

U 1 - APPROPRIATE MECHANIZATION TECHNOLOGY FOR ENERGY MANAGEMENT IN AGRICULTURE

Duration: 4 weeks Effective working days: 20 Total Units: 40

General (4 Units)

1. Need for energy conservation in Agriculture.
2. Scope of fuel conservation
 - Proper matching implements
 - Proper maintenance
 - Proper operational techniques
3. Scope of non-conventional energy sources in Agricultural Mechanization
 - Bio fuels
 - Solar energy
 - Wind energy
4. Selection & use of recent energy saving implements – No till drill, Bed planter,
5. Rotavator, Vertical conveyor reaper, etc.
6. Selection, handling and storage of fuels and lubricants
7. Selection of appropriate crop rotation, changing planting patterns

Energy/Fuel conservation potential

Farm Power (10 units)

- Importance of maintenance schedule and hand on practice
- Fuel conservation tips in farm machinery & power

Irrigation Systems (6 units)

- Centrifugal, submersible, jet pumps: general features, selection, installation and maintenance
- Micro irrigation system- Sprinkler, Drip, Rain gun
- Necessity, types, layout and installation of the system
- Adjustments, service & repair of irrigation equipments.

Farm Machinery (20 units)

- Introduction, adjustments, field operation servicing and maintenance of energy efficient agril. Machinery for crop production.
- Efficient hand tools for horticulture, Orchards, gardens, vegetables and crop cultivations
- Tractor drawn and self propelled energy efficient agricultural machinery.
- Rotavator, Power harrow, Pulverizing roller, Subsoiler.
- Zero till drill, Strip till drill, Raised bed planter, Ridger seeder cum fertilizer drill, Rice seeder Rice transplanter, Post hole digger, Rotary power weeder
- P.P. equipment for cotton, orchards, trees and other field crops, High clearance sprayer
- Vertical conveyor reaper (V.C.R)
- Combine harvester
- Straw combine(straw reaper)
- Straw baler
- Forage harvester
- Any other newly developed Agril. Implements/ Machines
- Energy efficient manually operated and animal drawn machinery like
- Seed cum fertilizer drill
- Paddy puddler
- Harrow cum puddler
- Improved bullock cart

U-2 SELECTION, OPERATION, SAFETY AND MAINTENANCE OF IMPROVED AGRICULTURAL MACHINERY

Duration: 6 weeks Effective working days:30 Units:60

1. General (05 units)

- Sources of farm power, status of farm mechanization and scope of farm engines, power
- tillers and tractors.
- Importance of safe operation and handling of farm machinery, observations of road signals, traffic rules etc.
- Study of service repair tools
- Study of fuel, oil & lubricants and their handling and storage.

2. Farm Power (20 units)

- Familiarization with the I.C. engine and brief study of various systems viz. air intake and exhaust, fuel, lubrication, cooling and governing systems.
- Demonstration of engine operation, servicing & maintenance.
- Different types, makes, models and availability of tractors, power tillers and their scope under different farming conditions in India.
- Use of power tiller for intensive farming as a supplemental power unit in farming conditions
- Different types of implements and equipments available for use with power tiller; study and demonstration.
- Introduction to tractors, basic mechanism, main units, control gauges and symbols.
- Pre-starting checks, correct operating and energy saving tips
- Importance of periodical maintenance and service.
- Servicing and maintenance of different systems.
- Demonstration of wheel track adjustment, wheel ballasting etc.
- Safety aspects in Tractor operation.

3. Farm Machinery (24 units)

3.1 Improved Hand tools

Wheel hand hoe, oil seed drill, fertilizer broadcaster, sickle, groundnut decorticator, maize sheller, grain cleaner cum grader, acid delinters, seed treater, horticultural tools.

3.2 Animal drawn implements and hand tools:

Familiarization with different animal drawn improved implements and manually operated tools, study of their constructional features, brief specifications, operation, adjustment and maintenance techniques, sources of supply and conditions under which these can be recommended for use.

3.3 Power operated implements:

Constructional features, selection, adjustment, periodical servicing, preventive maintenance and repair, operating techniques, guidelines, for safety measures during operation and off season storage techniques.

3.4 Seed bed preparation implements and equipments:

Plough, Subsoiler, Rotavator, disc harrow, Cultivator, Pulverizing roller, Land shaping equipments & machines

3.5 Improved sowing and planting equipments

Zero till seed cum fertilizer drill, Strip till seed cum fertilizer drill, Ridger seedercum fertilizer drill, Raised bed planter, Seed drill cum planter, Paddy transplanters and seeders, Automatic potato planter, sugarcane cutter, planter, garlic and vegetable planters, oil seed drills, etc

3.6 Manure and fertilizer spreaders, broadcasters/applicators.

Inter-row weeding and other inter-cultivation equipment - Power weeder, High clearance weeder

Harvesting and Threshing equipment - Self propelled Vertical conveyor reaper, Tractor drawn vertical conveyor reaper, forage harvesters, potato and groundnut diggers, power threshers, combine harvesters, straw reaper, maize sheller, Multicrop thresher etc

Crop Processing machines

Chaff cutters, maize shellers, paddy dehusker/huller, sugarcane crusher, cane detrasher, groundnut decorticators, oil seed crop crusher, dryers, etc. Mini dall mill, crop handling and transporting equipment

4. Irrigation (4 units)

- Types of irrigation pumps, principles of operation, constructional details, application and selection criteria.
- Practice on installation of pump, prime mover, fitting of pipes, valves etc. checking for correct operation, maintenance and troubleshooting.
- Familiarization with the sprinkler & drip irrigation system.
- Familiarization with the voltmeter, ammeter, etc. Checking of circuit, diagnosis of burnt out motor, starter setting for direction of rotation of motor, etc.

5. Plant Protection Equipment (2 units)

- Manual and power operated sprayer and duster including aero-blast sprayer, high clearance sprayers, etc.
- Practice on dismantling, resetting and assembling of sprayers and dusters, nozzles, cut of devices, changing and resetting of valves etc.
- Calibration of sprayers and dusters, Instructions for safe operation, off –season storage techniques.
- Specification and source of availability for plant protection equipments.

6. Alternative sources of farm energy (1 unit)

- Familiarization with construction and working of bio-gas plant, wind mill and solar energy appliances. Their proper care & maintenance.

7. Elementary agronomy & improved farming techniques (2 units)

- Dry farming technology, soil moisture conservation and crop production programme
- Rotation of crop, multiple and intercropping programme.
- Interculture of crops by machines and chemical weeds control methods.
- Use of chemicals (Insecticides / pesticides / weedicides) with spraying and dusting machines and integrated pest managements for control of insects and diseases.
- Storage principle, practice and handling of farm produce.
- Scientific farm management for maximizing production and maintenance of farm records.

8. Agricultural Machinery Management (2 units)

- Selection of farm machines and their matching equipments.
- Use of manuals for operation, maintenance & servicing. Maintenance of logbooks & history sheets.
- Calculation of operational cost for tractor and power tiller.
- Guidelines for storage of essential spare parts of tractors and agricultural machines, etc.

U-3 OPERATION, MAINTENANCE AND MANAGEMENT OF POWER TILLER

Duration: 2 weeks Effective working days: 10 Units: 20

General: 2 units

- Status of power in India for Agricultural Mechanization.
- Scope of power tiller in Indian Agriculture
- Acquaintance with different makes & models of power tiller available in India.
- Selection of power tillers

Operation and Demonstration : 10 units

- Study of different controls of a power tillers & safety instructions.
- Study of constructional features, adjustments, preventive maintenance and operating techniques of power tiller in tillage, puddling, seeding & planting, interculturing, plant protection, harvesting & post-harvesting, material handling and transporting machinery / equipment.
- Field practice with the above equipments and different seed bed preparation techniques with rotavator.
- Demonstration with special attachments i.e pit digger, tree cutter, grass cutter, etc.
- Study of ergonomic aspect in the operation of power tiller.

Repair & Maintenance: 8 units

- Study of constructional features, maintenance and repairing techniques of different systems of engine viz. air cleaning, fuel, lubrication, cooling etc.
- Study of constructional features, maintenance and repairing techniques of gear shifting mechanism, final drive & rotary drive
- Periodical maintenance and trouble shooting of Power tiller.
- Cost economics of operation of power tiller.

U-4 TRAINING PROGRAMME ON AGRO-PROCESSING AND VALUE ADDITION EQUIPMENTS

Duration: 2 weeks Effective working days: 10 Total Unit: 20

General : 4 Unit

- Problems in post harvest management practices of food grains, perishable crops including fruits and vegetables.
- Scope of Agri-preneurs /entrepreneurs in the field of Agro – processing and value addition.
- Technology for value added products for food grains, oil seeds, pulses, spices and plantation crops.
- Pre-requisite for Agri-preneurs/entrepreneurs and related business cultivation.

Processing Technology : 14 Units.

- Familiarization, Specific use and study of the following processing equipment to develop high quality produce:
- Cleaners & graders for food grain, vegetables, fruits, pods etc.
- Driers and dehydrator
- Grinders
- Decorticator
- Dehusking & scouring machines/hullers & shellers
- Poly house for raising vegetables/flowers
- Straw handling machine for animal feed

- Dal mill, floor mill, crusher
- Polishing
- Feed block preparation
- Maize Sheller
- Sugarcane crusher/ Gur making
- Storage structures
- Oil expeller
- Packaging & weighing equipment
- Refrigeration and cold storage equipment
- Any other equipment of regional requirement.

Study tours to various Agro Processing Units: 2 Units

To evaluate the technological status and associated problems for establishment of Agro processing unit.

U5-GENDER FRIENDLY EQUIPMENTS FOR WOMEN FARMERS

Working days: 03 Total Units : 06

General: 2 units

- Involvement of women in Agriculture.
- Technology and Gender issue.
- Ergonomical characteristics of women farmers.
- Assessment of drudgery during work.
- Improved farm tools and Equipments for women farmers.
- Safety gadgets for hand chaff cutter.
- Safety in operation of farm tools and machinery.

Demonstration of Selected tools and equipments popular in the region: 4 units

- Seed treatment drum, Acid delinters –small, medium & commercial grade, Hand Ridger, Dibbler. Manual seed drill, crust breaker, manual paddy transplanter Hand wheel hoe, Grubber.
- Hand operated sprayers.-Knap sack sprayer, Foot operated sprayer, Rocking type sprayer, Ultra Low Volume sprayers, Fertilizer broadcaster, Safety kit.
- Improved sickles - Punjab, CIAE models, Bhindi plucker, Scythe, Hand chaff cutter, Sugarcane stripping knife, Cotton stalk puller, Horticultural tools, Tubular maize sheller Groundnut decorticator, Pedal operated cleaner cum grader, Hanging type double screen grain cleaner, Grain mills and Dal mill with motors, Potato peeler and slicer and other equipment, Aonla pricking machine, papad and wadi making devices.

U-6 UTILIZATION OF NON-CONVENTIONAL ENERGY SOURCES IN AGRICULTURE

Duration: 1 week Effective working days: 5 Units:10

- Introduction and scope of non-conventional energy sources in agriculture
- Familiarization with wind mill and wind generator set.
- Study of solar energy appliances i.e solar water pump, water heater, distilled water plant, solar cooker, solar grain dryer, solar energy operated street light, etc.
- Bio-gas plant- General constructional features of various types, capacity, requirement of raw material and importance of its bi-products.
- Demonstration of cooking gas appliances and diesel engines running on bio gas and their periodical maintenance

U-7 WATER MANAGEMENT THROUGH SPRINKLER AND DRIP IRRIGATION AND WATER SAVING DEVICES

Duration: 1 week Effective working days: 5 Units: 10

General: 2 units

- Introduction of micro irrigation system in water management and comparison with conventional irrigational practices with special emphasis on energy conservation.
- Need of drip and sprinkler irrigation systems, its limitations and introduction to basic components.
- Water requirement of various crops and soil- water- plant relationship.
- Significance of drip and sprinkler irrigation systems and rain gun.

Description, Operation and Water management: 8 units

- Drip & Sprinkler irrigation system- Study of basic hydraulics, components, design, layout and their installation. Study and application of Design chart and design procedure: mains, sub mains and lateral line design charts for uniform and non-uniform slopes.
- Suitable pumping and power units for various micro irrigation systems.
- Operation, maintenance, management and trouble shooting of the above systems.
- Cost analysis of each systems

U8- SELECTION, OPERATION AND MAINTENMANCE OF PLANT PROTECTION EQUIPMENT

Duration: 1 week Effective days: 05 Days Units: 10

General: 1 unit

- Necessity, principles and method of plant protection for food and fruit crops.
- Study of plant disease, their causes and remedies.
- Study of main insects and their chemical control.
- Study on function, construction, selection and utilization of various manual and power operated plant protection equipment.
- Selection of appropriate plant protection equipments, their source of availability, cost etc.

Operation and Maintenance: 7 units

- Description, adjustment of various types of equipment and their demonstration
- Operation of manual operated and power operated plant protection equipment viz. Sprayers, Dusters, Fog generator etc.
- Dismantling and assembling of commonly used manual / power operated P.P. equipment. Types of pumps, nozzles, cut-off devices, spray pattern, calibration and adjustment of sprayers and dusters. Study of each component their maintenance and repair/ recondition.
- Service and off season storage techniques.

Calibration and Safety: 2 units

- Calibration of Sprayers for metering of appropriate spray volume of chemicals & optimum particle size.
- Instructions and precautions for safe operation of the plant protection equipments.
- Economics of Plant protection technique/ machines.

U9- SELECTION, OPERATION AND MAINTENANCE OF IMPROVED HARVESTING & THRESHING MACHINES

Duration: 2 week Effective days: 10 Days Units: 20

General: 2 units

- Scope of harvesting and threshing machines in Indian Agriculture and comparison with conventional and improved harvesting and threshing techniques already prevailing in the country.
- Acquaintance with major manufacturers of harvesting and threshing machines in India.
- Study of different harvesting machines such as tractor/ power tiller operated reaper, self propelled harvester, straw reaper etc.
- Importance of safety legislation to BIS and acquaintance with Dangerous Machine Act; responsibility of the manufacturer, supplier and user.

Description, Operation and Maintenance: 18 units

- Principles of working, Selection criteria, Types of Mowers, Vertical conveyor reaper, Reaper Binder, Power Thresher, Combine Harvester, Maize Sheller, Groundnut Decorticator etc.
- Familiarization and study of various systems of reaper, mower, Vertical conveyor reaper, thresher, combine harvester etc. and their technique of safe operation.
- Study and demonstration of following adjustment: cutter bar height, registration and alignment of reaper and combine harvester. Cylinder speed, concave clearance, blower speed, sieve adjustment, alignment of the pegs / beaters of the thresher.
- Installation of Vertical conveyor reaper on tractor/ power tiller and installation of thresher on threshing floor, pre-starting checks, alignment of belts with prime mover, attaching thresher with P.T.O. of a tractor
- Operation and demonstration of self propelled vertical conveyor reaper, power tiller operated vertical conveyor reaper & tractor front mounted vertical conveyor reaper, depending upon the suitability / availability of crop.
- Operation and demonstration of axial flow paddy thresher, groundnut thresher, Hadamba type and multi crop thresher depending upon the suitability / availability of crops.
- Preventive maintenance and off season storage technique.
- Cost analysis of threshing and harvesting techniques over conventional methods.

U10- SELECTION, OPERATION AND MAINTENANCE OF HAND PUMPS

Duration: 03 days Effective days: 03 Days Units: 06

General: 1 units

- Importance of potable water for the common man – Discussion on requirement, problem of scarcity and alternatives available for providing safe and hygienic water.
- Study and discussion on health, hygiene and balance diet. Familiarization with the national health plan.
- Hand pump – a sustainable water source, a discussion. The concept of VLOM (Village Level Operation and Maintenance).

Operation, Installation and Maintenance: 5 units

- Working principle of simple hand pump, familiarization with components.

- Introduction with the different type of special tools used during repair, maintenance and installation of hand pump.
- Dismantling, assembling and repair techniques of various hand pumps with special emphasis on IM-II and IM-III (India mark) improved hand pumps.
- Practice on installation (lowering and lifting in the tube well) and commissioning, precautions, techniques and trouble shooting.
- Familiarization and study on tube well drilling, water table, draw down, recharging capacity, selection of pipes & size, pipe fittings etc.

U 11 SELECTION, OPERATION AND MAINTENANCE OF AGRICULTURAL MACHINERY FOR DRY LAND AGRICULTURE

Duration: 2 Weeks Effective days: 10 Days Units: 20

GENERAL: 2 UNITS

- Concept of Dry-land Farming. Importance of Rain fed farming system in Indian Agriculture. Study of different cropping patterns recommended for Rain fed farming system. Selection of crops as per Agro-climatic conditions.

MACHINEY & EQUIPMENTS FOR DIFFERENT FARM OPERATIONS (18 units)

Tillage machinery

- Improved Implements/Machineries for important crops, such as cereals, pulses (red gram), oil seeds (groundnut, sunflower, etc)
- Study, Demonstration and Maintenance of Tillage implements used in Dry land Agriculture, such as plough, rotovator, Guntaka, cultivators, etc.

Seeding and planting equipments

- Study and Maintenance including calibration of Seeding and Planting Equipments in Dry land Agriculture, such as Drill-plough, Inclined plate type Planter, Dibblers, etc.
- Demonstration of Seeding and Planting Equipments

Harvesting, threshing and processing equipments

- Study and Maintenance of Harvesting, Threshing and Processing equipments/ tools used in Dry land Agriculture, such as Improved Sickles, Groundnut Digger, Reapers, Multi-crop thresher, Groundnut thresher, Groundnut Stripper, Red-gram thresher, Sunflower thresher, Maize Sheller, Groundnut Decorticator, Mini Dall-mill etc.
- Demonstration of Harvesting, threshing and processing equipment.

Intercultural and plant protection equipments

- Study, maintenance and Demonstration of Intercultural equipments, such as weeders, hoes, etc. and plant protection equipments.

Water management

- Watershed Management, Water Conservation through modern rain harvesting techniques, recharging of wells, etc.

U-12(a) PACKAGE OF MACHINERY FOR PADDY CULTIVATION

Duration: 1 weeks Effective work days: 5 units: 10

General: 1 unit

- Present status in different states and scope of paddy mechanization in India, average paddy production, different varieties of paddy.

- Source of power and types of machines used in paddy preparation.

Tillage and transplanting machinery: 6 units

Study and demonstration of:

- Tillage implements viz. plough, harrow, cultivator, rotavator, puddler, cage wheel etc.
- Field operation with tractor and power tiller with primary tillage and secondary tillage implement, energy saving tips while using machine in paddy field.
- Method of growing mat type nursery, field practices for nursery development.
- Techniques of supplying water in nursery, use of manure, fertilizer and pesticide for developing of plant, maintenance of nursery.
- Constructional features of transplanter and transplanting of paddy by different transplanter like, manual transplanter, self propelled transplanter,.
- Advantage of using paddy transplanter over manually transplanting method. Importance of paddy weeder
- Trouble shooting of paddy transplanter while using in field and its remedies, servicing and maintenance of paddy transplanters.
- Fertilizer broadcaster, sprayers and dusters.
- Method of irrigation in paddy crop cultivation, selection, installation and operation of pump set for irrigation in paddy fields and trouble shooting of pump sets.

Harvesting and threshing equipment: 3 units

- Study, demonstration, adjustment & servicing of vertical conveyor reaper, threshers, combine harvester, winnower etc.

U-12(b) PACKAGE OF MACHINERY FOR MAIZE CULTIVATION

Duration: 1 weeks Effective work days: 5 units: 10

General: 1 unit

- The importance of maize cultivation in India, scope for maize productivity and production in India. Use of maize in different parts of the country.
- Cropping system for advancing maize production, improved varieties of maize and their source of availability.
- Agronomic practice for higher production of maize

Cultivation machinery: 8 units

- Study, use, calibration, adjustment, maintenance, trouble shooting and demonstration of various machines used for field preparation, sowing, harvesting, shelling , etc. with special emphasis on :
 - ✓ Manually operated, animal drawn and tractor operated maize planter.
 - ✓ Weeder
 - ✓ Maize sheller, cleaner & grader
- Installation, adjustment and operation of power driven maize sheller. Safety precaution and trouble shooting in shelling operation.
- Shelling of maize by tubular maize sheller, cleaning, grading and storage of maize.
- Value of maize as food grain, scope of marketing of maize and its bi-products.

U12 (c) PACKAGE OF AGRICULTURE MACHINERY FOR VEGETABLE CULTIVATION

Duration: 1 Week Effective days: 05 Days Units: 10

General: 2 units

- Major crops grown in India with special emphasis on promotion and adoption of vegetable crops for better farm income.
- Scope of vegetable cultivation, selection of improved varieties and seed, market trend and comparative economic analysis.
- Brief study of soil type, climate, topography, water requirement and moisture conservation technique.
- Introduction to Propagation techniques viz. direct sowing, transplanting, budding etc.

Description, Operation and Maintenance: 8 units

- Selection of Machinery/equipments for seed bed preparation, sowing / transplanting, earthing / interculturing, spraying/ dusting, harvesting, transporting and processing of various important vegetable crops.
- Function, operation and maintenance of rotavator/ harrows, cultivator, ridger/ ditcher, planter/ transplanter, manual/ power operated sprayer- duster, digger shaker etc.
- Introduction and study of micro irrigation system- drip and sprinkler irrigation: selection, design layout, installation etc.
- Selection, operation and maintenance of sprayer and duster, nozzle adjustment, calibration and precaution during operation.
- Selection, operation and maintenance of harvester/ digger, suitable for specific crops.
- Cost analysis for cultivation of vegetables.

U12 (d) - PACKAGE OF AGRICULTURAL MACHINERY FOR SUGARCANE CULTIVATION

Duration: 1 week Effective days: 05 Days Units: 10

General (2 units)

- Introduction to agronomical practices for Sugarcane Cultivation.
- Introduction to land development/ seedbed preparation implements.

Description, Operation and Maintenance: 8 units

- Demonstration on working of land and seedbed preparation.
- Introduction to sett-cutter i.e. improved manual blade type and power operated Sett-cutter and their demonstration.
- Introduction to Sugarcane planter i.e. Bullock drawn and Tractor drawn Semi Automatic planter, Tractor drawn automatic sett-cutter cum planter, their adjustment, demonstration and service.
- Introduction to weeding and soil earthing implements, their adjustment and demonstration.
- Introduction to spraying equipments i.e. Wide swath boom with foot sprayer and Power sprayer their adjustment and demonstration.
- Practice on maintenance of spray boom and foot sprayer, calibration & resetting of sprayer, cut-off device, changing and resetting of valves etc.
- Introduction to sugarcane harvester i.e. improved manual cutting blade, tractor operated harvester.
- Demonstration on mounting and operation of Tractor operated harvesters.
- Introduction to Sugarcane detrashers i.e. Hand operated detrasher and Power operated detrasher and their demonstration.
- Introduction to stubble shaver with off baring fertilizer attachment and demonstration on operation of stubble shaver.

U12 (e)- PACKAGE OF AGRICULTURE MACHINERY FOR HORTICULTURE & MEDICINAL CULTIVATION

Duration: 1 Week Effective days: 05 Days Units: 10

General: 2 units

- Major crops grown in India with special emphasis on promotion and adoption of horticulture plants and medicinal crops for better farm income through export.
- Scope of horticulture and medicinal crop cultivation, selection of appropriate seeds / seedlings for a specific package, market trend and comparative economic analysis.
- Brief study of soil type, topography, climate water requirement and moisture conservation techniques
- Introduction to Propagation techniques viz. direct sowing, transplanting, budding etc.

Description, Operation and Maintenance: 8 units

- Selection of equipment for seed bed preparation, sowing / transplanting, earthing / interculturing, spraying/ dusting, harvesting, transporting and processing of various important horticulture and medicinal crops.
- Function, operation and maintenance of rotavator/ harrows, cultivator, ridger/ ditcher, post hole digger, planter/ transplanter, manual/ power operated sprayerduster, digger- shaker etc.
- Introduction to Green House Concept, preparation of nursery, techniques for nursery transplantation and the study of various packages for combination of crops.
- Introduction and study of micro irrigation system- drip and sprinkler irrigation: selection, design layout, installation etc.
- Selection, operation and maintenance of sprayer and duster, nozzle adjustment, calibration and precaution during operation.
- Selection, operation and maintenance of harvester/ digger, suitable for specific crops.
- Cost analysis for cultivation for horticulture and medicinal crops
- Selection, operation and maintenance of equipments for transportation and processing of fruits and medicinal crops.

U12 (f) – PACKAGE OF AGRICULTURAL MACHINES FOR OIL SEED AND PULSE CROPS

Duration: 1 week Effective days: 05 Days Units: 10

General: 2 units

- Scope of oil seed crop s productivity and production in India.
- The oil seed situation in India.
- Constraints and opportunity of oil seed production in India.
- Production technology for Kharif oil seed crops, like Soyabean, Til, Groundnut, Castor, Sunflower, Red gram, Black gram, Green gram etc.
- Production technology for Rabi crops like Mustard, toria, etc.
- Cropping system for enhancing advancing oil seed production.
- Improved varieties of all Kharif and Rabi oil seed crops.
- Introduction to Agronomical Practices for oil seed and pulses crops.

Operation, Maintenance & Demonstration: 8 units

- Demonstration of seedbed preparation equipments.
- Different method of sowings, Constructional features of seed cum fertilizer drills, ridger seeder cum fertilizer drill and planters used for Mustard, Groundnut and Soya bean etc. Introduction, selection and demonstration of various inter cultivation and weeding equipment (Manual, animal & power operated)
- Selection, safe operation, precaution while using plant protection equipment suitable for different conditions and its necessity.
- Demonstration on resetting and adjustment of sprayers and dusters, different nozzles, Cut-off devices, changing and resetting of valves etc, Calibration of sprayers and its safe operation.

- Different methods of harvesting and threshing for Mustard, Groundnut, Soyabean and Sunflower crops , constructional features and adjustment of combine harvester.
- Adjustment of thresher for cylinder speed, cylinder concave clearance, speeds of blower, shacking of screen etc. Actual operation, trouble shooting in thresher operation in oil seed crop
- Introduction to winnowing, cleaning, handling, packing, storage and processing equipments.
- Off-season storage techniques and source of availability.

U12(g)– PACKAGE OF AGRICULTURAL MACHINERY FOR FORAGE / FODDER PRODUCTION AND FODDER MANAGEMENT.

Duration: 1 week Effective days: 05 Days Units: 10

General: 2 units

- Importance of specialized farm machinery for fodder production.
- Introduction to different Harvesting, windrowing and cropping machinery for different fodder crops.

Specialized machinery for tillage and sowing of fodder crops : 2 units

Machinery for fodder harvesting and management : 6 Units

- Selection, use, operation & maintenance of different Machinery available for Fodder and Forage harvesting such as Mower, Rotary harvester, Reaper windrower, Forage harvester, Hay conditioner, Hay rake, Straw combine, Hay baler, Tipping trailer, Chaff cutter, Silage loader

U13-INFORMATION TECHNOLOGY APPLICATION IN FARM MECHANIZATION

Duration: 1 week Effective days: 05 Days Units: 10

General

- Basics of computer, familiarization with computers its significance and utilization of information technology in farm mechanization.

Utilization, operation & practice

- Utility of internet, web browsing, search engine, e-mail etc. and their application.
- Familiarization with database for appropriate Farm mechanization system through web browsing:
- Locating different institutions for financial back up, improved farm equipment manufacturers/ suppliers, research & training institutions etc
- Selection of crop specific machinery their requirement, market trends, annual cropping, price and weather forecasting.
- Practice on access to various informational technologies related to agricultural mechanization in and around the country.

T-1 REPAIRING AND OVERHAULING OF ENGINES AND TRACTORS

Duration: 6 weeks Effective working days:30 Units:60

1. General: 4 Units

- 1.1 Market assessment for services: customs etc. criteria for layout of small and medium service centres.
- 1.2 Financial analysis, selection of tools and equipments
- 1.3 Emerging pattern of machinery use; routine and periodical maintenance jobs on tractors, power tillers, etc.
- 1.4 Safety in handling machines and equipments
- 1.5 Selection of tractors and implements based on farming conditions
- 1.6 Study of fuel oil and lubricants, their handling and storage.

2. Farm Powers: 12 Units

- 2.1 Working principles of engine, study of various systems of engines. Air intake, fuel supply, lubrication, cooling & governing.
- 2.2 Dismantling of engine and detailed study of various components, measurement of clearances & tolerances reconditioning and adjustment of components.
- 2.3 Assembly of engine, operation, discussion on various troubles and remedy.

3. Tractor: 40 Units.

- 3.1 Study of different sub-assemblies, safe and correct procedure for dismantling and assembly. Use of special tools and measuring equipments used for maintenance and repair.
- 3.2 Engine dismantling and inspection of various parts, measurement of clearance, reconditioning, adjustment balancing, minimum permissible wear limits on different parts, fuel supply system dismantling and study of fuel feed pump, injector, governor, fuel filter and assembly. Engine assembly and trouble shooting.
- 3.3 Clutch – dismantling and study of clutch and its components adjustment and assembly.
- 3.4 Transmission – Study of gear box, differential and final drive, adjustments of clearances and backlashes of various gears, assembly of gear box differential and final drive and their adjustments.
- 3.5 Brake & steering – dismantling and study of each system, their components, adjustment, repair and assembly.
- 3.6 Wheel equipment – care and maintenance, repair of tyre and tubes, fitting of cage wheels and adjusting track width for different farm operations.
- 3.7 Hydraulic system, principle of hydraulic system, components, draft and position control system, dismantling and study of system, adjustment of various valves, pressure setting, trouble shooting etc.
- 3.8 Diagnostic techniques to assess the condition of the engine through Dynamometer, compression pressure test gauge etc.
- 3.9 Guideline for stocking tractor spare parts

4. Electrical System: 4 Units.

- 4.1 Dismantling and study of battery, dynamo, self starter, voltage and current regulator and lighting system.
- 4.2 Practice on use of voltmeter, ammeter, maggar, etc. Checking of circuit, diagnosis of burnt out motor, starter setting, setting for direction of rotation of motor. Electrical motors – service and maintenance of auto electrical equipments.

T2- REPAIR AND OVERHAULING OF POWER TILLER

Duration: 2 weeks Effective days: 10 days Units: 20

1. General: 4 units

- 1.1 Scope of Power tiller in Indian Agriculture.
- 1.2 Acquaintance with different make and models of Power tiller available in India.
- 1.3 Familiarization with different tools and special tools required for major overhauling of Power tiller.
- 1.4 Study of operator's manual, repair/maintenance manual and any other literature supplied by manufacturer.
- 1.5 Study of different working systems of Power tiller.

2. Dismantling and Assembling of Engine: 6 units

- 2.1 Study of different components of engine.
- 2.2 Checking of clearance, tolerance of different components.
- 2.3 Timing gear setting, tappet clearance setting, fuel timing adjustments, checking injector pressure, compression pressure etc.
- 2.4 Inspection of engine head, head gasket and valve seat; valve lapping etc.
- 2.5 Inspection and preparation of engine packing, tightening bolts and nuts with specified torque.

3. Dismantling and Assembling of Clutch: 2 units

- 3.1 Study of different components of clutch.
- 3.2 Checking the condition of clutch plates/liners for breaking, burning, smoothing etc. and decision about its replacement/repair.
- 3.3 Assembling of clutch and its free play adjustment.

4. Dismantling and Assembling of Gear box and final drive: 4 units

- 4.1 Study of different component of gearbox and final drive.
- 4.2 Dismantling of gear box and final drive, checking the conditions of gears for any physical damage to their teeth, checking the backlash of the, matting gears, condition of bearing, rubbing or heating due to wrong fitting.
- 4.3 Assembling of gearbox and final drive and checking for its smooth functioning.

5. Dismantling and Assembling of Rotary drive and Chain case: 4 units

- 5.1 Study of different component of rotary drive and chain case.
- 5.2 Dismantling the chain case and checking the condition of chains, sprockets, chain tensioner etc.
- 5.3 Assembling rotary drive and chain case and checking for its smooth functioning.
- 5.4 Trouble shooting of engine, gearbox, final drive, rotary drive, chain case etc.

T3- ESTABLISHMENT AND MANAGEMENT OF AGRICULTURAL MACHINERY REPAIR AND MAINTENANCE WORKSHOP

Duration: 4 Week Effective days: 20 Days Units: 40

1. General: 4 units

- 1.1 Source of farm power, status of farm mechanization and scope of improved agricultural machines in India.
- 1.2 Importance of safety in handling machine and equipments.
- 1.3 Study of fuel, oil and lubricants, their handling and storage.
- 1.4 Market assessment for services, custom hiring etc. Criteria for location layout and financial analysis of small and medium service centers,
- 1.5 Need for repair, reconditioning and adjustment of farm equipment. Selection of appropriate tools and equipments for modern workshop.

2. Farm Machinery: 15 units

- 2.1 Familiarization with different animal drawn improved implements and manually operated tools, study of their constructional features, brief specification, operation, adjustment, maintenance, repair/ reconditioning techniques,
- 2.2 Familiarization with the different power operated implements, constructional features, adjustments, maintenance, reconditioning/ repair –Tillage implements such as mould board and disc plough, sub soiler, disc harrows, cultivators, rotavator of different types.
- 2.3 Land shaping equipments and machines.
- 2.4 Dry land farming implements and equipments. Post hole digger, Manure and fertilizer spreader, broadcaster, applicators, source of availability.
- 2.5 Zero till seed cum fertilizer drill, Ridger seeder cum fertilizer drill, Strip till seed cum fertilizer drill, Raised bed planter, Seed drill cum planter, Paddy transplanters and seeders, Automatic potato planter, sugarcane planter, garlic and vegetable planters, sweep type cultivator, weeder, etc.
- 2.6 Paddy cultivation machinery, transplanter, rotavator.
- 2.7 Inter-row seeding and other inter-cultivation equipments.

3. Irrigation: 4 units

- 3.1 Types of irrigation pumps, principles of operation, constructional details, application and selection criteria.
- 3.2 Practice on installation of pump, prime mover, fitting of pipes, valves etc. checking for correct operation, maintenance repair/ reconditioning techniques and troubleshooting.
- 3.3 Familiarization with the sprinkler & drip irrigation system.
- 3.4 Familiarization with the voltmeter, ammeter, etc. Checking of circuit, diagnosis of burnt out motor, starter setting for direction of rotation of motor, etc.

4. Plant Protection Equipment: 2 units

- 4.1 Manual and power operated sprayer and duster including aero-blast sprayer, high clearance sprayers, etc. Practice on dismantling, resetting and assembling of sprayers and dusters, nozzles, cut of devices, changing and resetting of valves etc. operation, adjustment, maintenance, repair/ reconditioning techniques.

5. Harvesting and threshing equipment: 4 units

- 5.1 Vertical conveyor reaper, forage harvesters, , power threshers, combine harvesters, straw reaper, potato and groundnut diggers, maize sheller etc operation, adjustment, maintenance, repair/ reconditioning techniques,

6. Crop Processing machines: 4 units

Sugarcane crusher, cane detrasher, chaff cutters, maize shellers, paddy dehusker/huller, groundnut decorticators, oil seed crop crusher, dryers, etc. operation, adjustment, maintenance, repair/ reconditioning techniques,

7. Crop handling and transporting equipment : 4 units

Operation, adjustment, maintenance, repair / reconditioning techniques.

8. Alternative sources of farm energy: 1 unit

Familiarization with bio-gas plant, wind mill and solar energy appliances operation, adjustment, maintenance, repair/ reconditioning techniques.

9. Agril. Machinery Management: 2 units

9.1 Selection of farm tractors and their matching equipments.

9.2 Use of manuals, parts catalogue etc log books & history sheets.

9.3 Calculation of cost of operation for a modern agricultural machinery repair workshop

T 4- STUDY AND REPAIR OF HYDRAULIC SYSTEMS IN AGRICULTURAL MACHINES

Duration: 4 week Effective days: 20 days Units: 40

1. General: 2 units

- 1.1 Basics of Hydraulic system.
- 1.2 Familiarizations with various terminologies related to hydraulic systems like to be applied during the course viz. cross-sectional area, volume, pressure, discharge, lifting capacity etc.
- 1.3 Principle of working of simple hydraulic system, constructional details, importance and benefits over mechanical systems.
- 1.4 Application of Hydraulics in modern machines/vehicle/tractors etc.

2. Description of the System: 4 units

- 2.1 Tractor Hydraulic System and Drawbar- Principles of operation, different components and control. Geometry of the three point linkage.
- 2.2 Types of Hydraulic systems- Importance, specialties, application and study of draft, position and mixed control systems.
- 2.3 Dismantling and study of Single and Double acting hydraulic systems.

3. Overhauling and Repair: 28 units

- 3.1 Hydraulic system of general purpose Tractors
- 3.2 Study of various components and control, Geometry of three point linkage.
- 3.3 Dismantling of hydraulic system.
- 3.4 Practical study of rotary type hydraulic pump, distributor, ram cylinder, relief valve, linkages etc.
- 3.5 Practice on dismantling and assembling of complete system.
- 3.6 Demonstration on various adjustments, pressure setting in the hydraulic system during assembling.
- 3.7 Demonstration on servicing and trouble shooting of hydraulic system.

4. Visits and Demonstration: 2 units

- 4.1 Visit to Testing Wing and Demonstration on tractor hydraulic test setup.
- 4.2 Visit to Hi-tech Institutes / Tractor manufacturers.

5. Description of Miscellaneous Hydraulic Machinery: 4 units

- 5.1 Study of pumps, cylinders, hose, valves, joints, fittings etc.
- 5.2 Hydraulic brake and hydraulic steering: Study of various components, understanding oil flow diagrams, linkage arrangements etc of the above system.
- 5.3 Usage of Inner and Outer circuits of tractor hydraulics- setting, field adjustments and practice of tractor hydraulic control.
- 5.4 Use of instructional manuals, spare parts catalogue and preparation of logbooks, history sheets etc.

T5- REPAIR AND MAINTENANCE OF AUTO ELECTRICAL EQUIPMENTS AND BATTERY RE-CONDITIONING

Duration: 3 Week Effective days: 15 Days Units: 30

1. Fundamental of Electrical storage battery:

Type, constructional details, voltage, amperage, constructional material, chemical reaction, capacity, electrolyte, effect of temperature on specific gravity and charging of battery.

2. Rebuilding of Battery:

Diagnosis of dead battery, step wise dismantling of battery, inspection of components, requirement of material for rebuilding of a battery, step by step rebuilding of a battery, preparation of electrolyte and charging of battery.

3. Dynamo:

Fundamentals, types, circuit diagram, constructional details, dismantling, checking and assembly, testing, maintenance and trouble shooting.

4. Armature Winding:

Testing of commutator, insulation of slots, insulation of armature, hand winding, commutator connection, soldering, varnishing, generator trouble shooting, armature inspection, short circuit, fault, leakage test, practice on commercial tractor vehicle armature.

5. Self Starter:

Fundamentals, types and their circuit diagrams, constructional details, dismantling, study and assembly, care and maintenance, trouble shooting and testing.

6. Alternator:

Fundamentals, types and their circuit diagrams, constructional details, dismantling, study and assembly, care and maintenance, trouble shooting and testing.

7. Voltage and Current regulator:

Need for cutout, regulation, types and their application, circuit diagrams of different type of Regulators, checking and adjusting regulator, maintenance and care, trouble shooting.

8. Wiring:

Wiring circuit of different tractors, e.g B-275, MF-1035, HMT-2511, Ford-3600, Escort-335, Swaraj-724-855, Eicher, location of faults and their remedies.

9. Lights

Front, back, side lights & indicators

T6 - REPAIR, MAINTENANCE & REWINDING OF ELECTRICAL MOTORS AND SUBMERSIBLE PUMPS FOR AGRICULTURE USE

Duration: 3 Week Effective days: 15 Days Units: 30

1. Fundamentals of Electrical Motors:

Basic principles, types, functional components, dismantling and assembly, trouble shooting, servicing and maintenance of Electrical Motors.

2. Rewinding of Motor Dynamo Armature:

Reasons for burning of winding and methods of testing, function and types of winding, elements of winding, calculation of size of conductors and number of turns etc., material for winding, sequence for rewinding, practice on commercial motors, fans, grinders etc.

3. Starter for A.C. Motors:

Necessity types, components, their setting and trouble shooting, testing and fault location.

4. Motors for Irrigation Pumps:

Basic principles, types, functional components, dismantling and assembly, troubleshooting, servicing and maintenance, method of starting, changing direction of rotation, location of faults.

T7- OPERATION AND MAINTENANCE OF LAND SHAPING AND DEVELOPMENT MACHINERY

Duration: 4 Week Effective days: 20 Days Units: 40

1. General: 4 units

Importance of land leveling and grading, various operation involved surveying, layout, earth work for leveling, irrigation and drainage channels bunding, culverts, hume pipe, syphons etc.

2. Survey: 4 units

2.1 Planning of survey, terminology, introduction to conversion table, familiarization with survey equipments i.e measuring chains tapes, staff, levels (i) dumpy level (ii) farmer's level, theodolite optical square, compass – etc.

2.2 Survey practice.

2.3 Layout of fields, bounds and drainage with reference to farm development.

3. Machines used for Land shaping:

3.1 Crawlers and Bulldozers: 18 units

3.1.1 Engine clutch, central frame, transmission, power take-off, rear wheel assembly, track wheel, track, track frame, fastening torque converter.

3.1.2 Driving practices, operation and acquaintance with various controls, steering, and selection of gears.

3.1.3 Care and adjustment of under carriage parts, servicing and maintenance, operational performance, how to increase yardage, reduced cost, way to get better longer service from dozer, trouble shooting.

3.1.4 Bulldozer- General description, types of blade angles, dozer stampers tree dozers, root of rock blade, bush cutter, pitcharm, hydraulic lift, mechanical lift, cable dozer power control unit, control lever.

3.1.5 Bulldozer operation practices- Jungle clearance, digging side slopes, transporting rocks in cut, rock in fills, pitching, bunding, turning.

3.2 Scrapers: 5 units

- 3.2.1 Its importance in land shaping, types: (i) towed mechanical and hydraulic scraper (ii) self powered scrapers, operations digging, transporting, dumping, turning.
- 3.2.2 Field practices with hydraulic scrapers

3.3 Levellers: 3 units

- 3.3.1 Various types of levelers, planes, graders, terracers, and their uses.
- 3.3.2 Demonstration and field practice on levelers.
- 3.3.3 Practices with blade terracers fitted with 35 H.P tractor.

3.4 Misc. Soil loosening implements: 4 units

- 3.4.1 Heavy duty ploughs, rippers, sub-soilers, their use and constructional features.
- 3.4.2 Demonstration and practice of sub-soiler fitted on 35 H.P tractor and ripper.

T8 - REPAIR & OVERHAULING OF DIESEL PUMPING SET

Duration: 2 Week Effective days: 10 Days Units: 20

1. General: 2 units

- 1.1 Sources of farm power, status of farm mechanization and scope of farm engines, Diesel pumping set.
- 1.2 Different makes, types, models and availability of Diesel pumping set in India. Importance of safe operation and handling of pumping unit. Selection of tools and equipments.
- 1.3 Study of service repair tools, Study of fuel, oil & lubricants and their handling and storage.

2. Farm Engine: 12 units

- 2.1 Familiarization with the I.C. engine and brief study of various systems viz. air intake, fuel, lubrication and governing systems. Demonstration of engine operation, servicing & maintenance and repair.
- 2.2 Dismantling of engine and detailed study of various components, measurement of clearances, reconditioning and adjustment of components.
- 2.3 Assembly of engine, operation, discussion on various troubles and remedy.

3. Irrigation Pump: 6 units

- 3.1 Types of irrigation pumps, principles of operation, constructional details, application and selection criteria, dismantling and assembling of diesel pumping set.
- 3.2 Practice on installation of pump, prime mover, fitting of pipes and valves etc. checking for alignment, correct coupling technique with diesel engine / tractor. Operation, maintenance, repair and troubleshooting of the system.
- 3.3 Energy conservation potential in pumping unit. Study and demonstration

T-9 MAINTENANCE, REPAIR AND INSTALLATION OF COMBINE HARVESTER AND STRAW REAPER

Duration : 3 weeks Effective working days : 15 Units : 30

- Sources of Farm Power, status of Mechanization, scope of Combine Harvester and Straw Reaper
- Introduction to different type of harvesting, threshing machinery and straw bruising machinery

- Acquaintance with servicing and repair of tools for harvesting machine.
- Pre-checks for starting combine harvesters and straw reaper.
- Introduction to different systems and their components of different combine harvesters (self propelled and tractor mounted) and straw reaper
- Acquaintance with different controls of combine harvester and straw reaper
- Field practices on adjustment and operation of combine harvester and straw reaper trouble shooting.
- Practice on daily and periodical servicing of combine harvester.
- Cost economics of combine harvesters.

M 1- TESTING & EVALUATION OF FARM MACHINERY

Duration : 1 week Effective working days : 5 Units : 10

- General information regarding farm machinery testing institutes in India and Abroad , need and objectives of testing of Agril. Machines, different types of tests and introduction to BIS test codes.
- Test procedure of tillage implements viz. Plough, Harrow, Cultivators, Lab and field parameters of tillage machines. Practical to trainees on field testing of tillage implements such as draft, slippage, fuel consumption, field efficiency etc.
- Introduction to testing of plant protection equipments. Study of different types of Sprayers, dusters, their components. Dismantling & assembling of Knapsack Sprayers
- Study of test codes for sprayers & dusters, different parameters & test procedures of Sprayers & dusters. Practical demonstration on Sprayer and duster test.
- Introduction to testing of Combine harvester & Straw reaper. Study of test codes and different field parameters of Combine harvesters & Straw reapers.
- Practical demonstration of brake test, turning radius, other lab and field test of Combine harvesters and straw reapers.
- Study of test codes, test rig and parameters regarding C.F. Pump testing, Practical demonstration of C.F. Pump test.
- Introduction to the testing of Sowing machines, Study of test codes and test procedure of seed drill. Evaluation of different lab and field parameters, Laboratory calibration and analysis of Seed cum fertilizer drill.

M-2 AGRICULTURAL MACHINERY MANAGEMENT

Duration: 1 week Effective working days: 05 Units:10

1. General : (1 Unit)

- Introduction to farm power sources
- Necessity of farm machinery management
- Problems associated with machinery management

2. Selection of tractors and matching equipments (1 units)

- Criteria for selection of tractor and farm machinery
- To compute field capacity of machinery and improving field efficiency
- Estimation of power requirement
- Computation of matching machine size & capacity

3. Cost Analysis (1 Units)

- Estimation, fixed cost, variable cost and break even analysis.
- Total cost, custom works unit and break even analysis, deciding when to trade and trade guide lines.
- Selection of the best alternatives and case study

4. Spare parts management (1 Unit)

5. Maintenance management (1 Unit)

- Primary objective
- Preventive maintenance
- Maintenance policy
- Total productive maintenance
- Man power planning for skilled technicians.
- Farm level maintenance workshop planning.

6. Optimization technique for best option from various alternatives available in entrepreneurship – (1 Unit)

7. Marketing management of tractors and Agricultural machinery (1 Unit)

8. Testing & evaluation of tractors and interpretation of test reports – (1 Unit)

9. Testing and evaluation of tillage, sowing and harvesting equipments.(1 unit)

10. Evaluation of performance index for various farm operations – (1 Unit)

M-3 EXPORT MANAGEMENT OF AGRICULTURE MACHINERY

Duration: 1 week Effective working hours:5 Units:10

- General information about exporting of agricultural implements/hand tools, International Products Policy & Planning., choice of the form of business establishment.
- Registration with regional licensing authorities (for IEC), registration with EPC etc, Registration with sales tax authorities.
- Guest lecture by Implement exporter.
- Export business correspondence, sending/exporting samples and exhibits, letter to trade missions and agencies.
- Important foreign buyers of Agricultural hand tools, implements and their parts.
- Export procedures & documentation for export order processing,
- Preparing/obtaining export documents, Standardized pre-shipment export documents, Quality control, Pre-shipment inspection and ISO-9000/BIS 14000, labeling, marking, packaging & packing of export consignments.
- Use of computers for multimedia presentation, Internet, E-mail, electronic data interchange (EDI), Computerized business communication and product identification (bar code) systems.
- Export-Import Policy of India: Its salient features of the new Exim policy 2002- 2007, Promotional measures, Duty exemption scheme, Duty entitlement, Passbook scheme, Policy for 100% EOU/EPZ

M4- INSTRUMENTATION FOR FARM MACHINERY TESTING & EVALUATION

Duration: 1 week Effective working days : 5 days Units:10

- Need of instrumentation for farm machinery test. Introduction to different instruments used in testing of farm machinery, classification of instruments according to their use.
- Introduction to power measurement instruments, study of dynamometers available in the Institute and observations to be recorded during engine test. Demonstration of Engine test.
- Study of hardness machines and practical of hardness measurement in both HRC and HB. Study of draft measurement instruments like Hydraulic tension dynamometer, Spring type tension dynamometer, Universal type load cell strain gauge indicator
- Study of digital and dial type measuring instruments with practical demonstration.
- Study of soil testing instruments like digital PH meter, Cone penetrometer, Sieve shaker with set of sieves and Dolly & reamer for bulk density.
- Practical on soil and grain moisture meters
- Practical on contact and non-contact type of tachometers & Stroboscope, study of vacuum pressure measurement instruments like Bourden tube pressure gauge, Atm Barometer etc
- Practical on dial type bore gauge and other precision measuring instruments used in Engine test.
- Study of Vernier Calipers & Micrometers and their practical use. Study of thread gauge thermometers & Psychrometers.
- Study of Anemometer & noise measurement instruments and practical regarding their use. Study of Microscope, Abeny level.
- Study and practical of Vibration meter for Combine test.

M5- ENTREPRENEURSHIP DEVELOPMENT TO ESTABLISH CUSTOM HIRING AGRO-SERVICE CENTRE

Duration : 8 Week Effective working days : 40 Total Units : 80

1. General: (6 units)

- Entrepreneurship & its Importance for custom hiring Agro Service Center in development of rural area & promotion of Agril. Mechanization. Important Characteristics of Agro Service Center
I) Resource based ii) demand based
- Govt. Policies for promotion of Agricultural mechanization & Agro Service Center.
- Role of other agencies in Govt. / Non Govt.,

2. Quality of entrepreneur: 10 Units

Communication skill

- Definition & importance.
- Elements of communication.
- How to read write speak & listen.

- Types of communication special with reference to oral communication.
- Practical training on communication.
- Working skill on Computer with special reference to M.S. Office, E-mail & Internet.
- Problems in communication.
- Writing business letters of applications.
- Training on application of I.T. tools (Computer) for Agro Service Center.

3. Preparation of project report : (10 Units)

- Knowledge of planning, organization, Direction & Control of project on Agro
- Service Center for custom hiring.
- Importance of project report & its format.
- Identification of package of Agril. Machinery for Agro Service Center & its availability sources.
- Preparation of project report.
- Form & other procedures, rules regulation etc. with reference to custom Agro hiring service.

4. Finance : (6 Units)

- Procedure for obtaining loan from bank Co-operatives, State financial Co-operations.
- Procedure for obtaining subsidies from different Govt. & Non Govt. agencies.

5. Elements costing & Accounting: 10 Units

- Elements of costing.
- Fixed cost.
- Variable cost.
- Direct cost of Labour & other
- Estimation of custom hiring rate
- Maintenance of ledger, books, bank account, balance sheets etc

6. Agril. Machinery & other inputs required for Agro Service Center : 7 Units

- Working out the requirements of different machinery & user survey on farmer's field.
- Availability & source of machinery
- Cash & credit purchase.
- Comparison of rates
- Storage procedure.
- Guidelines for stocking of spare parts for different machinery & prime-movers.
- How to manage inventories / store registers

7. Development of technical skill : 25 units

- Introduction to different Agril. Machineries & Technology available for particular Agro climates regions.
- Selection of appropriate tractor & other machinery implements.
- Practice on operation & use of Agril. Machinery.
- Periodical servicing & maintenance of tractor / P.T. /Engines & Agril.
- Machinery, P.P. & irrigation equipments.
- Off season storage of Agril. Machinery.
- Importance of Log books & History sheets in maintain of Agril. Machinery

8. Study tour to Industries / Agro Service Centers : 6 Units

- To conduct the study tour to different industries & Agro Service Center situated in the particular region to give the detail exposure on Agril. Machinery & inputs required for the Agro Service Center.

M-6 FARM MACHINERY MANAGEMENT

Duration: One week (Effective working 5days) - Total Units 10

- Management & its importance with reference to Agricultural Machinery
- Emerging pattern of Agril.Machinery use.
- Selection of Tractor & matching implements.
- Govt. policies for promotion of Agricultural mechanization.
- Subsidies provided by the Govt. & Non Govt. agencies for different machineries
- Procedure for obtaining loan from various financing agency / organization
- Importance of quality control & requirements for testing of Agricultural Machinery.
- Elements of costing :- Direct material & labour Cost, indirect expenses.
- How to estimate profitability.
- Guideline for stocking the spare parts for tractors & other Agril. Machinery.

A1- TRAINING PROGRAM ON FARM POWER MACHINERY FOR DEGREE/ DIPLOMA ENGINEERING STUDENTS

Duration: 4 Weeks Effective days: 20 Days Units: 40

1. Engines & Tractors: 26 units

- Different type of power units, agricultural equipments and implements used in agriculture.
- Different systems such as fuel, air cleaning, cooling, lubrication, electrical, hydraulic etc.
- in tractors.
- Horse power, its measurement and requirements for different implements.
- Operation and maintenance of engines and tractors. Demonstration of repair and overhauling of same.
- Familiarization with technique in testing and evaluation of tractors and other agricultural machinery.
- Quality control of tractors and agricultural implements.
- Familiarization with the Indian and other standards of the agricultural machines.
- Cost economics and break even analysis of a general purpose tractor for custom hire work.
- Tips for energy conservation.

2. Agricultural machinery (Theory & Practical): 10 units

- Study of adjustments, operation and maintenance of tillage equipment like mould board and disc ploughs, secondary tillage equipments like harrow, cultivator, rotavator, seeding equipment (drills and planters) harvesting equipment such as reapers, binders, thresher, combine etc. Land development operations, laying of field and irrigation channels.

3. Irrigation Equipments: 4 units

- Selection criteria, installation, constructional details and repair of centrifugal pumps, jet pumps, submersibles pump.
- Orientation with drip & sprinkler irrigation systems.
- Energy conservation tips in irrigation system.

A2- PRACTICAL TRAINING PROGRAM ON FARM POWER AND MACHINERY FOR ITI & 10 + 2 STUDENTS

Duration: 4 Weeks Effective days: 20 Days Units: 40

1. General: 2 units

- Different makes, types, models and availability of tractors, power tillers and their scope under different farming conditions in India.
- Selection of tractors and implements based on farming condition.
- Study of fuel, oil and lubricants, their handling and storage.

2. Farm Power: 14 units

- Source of farm power, status of farm mechanization, and scope of farm engines, power tillers and tractors.
- Importance of safe handling and operation of farm machinery, observation of road signals, traffic rules etc.
- Introduction to makes and models of indigenous tractors, basic mechanism, main units, controls, gauges.
- Pre-starting checks, correct operating techniques and energy saving tips.
- Study of different sub-assemblies of a tractor, function, construction, utilization of various system viz. clutch, transmission, brake & steering, hydraulic etc.
- Demonstration on periodical maintenance of a tractor, repair of tyre and tubes, fitting of cage wheels etc.
- Demonstration for wheel track adjustment, wheel ballasting etc.

3. Farm Machinery: 12 units

- Power operated implements their constructional features, adjustments, maintenance and operating techniques etc.
- Tillage implements such as mould board and disc plough, sub soiler, disc harrows, cultivators, rotavator of different types. Land shaping equipments and machines.
- Familiarization and source of availability.
- Dry land farming implements and equipments. Manure and fertilizer spreader, broadcaster, applicators, source of availability.
- Seeding and planting equipments such as seed-cum-fertilizer drills and planter and source of availability.
- Paddy cultivation machinery, transplanter, rotavator, power –tillers, Inter-row seeding and other inter-cultivation equipments.
- Vertical conveyor reaper, forage harvesters, potato and groundnut diggers, power threshers, combine harvesters, straw reaper, maize sheller etc
- Chaff cutters, maize shellers, paddy dehusker/huller, sugarcane crusher, cane detrasher, groundnut decorticators, oil seed crop crusher, dryers, etc.

4. Irrigation: 2 units

- Types of irrigation pumps, principles of operation, constructional details, application and selection criteria.
- Practice on installation of pump, prime mover, fitting of pipes, valves etc. checking for correct operation, maintenance and troubleshooting.
- Familiarization with the sprinkler & drip irrigation system.
- Familiarization with the voltmeter, ammeter, etc. Checking of circuit, diagnosis of burnt out motor, starter setting for direction of rotation of motor, etc.

5. Plant Protection Equipment: 1 units

- Manual and power operated sprayer and duster including aero-blast sprayer, high clearance sprayers, etc. Practice on dismantling, resetting and assembling of sprayers and dusters, nozzles, cut of devices, changing and resetting of valves etc.
- Instructions for safe operation, off –season storage techniques and source of availability for plant protection equipments.

6. Alternative sources of farm energy: 1 unit

- Familiarization with bio-gas plant, wind mill and solar energy appliances.

7. Stationary Engine and Power tiller: 8 units

- Familiarization with the I.C. engine and brief study of various systems viz. air intake, fuel, lubrication and governing systems. Demonstration of engine operation, servicing & maintenance.
- Use of power tiller for intensive farming as a supplemental power unit in farming conditions where these can be used viz. small, medium and large farms.
- Different types of implements and equipments available for use with power tiller; study and demonstration.
 - ✓ Servicing and maintenance of different systems.
 - ✓ Importance of periodical maintenance and service.
 - ✓ Demonstration of wheel track adjustment, wheel ballasting etc

SJGSY - TRAINING PROGRAM FOR RURAL YOUTH UNDER SWARN JAYANTI GRAM SWAROJGAR YOJANA

Duration: 12 Week Effective days: 60 Days Units: 120

1. General: 6 units

- Different makes, types, models and availability of tractors, power tillers and their scope under different farming conditions in India.
- Market assessment for services, custom etc. criteria for layout of small and medium service centers location.
- Financial analysis selection of tools and equipments.
- Safety in handling machine and equipments.
- Selection of tractors and implements based on farming condition.
- Study of fuel, oil and lubricants, their handling and storage.

2. Farm Power: 15 units

- Source of farm power, status of farm mechniza5tion, and scope of farm engines, power tillers and tractors.
- Importance of safe handling and operation of farm machinery, observation of road signals, traffic rules etc.
- Introduction to makes and models of indigenous tractors, basic mechanism, main units, controls, gauges.
- Pre-starting checks, correct operating techniques and energy saving tips.

3. Farm Machinery: 30 units

- Power operated implements, constructional features, adjustments, maintenance and operating techniques and equipment be marketed.
- Tillage implements such as mould board and disc plough, sub soiler, disc harrows, cultivators, rotavator of different types. Land shaping equipments and machines.
- Familiarization and source of availability.

- Dry land farming implements and equipments. Manure and fertilizer spreader, broadcaster, applicators, source of availability.
- Seeding and planting equipments such as seed-cum-fertilizer drills and planter and source of availability.
- Paddy cultivation machinery, transplanter, rotavator, Inter-row seeding and other inter-cultivation equipments.

4. Animal drawn implements and hand tools:

- Familiarization with different animal drawn improved implements and manually operated tools, study of their constructional features, brief specification, operation, adjustment and maintenance techniques, sources of supply and conditions under which these can be recommended for use.

5. Improved sowing, planting, weeding and intercultivation equipments:

- Zero till seed cum fertilizer drill, Strip till seed cum fertilizer drill, Raised bed planter, Seed drill cum planter, Paddy transplanters and seeders, Automatic potato planter, sugarcane planter, garlic and vegetable planters, sweep type cultivator, weeder, etc.

6. Harvesting and threshing equipment:

- Vertical conveyor reaper, forage harvesters, potato and groundnut diggers, power threshers, combine harvesters, straw reaper, maize sheller etc

7. Crop Processing machines:

- Chaff cutters, maize shellers, paddy dehusker/huller, sugarcane crusher, cane detrasher, groundnut decorticators, oil seed crop crusher, dryers, etc.

8. Crop handling and transporting equipment

9. Irrigation: 4 units

- Types of irrigation pumps, principles of operation, constructional details, application and selection criteria.
- Practice on installation of pump, prime mover, fitting of pipes, valves etc. checking for correct operation, maintenance and troubleshooting.
- Familiarization with the sprinkler & drip irrigation system.
- Familiarization with the voltmeter, ammeter, etc. Checking of circuit, diagnosis of burnt out motor, starter setting for direction of rotation of motor, etc.

10. Plant Protection Equipment: 2 units

- Manual and power operated sprayer and duster including aero-blast sprayer, high clearance sprayers, etc. Practice on dismantling, resetting and assembling of sprayers and dusters, nozzles, cut of devices, changing and resetting of valves etc.
- Instructions for safe operation, off –season storage techniques and source of availability for plant protection equipments.

11. Alternative sources of farm energy: 1 unit

- Familiarization with bio-gas plant, wind mill and solar energy appliances.

12. Agril. Machinery Management: 2 units

- Selection of farm machines and their matching equipments.
- Use of manuals operation, maintenance, servicing & maintenance of logbooks & history sheets.
- Calculation of cost of operation for tractor and power tiller. Guidelines for storage of essential spare parts for tractors and agricultural machines, etc

13. Stationary Engine and Power tiller: 20 units

- Familiarization with the I.C. engine and brief study of various systems viz. air intake, fuel, lubrication and governing systems. Demonstration of engine operation, servicing & maintenance.
- Dismantling and assembling of single cylinder diesel engine: understanding technical specification, measurement of tolerances and clearances, overhauling techniques and trouble shooting.
- Use of power tiller for intensive farming as a supplemental power unit in farming conditions where these can be used viz. small, medium and large farms.
- Different types of implements and equipments available for use with power tiller; study and demonstration.
 - Servicing and maintenance of different systems.
 - Importance of periodical maintenance and service.
 - Demonstration of wheel track adjustment, wheel ballasting etc.

14. Tractor: 40 Units.

- Study of different sub-assemblies, safe and correct procedure for dismantling and assembly. Use of special tools and measuring equipments used for maintenance and repair.
- Engine dismantling and inspection of various parts, measurement of clearance, reconditioning, adjustment balancing, minimum permissible wear limits on different parts, fuel system dismantling and study of fuel feed pump, injector, governor, fuel filter and assembly. Engine assembly and trouble shooting.
- Clutch – dismantling and study of clutch and its components adjustment and assembly.
- Transmission – Study of gear box, differential and final drive, adjustments of clearances and backlashes of various gears, assembly of differential and final drive and their adjustments.
- Brake & steering – dismantling and study of each system, their components, adjustment, repair and assembly.
- Wheel equipment – care and maintenance, repair of tyre and tubes, fitting of cage wheels and adjusting track width for different operations.
- Hydraulic system, principle of hydraulic, draft and position control system, dismantling and study of system, adjustment of various valves, pressure setting, trouble shooting etc.
- Demonstration for wheel track adjustment, wheel ballasting etc.
- Emerging pattern of machinery use; Routine and periodical maintenance, jobs on tractor, power tiller etc.
- Guideline for stocking tractor spare parts.
- Diagnostic techniques to assess the condition of the engine through Dynamometer, compression pressure test gauge etc.

DF- SPECIAL TRAINING PROGRAM FOR DEFENCE PERSONNEL ON UTILIZATION, OPERATION, MAINTENANCE AND REPAIR OF AGRICULTURAL MACHINERY

Duration: 12 Week Effective days: 60 Days Units: 120

General: 10 units

- Sources of farm power, status of farm mechanization and scope of farm engines, power tillers and tractors.
- Different makes, types, models and availability of tractors, power tillers and their scope under different farming conditions in India.
- Importance of safe operation and handling of farm machinery, observations of road signals, traffic rules etc.
- Study of service repair tools, Study of fuel, oil & lubricants and their handling and storage.
- Market assessment for services: customs hiring etc. criteria for layout of small and medium service centers.
- Financial analysis, selection of tools and equipments.
- Selection of tractors and implements based on farming conditions.

2. Farm Engine: 15 Units

- Familiarization with the I.C. engine and brief study of various systems viz. air intake, fuel, lubrication and governing systems. Demonstration of engine operation, servicing & maintenance.
- Dismantling of engine and detailed study of various components, measurement of clearances, reconditioning and adjustment of components.
- Assembly of engine, operation, discussion on various troubles and remedy.

3. Power tiller: 10 units

- Use of power tiller for intensive farming as a supplemental power unit in farming conditions where these can be used viz. small, medium and large farms.
- Different types of implements and equipments available for use with power tiller; study and demonstration.
 - ✓ Introduction to indigenous Power tiller/ tractors, basic mechanism, main units, control gauges and symbols.
 - ✓ Pre-starting checks, correct operating and energy saving tips.
 - ✓ Servicing and maintenance of different systems.
 - ✓ Importance of periodical maintenance and service.

4. Farm Machinery: 35 units

- Power operated implements, constructional features, adjustments, maintenance and operating techniques and equipment to be marketed.
- Tillage implements such as mould board and disc plough, sub soiler, disc harrows, cultivators, rotavator of different types. Land shaping equipments and machines. Familiarization and source of availability.
- Dry land farming implements and equipments. Manure and fertilizer spreader, broadcaster, applicators, source of availability.
- Seeding and planting equipments such as seed-cum-fertilizer drills and planter and source of availability.
- Paddy cultivation machinery, transplanter, rotavator.
- Inter-row seeding and other inter-cultivation equipments.

5. Animal drawn implements and hand tools:

- Familiarization with different animal drawn improved implements and manually operated tools, study of their constructional features, brief specification, operation, adjustment and maintenance techniques, sources of supply and conditions under which these can be recommended for use.

6. Improved sowing, planting, weeding and intercultivation equipments:

- Zero till seed cum fertilizer drill, Strip till seed cum fertilizer drill, Raised bed planter, Seed drill cum planter, Paddy transplanters and seeders, Automatic potato planter, sugarcane planter, garlic and vegetable planters, sweep type cultivator, weeder, etc.

7. Harvesting and threshing equipment:

- Vertical conveyor reaper, forage harvesters, potato and groundnut diggers, power threshers, combine harvesters, straw reaper, maize sheller etc

8. Crop Processing machines:

- Chaff cutters, maize shellers, paddy dehusker/huller, sugarcane crusher, cane detrasher, groundnut decorticators, oil seed crop crusher, dryers, etc.

9. Crop handling and transporting equipment

10 Irrigation: 5 units

- Types of irrigation pumps, principles of operation, constructional details, application and selection criteria.
- Practice on installation of pump, prime mover, fitting of pipes, valves etc. checking for correct operation, maintenance and troubleshooting.
- Familiarization with the sprinkler & drip irrigation system.
- Familiarization with the voltmeter, ammeter, etc. Checking of circuit, diagnosis of burnt out motor, starter setting for direction of rotation of motor, etc.

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- Manual and power operated sprayer and duster including aero-blast sprayer, high clearance sprayers, etc. Practice on dismantling, resetting and assembling of sprayers and dusters, nozzles, cut of devices, changing and resetting of valves etc.
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12. Alternative sources of farm energy: 1 unit

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13. Agril. Machinery Management: 2 units

- Selection of farm machines and their matching equipments.
- Use of manuals operation, maintenance, servicing & maintenance of logbooks & history sheets.
- Calculation of cost of operation for tractor and power tiller. Guidelines for storage of essential spare parts for tractors and agricultural machines, etc

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- Study of different sub-assemblies, safe and correct procedure for dismantling and assembly. Use of special tools and measuring equipments used for maintenance and repair.
- Engine dismantling and inspection of various parts, measurement of clearance, reconditioning, adjustment balancing, minimum permissible wear limits on different parts, fuel system dismantling and study of fuel feed pump, injector, governor, fuel filter and assembly. Engine assembly and trouble shooting.
- Clutch – dismantling and study of clutch and its components adjustment and assembly.
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