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BROAD SYLLABUS FOR ADVANCED FARMERS' COURSE

This course is intended to last for 2 years and is meant for people who have undergone some basic training and field-work experience in farming. Successful trainees should be able to assume intermediate management positions, act as instructors for beginners or head departments within their field of specialisation.

Entry conditions are flexible, but a strong degree of motivation and prior experience in modern farming are the two real essential prerequisites for a trainee's acceptance.

Much of the material of the course will be covered by trainees as they work in the different departments of the SFB to which they will be assigned to work as supervisors. They are expected to keep notes of work done and by asking questions on the job will this cover much of the ground. It is emphasized that since the course has to cover its costs as well as pay the trainees allowance within the overall profitability of the SFB, trainees are expected to work considerably harder than in a conventional training institution. This itself is seen as a very important ingredient of the training programme.

Some of the material will be covered in classwork and private study. There will be approximately 14 hrs of classwork a week and trainees will be required to do study in their spare time.

The Syllabus is divided into the following sections:-

- I General Introductory Section;
- II Basic Science, with sections on animals, plants, soils, climate;
- III Support Studies, with sections on basic reference data, business, plant and machinery, maps and surveying, water supplies, electricity, soil conservation, construction, first aid, health and emergency procedures;
- IV Animal Husbandry with sections on cattle, sheep and goats, poultry, horses and mule, pigs;
- V Dairying;
- VI Crop Husbandry with section on dryland crops, irrigated crops, horticulture, forestry, fodder production;
- VII Veld Management.

SECTION I - General Introduction

Agriculture - its place in the economy of the country and the region of Southern Africa.

Agriculture in a given country - a review of the policies of the Ministry of Agriculture and selected priorities.

Farmers Brigades in Botswana - review their agricultural and educational significance.

Stress need to train employers rather than employees; importance of work discipline and productivity, use of initiative and imagination, job satisfaction.

Stress need to be constantly aware of costs of everything used on the farm, and ways of reducing them more especially by simple daily care and maintenance.

Safety on the farm, with special concern for poisons (insecticides); belts and pulleys, PTO shafts, electricity, tractor etc.

Some advice on personal conduct and behaviour especially towards teaching staff, visitors and customers.

SECTION II - Basic Science

A. Animal Science:

Review main groups of animals encountered in farming, Animal physiology, to cover nutrition, digestion, excretion, respiration, growth and reproduction; Functions of the main organs, especially blood; Principles of breeding and selection and touch on genetics; Parasitism and biological control of pests.

B. Plant Science:

Study of the plant - stem, leaves, root, flowers, fruits with attention to special organs (tubers, bulbs, etc); Plant reproduction sexual and vegetative incl artificial propagation by cuttings etc; Plant physiology, to cover growth, nutrition, respiration, and especially transpiration, osmosis and photosynthesis; Special section on plant/water relationships, wilthing, physiological drought, effect of frost, transplanting;

Principles of breeding and selection.

In sections A & B, emphasize points of similarity to facilitate understanding of the above.

C. Soil Science:

Origin of soils; influence of parent material on soil type;

Formation of soils; weathering, erosion, deposition;

Characteristics of soils:

Structure - important for trainees to gain an understanding of this and how it is affected by soil type, treatment and organic matter and cover;

Composition.

Soil physics, infiltration, capillarity, expansion and shrinking;

The ideal soil and its development;

Manure and fertilizers - sources, costs, their different effects on soils and their relationship to each other;

Carbon, nitrogen and phosphorus cycles;

Soil chemical analysis;

Trace elements and recognition of nutrient deficiencies.

D. Climate:

Rainfall and evaporation, their measurement and recording; use and interpretation of records

Frost, its occurrence and avoidance and its effect on plants;

Lightning, how to minimise its danger;

Temperature and humidity, their significance and inter-relationship;

Wind, its relationship to windpower and exposure of plants.

SECTION III - Support Studies

A. Basic Reference data:-

Using duplicated hand-outs where possible, this would cover items such as breeding cycles, dentition, normal temperatures in animals; vaccination and treatment time-tables for crops and animals; common units of measurement and standard weights and volumes; other handy reference and business data.

Earmarking and branding.

B. Business:--

Stress importance of this section; no good a farmer being able to produce and not being able to sell property;

Keeping good records and their interpretation and tabulation for easy study;

Keeping good accounts, using double entry system of Brigades with main and working ledgers; drawing up a trial balance; being able to interpret simple balance sheets and understand income statements;

Marketing: retail/wholesale; pricing, advertising, consumer preference, packaging;

Marketing Boards, controlled prices; special section on beef marketing procedure through BMC;

Classification of costs into recurrent/capital and direct/indirect;

Gross margins;

Budgets, inventories, stock valuation;

Understand concepts of depreciation and interest on capital;

Insurance - legally required and optional;

Certificates, registrations etc required by farmer (brand, road vehicles, water rights, transport permits, BMC Supplier's registration etc);

Availability of and how to use Government services esp Ministry of Agriculture (and its laboratory services at Sebele), Vet. Dept. with AI Scheme, Laboratory services at Gaborone etc), Geological Survey (availability of underground water and borehole registration). NBCC Secretariat, Surveys and Lands (maps and air photos)etc.;

Post Office; use of telephone (esp answering it), telegrams, post etc.;

Commercial Banks esp for foreign payments, deposits and overdrafts;

National Development Bank;

Railways, how to consign, receive, claim for damage; different tariffs, livestock, passenger services, demurrage;

Customs for imports and exports - RSA and Rhodesia;

Legal - vehicles and firearm licensing;

Tax laws, water laws, labour laws incl preparation of contracts of Service; Trade licensing;

General Business Practice;

writing and answering letters; orders, invoices, delivery notes, statements, receipts, discounts, credit notes, deposits, C.O.D.;

Buying - on credit, by HP, in bulk, locally/distant;
Farmers' and Procedures' Organisations - Co-ops,
companies, syndicates, Farmers' Associations;
Use of media - radio, Daily News, Farmers' Weekly
Agricultural Shows, Agrinews, Public Meetings;
Contact with MP's and Councillors.

D. Plant and Machinery:

Trainee must first understand the FULL cost of buying,
owning, and running a vehicle or machine;
Secondly, he must be fully conversant with its safe
operation and its care and maintenance before he can
finally learn its operation, and spares ordering
procedures;

The following should be covered:

tractor eg MF 135
trailers (2 and 4 wheeled)
ploughs (mouldboard and disc) esp correct setting
and procedure for ploughing;
subsoiler and chisel ploughs,
planters - animal and tractor drawn,
harrows, cultivators and discs,
mower, silage cutter/mill,
grader blade and soil scoop,
stationary engines (air and water-cooled, single and
multiple cylinder types) and especially how to set
them up well; belts and pulleys;
Refrigeration - enough understanding of the physics of
refrigeration to understand a dairy cooling plant and
how to maintain it and identify faults;
Pumps - lift, diaphragm, semi-rotary, impeller/centri-
fugal, piston, screw (Mono) pumps should all be covered
and their relative advantages and disadvantages fully
understood;
The physics of pumping water must also be studied;
Spraying and Injection equipment;
Firearms;
Scales and other measuring equipment;
Harness for animal-drawn equipment;
Dairy equipment covered under Section V - Dairying.

E. Maps and Surveying:

Understand maps, plans and diagrams;

Make drawings and sketch maps to convey information;

Aerial photos; their use, interpretation and how to get them.

Dumpy level - its use (incl practical experience) in mapping and planning furrows, pipelines and reticulations.

Simple building plans;

Scale, conventional signs.

F. Water Supplies:

Understand physics of water flow with relation to head, pipe size, flow rates, friction etc.;

Relate water source and type of pump to planning of supply system;

Design, erection, maintenance and use of tanks and reservoirs;

Planning reticulations incl irrigation lay-outs;

Recognition and use of all types of fitting in common use;

Quality of water;

Sources of water: dams, hafirs, wells, boreholes, springs, rivers, sandriver beds;

Notes on hydrology and geology of water supplies.

G. Electricity:

Safety rules

Enough understanding of the physics of electricity to know the meaning of Volt, Amp, KVA, KW, KWHR, single and 3-phase in planning a reticulation, and recognising trouble;

Operation and care of motors, lights, heaters, switch gear (incl circuit-breakers);

Operation and care of generators;

Importance of good earthing of equipment.

H. Soil Conservation:

Its relationship to and the equal desirability of water conservation;

Stress basic principle - store the water where it falls (by impeding surface run-off by maintenance of good ground cover and sound cultural techniques);

Conservation practice under annual crops, perennial crops, grass according to slope, soil type etc.;

Donga control by treatments and structures and catchment management;

Terraces storm drains;

Section on common mistakes - what NOT To Do;

Flood spreading;

Dam siting, construction and maintenance incl costs.

I. Construction:

Building - designing and siting simple farm building, ordering materials and erecting them;

Simple bricklaying, concrete work (stress importance of quality of materials used in it and subsequent curing), roofing for building like calf houses, poultry houses, pump houses, troughs and reservoirs;

Latrine construction;

Appropriate carpentry;

Cheap building materials and methods;

Fencing: sources and quality of materials, different types of fence;

Gates, kraals, crushers, anchors, corners, strainers etc.

J. First Aid, Health and Emergencies:

Basic teaching on health, hygiene and first aid to be given by trained staff;

Special attention to diseases communicable by dairy workers and spread through milk;

Special attention to procedures after the commoner type of farm accident;

Rabies, bilharzia, malaria, tapeworm, TB, brucellosis etc.;

Burns and electric shock;

Veld fires - their prevention and control.

SECTION VI - Animal Husbandry

A. General Principles:

At present stage of agriculture development in Botswana, standard of management is more important than choice of breed;

Importance of handling animals gently and quietly;

Disease control better achieved by prevention (management) than cure;

Butchering and humane kill procedure;

Post mortem procedure and preparation of samples for vet. lab.

B. Cattle:

(This part of course to cover both beef cattle and exotic dairy cattle kept semi-extensively; students to be made clear about which aspects are relevant to which type)

Outline of different breeds found in Botswana and their relative merits;

Reproduction -- oestrus, gestation, age for first service etc; bulling season, bull: cows ratio; treatment of pregnant cows, calving (incl. difficult calving); care of cow and calf, care of weaners;

Breeding - principles, choice of bull, qualities to aim for;

Reproduction and breeding as related to artificial insemination with detailed cover on its advantages, costs and disadvantages; practical tuition in AI;

Diseases and metabolic disorders - their causes, prevention and cure; special section on mastitis and diseases of calves reared artificially;

Routine treatments of cattle: dipping, castration, weaning, branding, dehorning, vaccinations, worming, weighing, etc.;

Nutrition: full study of the ruminant's digestive system with its ability to process large quantities of low quality bulky feeds and its corresponding dangers from bloat and ingestion of foreign bodies (esp wire);

Importance of access to grazing and clean water; walking distance milking parlour/water/grazing; shade in heat of day; economic consequences of night kraaling etc.;

Principles of feeding for maintenance, growth, production, protein and carbohydrate balance at different stages in growth and for maintenance/production;

Concentrate rations for feeding for beef and for milk and their relation to appetite; the place of bulk feeds like hay and silage in stall-feeding;

Artificial calf rearing;

Milk production: steaming up, feeding for production, qualities of a good lactation, different types of milk (colostrum, high/low fat, etc.);

Milking - correct method, importance of good routine at milking to stimulate let-down and for good hygiene; include a thorough understanding of the physiology of milking and the anatomy of mammary glands;

Accidental poisoning - plants, chemicals, and what to do;
Inspanning of beef cattle - training, costs, etc.;
Correct skinning technique to ensure good quality hides;

C. Sheep and Goats:

Indigenous types and possible exotic types (angora and Saanen goats and dorper and merino sheep) - their relative merits and products;

Compare them with cattle in grazing habits and their effect on the veld and other farm enterprises (eg need for elaborate fencing to control them);

Their various products - meat, hair, milk, wool pelts and their relative value and techniques required for their production;

Special attention needed - protection from predators, cold wet weather;

Internal parasites and their control;

Basic facts on their nutrition, breeding cycles etc.;

D. Poultry:

Outline of different types of poultry kept commercially (chickens, ducks, geese, turkeys) with their relative merits and distinguishing features;

special attention to chickens - difference between "village" fowls, pure bred exotics and highly bred hybrids specialised for meat or eggs;

General principles of poultry husbandry - housing, disease control, food, water, breeding (if required);

Rearing day-old chickens;

Principles of poultry nutrition;

Rearing, feeding and care of layers on extensive/house/battery system; grading and preparation of eggs for market; culling; recording; % age lay;

Rearing, feeding and care of broilers on intensive system; their preparation for market;

Production of own chicks - incubation and brooding;

Vices - their cause cure and control;

Special cover on costs and returns.

E. Horses and Mules:

Considered only as working animals - their breeding has not yet been attempted here so can only be covered theoretically;

Their costs and advantages as sources of draft power on the land and for road haulage;

Routine care - treatment and prevention of disease, feeding and watering before and after work;

Care of hooves, harness;

Importance of careful handling.

F. Pigs:

Brief summary of main points on pig-keeping, stressing the importance of relating feed costs very carefully to the price received for the finished animal;

Careful look at marketing procedures and choice of breeding stock.

SECTION V

Dairying:

Stress the importance of Clean Milk Production before any further processing can be considered, and how this is achieved;

Composition of milk (cows and goats) and how it can be affected by lactating animal's diet, stage of lactation (taints etc);

Basic bacteriology - milk as an ideal growth medium for bacteria;

Dairy processes relevant to Botswana:-

Pasteurising - costs, methods
separating
cream and butter production;
yoghurt, cheese and madila production;
skim milk and whey disposal and uses;

Packing marketing and pricing on the different products;

Laboratory: milk testing and quality control.

SECTION VI - Crop Husbandry:

A. General Principles:

The semi-arid climate of Botswana and the mostly excellent grassland of the country discourage extensive arable farming and favour cattle production - consider ecological and economic implications of this;

Importance of creating favourable environment for crops in view of harsh climate - careful siting of lands and gardens (flood control, shelter belts, as well as soil type and access to water and roads);

Importance of timeliness of operations, moisture conservation, rotation, and hygiene to avoid worst of pests and diseases;

Choice of crops to be relevant to market demands.

B. Dryland Crops:

Production system - traditional, conventional (with animal and tractor power), modern minimum-tillage (with conventional power equipment or toolbar and animal draft) - their relative merits and costs and convenience;

Fallows - their use and how they work;

Discussion of the different cultivation techniques and their use and effectiveness in weed control, moisture conservation etc;

Use of chemicals on the land, esp fertilizer - costs and merits;

Use of manure;

Review of available crops:-

sorghum, maize, millet, wheat, cowpeas, groundnuts, jugobeans, sunflower, cotton - their economics, cultivation, recommended varieties, marketing, etc.

C. Irrigated Crops:

Principles of Irrigation, methods, costs, sources and qualities of water, relative merits of different methods;

Problems of salt accumulation and PH changes;

Maintenance of equipment;

Calculation of application rates and their relation to evaporation pan readings;

Special reference to frost control and fertilizer application with overheard irrigation;

Review of available crops:-

maize, lucerne, cotton, potatoes, onions, groundnuts, with special attention to their fertilizer requirements and labour inputs; other fruit and vegetables covered in D.

D. Horticulture:

Principles of successful gardening - importance of successional planting, sound irrigation system and water supply, total goat-proofing of site and relevance of planting programme to market demand;

Pest and disease control, incl eelworm, importance of garden hygiene;

Importance of regular composting of refuse and heavy application of organic manures, mulch;

Packing and marketing of produce, pricing;

Review of crops:

cabbage, tomatoes, onions, carrots, spinach, potatoes, beetroots, green beans and the most popular with notes on the best varieties, planting season, cultivation techniques, etc.; Look briefly at other vegetables for which there is less demand but which can be grown in certain marketing situations;

Fruit culture: pawpaw, citrus, guava, fig, mulberry, capegooseberry, peach with notes on their propagation and culture;

Study of semi-controlled environment horticulture using the nethouse - its costs, construction and advantages.

E. Fodder production:

Compare silage and hay and grazing standing crops;
Details of hay and silage making;
Crops suitable for above: relative merits of annual and perennial crops for fodder production;
Costs of conserving bulk fodder;
Review of available fodder crops:
 napier fodder, fodder sorghums, maize, lovegrass, buffel grass, etc.; also drought resistant fodder reserve crops like spineless cactus, saltbush, fodder trees (Carob, honey locusts);
Feeding hay and silage.

F. Forestry:

Importance of firewood, building materials, shelter, stockfeed and amenity value in a denuding landscape;
Relevance to bradeor conservation programme;
Nursery practice and propagation methods, availability of seed and planting material;
Site choice and preparation, protection against goats, fire, termites;
Economics;
Review suitable species for planting in Botswana.

SECTION VII

Veld Management:

Systems of grazing management with and without fencing;
Place of fire and bush encroachment;
Types of veld; annual and perennial grasses and their respective desirability and palatability;
Nutritional value of grass and its vulnerability to damage at different stages of growth;
Stocking rates and stockdensities; special reference to short duration grazing.