



COMPETENCY BASED CURRICULUM

ORNAMENTAL HORTICULTURE

BQF CERTIFICATE III



TECHNICAL TRAINERS TRAINING AND RESOURCES CENTRE
DEPARTMENT OF WORKFORCE PLANNING AND SKILLS DEVELOPMENT
MINISTRY OF EDUCATION AND SKILLS DEVELOPMENT

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Department of Workforce Planning and Skills Development

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FOREWORD

Bhutan has seen a gradual increase in the requirement of skilled workers in recent years due to growth of industries. However, supply of skilled workforce that are responsive to the needs of the industry has not been able to keep in pace with the industry demand. Since the skilled workers are crucial ingredient for socio-economic development of the country, it is important to have adequate number of trained and certified workers. With growing industries, the "Ornamental Horticulturist" is not only the most significant occupation but also have high demand in the labor market. In an effort to meet the skilled human resources requirement in the area of agriculture sector, it is imperative to deliver training based on Competency Based Training system in Ornamental Horticulture BQF Certificate-III to ensure quality and adequate number of work force in this sector.

To this end, the Department of Workforce Planning and Skills Development (DWPSD) is pleased to present Competency Based Curriculum for Ornamental Horticulture Certificate-III course developed based on national competency standard. Since it is an outcome of a more participatory process of curriculum development, it is expected to provide training delivery with reformed approaches having its content being directly related to labor market needs, focusing on imparting of skills and assessment based on industry work standards. We believe that the Competency Based Curriculum will help in bridging the skill gap between industry's needs and training institutes thereby enhancing the employability of the technical graduates.

The Department acknowledges the valuable contributions made by institutes, officials, and experts from relevant industries who were involved in the design and development of this curriculum. As it is a dynamic document which may require revision based on the needs of the changing labor market, the Department look forward to receiving valuable feedbacks from the institutes and the industries to further improve and refine the curriculum

The Department hope that this document will help advance Competency Based Learning in most of the TVET Institutions.



(Phub Rinzin)

Director General

Department of Workforce Planning and Skills Development

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Competency Profile
Trade: Ornamental Horticulture BQF Certificate III

Competency Area	Sub- Competency Area	Competencies/Task			
A. Carry Out Floriculture Operations	A1. Perform Nursery Management	A1.1 Use PPE	A1.2 Identify suitable ornamental plant species	A1.3 Select site	A1.4 Prepare costing and estimation
		A1.5 Prepare site	A1.6 Prepare media	A1.7 Perform plant propagation	
	A2. Manage seedlings	A2.1 Irrigate plants	A2.2 Manage soil nutrients	A2.3 Transplant seedlings	A2.4 Perform pest and disease control
		A2.5 Perform hardening			
	A3. Perform plantation	A3.1 Select site	A3.2 Prepare costing and estimation	A3.3 Prepare site	A3.4 Construct fencing
		A3.5 Transport seedling	A3.6 Perform plantation	A3.7 Conduct post-plantation maintenance	A3.8 Perform harvesting
	A4. Perform Bonsai Production	A4.1 Identify suitable bonsai plant species	A4.2 Prepare bonsai production site	A4.3 Plant bonsai	A4.4 Manage bonsai
B. Carry Out Orchid Production	B1. Prepare for Orchid Production	B1.1 Identify suitable orchids	B1.2 Prepare nursery site	B1.3 Perform orchid propagation	

	B2. Carry out tissue culture	B2.1 Set up lab	B2.2 Perform tissue culture	B2.3 Perform hardening	
	B3. Perform Orchid Cultivation and Management	B3.1 Prepare production site	B3.2 Perform plantation activities	B3.3 Manage orchid	B3.4 Perform harvesting
C. Carry Out Herbal Production	C1. Prepare for Herbal Production	C1.1 Identify suitable herbs and shrubs	C1.2 Prepare nursery site	C1.3 Perform crop propagation	C1.4 Perform nursery plant maintenances
	C2. Perform Cultivation and Management	C2.1 Prepare plantation site	C2.2 Perform plantation activities	C2.3 Manage herbs and shrubs	
	C3. Perform post-harvest activities	C3.1 Prepare for harvesting	C3.2 Perform harvesting	C3.3 Perform postharvest practices	

COURSE INFORMATION

COURSE TITLE	Ornamental Horticulture
LEVEL	Certificate III
COURSE OBJECTIVE	Upon completion of this training program, the trainees will be able to: • Carry Out Floriculture Operations • Carry Out Orchid Production • Carry Out Herbal Production
COURSE DESCRIPTION	This course is designed to provide trainees with the knowledge, skills and attitudes required to be competent ornamental horticulturist. This course will prepare the trainees to exhibit professionalism, teamwork, adaptability, and safety practices as per the requirement of workplace. To obtain certification of this course, all learning outcomes prescribed must be achieved.
COURSE DURATION	1239 hours
TRAINER AND TRAINEE RATIO	1:12 (Practical) 1:20 (Theory)
ENTRY REQUIREMENT	Class VIII passed
TVET TRAINER REQUIREMENTS	• Must have a minimum qualification of Diploma in relevant field with three years of working experience; • Must have undergone Training of Trainers-Technical Instruction and Andragogy; • Must¹ have at least 5 years job/industry experience

¹ Applicable only if institutes hire instructor or guest lecturer from industry

COURSE OUTLINE

Sl. No	Subject /Module	Duration (Hours)	Content Competencies (Mapped)
1.	Core modules	417	CC
2.	OJT	420 (3 months)	CC
3.	Applied Dzongkha	42	SS
4.	ICT	48	SS
5.	Applied Mathematics	53	SS
6.	Technical English	51	SS
7.	Ethics and integrity	68	SS
8.	Entrepreneurship	70	SS
9.	Assessment	70	
	Total Course Duration	1239	

Note: (*) This curriculum contains core modules which cover main competencies of Ornamental Horticulture Certificate-III and OJT component. There are separate curricula for subjects/modules for delivery of soft skills, professional development & values and environmental concern & safety. In order to achieve the qualification of Ornamental Horticulture Certificate-III, the subjects and modules listed must be accomplished as per the credit hours provided.

Content Competencies:

CC-Core Competencies

SS-Soft Skills

PD-Professional Development and Values

ES-Environmental concern and Safety

COURSE STRUCTURE FOR CORE COMPETENCIES

Training Modality	Module Title	Learning outcomes	Nominal Duration (Hour)
1. Institute Training	A. Carrying out floriculture operations	A1. Perform nursery management A2. Manage seedlings A3. Perform plantation	186 hours
	B. Carrying out orchid production	B1. Prepare for orchid production B2. Carry out tissue culture B3. Perform orchid cultivation and management	108 hours
	C. Carrying out herbal production	C1. Prepare for herbal production C2. Perform cultivation and management C3. Perform post-harvest activities	123 hours
2. On the Job Training	A. Carrying out floriculture operations	A1. Perform nursery management A2. Manage seedlings A3. Perform plantation	420 (3 months)
	B. Carrying out orchid production	B1. Prepare for orchid production B2. Carry out tissue culture B3. Perform orchid cultivation and management	
	C. Carrying out herbal crop production	C1. Prepare for herbal production C2. Perform cultivation and management C3. Perform post-harvest activities	
Total CC Duration:			837 hours

ASSESSMENT AND CERTIFICATION SYSTEM

ASSESSMENT

Formative assessment for every module and learning outcome will be conducted through assignments, project works, continuous assessment, demonstration of practical skills/observations, oral questioning and written test.

Summative assessment after completion of each national certificate level will be conducted by TVET Quality Council, Bhutan Qualifications and professional certification authority, MoESD as per the National Competency Standards and Guidelines for National Assessment and Certification System, provided the course is accredited with TVET Quality Council, Bhutan Qualifications and professional certification authority, MoESD.

CERTIFICATION

On successful completion of every module, the institute will award a certificate of achievement to the trainees. The TVET Quality Council, Bhutan Qualifications and professional certification authority, MoESD will award a National Certificate to the trainees upon the successful completion of NC level assessment.

COURSE DELIVERY

1. Modular
2. Demonstration
3. Lecture
4. Industrial training/attachment
5. Project work
6. Problem-based learning
7. Project-based learning

RESOURCES

Materials

- Pen, paper, interview guide, survey forms, soil sample form, notebook, Petrol & 2T mixed (fuel), preservatives, shade nets/green net, polythene plastic, binding wires, lubricants, fencing poles, U-nails, nails, mason thread, post, purlins, manure and fertilizer, bamboo, soil, sand, compost, coco peat, peat moss, perlite, vermiculture, FYM (Farm yard manure), bokashi, biochar, poly pot/bag, leaf mold, seeds, seedlings, mother plants, potting materials, grafting and budding tapes, rooting hormones, wax/resin, parafilm, root stock, scion wood, greenhouse, water pipe/flexible pipes, water, plastic sheet, plastic bag, rice bran, sugar, salt, yeast, yogurt, EM, rice husk, charcoal (wood based), worm, green waste, rope, lighter, soil mixture, labelling tag, fungicides, pesticides, herbicide, sticky trap, ento-pin (2 mm), battery, twin thread, fencing pole, marker, floral foam, labelling paper, wrapping paper/plastic and ribbon, eraser, drawing book, plant samples, color pencil, paint, aluminum wire, copper wire, sample labels, specimen bags, wood stump, wire mesh, hooks, rods, wires, drip irrigation pipes/ micro-sprayers/misting, soft wires, ethanol, orchid pots, micro nutrients, growth hormones, jute sack, pebbles, MS media, BM media, knudson C media, growth hormones (BAP, GA, IAA), agar, sucrose, ethanol, sodium hypochlorite, tween20, parafilm, labeling tape, tissue paper, sterile cotton, aluminum foil, detergent, CD-DVD marker pens, distilled water, sphagnum moss, sand, culture bottles and hand sanitizer

Tools

- Measuring tape, altimeter compass, soil test kit, soil auger, clinometer, tensiometer, EC meter, knife, rake, spade, shovel, crowbar, hoe, sickle, pickaxe, wheel barrow, hammer, saw, rope, hand saw, tensioning crowbar, painting brush, sieves, measuring containers, sterilization unit, pH meter, secateurs, budding knives, grafting knives, trays, plastic pots, watering can, files, whetstones, pruning saw, watering can, , water sprinklers, plumbing tool set, water storage tank, measuring tape, bucket, jug, soil auger, tarpaulin, barrel with cone, chimney, tray, mortar and pestle, sieve, EC meter, jar glass, rooting tray, scissors, nets, guide books, magnifying lens, live box, euthanizing jar, container for specimen, sack, rake, seedling tray, knife, calculator, pliers, basket, vase, hessian cloth, root brush, sample container, saw, wooden planks, poles, drainage materials (gravel, pebbles, perforate pipes), hand shovel, knob cutter, tweezer, paper clips, rubber band, scotch knob, pruning saw, paraffin wax, hand sprayer, concave cutter, bonsai shears, root rake, Jin pliers, reference books (Flora of Bhutan, Bhutan Biodiversity Portal), SW map, scalpel and sharp pruning scissors

Equipment

- GPS, GIS, computer, power chain saw, power tiller (rotavator and plough), bed raiser, grass cutter, sieving machine, power knapsack sprayer, water pump and motor, smart drip set, soil test kit, irrigation system, thermometer

PPE

- Earplugs, safety glasses, gloves, safety boots, face mask, rain gears, gum boot, cap and face mask

Learning Materials

- Competency Based Learning Materials (CBLM)
- Reference books
- Hand-outs
- Audio visuals

Infrastructure and training facilities

- *Theory classroom size:* Minimum of 1 m² per trainee;
- *Practical Workshop size:* Minimum of 2.25 m² per trainee. Variables must be considered depending upon type of skills being taught and the number of trainees participating at a time.

MODULE INFORMATION:
ORNAMENTAL HORTICULTURE CERTIFICATE-III

MODULE 1
ON
CARRYING OUT FLORICULTURE OPERATIONS

MODULE INFORMATION

Occupation	Ornamental Horticulturist
Competency Area	Carry out floriculture operations
Module Title	Carrying out floriculture operations
Module Code	6113-L3-M1
Module Description	This module is structured to provide learners with the knowledge, skills and right attitude required to perform nursery management, manage seedlings and perform plantation.
Nominal Duration	186 Hours
Certificate Level	Certificate III
Pre-requisite	Class VIII passed
Learning Outcome	1. Perform nursery management 2. Manage seedlings 3. Perform plantation

Module Title	Carrying out floriculture operations		
Module Code	6113- L3-M1		
Learning Outcome 1	Perform nursery management		
Duration	Theory: 20 hours	Practical: 52 hours	Total: 72 hours
Assessment Criteria	• PPE is used as per the job requirement following standard procedure • Suitable ornamental plant species are identified as per the job requirement following standard procedure • Site is selected as per the job requirement following standard procedure • Costing and estimation are prepared as per the job requirement following standard procedure • Site is prepared as per the job requirement following standard procedure • Media is prepared as per the job requirement following standard procedure • Plant propagation is performed as per the job requirement following standard procedure		
Content	A1.00 Introductory knowledge • Introduction to floriculture crops • Grooming and hygiene standards • Hazard Analysis Critical Control Point (HACCP) • Trends and scope of ornamental horticulturist A1.01 Using PPE Knowledge • Definition of PPE • Importance of PPE • Function of PPE • Types of PPE • PPE manual/Instruction • Types of work area • OHS regulation • Relevant rules and regulation Skills • Wearing PPE • Using first aid kits Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of PPEs • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow OHS rules and regulation		

	A1.02 Identifying suitable ornamental plant species Knowledge • Introduction to Market trends • Background information on Local context and culture • Types of research tools and methodologies • Common ornamental horticulture practices in Bhutan • Introduction to plant characteristics Skills • Communication skills • ICT skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A1.03 Selecting site Knowledge • Introduction to nursery • Types of nurseries • Parameters for nursery site selection • Importance of site selection • Site selection manual/Instruction • Relevant rules and regulation Skills • Using GPS • Using GIS • Using compass • Using altimeter • Using clinometer • ICT skills • Analytical skills • Observation skills • Planning skills
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	<i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A1.04 Preparing costing and estimations <i>Knowledge</i> • Introduction to costing and estimation • Market price of materials • Calculation of area • Ratio of potting mixture ingredients <i>Skills</i> • Numeracy skills • ICT skills • Planning skills <i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A1.05 Preparing site <i>Knowledge</i> • Importance and objective of preparing site • Soil types, aspects and their suitability for floriculture plants • Introduction to composting (using debris) • Introduction to nursery shed • Types of nurseries shed and their application • Importance of nursery shed
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	• Introduction to Greenhouse • Importance of greenhouse • Types of greenhouses • Importance of fencing • Importance of fence alignment • Importance of applying preservatives on fencing poles • Types of Fencing; ➤ Electric fencing ➤ Bamboo fencing ➤ Net/plastic fencing ➤ Wood/pole fencing ➤ Live fencing ➤ Stone wall ➤ Trench ➤ Barbed wire ➤ Chain linked • Importance of choosing right materials for poles Skills • Using measuring tape • Fixing poles • Using tensioning crowbar • Operating power chain saw • Operating grass cutter machine • Operating power tiller • Operating bed raiser • Basic wood working skills • Planning skills • Layout skills • Observation skills • ICT skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A1.06 Preparing media
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	Knowledge • Types of media • Knowledge of plants' nutrient requirements for different ornamental plant species • Methods of mixing • Process of sterilizing media • Importance of storing media mixture • Importance of record keeping (records of media composition and pH/EC readings) Skills • Operating nursery equipment • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation • Ensuring proper sterilization of media • Ensuring to follow hygiene protocols to prevent contamination A1.07 Propagating plants Knowledge • Principle of plant propagation • Type of plant propagation • Limitations of plant propagation • Importance of selecting proper germplasm (Mother plant) • Importance of mother bed Skills • Using grafting tools • Observation skills • Plant Identification skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient
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	• Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials • Competency Based Learning Materials (CBLM) • Hand-outs • Audio Visuals • Reference books • Manuals • LMS Learning facilities and infrastructure • Classroom with adequate facilities • Information Technology (IT) lab • Library • Nursery/plantation site Materials • Pen, paper, interview guide, survey forms, soil sample form, notebook, Petrol& 2T mixed(fuel), preservatives, shade nets/green net, polythene plastic, binding wires, lubricants, fencing poles, U-nails, nails, mason thread, post, purlins, manure and fertilizer, bamboo, soil, sand, compost, coco peat, peat moss, perlite, vermicompost, vermiculite, FYM (Farm yard manure), bokashi, biochar, poly pot/bag, leaf mold, seeds, seedlings, mother plants, potting materials, grafting and budding tapes, rooting hormones, wax/resin, parafilm, root stock, scion wood and greenhouse Tools • Plant identifying app, gardening app, cool box, measuring tape, altimeter compass, soil test kit, soil auger, clinometer, tensiometer, EC meter, knife, rake, spade, shovel, crowbar, hoe, sickle, pickaxe, wheel barrow, hammer, saw, rope, hand saw, tensioning crowbar, painting brush, sieves, measuring containers, sterilization unit, pH meter, secateurs, budding knives, grafting knives, trays, plastic pots, watering can, files, whetstones and pruning saw Equipment • GPS, GIS, computer, power chain saw, power tiller (rotavator and plough), bed raiser, grass cutter and sieving machine PPE

	• Earplugs, safety glasses, gloves, safety boots, uniform, face mask, rain gears, gum boot, cap, first aid kit and face mask
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work

Module Title	Carrying out floriculture operations		
Module Code	6113- L3-M1		
Learning Outcome 2	Manage Seedlings		
Duration	Theory: 9 hours	Practical: 36 hours	Total: 45 hours
Assessment Criteria	- Plants are irrigated as per the job requirement following standard procedure - Soil nutrients are managed as per the job requirement following standard procedure - Seedlings are transplanted as per the job requirement following standard procedure - Pest and disease control is performed as per the job requirement following standard procedure - Hardening is performed as per the job requirement following standard procedure		
Content	A2.01 Irrigating plants Knowledge - Importance of watering - Types of water - Types of irrigation system - Timing and frequency of watering - Methods of irrigation - Irrigation automation Skills - Operating irrigation system - Operating power knapsack sprayer - Observation skills - Basic plumbing and electrical skills - Planning skills - ICT skills Attitude, safety and environmental concern - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation A2.02 Managing soil nutrients Knowledge		

	• Introduction to soil nutrients • Types of manure and fertilizer • Application of manure and fertilizer • Relevant rules and regulations Skills • Using soil test kits • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A2.03 Transplanting seedlings Knowledge • Importance of transplanting seedlings • Timing for transplantation • Importance of repotting Skills • Using nursery tools • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring to follow norms and standard for nursery and plantation, 2020 • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A2.04 Performing pest and disease control Knowledge
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	• Introduction to pest and diseases • Disease triangle • Types of pest and diseases in nursery • Sign and symptom of pest and diseases in nursery • Specimen collection, preservation and storage method • Preventive measures • Pest control/mitigation measures and its application • Host plant species • Types of insect traps Skills • Using hand lens • Operating power knapsack sprayer • ICT skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper handling of chemicals • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A2.05 Performing hardening Knowledge • Definition of seedling hardening • Characteristics of hardened seedlings • Hardening duration • Shade tolerance species Skills • Plant handling skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient
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	• Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials • CBLM • Hand-outs • Audio Visuals • Reference books • Manuals • LMS Learning Facilities and infrastructure • Classroom with adequate facilities • Information Technology (IT) lab • Library • Nursery/plantation site Materials • Water pipe/flexible pipes, nails, water, plastic sheet, plastic bag, manure and fertilizer, rice bran, sugar, salt, yeast, yogurt, EM, rice husk, charcoal (wood based), worm, green waste, rope, paper, lighter, poly pots, soil mixture, labelling tag, fungicides, pesticides, herbicide, sticky trap, ento-pin (2 mm) and seedling Tools • Watering can, hammer, water sprinklers, plumbing tool set, spade, water storage tank, measuring tape, bucket, wheel barrow, jug, soil auger, tarpaulin, barrel with cone, chimney, tray, mortar and pestle, sieve, EC meter, pH meter, jar glass, rooting tray, scissors, nets, guide books, magnifying lens, live box, euthanizing jar, container for specimen, sack, rake and seedling tray Equipment • Power knapsack sprayer, water pump and motor, smart drip set, soil test kit, irrigation system and thermometer PPE • Safety boots, uniform, gloves and face mask

Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work

Module Title	Carrying out floriculture operations		
Module Code	6113- L3-M1		
Learning Outcome 3	Perform plantation		
Duration	Theory: 9.5 hours	Practical: 29.5 hours	Total: 39 hours
Assessment Criteria	• Site is selected as per the job requirement following standard procedure • Costing and estimation are prepared as per the job requirement following standard procedure • Site is prepared as per the job requirement following standard procedure • Fence is constructed as per the job requirement following standard procedure • Seedlings are transported as per the job requirement following standard procedure • Seedlings are planted as per the job requirement following standard procedure • Post plant maintenance is conducted as per the job requirement following standard procedure • Harvesting is performed as per the job requirement following standard procedure		
Content	A3.01 Selecting site Knowledge • Introduction to plantation • Site selection parameters for plantation Skills • Using GPS/SW map • Using GIS software • ICT skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A3.02 Preparing costing and estimation Knowledge • Introduction to costing and estimation		

	• Market price of materials Skills • Numeracy skills • ICT skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow norms and standard for nursery and plantation, 2020 • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A3.03 Preparing site Knowledge • Importance of preparing site • Introduction to basic landscaping (Gardening) Skills • Interpreting drawing • Creativity skills • ICT skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A3.04 Constructing fence Knowledge • Importance of plantation fencing
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	• Importance of choosing right materials <i>Skills</i> • Using measuring tape • Fixing pole • Using power chain saw • Observation skills • Planning skills <i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A3.05 Transporting seedlings <i>Knowledge</i> • Importance of careful handling of seedlings • Selection of storage sites for seedlings • Mode of seedling transportation <i>Skills</i> • Handling seedlings • Observation skills • Planning skills <i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A3.06 Planting seedlings <i>Knowledge</i> • Planting season and time
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	• Importance of mulching and drainage • Watering schedule • Soil aeration • Methods of planting seedlings Skills • Using plantation tools • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A3.07 Conducting post-plantation maintenance Knowledge • Importance of post-plantation maintenance • Causes of seedling mortality • Treatment/mitigation measures • Calculation of survival percentage • Importance of pinching and thinning Skills • Operating power chain saw • Operating power knapsack sprayer • Numeracy skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
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	A3.08 Performing harvesting Knowledge • Harvesting/maturity indices • Basic knowledge of postharvest treatments • Techniques of handling plants • Storage conditions for different plant types • Common postharvest diseases and pests • Introduction to product development • Market standards and aesthetic requirements for sale and exhibition Skills • Creativity skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials • CBLM • Hand-outs • Audio Visuals • Reference books • Manuals • LMS Learning Facilities and infrastructure • Classroom with adequate facilities • Information Technology (IT) lab • Library • Nursery/plantation site Materials • Battery, pen, notebook, pencil, petrol & 2T, lubricants, twin thread, fencing pole, green net, nails, preservatives, binding wire, barbed wire, mason thread, water, seedlings, stakes, mulch, pesticides and fungicides, manure and fertilizer, marker, floral foam, labelling paper, wrapping paper/plastic, and ribbon

	Tools • Knife, measuring tape, calculator, rake, spade, sickle, hoe, wheel barrow, crowbar, pickaxe, shovel, painting brush, tray/crates, flexible pipe, bucket, jug, sprinkler, water tank, watering can, hedge shears, secateurs, hammer, pliers, basket, scissors and vase Equipment • Computer, colour printer, power chain saw, power tiller, grass cutter and power knapsack sprayer PPE • Uniform, safety boots, gloves, goggles, face mask, earmuff and rain gears
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work

Module Title	Carrying out floriculture operations		
Module Code	6113- L3-M1		
Learning Outcome 4	Perform bonsai production		
Duration	Theory: 6 hours	Practical: 24 hours	Total: 30 hours
Assessment Criteria	- Suitable bonsai species are identified as per the job requirement following standard procedure - Bonsai production site is prepared as per the job requirement following standard procedure - Bonsai is planted as per the job requirement following standard procedure - Bonsai is managed as per the job requirement following standard procedure		
Content	A4.01 Identifying suitable bonsai species Knowledge - Introduction to bonsai production - Introduction to basic botany - Species selection - Knowledge of climatic conditions - Introduction to plant propagation and growth habits Skills - Using GPS/SW map - ICT skills - Observation skills - Planning skills Attitude, safety and environmental concern - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation A4.02 Preparing bonsai production site Knowledge - Importance of site selection - Importance of shade and wind breaks - Importance of irrigation Skills - Observation skills - Planning skills		

	<i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to avoid water logging • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A4.03 Planting bonsai <i>Knowledge</i> • Importance of dormancy cycle • Bonsai soil composition • Pot size and type • Soil pH and nutrient retention • Types of plant growth regulating hormones <i>Skills</i> • Creativity skills • Observation skills • Planning skills <i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation A4.04 Managing bonsai <i>Knowledge</i> • Importance of repotting bonsai plants • Importance of monitoring the plants • Knowledge on bonsai tree training <i>Skills</i> • Training and pruning skills • Wiring skills
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	• Creativity skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials • CBLM • Hand-outs • Audio Visuals • Reference books • Manuals • LMS Learning Facilities and infrastructure • Classroom with adequate facilities • Information Technology (IT) lab • Library • Nursery/plantation site Materials • Notebook, pen, pencil, eraser, drawing book, plant samples, color pencil, twin thread, organic matter (compost, sand, loam soil, coco peat), paint, rope, shade nets, seedlings, bokashi, biochar, labeling tags, poly bags, bamboo sticks, hormones, pots, aluminum wire, copper wire, labeling tags, pesticides and fungicides and manure and fertilizer Tools • Spade, secateurs, hoe, hessian cloth, knife, tray/crates, root brush, sample container, shovels, sickle, rakes, hammer, brush, saw, wooden planks, poles, watering cans, pipes, sprinklers, wheel barrow, measuring tape, tarpaulin, drainage materials (gravel, pebbles, perforate pipes), hand shovel, knob cutter, tweezer, paper clips, plier, rubber band, scotch knob, pruning saw, paraffin wax, hand sprayer, concave cutter, bonsai shears, root rake and Jin pliers Equipment • Power chain saw, power tiller, grass cutter and power knapsack

	sprayer PPE • Uniform, safety boots, gloves, goggles, face mask, earmuff and rain gears
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work

MODULE 2
ON
CARRYING OUT ORCHID PRODUCTION

MODULE INFORMATION

Occupation	Ornamental Horticulturist
Competency Area	Carry out orchid production
Module Title	Carrying out orchid production
Module Code	6113- L3-M2
Module Description	This module is structured to provide the learners with knowledge, skills and right attitude to prepare for orchid production, carry out tissue culture and perform orchid cultivation and management
Nominal Duration	108 Hours
Qualification Level	Certificate Level 3
Pre-requisite	Completed Module: 6113-L3-M1
Learning Outcome	1. Prepare for orchid production 2. Carry out tissue culture 3. Perform orchid cultivation and management

Module Title	Carrying out orchid production		
Module Code	6113- L3-M2		
Learning Outcome 1	Prepare for orchid production		
Duration	Theory: 7 hours	Practical: 29 hours	Total: 36 hours
Assessment Criteria	- Suitable orchid is identified as per the job requirement following standard procedure - Nursery site is prepared as per the job requirement following standard procedure - Orchid propagation is performed as per the job requirement following standard procedure		
Content	B1.01 Identifying suitable orchids Knowledge - Classification and morphological characteristics of orchids - Ecological requirements of orchids - Local and exotic orchid species in Bhutan - Market demand trends for orchids - Basic principles of orchid conservation and sustainable use - Relevant rules and regulations; ➤ Biodiversity Act of Bhutan, 2022 ➤ Biodiversity Rules and Regulations, 2023 ➤ Forest and Nature Conservation Act of Bhutan, 2023 Skills - Using SW map - ICT skills - Analytical skills - Observation skills - Planning skills Attitude, safety and environmental concern - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring no harm to wild orchid population during assessment - Ensuring to avoid disturbing natural habitats - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation B1.02 Preparing nursery site Knowledge - Importance of preparing nursery site		

	• Types of nurseries Skills • Operating irrigation system • Operating power chain saw • Creativity skills • Observation skills • Planning skills • ICT skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation B1.03 Performing orchid propagation Knowledge • Plant morphology • Importance of tools and area sterilization • Importance of plant journaling • Importance of irrigation and moisture control in orchid production • Techniques of orchid propagation • Types of media Skills • Handling plant lets • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
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Learning Conditions	Learning Materials • CBLM • Hand-outs • Audio Visuals • Reference books • Manuals • LMS Learning Facilities and infrastructure • Classroom with adequate facilities • Information Technology (IT) lab • Library • Nursery/plantation site/field Materials • Sample labels, notebook, pen, specimen bags, shade net/green net, poles (bamboo/pvc/wood plank), wood stump, wire mesh, hooks, rods, wires, drip irrigation pipes/ micro-sprayers/misting, nails, soft wires, ethanol, orchid pots, micro nutrients, growth hormones, jute sack, thread/rope, and growing medium (mosses, tree barks, tree fiber, coco peat, coco chips, biochar, perlite, sand, pebbles) Tools • Reference books (Flora of Bhutan, Bhutan Biodiversity Portal), SW map, knife, spade, saw, measuring tape, hammer, saw, knife, plumbing tool set, scalpel, sharp pruning scissors, hand shovel, secateurs/pruning shears, hand sprayer and wheel barrow Equipment • Camera, power chain saw, thermometer and hygrometer PPE • Gloves, safety boots, uniform and face mask
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning

Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work
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Module Title	Carrying out orchid production		
Module Code	6113- L3-M2		
Learning Outcome 2	Carry out tissue culture		
Duration	Theory: 5 hours	Practical: 25 hours	Total: 30 hours
Assessment Criteria	• Lab is set up as per job requirement following standard procedure • Tissue culture is performed as per job requirement following standard procedure • Hardening is performed as per job requirement following standard procedure		
Contents	B2.01 Setting up lab Knowledge • Principles of laboratory design • Functions of laboratory equipment • Introduction to biosafety and contamination control • Media composition Skills • Operating laboratory equipment • Planning skills • Observation skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to practice precaution while handling chemicals • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation B2.02 Performing tissue culture Knowledge • Principles of plant tissue culture • Selection of explant • Techniques of explant propagation (through seed & tissue) • Types of orchid media • Techniques of sterilization and aseptic • Methods of media preparation • Role and preparation of growth hormones • Laboratory conditions required for orchid growth (temperature, light, pH) Skills • Operating laboratory equipment		

	- Analytical skills - Observation skills - Planning skills <i>Attitude, safety and environmental concern</i> - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring to practice precaution while handling chemicals - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation B2.03 Performing hardening <i>Knowledge</i> - Concept and purpose of hardening - Media ratio - Environmental conditions <i>Skills</i> - Handling plants - Observation skills - Planning skills - Problem solving skills <i>Attitude, safety and environmental concern</i> - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials - CBLM - Hand outs - Audio-visuals - Reference books

	• Manuals • LMS Learning Facilities and Infrastructure • Classroom with adequate facilities • Library • IT lab • Lab Materials • MS media, BM media, knudson C media, growth hormones (BAP, GA, IAA), agar, sucrose, ethanol, sodium hypochlorite, tween20, parafilm, labeling tape, tissue paper, sterile cotton, aluminum foil, detergent, CD-DVD marker pens, distilled water, cocopeat, perlite, charcoal, biochar, sphagnum moss, sand, compost, fungicide, pots, culture bottles, marking labels and hand sanitizer Tools • Forceps, scalpels, scissors, spatulas, dustbins, trays, jars, cleaning brushes, pipette tips, spirit lamp, pipettes, polypropylene measuring jugs, spray bottles, test tubes, measuring cylinders, flasks, beakers, petri dishes, cloths/towel, misting chambers and steel bowl Equipment • Autoclave, laminar airflow cabinet, incubator/growth chamber, magnetic stirrer, pH meter, oven, refrigerator, microscope, thermometer and hygrometer Instrument • Digital weighing balance PPE • Face masks, gloves, lab caps, lab coat, aprons, uniform, lab footwear/shoe cover and safety boot
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning

Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work • Rubrics
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Module Title	Carrying out orchid production		
Module Code	7412- L3-M2		
Learning Outcome 3	Perform orchid cultivation and management		
Duration	Theory: 8 hours	Practical: 34 hours	Total: 42 hours
Assessment Criteria	• Production site is prepared as per job requirement following standard procedure • Plantation is performed as per job requirement following standard procedure • Orchid is managed as per job requirement following standard procedure • Post-harvest activities are performed as per job requirement following standard procedure		
Contents	B3.01 Preparing production site Knowledge • Growing conditions of different orchid species • Irrigation and drainage management • Knowledge of tools and equipment • Importance of shade house design and maintenance Skills • Creativity skills • Analytical skills • Observation skills • Planning skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation B3.02 Performing plantation activities Knowledge • Understanding growing habits of different orchids (root system) • Knowledge of media composition Skills • Handling plants • Observation skills • Planning skills Attitude, safety and environmental concern		

	• Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation B3.03 Managing orchids Knowledge • Importance of repotting • Importance of pruning and deadheading • Orchid blooming cycle • Common orchid problems (water stress, nutrient, weather, pest and diseases) • Importance of watering (based on species) • Importance of nutrient management Skills • Handling plants • Observation skills • Planning skills • Problem-solving skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation B3.04 Performing harvesting Knowledge • Maturity indices of orchid plants • Orchid blooming cycle • Basic knowledge of postharvest treatments • Storage conditions for different orchid species • Common postharvest diseases and pests
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	• Market standards and aesthetic requirements of orchid plants Skills • Handling plants • Creativity skills • Organizing skills • Observation skills • Planning skills • Problem-solving skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation • Ensuring to avoid chemical runoff into soil and water bodies
Learning Conditions	Learning Materials • CBLM • Hand outs • Audio-visuals • Reference books • Manuals • LMS Learning Facilities and Infrastructure • Classroom with adequate facilities • Library • IT lab • Nursery/production site Materials • Shade nets, pen, compost, wire mesh, nail, note book, pencil, seedlings, media, poly bags, pots, manure and fertilizers, mosses, twin thread, sand, fungicides, pesticide, wrapping papers/color papers, floral foam, boxes, hydration solutions, preservatives, antitranspirant, labels, marking pens, rubber bands, ribbon and stickers Tools • Measuring tape, spade, hoe, rake, shovel, wheel barrow, PVC pipes, water hose, buckets, containers, hand saw, hammer, sieves, pliers, rope, knife,

	secateurs, hand shovel, watering can, hand sprayer, scissors, pruning scissors, buckets, trays, baskets, soft brushes, vase and watering cans Equipment • Power knapsack sprayer, humidifier and mist PPE • Gloves, safety boots, face mask, uniform and rain gears
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work

MODULE 3
ON
CARRYING OUT HERBAL-SHRUBS PRODUCTION

MODULE INFORMATION

Occupation	Ornamental Horticulturist
Competency Area	Carry out herbal production
Module Title	Carrying out herbal production
Module Code	6113- L3-M3
Module Description	This module is structured to provide the learners with knowledge, skills and right attitude required prepare for herbal production, perform cultivation and management and perform post-harvest activities
Nominal Duration	123 Hours
Qualification Level	Certificate Level 3
Pre-requisite	Completed Module 6113-L3-M2
Learning Outcome	1. Prepare for herbal production 2. Perform cultivation and management 3. Perform post-harvest activities

Module Title	Carrying out herbal production		
Module Code	6113- L3-M3		
Learning Outcome 1	Prepare for herbal production		
Duration	Theory: 11hours	Practical: 25 hours	Total: 36 hours
Assessment Criteria	- Suitable herbs and shrubs are identified as per the job requirement following standard procedure - Nursery site is prepared as per the job requirement following standard procedure - Crop propagation is performed as per the job requirement following standard procedure - Nursery plant maintenance is performed as per the job requirement following standard procedure		
Content	C1.01 Identifying suitable herbs and shrubs Knowledge - Classification and morphological characteristics of herbs - Ecological requirements of herbs - Local and exotic herbs species in Bhutan - Market demand trends for herbs Skills - Observation skills - Decision-making skills - Analytical skills - ICT skills Attitude, safety and environmental concern - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring no harm to wild herbs populations during survey or collection - Avoiding disturbing natural habitats - Ensuring to practice precaution during herb identification - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation C1.02 Preparing nursery site Knowledge - Types of nurseries - Types of nursery bed - Climatic and environmental requirements for herbal crops		

	• Importance of nursery management and record keeping Skills • Operating power chain saw • Using GPS • Operating grass cutter • Operating power tiller • Observation skill • Planning skills • ICT skill • Analytical skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation C1.03 Performing crop propagation Knowledge • Introduction to types of propagation • Soil properties and media preparation • Climate and environment condition • Introduction of type of sowing • Introduction to seed treatments Skills • Handling herbs • Observation skills • Planning skills • ICT skills • Analytical skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE
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	• Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation C1.04 Performing nursery maintenances Knowledge • Plant biology and growth • Pest and disease management • Nursery sanitation and hygiene Skills • Pruning skills • Observation skills • Planning skills • Organizing skills Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials • CBLM • Hand-outs • Audio Visuals • Reference books • Manuals • LMS Learning Facilities and infrastructure • Classroom with adequate facilities • Information Technology (IT) lab • Library • Nursery/production site/field Materials • Notebook, pen, field guide books, sample labels, specimen bags, green net, poles, bed edging, nails, 2T & petrol, lubricant, preservatives, binding wire, thread/rope, seeds, cuttings, media, organic fertilizer, rooting

	hormones, label tag, poly pot, grafting tape, wax, resin, manure and fertilizer and fungicide and pesticide Tools • Secateurs, hoe, spades, rake, trowel, measuring tape, shovel, pickaxe, crowbar, hammer, tank, drip irrigation set pipes, pipe connector/joints, sprinklers, knife, sickle, saw, wheel barrow, grafting knife, sieves, watering can/hand sprayer, seed tray and bucket Equipment • Camera, power chain saw, grasscutter, power tiller, power knapsack sprayer and GPS PPE • Gloves, safety boots uniform and facemask
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work

Module Title	Carrying out herbal-shrubs production		
Module Code	6113- L3-M3		
Learning Outcome 2	Perform cultivation and management		
Duration	Theory: 3 hours	Practical: 15 hours	Total: 18 hours
Assessment Criteria	- Plantation site is prepared as per the job requirement following standard procedure - Plantation activities are performed as per the job requirement following standard procedure - Herbal-shrubs are managed as per the job requirement following standard procedure		
Contents	C2.01 Preparing plantation sites Knowledge - Water management - Importance of soil testing - Crop spacing and plantation layout Skills - Using soil test kit - Operating irrigation system - Operating power tiller - Operating grass cutter - Observation skills - Planning skills - Numeracy skills Attitude, safety and environmental concern - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation C2.02 Performing plantation activities Knowledge - Understanding herbal crops (botany and climatic requirement) - Agronomic practices - Importance of soil amendments Skills - Handling herbs - Operating power tiller - Operating irrigation system		

	• Planning skills • Creativity skills • Organizing skills • Observation skills <i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation C2.03 Managing herbs and shrubs <i>Knowledge</i> • Importance of soil nutrient management • Importance of water management • Importance of IPM practices • Knowledge on training and pruning <i>Skills</i> • Using power knapsack sprayer • Training and pruning skills • Observation skills • Planning skills <i>Attitude, safety and environmental concern</i> • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials • CBLM • Hand-outs • Audio-visuals • Reference books

	• Manuals • LMS Learning Facilities and Infrastructure • Classroom with adequate facilities • Library • IT lab • Nursery/production site Materials • Book, pen, manure and fertilizer, lubricants, fuel, green net, nails, twin thread, seedlings, organic manure/compost, fencing materials (shade net, binding wire, barbed wire, hammer, u-nail, nails, ropes, poles), mulching materials, staking materials, poly pots, media, herbicides, fungicides and pesticides Tools • Spade, sickle, wheelbarrow, shovel, crowbar, rake, hammer, trowel, pickaxe, measuring tape, stringline, pegs, measuring cylinder/tools, watering cans, pruning saw, secateurs, hoe and knife Equipment • Soil test kit, drip set, power tiller, (rotavator, bed raiser), power chain saw and grass cutter PPE • Gloves, safety boots, face mask, uniform and rain gears
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work • Rubrics

Module Title	Carrying out herbal crop production		
Module Code	6113- L3-M3		
Learning Outcome 3	Perform post-harvest activities		
Duration	Theory: 8 hours	Practical: 61 hours	Total: 69 hours
Assessment Criteria	- Harvesting is prepared as per job requirement following standard procedure - Harvesting is performed as per job requirement following standard procedure - Post-harvest practices are performed as per job requirement following standard procedure		
Contents	C3.01 Preparing for harvest Knowledge - Importance of herb maturity indices - Importance of sanitizing tools Skills - Observation skills - Organizing skills - Planning skill - Communication skill Attitude, safety and environmental concern - Effective time management - Being team player - Being efficient in using resources - Being vigilant and patient - Having work ethics and integrity - Proper handling of tools, materials and equipment - Having sense of ownership and accountability - Ensuring appropriate use of PPE - Ensuring proper disposal of waste - Ensuring to follow environmental rules and regulations - Ensuring to follow OHS rules and regulation C3.02 Performing harvesting Knowledge - Importance of maintaining quality and cleanliness while harvesting - Techniques of harvesting Skills - Using appropriate harvester - Handling herbs - Observation skill - Planning skills - Organizing skills Attitude, safety and environmental concern - Effective time management		

	• Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation C3.03 Performing post-harvest practices Knowledge • Concept of value addition • Basic knowledge of post-harvest treatments • Storage conditions for different products • Common causes of post-harvest loss • Market standards and aesthetic requirements for sale and exhibition • Methods of product packaging and labelling Skills • Handling herbs • Operating equipment • Using pH meter • Using label printer • Analytical skill • Observational skill • ICT skill • Creativity skill Attitude, safety and environmental concern • Effective time management • Being team player • Being efficient in using resources • Being vigilant and patient • Having work ethics and integrity • Proper handling of tools, materials and equipment • Having sense of ownership and accountability • Ensuring appropriate use of PPE • Ensuring proper disposal of waste • Ensuring to prevent chemical runoff into soil and water bodies • Ensuring to follow environmental rules and regulations • Ensuring to follow OHS rules and regulation
Learning Conditions	Learning Materials • CBLM • Hand-outs

	• Audio-visuals • Reference books • Manuals Learning Facilities and Infrastructure • Classroom with adequate facilities • Library • IT lab • Nursery/production site Materials • Note book, log book, pen, pencil, harvesting baskets, bags, ethanol, tarpaulin, plastic bags, threads, cloth bags, sanitizing materials, tag, wrapping papers/color papers, boxes, hydration solutions, preservatives, plastic, paper, jute, drying rack, zip lock, bags/pouches, bottles, cans, glass jar, stickers, tape, rubber band and ribbon Tools • Secateurs, sickles, hoe, spade, knife, scissor, tweezer, trays/crates, hand shovel, hoe, bucket, soft brushes, bowls, pickaxe, wheel barrow, hand trowel, soft brushes, cool box, sieves, sponges, tongs, measuring spoons, misting sprayer and stapler with pin Equipment • Grass cutter/harvester, solar/mechanical dryer or oven, moisture meter, weighing scale, essential oil extractor, packaging/heat/vacuum sealer, blender, grinder and pH meter, refrigerator and label printer/color printer Instrument • Weighing balance PPE • Gloves, safety glasses, gloves, safety boots, face mask, rain gears, apron, caps and uniform
Instructional Methodologies	The trainer shall use <i>inter alia</i>, the following instructional methods: • Lecture • Interactive discussion • Demonstration • Field visit/training • Guided practice • Group practice with project-based learning • Individual practice with problem-based learning
Method of Assessment	The trainer shall use <i>inter alia</i>, the following assessment methods: • Practical observation • Oral/viva-voce • Written test • Assignment • Project work • Rubrics

ANNEXURE

Annex I: Time Distribution

Time Duration					
Ornamental Horticulture Certificate III					
Module	Learning outcomes	Tasks	Theory (hours)	Practical (hours)	Total (hours)
A. Carry out floriculture operations	A1. Perform nursery management	A1.00 Introductory Knowledge	6	0	6
		A1.01 Use PPE	1	2	3
		A1.02 Identifying suitable ornamental plant species	3	9	12
		A1.0 Select site	1	2	3
		A1.04 Prepare costing and estimation	2	4	6
		A1.05 Prepare site	3	15	18
		A1.06 Prepare media	1	5	6
		A1.07 Perform plant propagation	3	15	18
		Sub total	20	52	72
	A2. Manage seedlings	A2.01 Irrigate plants	2	10	12
		A2.02 Manage soil nutrients	3	15	18
		A2.03 Transplant seedlings	1	5	6
		A2.04 Perform pest and disease control	2	4	6
		A2.05 Perform hardening	1	2	3
		Sub total	9	36	45
	A3. Perform plantation	A3.01 Select site	1	2	3
		A3.02 Prepare costing and estimation	1	2	3
		A3.03 Prepare site	1	5	6
		A3.04 Construct fencing	0.5	5.5	6
		A3.05 Transport seedling	1	2	3

		A3.06 Plant seedlings	1	5	6
		A3.07 Conduct post-plantation maintenance	2	4	6
		A3.08 Perform harvesting	2	4	6
		Sub total	9.5	29.5	39
	A4. Perform bonsai production	A4.01 Identify suitable bonsai plant species	3	9	12
		A4.02 Prepare bonsai production site	1	5	6
		A4.03 Plant bonsai	1	5	6
		A4.04 Manage bonsai	1	5	6
		Sub total	6	24	30
		Total (A)	44.5	141.5	186
B. Carry out orchid production	B. 1 Prepare for orchid production	B1.01 Identify suitable orchids	3	15	18
		B1.02 Prepare nursery	3	9	12
		B1.03 Perform orchid propagation	1	5	6
		Sub total	7	29	36
	B2. Carry out tissue culture	B2.01 Set up lab	1	5	6
		B2.02 Perform tissue culture	3	15	18
		B2.03 Perform hardening	1	5	6
		Sub total	5	25	30
	B.3 Perform orchid cultivation and management	B3.01 Prepare production site	2	10	12
		B3.02 Perform plantation activities	1	11	12
		B3.03 Manage Orchids	2	4	6
		B3.04 Perform harvesting	3	9	12
		Sub total	8	34	42
		Total (B)	20	88	108
C. Carry out herbal production	C1. Prepare for herbal production	C1.01 Identify suitable herbs and shrubs	6	6	12
		C1.02 Prepare nursery site	2	10	12
		C1.03 Perform crop propagation	3	9	12
		Sub total	11	25	36

	C2. Perform cultivation and management	C2.01 Prepare plantation site	1	5	6
		C2.02 Perform plantation activities	1	5	6
		C2.03 Manage herbs and shrubs	1	5	6
	Sub total		3	15	18
	C3. Perform post-harvest activities	C3.01 Prepare for harvesting	1	2	3
		C3.02 Perform harvesting	1	5	6
		C3.03 Perform post-harvest practices	6	54	60
	Sub total		8	61	69
	Total (C)		22	101	123
	Grand total		86.5	330.5	417

Lesson Plan

Course Title:		NC Level:		
Module Code:		Duration:		
Module Title:				
Learning Outcome:				
Skill/Task/Topic:				
Terminal Performance Objective:				
(Note: Write narrative statement extracted from TPO of Task Sheet)				
Enabling Objectives (Related knowledge):				
By the end of the lesson learners will be able to:				
i) ii) iii)				
What (Content/Activity)	Who (T/L)	How (Methods/ Media)	Duration (Min.)	Questions
Introduction:				
Main body				
Conclusion				
Projects/Problems:				

Instructional Resources Plan				
Skills/Task/Topic:				
No. of Trainees:				
Sl. No.:	Instructional materials/resources	Specifications	Qty.	Remarks
Prepared by :		Signature	Date:	
Revised by:		Signature	Date:	
Approved by:		Signature	Date:	

Task sheet

TS-1/4: Practical Plan			
Course Title:			N C Level:
Module code:			Duration:
Module Title			
Learning outcome			
Skills/Task Title:			Task no:
Terminal Performance Objective: <i>Given:</i> <i>Cue:</i> <i>Who:</i> <i>What:</i> <i>Within:</i> <i>How well:</i> - - -			
Enabling Objectives (Related Skills): <i>By the end of a lesson, the learners will be able to:</i> i) ii) iii) iv)			
Activities	Who (T/L)	How (methods/ media)	Duration

Project/Assignment:						
TS-2/4: Tool and Equipment required:						
<i>Sl no.</i>	<i>Particulars</i>	<i>Specifications</i>	<i>Qty.</i>	<i>Remarks</i>		
Training Materials required:						
<i>Sl no.</i>	<i>Particulars</i>	<i>Specifications</i>	<i>Qty.</i>	<i>Rate</i>	<i>Amount</i>	<i>Remarks</i>
TS-3/4: Performance Guide						
Skill/Task:					Date:	
Directions: Use the following performances criteria to rate the learner. Check YES/NO to indicate whether the learner performed each step as indicated or not?						
Sl. No:	Steps				Yes	No

Annex V: Course Plan
Institutes letter head and Logo

(Trade)YEAR PLAN- _____ Semester_____ (Year)

Trade: NC Level:			Schedule																																								Total Hours																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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Prepared by:

Verified & Approved by:

Date:

Monthly/Weekly Plan

Month:

Trade:

Trainer:

Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week 01							
Week 02							
Week 03							
Week 04							
Week 05							

Developed by:

Approved by:

Date



For more information please contact:

Technical Trainers Training and Resource Center (TTTRC), DWPSD

Official mail: tttrd@moesd.gov.bt or dwpsd@moesd.gov.bt