SYLLABUS
FOR THE TRADE
OF

Horticulture

UNDER
CRAFTSMEN TRAINING SCHEME (CTS)

Revised in
2012

By
Government of India
Ministry of Labour & Employment (D.G.E. &T.)
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake
Kolkata-700 091

List of members attended the Trade Committee Meeting to revise the syllabus for the trade of *"Horticulture "* held on 27.12.2011 at HDF Gramin ITC, Orissa

Sl. No	Name	Name of the Organization	Remarks
1	Mr. Ranjan Kumar Das Mohapatra, Dy. Director of Horticulture,	Dept. of Horticulture,Mayurbhanj	Chairman
2	Mr. L.K. Mukherjee, Deputy Director	CSTARI,Kolkata	Member
3	Dr. Keshaba Charana Panda, Principal	HDF Gramin ITC, Mayurbhanj	Convener
4	Mr. Sudershan Mohanty, Dypt.Director Agriculture	Dept. of Agriculture,Mayurbhanj	Member
5	Mr. Jagannath Patra, Programme Co-ordinator	Krushi Vigyan Kendra, Mayurbhanj	Member
6	Mr. Sarat Chandra Sethy, Distric Agriculture Officer	Dept.of Agriculture , Betnoti	Member
7	Mr. Sudam Kumar Nayak, Plant Protection Officer	Dept.of Agriculture , Betnoti	Member
8	Mr. Ch. Swapan Ku. Mohapatra, Director	HDF Gramin ITC, Mayurbhanj	Member
9	Mr. Sudarshan Das, Secretary	HDF, Bhubaneswar	Member
10	Mr. Bhupati Kumar Patra, Vice Principal	HDF Gramin ITC, Mayurbhanj	Member
11	Mr. Bijay Ku. Das, Lecturer	HDF Gramin ITC, Mayurbhanj	Member
12	Mr. Sachindra Dalabehera, Lecturer	HDF Gramin ITC, Mayurbhanj	Member
13	Dr. Ranjay Ku. Giri, Lecturer	HDF Gramin ITC, Mayurbhanj	Member
14	Mr. Pradeep Chandra Das, Lecturer	HDF Gramin ITC, Mayurbhanj	Member
15	Mr. Shubhadeep Bera, Co-Ordinator	HDF Gramin ITC, Mayurbhanj	Member
16	Mr. Bishnupada Bhowmick, Lecturer	HDF Gramin ITC, Mayurbhanj	Member
17	Mrs. Sanghamitra Pattanayak, Scientist Hort.	Krushi Vigyan Kendra, Mayurbhanj	Member

GENERAL INFORMATION

1. Name of the Trade : Horticulture

2. N.C.O. Code No. :

3. Duration of Craftsmen Training : One year

4. Entry Qualification : Passed 10^{th} Class Examination

5. Unit strength : 20

6. Space norms : Workshop:10000 Sq. meter.

7. Power norms : 3 KW

8. Trainers qualification : (i) B.E./B.Tech (Agriculture) with one year Experience in the relevant field.

OR

(ii) BSc (Ag/Hort) with two years relevant field

OR

(iii) National Trade Certificate in the trade of Horticulture or Floriculture and Landscaping with five years experience in the relevant field.

9. Desirable qualification : Preference will be given to a candidate with CITS

Syllabus for the Trade of *"Horticulture"* under C.T.S.
Duration : One Year

A. Agro-meteorology & Farm Power :

Week	Trade Practical	Trade Theory
1-5	**Agro-meteorology -** Identification of meteorological instruments. Making sketches with problems of recording of a) Rainfall, b) Temperature, c) Humidity, d) Wind direction and speed, e) Evaporation and f) Sunshine hours. (ii) Installation of the above instruments. (iii) Recording meteorological data. Visit to agro-meteorological Stations.	a) Importance of different elements of weather and climate in agriculture – rainfall, temperature, humidity, sunshine, wind speed and direction. b) Weather and climate of related state of the country – Annual andSeasonal pattern relating crop season, highlighting seasonal variation, Winter – Rabi, Summer - Pre – kharif, Monsoon – maturity and harvesting of Kharif crops and field preparation and sowing of Rabi crops. c) Brief idea about Special weather phenomena and hazard weather events viz, cyclonic storm and storm surge, flood, drought, heat and cold wave, hail storm, western disturbances and associated weather events : Their nature, period and areas of occurrence and effect On crops and crop management. Weather forecast & its implication.
	Agro climatic regions -	Agro-climatic regions with their special characteristics.
	Weights and measures and land records - Calculations on weights and measures. Study of land records, Cadastral map, identification of plot and its measurement. Practice & use of electrical Top-pan Balance for measuring milligram fractions of chemicals.	Weights and measures : Concept of Metric System of area and weights, Conversion of units of acres to hectares. Brief idea about land records, Cadastral map, identification of plot and its measurement.
	Farm Power and Machinery - Practices in ploughing, harrowing, laddering, use and care of seed drill, wheel hoe, handling of sprayer, duster and pedal thresher. Calibration and fitting, fixing of seed drill, wheel hoe, paddy weeder, MB plough, Operation of pump set.	a) Agricultural implements: Country plough, MB plough, Bidhe, Wheel hoe, Paddy weeder, seed drill, pedal thresher, duster and sprayer, Harvesting and post harvesting equipments.

	Making sketches of parts of important farm equipment. Use of electrical power driven machineries like motors, use of alternative and renewable sources of energy devices.safety awareness related to the trade-personal, machine/equipment.	b) Types and application of Farm Power, Farm electricity, renewable energy.
	Use of farm machineries like Tractor, power tiller, Rotavator. Cost calculations.	c) Tractor & Power tiller – Types, application, Operation and maintenance. Operation cost analysis.
	<u>Basic Knowledge on Plant Biology-</u>	
6-7	Study of germination, plants parts, roots, flowers, fruits & seeds. Identification of Common families /varieties	Morphology, physiology & other preliminary knowledge.

B. <u>Soils, Water and their Management :</u>		
8-13	**<u>Soil -</u>**	Soils and its concept of formation Properties
	Practice - cultural measures of soil moisture & conservation **<u>Soil moisture & its conservation -</u>** Study of soil water at field capacity, hygroscopic water and water at wilting point	Soil moisture and its conservation, Water conservation technique and consumptive use of water.
	<u>Soil erosion and its control -</u> Study of soil erosion and Practice soil erosion, control techniques – contour bunds, trenches, gully control measures.	Soil erosion – its types, causes, effect, control measures.
	<u>Soil conservation -</u> Vegetative measures of water conservation. Visit to water conservation Sites.	Low cost soil conservation techniques with vegetation etc.
	<u>Watershed and water harvesting -</u> Visit to Watershed. Drawing of notional watershed maps. Identifying watershed resources. Study of water table, aquifer, Aquifer recharging techniques.	Water Harvesting techniques and aquifer recharging methods. Concept of Watershed.

	Irrigation and Drainage - Practice different methods of irrigation.	a) Irrigation : Its need, irrigation types, Methods of application, appliances.
	Practice water lifting with all available devices. Study of quality of irrigation water.	b) Water lifting equipment – Indigenous and power operated; Assessment of quality and quantity of water.
	Study of water conveyance and water loss during irrigation.	c) Irrigation Water – Conveyance and control technique.
	Control of water loss by various techniques	d) Loss of irrigation water in different ways. Methods of prevention of such loss.
	Installation of micro and pressure irrigation systems. Practice irrigation through micro and pressure irrigation systems.	e) Micro Irrigation system – Drip, Sprinkler and other methods.
	Practice drainage systems.	f) Drainage – need, type and control technique.
	Soils and Soil Management - Visual identification of textural type of soils. Collection of soil samples, procedure for sending samples to Soil Testing Laboratory. Interpretation of soil testing results and fertilizer recommendation. Practicing different methods of correction of soil acidity, such as liming, sludge, wood ash, dolomite, basic slag, rock phosphate with frequency and rate of application. Study of soil particles – salt, silt, clay. Study soil porosity. Study bulk and particle density of soil. Study soil types based on textural classes.	Texture (definition, particle size of soil ingredients i.e. sand, silt, clay) classification and importance. Porosity, bulk density & particle density.
	Study different structures of soil. Study soil reaction- Measurement of pH by litmus method and using electronics devices. Study water holding capacity of soil.	Structure (definition, classification, importance), water holding capacity, pH, EC, CEC, Soil solution, Soil classes on the basis of agro climatic zones.

	Visit to acid soil and saline soil areas and identification of field problems.	Acid, Alkaline and Saline soils : (i)Definition, ii) Causes, iii) Problems and (iv) Methods of correction.
	Practice method of correction of acid soil by application of various materials such as lime, sludge, wood ash, dolomite, basic slag, rock phosphate.	Acid Soils – different methods of correction of soil acidity, such as liming, sludge, wood ash, dolomite, basic slag, rock phosphate - their composition, frequency and rate of application.
	Practicing methods of corrections	Saline soils – Corrections through

	through improvement of drainage, flushing, leaching and scrapping. Practicing methods to combat the salinity problems. Adoption of different agronomic practices such as ridge and furrow methods of sowing and irrigation.	improvement of drainage, flushing, leaching, scrapping. Methods to combat the salinity problems. Adoption of different agronomic practices such as ridge and furrow methods of sowing and irrigation, growing of salt tolerant crops.
	Practice correction methods through application of Sulphur and Gypsum – frequency and rate of application.	Alkaline soils – Correction through application of Sulphur and Gypsum – frequency and rate of application.
	Role of organic matter in soil and its recycling - Collection and use of Azolla, BGA and its multiplication. Study of recycling of organic matter.	a) Concept of soil organic matter – humus. b) Role of organic matter (OM): Effect of OM on soil properties such as structure. Effect of OM on soil micro-organisms. Effect of OM on soil fertility. c) Recycling of OM in the field. d) C/N Ratio of Soil and organic matter.
C. Soil Fertility, Fertilizers, Manures & Soil Fertility Management :		
14-19	**Soil fertility, Manures and Fertilizers, Fertility Management -** Practice of Integrated Nutrient Management System (INMS) in the field. Awareness on occupational health hazards and safety related to the trade	a) Soil fertility, productivity and its maintenance. Concept and practices of INMS.
		b) Different types of manures such as compost (NADEP compost, Vermi compost), FYM, Sludge, Poultry manure : Their nutrient contents and role in improving soil and soil fertility.
	Identification of seeds of Green. Manuring. crops. Identification of different Green. Manuring. crops – Dhaincha, Kalai, Cowpea, Subabul, Glyricidia. Demonstration and incorporation of green manuring crops.	c) Green manure – Role of Green Manuring in crop production. Green manuring , its principles, methods and practices. Different types of Green Manure crops. Cultivation of important Green Manuringcrops such as Dhaincha, Kalai, Cowpea, Sunhemp, Glyricidia.
	Identification of bio-fertilizers.	d) Bio-fertilizer – i) Concept and classification.
	Preparation of bio-fertilizers. Practice of bio-fertilizers, application, techniques.	ii) Use of bio-fertilizer as Azolla, Blue-green algae, Rhizobium, Azotobactor, Phosphate and Potash solubilizing bacteria and mycorrhiza– their propagation,

		source of availability, application and limitations.
	Field diagnostic study for deficiency symptoms of nutrient elements.	e) Essential plant nutrient elements - Role of Major and Minor plant nutrient elements. Deficiency symptoms.
	Identification of fertilizers and micronutrient containing chemicals.	f) Chemical Fertilizers : i) Classification (both macro and micro-nutrient containing fertilizers), nutrient contents.
	Practice application of fertilizers and manures by various means.	ii) method of fertilizer application: Broadcasting, Band and furrow placement, Ring placement, Foliar spray – their advantages and disadvantages.
		iii) Time of fertilizer application.
	Study of leaching, run-off, chemical and biological fixation of nitrogen. Study of nodulation.	g) Depletion of Soil fertility : i) Factors affecting such as leaching, run-off, chemical and biological fixation of nitrogen, de-nitrification, volatilization, crop removal.
	Practice cultural methods such as recycling or application of crop residue, ploughing, leveling, application of organic matter, fertilizers and soil amendments, crop rotation and adoption of appropriate cropping systems for maintenance of soil fertility.	ii) Maintenance of soil fertility : through adoption of cultural methods such as recycling or application of crop residue, ploughing, leveling, application of organic matter, fertilizers and soil amendments, crop rotation and adoption of appropriate cropping systems.
D. <u>Introductory Horticulture</u> :		
20-24	**<u>Fundamentals of Horticulture -</u>** Identification of plants according to classification based on both botanical importance and commercial importance. Common names, botanical names Making sketches and diagrams. Studying the life cycles of some selected plants of each class of plants.	Introduction on Horticulture. Classification of the subject. Importance of horticulture. Scope of horticulture. Classification of horticultural plants.

	Introduction to fruits, flowers and vegetables - Identification of fruits – study of size, shape, colour, aroma etc. Identification of fruits and vegetables through field study.	Common fruits, flowers and vegetables grown in the country according to agro-ecological situation and season. Classification of vegetables based on season and edible parts.
	Importance of fruits, flowers and vegetables - **Scope of horticultural development and different schemes in horticulture -**	Distribution of area, production and productivity of different fruits, vegetables and flowers. Importance of fruits and vegetables as protective food. Nutritional composition and value of fruits and vegetables. Daily requirement of fruits and vegetables per person. Present situation and scope of development of horticultural crops. Schemes on horticultural development.
25-26	**Layout of Plots and Gardens -** Making plans for home, gardens, individual instructional plots, gardens, nurseries, landscape gardens, experimental designs.	Planning for home gardens, individual instructional plots, gardens, nurseries, landscape gardens, experimental designs.

E. Fruit Culture, Vegetable propagation and Preservation of fruits & vegetables :		
27-32	**Cultivation of fruits, Management of orchards -** Preparation of seed bed, sowing of seeds, seed treatment, watering, transplanting, Protection against adverse environment. Management of seed bed. Preparation of individual and group plots : Planning, making layout, planting, aftercare. Digging of pit, enrichment of soil, refilling of pits, planting, watering etc.	Present situation of cultivation of different fruit crops like Mango, Banana, Citrus (Lime and Pumelo), Guava, Litchi, Pineapple, Coconut, Papaya , Ber, Apple, Grapes, Pear, Watermelon etc. with special emphasis on the impact point – (Climate, Variety, Planting materials, Planting time, Spacing, Manures and fertilizers, Interculture, Harvesting, Grading, Storage, Marketing, Yield, Economics); Orchard Management.
	Vegetative Propagation - Study and practice of propagation techniques of different types of plants Study of plant hormones.	Different methods of vegetative propagation of fruits and flowers. Importance of vegetative Propagation. Types : Cutting, Air layering, Ground layering, Inarch grafting, Veneer grafting,

	Practice of propagation techniques : Cutting, Air layering, Ground layering, Inarch grafting, Veneer grafting, Stone grafting, Patch budding, Chip budding and T-budding (with diagrams).	Stone grafting, Patch budding, Chip budding and T-budding (with diagrams). Role of plant hormones in propagation and crop production.
	Fruits and Vegetable preservation – Collection of materials like fruits, vegetables. Practice on processing like grading, washing, peeling and dehydration by various techniques using solar, electrical power. Practice - preparation of squash, jam, Jelly, Sauce & pickles of different fruits. Use of preservatives like chemicals, sugar, brim for fruits and vegetables Canning, bottling & leveling	Importance of preservation. Processing and processing instruments, bottling. Methods of preparation of squash, jam, Jelly, Sauce, pickle, ketchup. Preservatives. Storage, refrigeration. Fermentation. Storage and storage conditions of processed materials. Standards and qualities.
F. Cultivation of Vegetables & Spices :		
33-37	**Cultivation of Vegetables and Spices -** Raising individual and community plots of vegetables. Raising museum plots of vegetables. Practice on all cultural operations related to all impact points	Present situation in the cultivation of different vegetable crops. Cultivation of vegetables with special emphasis on the impact point : (Climate, Land preparation, Variety (OP and F_1 Hybrid), Planting materials, Planting time, Spacing, intercultural operations, INMS. Requirement of Manures and Fertilizers, Interculture, Harvesting, grading, storage, packaging, transportation, Yield). Name of the Vegetables to be dealt with : Cucurbits (Sweet gourd, Bottle gourd, Bitter gourd, Ridge gourd, Pointed gourd, cucumber). Cauliflower, Cabbage, Red cabbage, Gherkin, Kohlrabi, Broccoli, Tomato, Brinjal, Okra, Radish, Carrot, Beet, Chili, Capsicum, Beans (Cowpea, French bean) Pea, Garlic, Onion, Turmeric, Ginger and spinach, Parsley, Celery, China cabbage, Baby corn.

G. <u>Cultivation of Flowers, Climbers, Foliages & Other crops :</u>		
38-41	**<u>Cultivation of flowers and climbers -</u>** Identification of flowers and climbers. Raising individual and community plots of flowers. Raising museum plots of flowers. Practice on all cultural operations related to all impact points.	Rose, Tube-rose, Gladiolus, China rose, Jasmine, Marigold, Chrysanthemum, Dahlia, Gerbera, Antirrhinum, Aster and other important flowers : (Climate, Land preparation, Variety, Planting materials, Planting time, Spacing, intercultural operations, nutritional management, water management, Harvesting, storing, packaging, marketing). Climbers and their management.
	<u>Cultivation of foliages and palms -</u> Identification, care and management of foliages like dieffenbachia, anthurium, coleus, begonia, philodendrons and palms etc.	Care and management of potted plants and common and important foliages like dieffenbachia, anthurium, coleus, begonia, philodendrons and palms etc.
	<u>Cultivation of Medicinal plants -</u> Identification of medicinal and aromatic plants. Raising individual and community plots of medicinal and aromatic plants. Practice on all cultural operations related to all impact points.	Aswagandha, Sarpagandha, Basaka, Citronella, Mentha, Aloe etc. : (Climate, Land preparation, Variety, Planting materials, Planting time, Spacing, intercultural operations, nutritional management, water management, Harvesting, post harvest operations, storing, packaging, marketing).
	<u>Cultivation of Mushroom -</u> Practice on production technique of all kinds of mushrooms.	Package of practices of Paddy straw mushroom, Oyster mushroom, Button mushroom.
	<u>Betelvine -</u> Practice on construction of vineyard. Preparation of soil in the vineyard. Propagation of vines. Planting, Manuring, Harvesting, Grading, Marketing.	Cultivation and marketing with special emphasis on field problem.
H. <u>Pest Management :</u>		
42-44	**<u>Pest management -</u>** Identification of different classes of pesticides including bio-pesticides. Identification of bio-control agents. Preparation and application spray solution and dusts. Preparation of Bordeaux mixture and its	Classes of insect pests diseases. Concept of plant protection in general. Integrated Pest Management.

	application. Identification of major insect pests and diseases of vegetables, fruit crops and other horticultural crops as dealt with in respective chapters.	Bio-control agents and bio-pesticides. Systematic waste disposal keeping environment pollution in view.
I. <u>Seed Production, Marketing & Trade Management :</u>		
45-48	**<u>Seed production</u> -** Identification of classes of seeds, package of practices for seed production, processing of seeds, packaging according to classes of seeds. Modern techniques of packaging. Packaging requirements.	Seeds : Quality of seeds, classification of seeds - breeder seeds, foundation seeds, certified seeds, TL seeds. Seed processing, Modern techniques of packaging seeds, Packaging requirements. Seed Act.
	<u>Inventory control & maintenance of Records -</u> Practice on Stocking and issuing and Maintenance of farm records like Cultivation Registers, Stock Book etc. Stock verification.	Methods of management of Store. Stocking and issuing. Maintenance of Farm Records like Cultivation Registers, Stock Book etc.
	<u>Markets & Marketing -</u> Study of markets, Survey techniques, Tabulation of data and interpretation.	Types of markets, Study of markets, Survey techniques.
	<u>Trade and trading -</u> Visits to Trade Centers, Interviews for assessing trade problems. Visit to Export Houses and Centers.	Trade : Its concept, scales of trade, trading requirements – licensing, registration, sales tax, other taxes; Pricing of products; Export of products – present scenario and potentials.
49-50	**Workshop, Field practical , project preparation,**	**Group Discussion** **Entrepreneurship Development**
51-52	**Revision & Test**	

LIST OF TOOLS & EQUIPMNT FOR THE TRADE OF *"HORTICULTURE"*

(Unit Size : 20)

Sl. No.	Description of Item	Quantity
1.	Spade	21 Nos.
2.	Kudali	21 Nos.
3.	Khurpi	21 Nos.
4.	Hand hoe	21 Nos.
5.	Secateur	21 Nos.
6.	Pruning Saw	10 Nos.
7.	Budding & Grafting Knives	10 Nos.
8.	Rake	10 Nos.
9.	Rose Cane	05 Nos.
10.	Sprayer	
	a) Foot Sprayer	2 Nos.
	b) Hand Sprayer	4 Nos.
11.	Transplanting Shovel	10 Nos.
12.	Measuring tap	05 Nos.
13.	Different types of ropes	10 kg.
14.	Different types of labels	5000 Nos.
15.	Stackes	5000 Nos.
16.	Lawn mover	1 No.
17.	Duster	2 Nos.
18.	Pruning knives	5 Nos.
19.	Hedge shears	5 Nos.
20.	Grass shears	5 Nos.
21.	Deshi plough	5 Nos.
22.	Tagari (Basket)	10 Nos.
23.	Hot plates	1 No.
24	Physical balance & weight box	1 No.
25	Sprinkler	1 No.
26.	Sword	1 No.
27.	Cutting, peeling, coring and pitting knives	10 Nos. each
28.	Spoons and forks	6 Nos.
29	. Counter pan balance with weights	1 No.
30	Avery weighing scale	1 No.
31	Physical balance	1 No.
32	Pocket refractometer0-30, 30-60,60-90	1 Set
33	Thermometers 0° - 150°C	2 Nos.
34	Brix hydrometer 0-30°, 30-60°, 60-90°	1 Set
35	Can vacuum testing gauge	1 No.
36	Jelmeter	1 No.

37	Salometer	1 No.
38	A simple R, o, sealing machine for bottles and Jars	1 No.
39	Can sealing machine manually – operated similar to Dixie sealer or the power driven, more costly MB No. 1A Seamer	1 No.
40	Crown corking machine, manually operated	1 No.
41	Pressure cooker, Burpee type	1 No.
42	Preparation tables, (6′ x 3′ x 3′)	2 Nos.
43	Basket press, Screw type Juice Extractor, manual,	1 No. each
44	Lemon Squeezers	10 Nos.
45	Carbonation unit	1 Set
46	Vinegar generator	1 Set
47	Cans, bottles, jars, closures, labels as required	

Consumable Tools

Sl. No.	Description of Item	Quantity
1	Plastic bucket	15 Nos.
2	Seed sieve	1 No.
3	Kerosene and gas stoves, charcoal ovens	2 Nos.
4	Basins, buckets, sauce pans, mugs etc. (assorted)	10 Nos. each
5	Stainless steel sieves	2 Nos.
6	Wooden ladles	3 Nos.

Meteorological Instruments

Sl. No.	Description of Item	Quantity
1	Raingauge	1 Nos
2	Max-Min Thermometer	1 Nos
3	Dry & Wet Bulb Thermometer with chart	1 Nos