

Model Curriculum

Mushroom Grower

SECTOR: AGRICULTURE & ALLIED
SUB-SECTOR: AGRICULTURE INDUSTRIES
OCCUPATION: AGRI ENTREPRENEURSHIP & RURAL ENTERPRISES
REF ID: AGR/Q7803, V1.0
NSQF LEVEL: 4



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

AGRICULTURE SKILL COUNCIL OF INDIA

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/Qualification Pack: **'Mushroom Grower'** QP No. **'AGR/Q7803 NSQF Level 4'**

Date of Issuance: October 20th, 2016

Valid up to: March 31st, 2019

* Valid up to the next review date of the Qualification Pack



Authorised Signatory
(Agriculture Skill Council of India)

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Mushroom Grower

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Mushroom Grower”, in the “Agriculture & Allied” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Mushroom Grower		
Qualification Pack Name & Reference ID.	AGR/Q7803, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	8 th standard pass, preferably		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Identify & arrange resources/ inputs for mushroom cultivation unit: commercially important species of mushroom, site location for mushroom cultivation, base material for compost preparation etc • Undertake good quality mushroom production using appropriate techniques: preparation of compost, ensure proper environmental conditions, disease & pest management, casing & pinning for mushroom cultivation, harvest good quality mushroom, sorting & grading, packaging, labelling & transportation • Undertake basic entrepreneurial activities for small mushroom enterprise: arrangement of finance, pooling of resources, market linkages etc • Practice health & safety at the work place: Well versed with health and safety measures in terms of personal as well as others’ safety. 		

This course encompasses 6 out of 6 National Occupational Standards (NOS) of “Mushroom Grower” Qualification Pack issued by “Agriculture Skill Council of India”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	Introduction Theory Duration (hh:mm) 05:00 Practical Duration (hh:mm) 00:00 Corresponding NOS Code Bridge Module	<ul style="list-style-type: none"> Understand General Discipline in the class room (Do's & Don'ts) Study the Scope & importance of Mushroom cultivation in India Understand the usage & market demand for mushroom Understand the Role of a 'Mushroom Grower' 	Laptop, white board, marker, projector
2	Prepare & pasteurize the compost necessary to cultivate mushrooms Theory Duration (hh:mm) 10:00 Practical Duration (hh:mm) 20:00 Corresponding NOS Code AGR / N7813	<ul style="list-style-type: none"> Select appropriate materials to prepare the compost- base materials from various agricultural by-products, materials rich in cellulose impart proper physical structure to the substrate, ensure adequate aeration during composting, and add bulk to the compost select & apply chemicals for mineral deficiency rectification and stabilization Identify different types compost- natural & synthetic, formulation of different compost Select composting methods- short, long; indoor, outdoor Undertake compost rotation and ensure adequate moisture, carbohydrate, gas exchange etc Pasteurize the compost to kill insects, nematodes, pest fungi, or other pests Understand good compost attributes 	Laptop, white board, marker, projector, Audio-visual aids, growth substrate, sprayer, duster, chemicals
3	Select commercially important species of mushroom and design appropriate site to cultivate mushrooms Theory Duration (hh:mm) 10:00 Practical Duration (hh:mm) 25:00	<ul style="list-style-type: none"> Select commercially important type of mushroom based on market's demand, climatic conditions of the farm, growing season, investments, etc. Procure mushroom spawns from authentic source Select appropriate mushroom cultivation site with proper drainage & water supply facility Design and construct mushroom farm according to the growing conditions required for different kinds of 	Laptop, white board, marker, projector, Audio-visual aids,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code AGR/N7814	mushrooms <ul style="list-style-type: none"> Understand different types of mushroom growing facilities and fixtures Understand types, components and their specifications of bulk chamber conducive for good quality mushroom growing 	
4	Undertake disease control and pest management activities, casing and pinning for mushroom cultivation Theory Duration (hh:mm) 10:00 Practical Duration (hh:mm) 25:00 Corresponding NOS Code AGR/N7815	<ul style="list-style-type: none"> Inspect mushroom bags or beds carefully for early detection of pests and diseases Control diseases and exercise preventive care- spray pesticides/ fungicides etc pasteurize the mushroom farm to remove nematode in mushroom cultivation Prepare casing soil to hold moisture Promote the formation of primordia, or mushroom pins by supplying water to the mycelium detect the earliest formation of recognizable mushrooms from mycelium case at a regular interval after harvesting or cover the holes after mushroom picking 	Laptop, white board, marker, projector, Audio-visual aids, sprayer, duster, safety gloves & boots, face mask, disinfectant, chemicals
5	Undertake harvest & post-harvest procedures of mushrooms Theory Duration (hh:mm) 10:00 Practical Duration (hh:mm) 35:00 Corresponding NOS Code AGR/N7816	<ul style="list-style-type: none"> Assess the maturity of mushroom and harvest periods Apply good harvesting practices Cut, clean and dry harvested mushroom using approved procedures sort and grade the harvests as per required quality specifications Store, pack, label and transport produce Record information, e.g. quality, quantity, type, expenditure incurred in operation, etc. in appropriate registers, record book and logs Utilize spent mushroom substrate in organic farming, vermicomposting, bioremediation of contaminated soil etc 	Laptop, white board, marker, projector, Audio-visual aids, Polypropylene bag, non-waxed paper bag, tin cans for export, labels, Weighing machine, Bag sealing machine
6	Undertake basic entrepreneurial activities for small enterprise	<ul style="list-style-type: none"> Assess demand & supply of mushroom in the market Seek information regarding 	Laptop, white board, marker, projector, Audio-visual aids, pen,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Theory Duration (hh:mm) 20:00 Practical Duration (hh:mm) 10:00 Corresponding NOS Code AGR/N9908	subsidies/loan available through govt institutions <ul style="list-style-type: none"> • Avail loan from the financial institutions • Identify & develop appropriate marketing channels • Track prices prevailing in the market and formulate competitive pricing mechanism • Maintain book of accounts • Calculate B:C ratio • Comply with relevant regulations in marketing & sale of the produce 	paper
7	Maintain Health & Safety at the work place Theory Duration (hh:mm) 10:00 Practical Duration (hh:mm) 10:00 Corresponding NOS Code AGR/N9903	<ul style="list-style-type: none"> • Maintain a clean & efficient workplace • Render appropriate emergency procedures • On Time Reporting to appropriate person. • Practice General safety and first aid 	Laptop, white board, marker, projector, , Personal protective equipment Like: Helmet / head gear, safety gloves, Safety boots, First Aid Kit: Bandages, Adhesive bandages, Betadine Solution / ointment, Pain relief spray / ointment, Antiseptic liquid; Phone directory, Search lights, fire extinguisher
	Total Duration: Theory Duration (hh:mm) 75:00 Practical Duration (hh:mm) 125:00	Unique Equipment Required: Laptop, white board, marker, projector, Audio-visual aids, growth substrate, sprayer, duster, safety gloves & boots, face mask, disinfectant, chemicals, Polypropylene bag, non-waxed paper bag, tin cans for export, labels, Weighing machine, Bag sealing machine	

Grand Total Course Duration: **200 Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by Agriculture Skill Council of India)

Trainer Prerequisites for Job role: “Mushroom Grower” mapped to Qualification Pack: “AGR/Q7803, v1.0”

Sr. No.	Area	Details
1	Description	Trainer is responsible for educating the trainees –selection of commercially important mushroom species, designing of mushroom cultivation site, compost preparation, pest & disease management, casing & pinning for mushroom cultivation, harvest & post-harvest methods, health & safety practices at work site, basic entrepreneurship skills.
2	Personal Attributes	Trainer should be Subject Matter Expert. He/ she should have good communication, leadership, observation and practical oriented skills.
3	Minimum Educational Qualifications	Diploma in Agriculture
4a	Domain Certification	Certified for Job Role: “Mushroom Grower” mapped to QP: “AGR/Q7803 v1.0”. Minimum accepted score is 80%.
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “MEP/Q0102”. Minimum accepted % as per respective SSC guidelines is 80%.
5	Experience	<ul style="list-style-type: none"> • Post Graduate (Agriculture / Horticulture/ Forestry) • B. Sc. (Agriculture / Horticulture/ Forestry) with 1 year of relevant experience • B.Sc. with 3 years of relevant experience and a total of 5 years of work experience • Diploma in Agriculture with 3 years of relevant experience and a total of 5 years of work experience

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Mushroom Grower
Qualification Pack	AGR/Q7803, v1.0
Sector Skill Council	Agriculture

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in aggregate
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack

Assessable Outcomes	Assessment Criteria	Total Marks	Out of	Theory	Practical Skills
AGR/N7813 Prepare and pasteurize the compost necessary to cultivate mushrooms	PC1. identify different types of base materials from various agricultural by-products, e.g. freshly harvested paddy straw, wheat straw, mustard straw, etc.	100	10	5	5
	PC2. select materials which acts as a reservoir of cellulose, hemi-cellulose and lignin, and is utilized by the mushroom species during its growth as a carbon source		10	5	5
	PC3. identify materials that have nitrogen (N) and carbon (C) ratio 1: 10 for the establishment of the bacterial flora in the compost		6	3	3
	PC4. select materials that acts as a nutrient source, impart proper physical structure to the substrate, ensure adequate aeration during composting, and add bulk to the compost		6	3	3
	PC5. select chemicals for rectifying the mineral deficiencies in the compost such as muriate of potash, super phosphate, urea, calcium ammonium nitrate, ammonium sulphate, etc.		6	3	3
	PC6. identify chemicals which has a stabilizing effect on ammonium content, serves as a calcium source for the mushroom and also for the oxalic acid produced by the mushroom mycelium, which gets converted into calcium oxalate, e.g. gypsum and calcium carbonate		6	3	3
	PC7. select the necessary tools required to produce a compost		4	2	2
	PC8. compute different formulations of composting ingredients to achieve the required nitrogen and carbon ratio for mushroom compost		6	3	3
	PC9. identify the types of compost—Natural and synthetic		4	2	2
	PC10. select the method of composting with respect to the availability of steam pasteurization		4	2	2
	PC11. ensure to sprinkle water over the compost regularly after an interval of a day		3	1	2
	PC12. rotate the compost after an interval of 2–3 days regularly to allow gas exchange, adequate moisture, and carbohydrates throughout the process		4	2	2

	PC13. store the agricultural by-products under cover to minimize growth of unwanted and potentially detrimental fungi and bacteria		3	1	2
	PC14. pasteurize the compost to kill insects, nematodes, pest fungi, or other pests		4	2	2
	PC15. identify the attributes of a good compost—dark brown in colour, non-greasy, inoffensive sweet smell, ammonia free, no insects and nematodes		5	2	3
	PC16. leave the work in a safe condition		3	0	3
	PC17. return used tools and materials in appropriate storage area		3	0	3
	PC18. dispose wastes materials in accordance with environmental health & safety guidelines		5	2	3
	PC19. report any work related problems or issues to responsible authority and seek guidance on how to rectify problems		4	2	2
	PC20. exercise safe handling practices while handling sharp tools and equipment		4	2	2
		Total	100	45	55
AGR/N7814 Select commercially important species of mushroom and design appropriate site to cultivate mushrooms	PC1. select the type of mushroom based on market's demand, climatic conditions of the farm, growing season, investments, etc.	100	10	5	5
	PC2. collect mushroom spawns from reliable sources, e.g. nearest Krishi Vigyan Kendra (KVK), etc.		10	5	5
	PC3. select species which will be cost effective and economically beneficial according to market research		10	5	5
	PC4. identify the type of mushroom with more shelf life as per industry standard		10	5	5
	PC5. select freshly prepared spawns because the mycelium is in the state of active growth		6	3	3
	PC6. undertake site assessment		4	2	2
	PC7. locate site easily accessible by main roads and pathways		4	2	2
	PC8. ensure that the site is deprived of sunlight		6	3	3
	PC9. ensure proper drainage of rain water		6	3	3
	PC10. prepare and check the suitability of design and layout of the farm according to the growing conditions required for different kinds of mushrooms		8	4	4
	PC11. ensure availability of fresh water supply for the mushroom growing facility		6	3	3

	PC12. ensure effective underground drainage system or gutters for carrying out waste water		6	3	3
	PC13. use safe and reliable construction techniques to build required fixtures for mushroom growing		6	3	3
	PC14. use crop rotation method for mushroom cultivation		8	4	4
		Total	100	50	50
AGR/N7815 Undertake disease control and pest management activities, casing and pinning for mushroom cultivation	PC1. ensure substrates are not exposed to pathogens or pests during spawning	100	4	2	2
	PC2. inspect mushroom bags or beds carefully for early detection of pests and diseases		4	2	2
	PC3. ensure that flies do not enter the mushroom farms, e.g. not dumping any waste near mushroom farms, installing screens on windows and doors, etc.		4	2	2
	PC4. use sterilized casing soil, proper disposal of spent compost to control nematodes, mites, insect pests, etc.		4	2	2
	PC5. spray fungicide after casing to check dry bubble, e.g. dithane Z-78, sporgon, topsin M, chlorothalonil, prochloraz, daconil, etc.		4	2	2
	PC6. control local infections by spraying the affected patch with commercial formalin		4	2	2
	PC7. spray chlorinated water to manage bacterial diseases		4	2	2
	PC8. disinfest mushroom farms by spraying pesticide as a prophylactic measure, e.g. dicofol, etc.		4	2	2
	PC9. control mites by spraying insecticide on the compost, e.g. diazinon emulsion, etc.		4	2	2
	PC10. maintain hygiene by wearing clean clothes and shoes and wash hands before entering mushroom farms		4	2	2
	PC11. pasteurize the mushroom farm to remove nematode in mushroom cultivation		4	2	2
	PC12. treat the mushroom farms with small amount of caustic chemical to keep rodents away, e.g. zinc phosphate, etc.		4	2	2
	PC13. use fungicides to control major fungal pathogens, e.g. bavistin, etc.		4	2	2
	PC14. prepare casing soil to hold moisture for the development of a firm mushroom		4	2	2

	PC15. use freshly prepared spawn because the mycelium is in the state of active growth		4	2	2
	PC16. protect the compost from drying, and provide support for the developing mushrooms and resisting structural breakdown following repeated watering		4	2	2
	PC17. promote the formation of primordia, or mushroom pins by supplying water with a sprayer pump to the mycelium for growth and development		4	2	2
	PC18. maintain proper hygienic condition by wearing gloves and boots dipped in disinfectant while entering the mushroom farms for casing		4	2	2
	PC19. adjust compost temperature and relative humidity		4	2	2
	PC20. fertilize with nitrogen to increases yield of mushrooms		4	2	2
	PC21. maintain carbon dioxide concentration at a higher level to accelerate the growth of mushrooms		4	2	2
	PC22. apply water to casing in a few instalments so that water does not run into spawn run compost		4	2	2
	PC23. detect the earliest formation of recognizable mushrooms from mycelium		4	2	2
	PC24. case at a regular interval of three days after harvesting or cover the holes after mushroom picking		4	2	2
	PC25. pick the mushrooms daily		4	2	2
	Total		100	50	50
AGR/N7816 Undertake harvest and post-harvest procedures of mushrooms	PC1. select mushrooms that are young and healthy	100	8	4	4
	PC2. assess the maturity of a mushroom by how far the veil is stretched respective of their types, and select mushrooms from medium- to large-size,		8	4	4
	PC3. identify harvest periods		8	4	4
	PC4. apply good harvesting practices, e.g. air temperature during cropping should be held between 14°C to 17°C and relative humidity should be high to minimize the drying of casing		4	2	2

PC5. twist and pluck the mushrooms from its base by undertaking control measures to prevent contamination of the mushroom	4	2	2
PC6. use approved cutting techniques for harvesting	4	2	2
PC7. use approved cleaning methods to remove soil particles, compost, and other foreign materials, e.g. washing in water and sodium meta bisulphite solution	4	2	2
PC8. remove the water content from the mushroom, as it is highly perishable	6	3	3
PC9. sort and grade the harvests as per required quality specifications	5	2	3
PC10. store freshly harvested mushrooms at lower temperature e.g. 2°C to 7°C	4	2	2
PC11. select packaging material with respect to the shelf life, type of market where it is to be sold, and investment	4	2	2
PC12. identify packaging materials which is strong in nature, does not get contaminated easily, available abundantly, lucrative and attractive	3	1	2
PC13. check the selected storage area is clean, well-ventilated and dry	4	2	2
PC14. protect the storage area from direct sunlight, dust, rain, rodents, insects, and livestock, etc.	4	2	2
PC15. select the type of storage according to the shelf life of mushrooms—short-term and long-term	4	2	2
PC16. pack the mushrooms in bags (usually polypropylene) of different capacities or perforated polythene pouches with 0.5 percent venting area or polystyrene/pulp-board punnets for sale	4	2	2
PC17. transport precooled mushrooms in insulated ice containers internally lined with thermocole and covered with tin sheets on both the sides	3	1	2
PC18. label the packed item correctly with all the required information	3	1	2

	PC19. record information, e.g. quality, quantity, type, expenditure incurred in operation, etc. in appropriate registers, record book and logs		5	1	4
	PC20. use spent mushroom substrate in organic farming as it is rich in nutrient resources		5	1	4
	PC21. utilize spent mushroom substrate in vermicomposting and bioremediation of contaminated soil		6	3	3
		Total	100	45	55
AGR/N9908 Undertake basic entrepreneurial activities for small enterprise	PC1. seek information regarding demand and supply of produce in the market	100	10	5	5
	PC2. identify target customers and assess their needs such as amount required, purpose, quality, expectations, etc.		10	5	5
	PC3. perform basic accounting such calculating expenditure incurred, costing and pricing of produce		10	5	5
	PC4. ensure that the cost of production, transportation and marketing are included in costing and pricing		10	5	5
	PC5. collect information related to various subsidies/funds offered by the Government, authorized state units and other financial institutions involved with the promotion of the produce		10	5	5
	PC6. comply with relevant regulations in marketing of the produce		10	5	5
	PC7. track information related to wholesale and retail price of the produce		10	5	5
	PC8. record daily sell and purchase of items in designated log books, register, etc.		10	5	5
	PC9. record quantity, quality, date of manufacture and batch number of every produce accurately		10	5	5
	PC10. identify appropriate marketing channels related to the produce considering requirements and constraints		10	5	5
		Total	100	50	50
AGR/N9903 Maintain health & safety at the	PC1. undertake basic safety checks before operation of all machinery and vehicles and hazards are reported to the appropriate supervisor	100	8	4	4

workplace	PC2. work for which protective clothing or equipment is required is identified and the appropriate protective clothing or equipment is used in performing these duties in accordance with workplace policy		8	4	4
	PC3. read and understand the hazards of use and contamination mentioned on the labels of pesticides/fumigants etc		8	4	4
	PC4. assess risks prior to performing manual handling jobs, and work according to currently recommended safe practice		8	4	4
	PC5. use equipment and materials safely and correctly and return the same to designated storage when not in use		8	4	4
	PC6. dispose of waste safely and correctly in a designated area		6	3	3
	PC7. recognize risks to bystanders and take action to reduce risk associated with jobs in the workplace		6	3	3
	PC8. perform your work in a manner which minimizes environmental damage all procedures and work instructions for controlling risk are followed closely		6	3	3
	PC9. report any accidents, incidents or problems without delay to an appropriate person and take necessary immediate action to reduce further danger		6	3	3
	PC10. follow procedures for dealing with accidents, fires and emergencies, including communicating location and directions to emergency		6	3	3
	PC11. follow emergency procedures to company standard / workplace requirements		6	3	3
	PC12. use emergency equipment in accordance with manufacturers' specifications and workplace requirements		6	3	3
	PC13. provide treatment appropriate to the patient's injuries in accordance with recognized first aid techniques		6	3	3
	PC14. recover (if practical), clean, inspect/test, refurbish, replace and store the first aid equipment as appropriate		6	3	3

	PC15. report details of first aid administered in accordance with workplace procedures		6	3	3
		Total	100	50	50
Total		600	600	290	310
Percentage Weightage:				48%	52%
Minimum Pass% to qualify (aggregate):				70%	