUMKUR

17. REGIONAL RESEARCH STATION
UAS, MANDYA.

18. UAS DEONI FARM
HALLIKHED
BIDAR

18. LIST OF MILK PLANTS OF KARNATAKA MILK FEDERATION

1. BANGALORE DAIRY
   HOSUR ROAD, B'LORE - 27

2. BELGAUM DAIRY
   MALAMARUTTUR EXT, BELGAUM

3. BRLLSRY DAIRY
   NEAR FIRE STATION, BELLARY

4. DHARWAR DAIRY
   RAYAPURA, DHARWAR

5. GEJJALAGERE DAIRY
   MANDYA, MANDYA

6. GULBARGA DAIRY
   HUMNABAD ROAD
   GULBARGA

7. HASSAN DAIRY
   B.M ROAD
   HASSAN

8. KUDIGE DAIRY
   KUDIGE, COORG

9. MANGALORE DAIRY
   KULSHEKA
   MANGALORE - 5

10. MOTHER DAIRY
    G.K.V.K. YALAHANKA
    B'LORE - 6

11. MYSORE DAIRY
    SIDDARTHA LAYOUT
    MYSORE - 1

12. SHIMOGA DAIRY
    MACHENA HALLI, NIDIGE P.O
    SHIMOGA

13. TUMKUR DAIRY
    MALLASANDRA
    TUMKUR - 572 101

14. CHILLING CENTRES

APPENDIX I

Ed.CIL CORE GROUP

1.	Prof. A.K. Mishra Head Department of Vocationalisation of Education National Council of Educational Research & Training New Delhi	Team Leader
2.	Dr. (Mrs.) Santosh Chawla Retd. Principal Lady Hardinge Medical College New Delhi	Member
3.	Prof. S.K. Jamuar Department of Electrical Engineering Indian Institute of Technology, Delhi	Member
4.	Dr. C.K. Mishra Department of Vocationalisation of Education National Council of Educational Research & Training New Delhi.	Member
5.	Dr. A.K. Sacheti Department of Vocationalisation of Education National Council of Educational Research & Training New Delhi.	Member
6.	Prof. H. Puttiah Director Directorate of Vocational Education Government of Karnataka Bangalore	Client Representative
7.	Dr. M.S. Sukhija Director (Technical) Ed.CIL New Delhi	Project Director
8.	Mr. J.J. Nandi Deputy Manager (Projects) Ed.CIL New Delhi	Project Convenor
9.	Mr. Chaman Singh EA(P), Ed.CIL, New Delhi	Project Coordinator

APPENDIX II

LIST OF EXPERTS

1. Dr. A.K. Sacheti
   Department of Vocationalisation of
   Education
   National Council of Educational
   Research & Training
   New Delhi.

2. Dr. S.R. Sampath
   (Formal Head, NDRI)
   N.I.T. Colony, RMV Stage II
   Bangalore

3. Dr. B. Prabhakar Hegde
   Department of Dairy Production
   Dairy Science College
   University of Agriculture Sciences
   Bangalore