Skill India
कौशल भारत - कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

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National
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ASCI
Agriculture Skill Council of India

Facilitator Guide

Sector
Agriculture

Sub-Sector
Agriculture Crop Production

Occupation
Field Crop Cultivation (Cash Crops)

Reference ID: **AGR/Q0202,** Version **3.0**
NSQF **Level: 3**

Cotton Cultivator

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6th Floor, GNG Building, Plot No.10
Sector - 44, Gurugram - 122004, Haryana, India
Email: info@asci-india.com
Website: www.asci-india.com
Phone: 0124-4670029, 4814673, 4814659

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Disclaimer

> Skilling is building a better India.
> If we have to move India towards
> development then Skill Development
> should be our mission.

Shri Narendra Modi
Prime Minister of India

Acknowledgements

We are thankful to all organizations and individuals who have helped us in preparation of this Facilitator Guide. We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving quality, coherence and content presentation of chapters. This Facilitator Guide will lead to successful roll out the skill development initiatives, helping greatly our stakeholders particularly trainees, trainers and assessors etc. We are thankful to our Subject Matter Expert for the content and helping us in preparation of this Facilitator Guide.

It is expected that this publication would meet the complete requirements of QP/NOS based training delivery. We welcome the suggestions from users, industry experts and other stakeholders for any improvement in future.

About this Guide

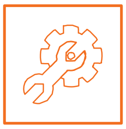
The objective of the guide is to provide an approach map for interacting with the trainees undergoing training on this job role. The aim of the course is to provide both theoretical and practical knowledge to the trainees, and also to guide them for marketing the product and generating finances. The guide is neither a substitute nor complete road map, but an aid to help to pass on the knowledge on all the aspects to the trainees in a systematic manner. It is expected that the trainer is fully conversant with all the contents of the guide. The guide is just to indicate that how to proceed for covering a topic and includes some additional information that may be necessary for the trainer to develop better comprehension on following aspects:

- **Knowledge and Understanding:** Satisfactory operational learning and comprehension to play out the required chore.
- **Performance Criteria**: Pick up the required aptitudes through hands on preparing and play out the required operations inside the predetermined measures.
- **Professional Skills**: Capacity to settle on operational choices relating to the zone of work.

The job will also include judging the comprehension and also help them learn more by hands on training. But it has to be ensured that these are in accordance with the knowledge imparted and time spent on each unit. It is expected that irrespective of the region, knowledge on all aspects will be imparted to trainees.

Symbols Used

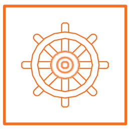
Ask


Activity


Do


Demonstrate


Explain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1. Introduction to the Role of Cotton Cultivator

Unit 1.1 - Overview of Cotton

Bridge Module

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Describe the size and scope of the agriculture industry and its sub-sectors.
2. Discuss the role and responsibilities of a Cotton Cultivator.
3. Identify various employment opportunities for a Cotton Cultivator

UNIT 1.1: Overview of Coton

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain when cotton cultivation started & how it spread across the world.
2. Explain the scope and opportunities in cotton cultivation.
3. Describe the suitable agro climatic conditions and cropping patterns.
4. Identify the importance of cotton crop for the farmer, for the textile industry and for the country.

Resources to be Used

- Participant handbook, pen, writing pad, flipchart, markers laptop, projector, equipment and tools (as, recommended for the job role, white board, duster, marker etc.
- Power point slides, pictures/posters etc.
- Indian Farming Magazine (English and local language) articles on cotton and its uses
- Package of Practices for cotton cultivation of local Agicultural University
- Web download CICR Nagpur for various topics
- PPT and pictorial material on cotton cultivation under different ecologies and geographies in India and the world.

Do

This section is for trainer to take into cognizance the following:

Check list:

- Before getting on with the program as such, please ensure that all arrangements are in order.
- The Meeting Room is identified, well-marked and labeled from outside. If it is in a big campus, directions to the venue should be placed at vantage points.
- Class Room must be clean, well ventilated, provided with proper fan and lights and there should be multiple points for connecting to mobile phones and laptops (use multiple point extension boards if necessary).
- Washrooms and lavatories should not only be clean but should not start smelling during the day.
- The projection unit should be fully functional and backed up with maintenance arrangements
- Food materials should be brief but healthy, not elaborate. Tea/coffee in the morning and afternoons and lunch should be arranged as far as possible. If not, space should be provided for trainees to be able to take a cosy lunch in shade and under a proper cover.
- If its going to be rainy, make sure there are no leakages or chances of short circuits in the fittings.
- Make enough room for trainees and for at least two –four visitors who may have to be invited to the training during the course period.

- Keep transport arrangements ready for a planned trip to farmers' fields or a factory or to any such market place that course work encourages to visit.
- The subject matter to be shared in soft or hard copies in advance and reasonable time be given to participants to go through the material.
- All contact persons should be on same page. For this prior communication with all concerned is essential.
- Friendly and pleasant does not mean unruly. Make sure that you are the boss. Not as rude as Hitler, but approachable and responsive.

Say

At the outset i.e., the first meeting between trainer & the trainees for the program, you should:

- Extend greetings to the participants and thank everyone for their participation in the program.
- Get introduced to each other with a touch of welcome features of the personality of the participants, but not even remotely touching on anybody's physical weakness, if any, or those related to dress, caste, gender, etc.
- Briefly touch upon the importance of a congenial atmosphere during the program and a pro- active approach to help participants derive maximum benefit from this event.
- Ask participants about their existing understanding of the subject. During training activity, lay emphasis on areas that they are unaware of or have less knowledge.
- Emphasize repeatedly the importance of mutual communication, clarification and positive interaction with the trainer and among the trainees themselves.

Explain

- Explain that Cotton is part of a large dry farming tract, viz., about 60% of India's total cultivable area.
- Do talk about typical uncertainties of dryland farming and management of water for farm and home.
- **More crop per drop** concept should get due emphasis. Material for this PPT is also given in between.
- In this discourse, give them an insight into the role that khadi has played in the independence movement of India; swadeshi and the prestigious cotton cloth for Kings across the world.
- The role of the British in making cotton a better prospect for Indian farmers by creating market and industry for that. In fact, a Britisher invented the roller ginning machine in India for use here itself so that lint and not seed cotton would have to be transported for the cloth factories in England.

Notes for Facilitation

This Unit does not have the practical skill component, being primarily historical and descriptive, Hence it should be liberally complimented with pictorials. For this a PPT should be prepared to make a lasting impact so that throughout the training period the trainees get to feel that they are dealing with a crop of great commercial value, industrial value, economic value, and a high social value too.

Web sites are full of pictures of cotton history and stories emanating from countries, especially south east Asian countries. The PPT should reflect the expression and story developed by the trainer. Please make full use of this facility and invite good participatory inputs from trainees.

Explain

Origin of Cotton

- Deal briefly as to how scientists establish the place of origin of crops and the criteria used to establish the same in case of cotton for India, Egypt, USA / Mexico.
- Discuss and explain the difference between domestication and cultivation.
- What is the significance of sites located along a specific portion of the what is Pakistan today with reference to cotton cultivation cotton fabrics trade over 5000 years age.

Value & uses of cotton.

- Prepare a good PPT on this topic. Fill it with interesting facts.
- Its seed oil is used in food and lipsticks and other cosmetics.
- The cotton lint from one 178 kg bale (India standard) can produce 168 pairs of denim jeans or 186 single bed sheets or 588 shirts or 940 t-shirts or 2352 nappies or 3,371 pairs of socks.
- Products made from cotton seed, fuzz, hull, sticks, etc.
- Industry as user - Including the Handloom sector (big chunk of industrial use of cotton).

Cotton development initiatives in India in recent years

Using the Cotton Cultivator Handbook apprise the trainees of these organizations and their role and functions in cotton crop development and industry development. CCI should be the center piece because TMC today has only a passive role.

Elaborate

The Great Indian Cotton boom in 21'' Century:

- Don't forge to recapitulate that in the last two decades of 20'[1]century, cotton crop had run into a rough weather with area & yield going down and also, farmers changing over to other crops making cotton a less favoured crop. The area during those two decasee declined by 2 million ha and yield stayed stagnant at 275-325 kg/ha of lint. The advent of 21[3]'century brought in the Bt boom whose momentum was so strong that in spite of strong opposition from Anti-GM Activists, indifference of cotton breeders, and even the unusually high prices of seeds failed to dissuade the farmers from adopting Bt hybrids of hirsutum cotton.
- But don't forget to mention and the related data to show how skewed our production has become with everything favouring only hirsutum cotton, which is disadvantageous to the industry. Also deal with its possible correction.

Say

Details for differences and similarities amongst the cotton zones and states in India. Other characteristics that can be used are like "ecology" (organic farming), intensity or quantum of industry based on cotton, handlooms, etc.

Describe and talk about Experiences

- If there are trainees from different zones, or if any of the trainees has some experience of cotton cultivation - unique or interesting (different from usual) for others to listen to.

Develop this subject to its potentialities

- It may look like a very dull or unimportant area of study but it can turn out to be very interactive.
- Intercropping or multiple cropping is only one of the aspects of cropping patterns.
- There are others like raised bed planting, broad bed furrow planting, ridge furrow planting. paired row planting, high density or low density planting, double cropping and so forth, with or without relay planting of crops under irrigation.
- Ask them to develop imaginary but practical intercropping, rotational and relaty cropping options using rabi and kharif crops of relevance to a zone.

Elaborate

- Yourself or have it done by a senior State department Agri official about how they are promoting cotton cultivation and extending due incentives to the farmers for the same.

Do

- Ask the participants about their existing knowledge in relation government initiatives for the sake of cotton framers.
- Ask them to also list their grievances about the system.
- Let them project what they would like government to do.
- Invite a local government official preferably a senior person like DDA by prior intimation for him to be ready for the same, to address participants about cotton dev sc hemes in operation and the benefits availed by farmers.
- Compare the facilities being offered in food crops, oilseeds and commercial crops by the Dept of Agri of the state concerned.
- Do Hold a group discussion on how participants feel about their role or the role of important cotton cultivators in their vicinity and influence fellow farmers about raising productivity, raising agenda and activities for value addition at farm gate to provide extra employment and earn more.

Explain

Role of cotton farmer at their farm homes,

Indian farmer plays following simultaneously, He is an entrepreneur, He is a Manager, He is a Finance, He is a Labourer or Worker, He takes decisions in two capacities as an entrepreneur and a manager. He acts as catalyst for growth of the crop husbandry, production and utilization and for the cultivators to go beyond production and become part of value chain by value addition at farm gate.

- Make the participants contribute to this all important discussion especially with "doubling the farm income" as focus.
- Is this possible purely by agricultural efforts or will "agribusiness" angle need to be introduced?
- Let a lot of questions be asked and let some consensus develop. Even if it does not, the points must be driven home in right earnest.

Elaborate

Bt. cotton in India

Give a concise but informative account of the following and make it interactive:

- A historical account of development of GM crops.
- Development of Biotechnological approaches to upgrade cultivars for genetic tolerance.
- How Bt cultivars invaded India and the resistance actually created deeper interest in this group of genotypes in India.
- How Monsanto Cry 1A gene which brought Bollguard cotton to India was recreated by IIT Bhubaneswar and Indian Bt was born.
- How insect resistane to genetic incorporation of host plant tolerance prompted gene stacking.
- What is gene stacking.
- Is it single trait gene stack or multi trait gene stack or both.
- Is Bollguard 1, Bollguard 2, Bollguard 3 acceptable to Indian farmer?
- Should barriers to GM crops be done away with?
- Is is OK if our farmers have to smuggle in seeds from Bangladesh?
- Must caution the trainees to not be led or misled by propaganda of lobbies. They must consult several upright and neutral experts asking for advantages and disadvantages both.

Do ask these two all important questions:

- How Cultivation of Cotton varies under different ecologies.
- Compare and contrast the normal, organic and Bt cropping ecologies of cotton.

Cotton Development Initiatives in India

- Government of India launched the Technology Mission on Cotton (TMC), in February 2000, to address the issues relating to raising productivity, improving quality, and reducing the cost of production of cotton in India.

Some important schemes for handloom development developed during last two decades:

- Deen Dayal Hathkargha Protsahan Yojana
- Workshed cum Housing Scheme
- Weavers Welfare Scheme
- Health Insurance Scheme for Handloom Weavers
- The Mahatma Gandhi Bunkar Bima Yojana
- The Integrated Handloom Cluster Development Scheme
- In 2008, CAI launched cotton price index in line with some commodities futures markets in the US and UK.
- Draft the Cotton Trade (Development And Regulation) Bill, 2012.

❖ A brief general explanation of terms used in Participant Handbook as well as those that participants may like to ask on their own. Encourage discussion on synonyms for various operations and terms.

❖ Encourage participants to ask questions & clear their doubts (if any).

❖ Assist participants to streamline their thought process while discussing the question.

❖ Indicate briefly the option for career progression and career mobility. He /she can work anywhere in India or even seek employment outside the country.

❖ Discuss with participants about their role and responsibility as cotton cultivators.

Explain

Farmers' right under PPV and FRA act as:

- How Indian farmers have preserved different varieties and germplasm of cotton by using seed year after year and making cotton a better crop over the millennia
- How the right of the farmers on new and developing varieties of cotton are retained
- Farmers can and should contribute positively towards maintaining and preserving valuable germplasm of this valuable crop plant.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. A sympodial branch extends from the main stem & each new fruiting node has an extending leaf and a fruiting structure or square at each node. Monopodial branching is a result of terminal bud continuing to grow as a central leader while lateral branches remain subordinate.
2. Determinate growth habit, or "bushy" growth habit makes a plant grow to a compact height by virtue of its genetic property to stop growth of a branch by producing a top bud. This is considered as a useful trait in modern plant breeding as it sets up a definite maturity period. On the other hand, indeterminate growth habit again genetic, will cause a plant to grow and produce fruit on completion of life cycle (death by season) growing to indefinite heights (mostly 200cm onwards) normal.
3. In India, cotton is grown in 9 major cott on growing States viz. Punjab, Haryana and Rajasthan in Northern zone, Gujarat, Maharashtra and MP in Central zone and Andhra Pradesh, Karnataka and Tamil Nadu in Southern zone.
4. Cott on leaf curl virus (CLCuV) disease.
5. Karnataka
6. Smaller duration of the crop coupled with a harsh climate viz., temperature (40 - 450 C) and aridity.
7. Varalaxmi, DCH 32, NHB 12, Savita, DHH 11, HB 224, H4, H6, JKHy 1, PKVHy3, PKVHy4, TCHB 213 and DHB 105 in tetraploid cott ons have contributed greatly in providing best quality cott on.
8. Less awareness and motivation among farmers to grow ELS cott on.
9. Motivation through showcasing successful case studies.
10. To address the rights of plant breeders and farmers on an equal footing. The PPVFR Act recognizes the age-old multiple beneficial roles played by farmers in cultivating, selecting, and developing.

    The PPVFR Act also deems it equally necessary to protect Plant Breeders' Rights (PBRs) & allow plant breeders to hold exclusive rights to produce, sell, market, distribute, import or export the propagating material of a registered variety.
11. It will help in improved production, higher net returns and improved soil fertility.
12. To be practically done by farmer.

B. Fill in the blanks

1. Mohanjidaro
2. This era
3. 4
4. Cotton industry
5. Assam Comilla and Bengal Desi
6. Gossypium arboreum
7. Hirsutum and barbendense
8. Gossypium barbadense
9. Gossypium arboreum
10. 50 years
11. Hirsutum and barbadense

C. Multiple Choice Questions

1. a, 2. c, 3. d

D. True / False Questions

1-T, 2- F, 3-T, 4-F, 5-T, 6-T, 7-T, 8-T, 9-F, 10-F, 11-T, 13-F, 14-T, 15-F, 16-F, 17-F

Notes

2. Cotton Seed Preparation and Site Selection

Unit 2.1 - Requirements for Good Seed
Unit 2.2 - Classical Cotton Varieties and Hybrid Seeds
Unit 2.3 - Cotton Varieties for Industry Needs
Unit 2.4 - Seed Production Procurement
Unit 2.5- Land Levelling & Field Preparation
Unit 2.6- Sowing and Planting Systems in Cotton

AGR/N0204

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the criteria for selecting the site for cotton cultivation.
2. State various agro-climatic zones in India suitable for cotton cultivation.
3. State the climate, soil type, soil fertility, nature of subsoil and soil depth suited for growing cotton.
4. Describe the process of getting the soil sample tested through an authorised lab to determine the soil's suitability for cotton cultivation.
5. List various inputs required for cotton cultivation such as water, fertilisers, pesticides, labour, etc.
6. State the appropriate precautions to be taken while operating different types of farm machineries.
7. Explain the criteria for selecting the cotton variety to cultivate such as climate along with resistance to various pests and diseases.
8. Explain various quality parameters to be checked while procuring cotton seeds.
9. State the cultivation period, an appropriate time for sowing and yield of different cotton varieties.
10. Describe the process of procuring and treating cotton seeds.
11. State the appropriate temperature and humidity for storing the treated cotton seeds.
12. Describe different methods for sowing cotton seeds such as broadcasting and mechanised sowing.
13. State the recommended seed rate to be maintained while sowing cotton seeds.
14. Explain the use of the relevant tools and equipment for sowing cotton seeds.
15. State the recommended planting density to maintain while sowing cotton seeds.
16. Explain the benefits of resource optimisation.
17. Explain the importance of recycling and disposing different types of waste as per the applicable regulations.
18. Explain the importance of inclusion of all genders and People with Disability (PwD) at the workplace.

UNIT 2.1: Requirements for Good Seed

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the factors associated with good quality healthy seed.
2. Explain the methods of seed treatment before sowing in cotton.
3. Identify to upgrade seed for efficiency of nutrient uptake by plants.
4. Explain the minor but vital differences in seed treatment across zones & cotton cultivars (desi, Bt, American, long staple , hybrids).

Resources to be Used

- Participant handbook, pen, writing pad, flipchart, markers laptop, projector, equipment and tools (as, recommended for the job role).
- Power point slides, Pictures / posters e.g. that can depict various specific innovative images related to cotton & cotton cultivation.
- **CICR publications (web based)**
- FAO publications on cotton cultivation

Say

- **Recapitulate:** Briefly (within 3-4 minutes) go over what has been learnt in the class so far and find out if any clarification is needed on these sections. Satisfy the queries and proceed.
- As usual start with morning greetings, a word about how the weather is behaving, and about how the participants are feeling about stay arrangements. Arrange to take note and arrange to solve them, if necessary.
- Discuss some comments of participants during the talk regarding climate change.
- Now, start the session by discussing about subject matter on agenda.

Demonstrate

Requirements for Good seed

1. Selecting Good seed : How to identify and procure quality seed,
2. Seed delinting, soaking, treatment with seed amendments
3. Seed treatments recommended in different cotton zones

Preliminary seed health check:

- Why & how of seed upgradation.
- Seed soaking as a means of seed upgradation.
- Seed delinting, soaking, treatment with seed amendments.
- Pre-sowing treatment of the seed.

Delinting, Precaution

- Please add sulfuric acid to water & not water to sulfuric acid.
- Treatment of delinted cotton seeds with chemical and microbial fungicides.

Do

- Encourage participants of group discussion to ask questions so that they can clear their doubts (if any) on future job role.
- Indicate briefly the option for career progression and career mobility of Cotton Farmer completing training under NSQF framework. He /she can work anywhere in India or even seek employment outside the country.
- Inculcate the serving attitudes and create awareness of 'people' dimension of Cotton Farmer's role.
- Have inputs from participants on what kind of living organisms are useful to apply as seed dressing & why.

Explain

Microbes for Seed Treatment for Nutrition and Disease Prevention

- **Organic Seed Treatment :** May use of 6% cow urine solution with distilled water hydration (for 12 hrs), Cow urine at 2%, 6%, 10%, Curry leaf extract 6%, 10%.
- **Chemical Seed Treatment :** To obviate the incidence of early incidence of sucking pests or seedling rot at emergence, treatment With Gaucho @ 5g/kg of seed and Carbandazem @2g/kg seed is recommended in all zones. Also, the west zone advises treatment with Paushamycin/Plantomycin l00 mg + Carboxin 1 g/lt of water, soak for 6-8 hrs and then shade dry.
- Must let the trainees know novel and new types of seed treatment viz., ultrasound, electric & magnetic field treatments as also the upcoming nano-particle treatment technologies.

Notes for Facilitation

- Please make full use of this facility and invite good participatory inputs from trainees.
- Make sure the participants are in proper shape to learn and have in hand pen pencil, note books and access to Participant Handbook in soft or hard copy.
- Give a brief general explanation of terms used in participant handbook to help participants take part in discussions.

UNIT 2.2: Classical Cotton Varieties and Hybrid Seeds

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Identify Indigenous and improved cott on cultivars (varieties/hybrids) in India.
2. Select varieties adapted to different agro climatic regions/zones.
3. Identify Bt cott on cultivars for different growing seasons.
4. Identify Bt events, gene stacking and the current technical nomenclature in the Genetically Modified (GM) cultivar space.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Explain

- The reason to why develop disease and pest resistant varieties.
- ***Discourseonhostplantresistancehastobesystematic:***
- First give an account of disease resistant varieties developed since pre-independence period and then come to pest resistance. Among pests, first information is about sucking pest resistance and then about Bt which is resistant to lepidopterous feeding type pests.
- As for Bt genotypes, there is a history of struggle but success at last and the 21$^{3'}$century boom for cotton in India.
- Finally compare the three types of genotypes and their influence on cotton growth in India.
- Describe popular, high yielding cotton verities / hybrid.
- The traits for high yield, quality and resistance to biotic and abiotic stresses of different varieties and hybrids.
- Varieties of cotton suitable to overcome the serious pest problem.
- Status & importance of Bt. varieties & hyrids of cotton.
- Basic methodology of organic cotton production.
- Hybrid varieties suited to different cotton growing tracts.

Notes

Passing reference

- Challenges in cotton improvement – yield, quality & resistance breeding deserves only a passing reference as these genotypes are future of cotton cultivation.
- Let them know about Droughtguard, Nutrient Use Efficiency (NUE) types, gene switch. This is an info that should register with them.

Elaborate

- The importance of Bt. seeds. There has been a virtual flooding of the market with Bt. seeds during the last two decades. These have been the mainstay of India's consistent rise in cotton production. All the dirty talk and dirty politics against GM crops was a war between seed companies. Those who were denied access to Bt gene by Monsanto patent, got together to condemn this monopolistic giant company.
- It is important to note that on a Bt cultivar lot of bollworms may be found present, but either they will not eat the foliage or will die after they feed on the plant. They will not die until they eat and as soon as they eat they die.
- You cannot miss the fact that Bt. hirsutum dominance has brought about a disbalance in the production of different fibre length varieties for industry demand & needs.
- This has also stifled to at least some extent, the growth of textile industry because of disbalance and much of the export has centered on raw cotton.
- With new type of ginning machines evolved, for which Indian cotton is not really fit, fresh problem of export is arising and both import and export are going against good economic strategy.

UNIT 2.3: Coton Varieties for Industry Needs

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain Bt varieties & hybrids with resistance to boll worms.
2. Identify attributes and features of cotton fibre quality and the varieties representative of quality features.
3. Explain the different species of gossypium representing different quality traits of cotton and their relative importance to the industry.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Ask

- If they know or heard about Bt. varieties & hybrids with resistance to boll worms.
- Why, it was possible to cut down expenses on plant protection after arrival of Bt cultivars, consumption of the reasons?
- Why Bt genotypes have covered about 85% of the entire cotton area in the country?

Explain

Cannot say much against Private sector contribution to cotton growth:

- In the government circles and amongst the activist groups, there is much resentment against Private sector. First, they called Bt genotypes unsafe, health hazard and anti-environment. Then they called it a reason for rising farmer suicide. And finally the seed costs became an issue. But Cotton farmers bravely countered this misdirected & mischievous propaganda.
- Give Credit to private sector for bringing the best of the varieties to farmers' door and rising as one dedicated industry in respect of cotton. There were spurious fly by night operators but all settled down to a systematic demand supply pattern.

Tips

Don't Miss

- Talking about futuristic development of new gene stacked cotton genotypes because they are the means of stabilizing cotton production and making farmer a more assured crop grower. Farmers should demand freedom to choose the varieties that would reduce their risks and give them more returns. It is one of their rights.

Talk about

- Suitability of Indian raw cotton to ginning needs, especially new type of (fast speedy) machinery which calls for more fibre strength without sacrificing fineness and staple length (count).

Explain

Bt cotton: GM varieties & hybrids.

- Yield of FLDs demonstrated on Bt. hybrids.
- Species-wise (=quality wise) availability of cotton in India & its changing profile.
- Coloured Fibre Cotton for organic cultivation.
- Spun specification, fiber properties.
- Effect of fibre properties on processing and yarn quality.

Varieties for milling suitatbility

- The spinning systems have different priorities as far as the fibre quality is concerned. Some of the major spinning systems and their fibre quality requirements in the order of importance are given. It is essential that the spinner purchases cotton which is most suitable to process on their spinning machines to achieve the quality standards desired. Most spinning mills operate continuously, which means the fibre properties of the cotton used must be uniform throughout the year.
- With the rise in spinning speeds, the fibre quality parameters assume much more significance than ever before. The cotton fibre properties have to be more consistent in order to produce a yarn of international standards.
- There is a need to develop high strength cotton varieties to tap the opportunities available in technical textile market. The need for improving the fibre quality has to be realised by the breeders and the farmers should be educated about basic fibre quality parameters.

UNIT 2.4: Seed Production Procurement

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the importance of seed as a vital input in seed production.
2. Explain economic importance of seed production for farmer & for seed industry.
3. Describe different categories of seeds.
4. Recognise the methodology of seed production.
5. Undertake production of hybrid seeds of cott on.
6. Recognise the difference between male and female parents.
7. Explain the importance of isolation distance and roguing.
8. Idenfity the seed standards of varieties and hybrids of cotton.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Explain

Seed is the single most important input in crop production. It carries the genetic potential of the variety and therefore, determines the ultimate productivity of the crop together with various other inputs. Therefore, seed is and should always be the basic prerequisite of any cropping enterprise or scheme.

The series or the cycle of seed production chain can be easily explained using these two figures:

- To deal with this subject,
- First step is motivation to the cotton cultivators.
- All seed producers believe "Once a seed producer always a seed producer"
- It may be labour intensive but the labour is worth the extra money the farmer can make.
- Moreover it is a skill that stands always with the farmer in a good stead.
- Also, as custodians of genetic variability, the farmers are in a position to retain maintain & share with fellow farmers some of the best and the latest parental materials of cotton cultivars. That is an extra bonus.

Delivery of the procedure

- It is necessary to provide step by step detailed information and get feedback from trainees at each step.

Consider the following topics in a sequential manner Seed Quality Control:

- Practices to ensure seed purity.
- Steps in quality Seed Production.
- Precautions at harvest & post-harvest stages.

Do

Don't miss

- Telling the class the story of Dr C.T.Patel who produced the first cotton hybrid in the world. You can get his biodata etc from Wikipedia.

Hybrid seed production

- It always helps especially when farmers are upgrading themselves into a skilled work area to know a few details more than just the plain procedural matters. Use handbook of cotton cultivator to discuss different types of hybrids and the relevant parents for hybrid production. Parental features must be very clear. That is the fountain head of purity, performance & reliability of the seed material produced.
- Do arrange a visit to a seed production plot or a visit to the training class by an expert from seed production unit of a public or private seed company.
- The structure of cotton flower. Deserves careful first hand information and must be clear and on finger tips of the trainees.

Handling

- Get many cotton flowers from a cotton field or for that matter flower of Bhindi which is close to the cotton flower and let trainees carry out emasculation and pollination as a practical exercise in the class.

Keep handy, the materials required for hand emasculation & pollination of cotton flower:

- Plastic Tray, about 40 cm diameter, a pointed but not sharp forceps, pin or a needle, ordinary water painting brush, ordinary light weight thin cool drink pipe (drinking straw), a 10 cm vial with wide mouth, containing alcohol needed to sterilize forceps brushes, and for quick drying (alcoholic spirit will do, not wihisky because it will not dry soon), light weight threaded labels, light weight paper covers for safeguarding flowers from contamination of undesired pollen, B type pencil which writes easily (not ink pen because it will fade with time).

Steps

Steps 1.

- Select flower before it opens, cover with paper cover, open next day for emasculation. Emasculate using forceps, and pulling out the anthers from its filament base (avoiding the anther bulb). Take care not to damage cut or burst anthers; if by mistake, it happens, sterilize forceps immediately by immersing in alcohol, taking out and blowing it dry before next use, make sure all anthers are removed, put a small cut part of straw on female which now stands exposed alone (emasculated flower), pollinate next day, collect flowers from male parent at sunrise, use a brush to pick pollen from male and use this brush to pollinate the female of the emasculated flower.

Steps 2.

Details and regulations about seed production

- Should be repeated in the classroom and through group discussion and more so by assignments. It is best to engage the trainees with practical handling of flowers for hybridization.

Demonstrate

Manual hybridization of cotton flowers

- Best to go by practical handling in the class individually or in small groups of 2-3 at a time. While talking about pollination don't forget to mention the best time for collection of flowers for use of pollen.

Elaborate

Seed Quality Control

- This is an exercise that is sacrosanct throughout the life cycle of crop raised for seed production.
- Many seed producers think that this will come at the end when seed is to be harvested It is not so.
- Take care to explain it well, Male sterility, maintainer, restorer, etc.
- It is a tricky subject which should not be left to trainees to learn at ease. All details must be made quite clear.
- Good PPT either by trainer or by a specialist from a seed company is obviously important. The seed production expert brings with him experiences of interaction with seed producing farmers which can be of significant importance to future seed producers.
- Make hybrid seed production section of training so interesting that many trainees will be tempted to become seed producers themselves.
- What the handbook will not tell is that seed producer farmers have to be utmost honest and demonstrate integrity of contract with seed producing company. The contract must be fully respected. Otherwise, once a farmer becomes known as untrustworthy, the word spreads fast and no company will be willing to enter into a contract with such a person.
- Remember no single hybrid can run for many years. So if you think you can hoodwink the company by playing trick, you are mistaken.

Problems associated with hybrid seed production

- Deserve to be well understood and will be useful when a cultivator becomes a seed producer.
- Ask the class to update seed production cost data as per the prevailing rates in their area as on date of Training.
- Ensure field Standards for Seed Quality of Cotton Varieties. Entire seed production effort is a waste if the quality of the product does not conform to the defined Standards as per Seed Act. These standards must be on the fingertips of the trainees.

Tips

- Always remember the factors that most likely contribute to this kind of yield expectation in cotton
- If you look at the enlarged version of this circle" India cotton 2020" you will find a big list of factors that could contribute or have to be taken into account.
- Few primary factors as below:
  - ❖ **Long** duration Bt cotton hybrids like Mallika, Brahma, RCH 602, RCH 773BGII which either have a large canopy or are grown high density (30 thousand plants / ha).
  - ❖ **Boll forming** prolificity. Large number of bolls on a sympodial
  - ❖ **Irrigation,** preferably drip, helping to extend picking period to 4 pickings.
  - ❖ **Fertigation** with liquid fertilizers, supplemented by spray of micronutrients, if not possible through fertigation, matching expected yield potential (above normal).
  - ❖ **Managing** sucking pests right from the outset.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Practical Exercise to be done by participants under the supervision of trainer.

B. Fill in the Blanks

1. Vary
2. Breeder Seed
3. Rouging
4. National Seed Certification

C. Multiple Choice Questions

1-d, 2-, a, 3-b, 4-a, 5-d

D. Match in the Following

1. 98%, 2. 2%, 3. 5/kg

E. Give a Proper caption for the Picture

1. To be done by participant

UNIT 2.5: Land Leveling & Field Preparation

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Identify methods of land levelling for cott on cultivation.
2. Describe about tillage, types and its methods.
3. Use different tools, machinery and tillage equipment.
4. Identify different methods of seed placement and early care.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Ask

Mention general resources:

- Let the class deliberate on whether at all leveling would be needed and if yes, ask advantages of levelling.
- Ask if any of the participants has an experience of this exercise and let him relate the experience.
- Ask if it is done every year ?
- Is it necessary to level the entire land owned in one go ?
- How will the entire area be managed to ultimately look uniform even if done piece meal.
- Discuss why it is not necessary to attend to leveling every year.
- Talk about different practices adopted to level the field, mostly done piece meal.

Say

- By the apparent looks, a field may look quite leveled but generally, wide topographic variation exists which our eye system cannot detect/Within a field, this would cause uneven growth and staggered flowering etc., which will be costly to handle as well as bring down the quality & quantity of yield.
- Levelling help better handling of field moisture levels and its distribution across the field, leading to water economy in crop raising.
- There is a better chance that in-site conservation will be more effective and efficient
- The nutrient leaching and loss by run-off will be low in a field which is leveled.
- The growth is better in a level field because it supports a better environment in the rhizosphere and in the canopy.
- All the above advantages are conducive to a higher crop productivity and a better quality output from the field.

Laser leveling system - (use pictures in slides of ppt)
differs from conventional lan leveling technique based on mapping of leveling reference points. It has four essential elements:

- The laser emitter;
- The laser sensor;
- The electronic and hydraulic control system; and
- The tractor and grading implement.

Explain

Discuss Primary, secondary tillage, tilth irrigation & field drainage facilities:

Emphasize

- In deep vertisols or red laterites, sub-soil tillage with a chisel plough helps to break hard Pan so as to allow good tap root development, draw upon nutrients lying unused in deeper layers of soil profile and above all for greater and more efficient in situ water conservation or preventing run off.
- It is necessary to discuss the functions of each piece of machinery and the time during the crop cultivation life, when each is to be used with prescribed operation.

Methods of Planting in Cotton

- Planting of cotton is done in majority of cases by labour intensive dibbling method by pre-marking the hill seeding points. Features that deserve care & attention must be discussed: Plant population and geometry of Planting.
- Good deliberation is necessary about the canopy size of the crop being sown, and size, degree and quantum of resource baset. The variety, agro-climate, the time of planting,water resource available, irrigation system available or installed methods of planting in cotton explain,
  - ❖ Ridges furrow
  - ❖ Sowing depth
  - ❖ Plant geometry
  - ❖ The bed preparation system irrigation & field drainage facilities.

Elaborate

Long term Tillage systems for sustainable farming:

This topic is likely to be new for the participants. So take them into confidence while discussing this.

1. **Conventional Tillage**

   Almost everybody is familiar with it, as they have seen and conducted it. It involves opening the surface of soil during summer to let heat deal with whatever is left of insects, fungi, weeds and follow it up with soil pulverization to create good tilth. The process enables good intake of whatever rainfall occurs while minimizing run off. Ultimately a good moist seed bed enables planting the crop on flat surface often after marking out the plant geometry to help hand dibbling of seeds in marked out slots.

2. Now tell them advantages of each of these systems

- Mulch-Till
- Conservation tillage
  - ❖ The term conservation tillage represents a broad spectrum of tillage systems.
  - ❖ However, maintaining an effective amount of plant residue on the soil surface is a crucial issue.

3. **Intermediate tillage (I T)**
   - As the name itself shows-a flexible, manoeuvrable system.

4. **Permanent beds (PB):** The permanent bed planting is somewhat similar to IT, but in comparison to IT, where the soil was ploughed once every two cultivation cycles, the PB plots were never tilled. The crop is grown on already existing raised beds. Beds are just reshaped before planting the next crop & that too, only if necessary.

5. **Zero tillage (ZT):** Details are given in sub unit that follows.
   - On a long term perspective to manage rained land area for cotton cultivation, it is most desirable to undertake and implement tillage systems.
   - Make it a participatory discussion with advantages and disadvantages but the conclusion and consensus may preferably evolve around ridge and bed planting systems, even on a permanent basis.

UNIT 2.6: Sowing and Planting Systems in Cotton

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the diversity and versatility of a variety of planting methods of cotton in different zones.
2. Select correlate the systems with economy, proficiency and economic efficacy of cotton production.
3. Correlate the planting methods and systems with varietal characteristics vis-a-vis the agroclimatic conditions.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Explain

Recommended management practices for crop planting in rainfed cotton belt:

- Compartmental bunding;
- Ridge and furrow;
- Broad bed furrow;
- Supplemental irrigation;
- Furrow openings in cotton;
- Ridge and furrow system with intercrop
- Improved variety with large canopy
- Incorporation of cotton stalks with rotavator.

Direct planting, drilling, and direct seeding

- In most cases, first 40 days of cotton crop if managed well will ensure a successful remunerative crop. Thus the effort at planting should be to cover all aspects of this period.
- Do perform a germination growth test of the seed to be used as a double check to ensure good crop establishment.
- This is a good guide for field operations related to planting the cotton crop in the field in various zones . Also give due care to other suggestions mentioned in Cotton Handbook:

Directions for gap filling

- Raise nursery along with planting so that gap filling does not have to be done by seeds which will produce laggard seedlings and plants. Nursery ensures plants of same age in entire field.
- Prompt and motivate raising a nursery on a community basis at say 7-10 day intervals so that the entire village or vicinity can be covered with matching age of seedling and will serve the purpose in the field.

Do

Elucidate the diversity of practices and sowing operations among zones

- The more detailed information given in the 'Cotton Handbook' should be screened by the Trainer carefully, identifying similarities and differences between zones for aspects like seed treatment, seed rates, seeding depths, time of sowing, etc. for inter-cultivation.

Highlight Management of Irrigation & field drainage facilities

Critical factors to consider during this planning exercise should be summarised as follows:

- Field selection
- Availability of water the quantity of water available, distance to the field, sustainability of water source, quality of the water.
- Soil depth & drainage
- Soil / water quality When soils are salty or the irrigation water is having salt content, it may be difficult to produce successful crop without a facility for proper drainage.
- Do mention and explain why Interculture, Intercropping and weed minimization are areas best managed at early crop growth phase. The effort required is less, the advantage is maximized, the crop growth and health are made risk-free by proper management of crop upto 40 day age.

Tips

- Introduce scientific terminology on cropping patterns & intercrops in cotton cultivation.
- It will be exciting to the participants that they express advantages in scientific terms than just saying it is more paying or it helps in minimizing weeds, etc. Participants are not likely to know these technical terms but let them learn to express facts as per these terms.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Nursery raising is recommended to meet the seedling requirement as germination in field generally falls short.
2. Seed hardening is soaking of 1 kg seed of cotton in one liter of Pungam leaf extract (1%) for 8 hours & then dry in shade; This treatment is helpful in increasing germination and vigour of cotton seedlings.
3. It helps in weed control.
4. In rainfed situations, intercrops are a safeguard against possible risks of unpredictable monsoon situations. But in adequate rainfall, high rainfall or irrigated conditions, it is basically an approach to make better use of cultivable area & earning extra cash midway through the crop season.
5. It is done in cenral and south zone
6. North Zone
7. Due to different germination percentage and size of the seed.
8. Learning by doing activity
9. 10, 11 and 12- Pls. refer to Unit 2.5 for details in Participant handbook.

A. Fill in the Blanks

1. Central and southern zone (especially the adjoining Telangana region to Maharashtra)
2. Compact
3. Laser levelling
4. Extra
5. 3-4
6. Moisture and nutrients
7. Weeds

C. Multiple Choice Questions

1. d (Spike), 2. b (Disc harrow), 3. c (Land leveler), 4. d (Land leveler)

D. Refer to unit 3.1 of participant handbook

Notes

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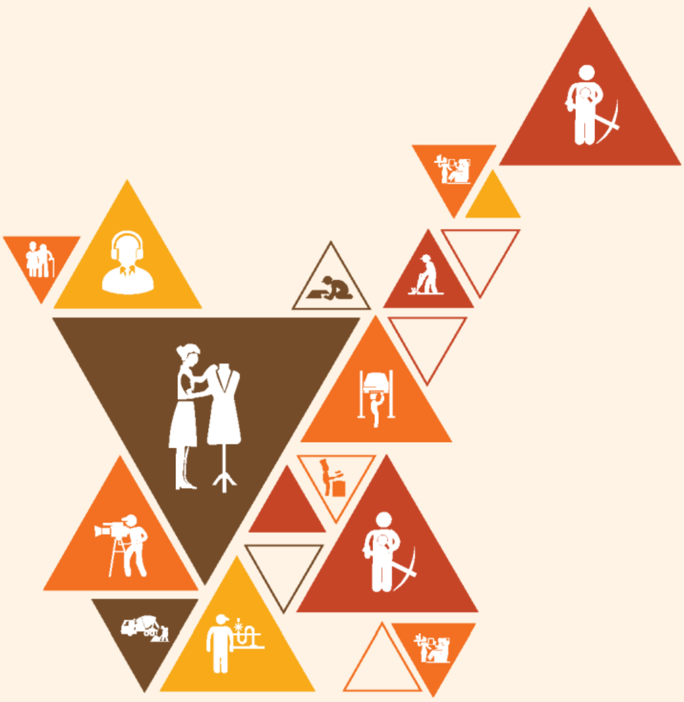
सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASCI
Agriculture Skill Council of India

3. Macro and Micro Nutrient Management for Field Crops



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Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the basic concepts of plant nutrition and soil fertility.
2. Explain different types of macro and micronutrients, their properties and their functions.
3. List common symptoms of nutrient deficiency in plants.
4. Explain the use of different types of green manure and nitrogen-fixing crops.
5. Describe the process of soil sampling and testing.
6. Explain the importance of getting the soil tested through a government-approved lab.
7. Explain how to interpret the soil analysis report to determine the macro and micronutrient requirements of the soil.
8. Explain different soil types, their advantages and disadvantages with reference to the presence of various nutrients.
9. State the appropriate time and methods for the application of different types of fertilisers.
10. Explain the importance of regulating the dose of fertiliser according to the crop cycle.
11. Explain the importance of soil conservation and various soil conservation practices.
12. Explain different varieties of organic and inorganic fertilisers to be applied to the soil to improve its fertility and the nutrient content in them.
13. Explain the harmful effects of the over-dosage of fertilizers.
14. Describe the process of preparing a soil nutrition supplementation calendar based on the stages of the crop's growth.

UNIT 3.1: Soil Sampling & Analysis for Essential Nutrients

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Conduct soil sample collection process.
2. Undertake analysis for soil fertility status.
3. Estimate the essential nutrient requirements based on soil analysis report.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Say

- Extend greetings to participants; enquire about their health, comfort and reaction to existing arrangements, food. Ask if they ready with their arsenal for taking down notes and with home work?
- Ask if anything needs improvement, tell them to be open with the solution provided.
- Start the day with an inspirational prayer. Alternatively use inspirational power point slides to motivate participants and to set the mood of the class has to come after objectives.

Demonstrate

Soil Sampling

- The use of augur (with implements) as well as by taking out a V-notch in the field for taking out soil samples from prescribed depths, the materials needed for proper collection, labeling, storage and Tell the procedure for submitting the soil samples for analysis in the Soil Lab.
- Discuss the standard rating chart and how to interpret the report or judge the soil health status.

Nutrient	Low	Medium	High
Organic carbon	< 0.5 %	0.5 - 0.75%	> 0.75%
Available Nitrogen (N)	< 240Kg/ha	240 - 480kg/ha	> 480Kg/ha
Available Phosphorus (P)	< 10.0Kg/ha	10 – 25 Kg/ha	> 25 Kg/ha
Available Potassium (K)	< 110Kg/ha	110 - 280Kg/ha	> 280Kg/ha

- Ask the trainees learn this table by heart and keep checking it during the entire session on fertilizers.

Explain

With the help of participants handbook explain the following:

- Collection of soil samples from a profile
- Collection of soil sampling from field
- Processing of the sample
- Calculation of amount of fertilizers to apply essential nutrients

Notes For Facilitation

- Encourage participants to listen and learn from each other's experiences and perspectives.
- Summarize the key points covered in the session
- Encourage participants to ask questions and clarify any doubts they may have.
- Get participants to open up their participant handbooks and solve the exercises given at the end of the unit. Discuss the answers.

UNIT 3.2: Macro and Micro Nutrients for Coton Crop

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Identify the nutrient problem of cott on in the field.
2. Differentiate the symptoms of nutrient deficiency and apply proper remedial measures.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Ask

- If they are aware of nutrients required for plants? If yes, ask them to share with the group.
- If they know difference between Macro and micro nutrients?
- If any one can tell which nutrient/ fertilizer is mostly applied in the field and why?

Explain

Functions of Plant Nutrients (Macro, & Micro)

- Explain the terms Micro and Macro Nutrients and the terms Primary Secondary and supplementary nutrients.
- Describe clearly, the fact that while each nutrient carries it own functions in the plant, it is only as a component of a more complex molecule which contains other individual nutrients as well. So each nutrient cannot have a function which is unique and totally different from that of others. You will find several functions overlapping and cross-covered. But that will not imply that if two or three nutrients affect the same function, it will be alright if one or the other of them is missing or ignored.

Do

- After completing the description of all primary secondary and supplementary nutrients, make the class to deliberate on what if Zn is not present in soil for the plant, what if xyz nutrient is not present in the soil, how will the plant react or look like, etc.
- That will bring you to a discussion on Nutrient Deficiency Symptoms and their alleviation.
- Make a good pictorial presentation on the symptoms collecting pictures and preferably live samples of cotton plant to make it explicit for the participants.

- Emphasize again that symptoms may look overlapping but knowing the history of the field, the cropping systems adopted, the fertilizers applied to this cotton and the previous crop, the amount of weeding which had to be done or left undone, will give you a good idea of what could be missing. In case of doubt, give a mixed fertilizer (including a mixed fertilizer for micronutrients).

Notes for Facilitation

- Prearrange appropriate visuals, PPT and youtube videos if possible on nutrient functions and their deficiency symptoms.
- Collect some plants with nutrient deficiency symptoms for identification and practical purpose.
- Plan a nearby field visit to show healthy and plants affected with nutrient disorders.

UNIT 3.3: Sources of Organic and Inorganic Fertilizers

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe sources of organic and inorganic fertilizers.
2. Explain how & where to use them for crop raising.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Say

- Tell the participants to be conscious the fact all living organisms in the world are covered by the word organic. So when people say that GM is not organic, it is stupid.
- Tell in no uncertain terms that Green manuring is a several thousand years old practice and those who want to brag about organic farming being a new technology are simply fooling themselves.
- Biggest advantage of including organics in farming is the sustainability of soil fertility which is a big plus.
- When chemical fertilizers were introduced, they became misused like the well known misuse of chemical pesticides, which have both resulted in serious problems for farmers.

Notes

- Remember it is not organic or inorganic which is the problem it is the wishful use and not the recommended use that creates problems.
- What is not organic is not all bad, what is organic is not all good. It is the balanced & judicious use that makes either of them work.

Do

- Describe the use of microbes as the cheapest and most effective means of farm management including plant nutrition.
- Don't forget to mention that green manures require about 3 weeks for decomposition in the field. So all subsequent operations have to be timed according. During decomposition of green matter, gases are produced which will kill the crop if it is planted during this process.

Explain

- How cost effective and advantageous it is to produce organic input resources at home from materials that are always available at the farm and homestead.
- It may be worthwhile to conduct a Group Discussion on the experiences of the participants with home preparation of organics (wormiculture, composting, Panchgavya, Brahmastra, etc) and their impression about the effectiveness.
- Deal with the question of recommended dozes and application of chemical fertilizers for cotton under rainfed, irrigated, drip and bimodal rainfall situations separately and zone-wise.

Do

- Formulate and assign participants to prepare charts to provide during the life cycle of cotton plant the recommended doze of major and minor nutrients using different types of fertilizer, nutrient resources, in diverse combinations – standard chemical fertilizers, organic formulations projected by organic farming enthusiasts, bio- and microbial fertillzers, green manures, etc.
- This will help them to first calculated the relative contribution of nutrients from the sources they want to use and combine them into a full recommended dose of nutrients for cotton crop.

UNIT 3.4: Methods and Time of Fertilizer Applications

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the methods of fertilizer applications.
2. Explain proper time of fertilizer application.
3. Manage fertilizer application for cott on crop.
4. Describe balanced dose of fertilizers for cotton.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Ask

- If they have seen/ ever used different methods of fertilizer application. In case of yes, ask them to discuss among group.
- If they are aware that fertilizer application timing is crucial for plant growth.
- Did they know that problem soils could be ameliorated?

Explain

Use figure mentioned in as a basic guide to nutrient needs of cotton crop and to time the fertilizer applications in a manner that they are available in adequate quantity for the crop throughout its life cycle.

Fertilizer Application Methods Following aspects need consideration in fertilizer application :

- Nutrient content of manures and fertilizers.
- Nutrient requirements of crop at different stages of crop growth.
- Time of application.
- Appropriate or suitable method of application, placement of fertilizers.
- Feasibility & desirability of foliar application.
- Residual effects of manures and fertilizers of preceding or on succeeding crop.
- Crop response to fertilizers application and interaction of N, P, and K.
- Unit cost of nutrient applications and economics of manuring.

Fertilizers are applied by different methods mainly for 3 purposes:

- To make the nutrients easily available to crops.
- To make up fertilizer losses during progressive growth stages of crop.
- To hasten vegetative or reproductive growth.

The time and method of fertilizer application vary in relation to:

- The nature of fertilizer,
- Soil type
- The differences in actual nutrient requirement between desi and narma types and between varieties and hybrids, maturity period etc.

Application of fertilizers in solid form:

- Broadcasting at sowing
- Top dressing
- Placement
- Pellet application
- Application of liquid fertilizers
- Foliar, sprinkler, drip, fertigation

Tips

Some tips on applying fertilizers:

- It is sometimes difficult to broadcast small amounts of fertilizer over a relatively large area. Fertilizer can always be stretched by the addition of inert filler such as dirt or sand.
- Never broadcast nitrogenous fertilizers (ammonium sulphate, urea, N-P-K) in standing water. Upon contact with water, the nitrogen is lost into the air.
- Use bunding to avoid run off of nutrients with a heavy shower.
- Try to avoid fertilizer run off to swamps from which water is used for drinking, washing, or laundering, by humans and farm animals.

On fertilizer doze:

- Calculating the amount of fertilizer to be applied at a given stage of application is an all important issue and must be discussed with interactive participation from trainees for the various formulations available in the market.
- Should be followed up with a home assignment largely focusing on calculation of amount of fertilizer needed as per their strengths of nutrients.

UNIT 3.5: Integrated Nutrient Management (INM) in Coton

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain how to use data on nutrient status of soils for proper application of macro and micro nutrients required by cotton crop.
2. Describe methods of balanced application of various fertilizers and micro nutrients.
3. Describe recommended dose of fertilizers for different varieties of cotton.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Ask

- If they are aware about the term 'INM'.
- If some one can explain role of growth regulators.
- If someone can share the experience or tell fertilizer schedule generally followed in their area?

Explain

- INM - the concept
- Scope of INM practice
- Strategies for increasing cotton productivity through INM
- Balanced fertilization

Do

- Using this chart, a good discussion and deliberations can be carried out for the benefit of the participants from different zones and even just for information sake:

Management practices	Northern Zone (Punjab, Haryana, Raj.)	Central Zone (Gujarat, M.P. and Mah)	Southern Zone (Karnataka, A.P. & T N)
1. Fertilizer Dose	N @ 50-100 kg ha-1 (100-150 kg ha-1 for hybrids) and P & K as per soil test.	NPK varies from 40:20:20 to 240:120:120 depending on genotype/hybrid/agro-ecology.	NPK varies from 40:20:20 to 150:75:75 depending on genotype/ hybrid/ agro-ecology.
2. Time and Schedule of foliar NPK supply	½ at thinning & ½ at 1st flower with accompanying foliar-N if needed. Full P at sowing and K as per soil test. 2-3 sprays of 2 % urea/DAP KNO3 flowering onwards at (7-10 days intervals).	N in 3 equal splits at sowing squaring & peak Flowering. P and K as per soil test. 2 % urea at flowering & 2 % DAP at boll development.	½ N at squaring & ½ at peak flowering & K at sowing. Full N, P & K at planting in rainfed areas of Karnataka. 2 % urea/ DAP at flowering & at boll development.
3. INM	50 % of NPK + FYM @10 t/ha & foliar sprays. Full N & P ± FYM @10t/ha (Mathura,U.P.).	50-100 % of NPK+ FYM @ 5-10 t/ha ± vermi compost @ 1.25–5 t/ha.	50-100 % of NPK+ FYM @ 5- 10 t/ha (or poultry manure @ 5 t/ha) + DAP/urea sprays
4. Bio- inoculants	*Azotobacter/Azospirillum* for seed along with 40-50kg Nha-1.	*Azotobacter* for seed	*Azospirilum* (seed + soil) in T.N.

Table 4.5.1. Fertilizer management practices for cot on in different zones

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. 1, 2, 3 & 4 - for active discussion and involvement of participants.
5. By reducing pesticide residue effect and improving soil physical, chemical and biligical properties. For details. Refer Participant handbook.
6. Crop residue burning has negative environmental effect effecting air quality index.
7. Cycocel (CCC), or Mepiquat chloride (MC) is used to curb unwanted apical growth while Naphthaleneacetic acid (NAA) is best for useful to have a bigger plant canopy for higher productivity in cott on crop. Refer 'Growth regulators' section of Unit 4.5 of PHB.
8. Foliar spray is more effective. Pls. refer Participant handbook and discuss in detail in group.
9. It is micronutrient deficiency disorder.
10. Farm visit activity.
11. Farm based activity.
12. NAA could be used in case of requirement of bigger plant canopy for higher production.
13. No. Through Foliar application.
14. Refer to section 4.5.2. of PHB
15. Learning by doing exercise for participants.

B. Fill in the Blanks

1. 16
2. Macronutrients
3. 25-30kg/ha
4. It could fix about 20 kg N/ha/per year
5. 20-25%
6. Bb
7. Soil fertility restoration
8. Clean cloth or polythene bag
9. 15
10. Medium
11. 10:1

C. Multiple Choice Questions

1.-a, 2-a, -b, 4-d, 5-a, 6-a, 7-c, 8-d, 9-d, 10-d, 11-a, 12-b, 13- a, 14-a, 15-b, 16-c, 17-d,

Notes

4. Weed and Integrated Pest Management for Cotton Crop

AGR/N0205

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the criteria for selecting herbicide to be applied to a cotton crop.
2. Explain the importance of using herbicides in the prescribed dose and at the appropriate stage of crop growth.
3. Explain the benefit of maintaining a healthy crop stand that is capable of competing with weeds at the critical stages of its growth.
4. Explain different biotic and abiotic factors causing diseases and disorders in plants.
5. Explain the different modes of transmission of disease such as tools, implements, vectors, water, etc.
6. Explain the importance of adopting safe production methods for safe produce.
7. Explain the advantages of biological control of insects, pests and diseases
8. Explain the use of bio-pesticides in Integrated Pest Management (IPM)
9. State the minimum residue levels and Protected Health Information (PHI) for different types of pesticides.
10. Explain the use of the pesticide spraying tools and equipment.
11. Explain national and international standards on pesticide residues.
12. Explain the use of recommended parasitoids for the prevention of pests.
13. Explain the benefits and importance of using pest and disease-resistant varieties of cotton
14. Explain the recommended practices to restrict the entry of pathogens into the field through planting material, irrigation water, workers, tools and equipment, and vectors such as whitefly
15. Explain the practice of crop rotation with suitable crops.
16. Explain the importance of identifying and removing the diseased crop to prevent the spread of pests and disease to the healthy crop.
17. Explain the use of the recommended combination of biological, mechanical and chemical control methods for effective pest and disease prevention such as traps, sticky plates etc.
18. Explain the appropriate integrated pest management techniques like trash mulching, de-trashing, egg destruction, bund freeing, water draining, usage of bio-control agents, etc.
19. Explain how to identify different types of pests in the cotton crop such as jassid, aphids, whitefly, pink bollworm, mealybugs, weevils, etc.
20. Explain how to identify plant disease vectors and major cotton diseases such as wilt, root rot, boll rot, leaf blight, leaf spot, leaf curl virus, yellow mosaic virus, bacterial blight, etc.
21. Describe the process of determining the stage of pest and disease incidence along with the extent of damage and Economic Threshold Levels (ETL) of pests

22. Explain the use of IPM methods such as light and pheromone traps to identify the presence and population of insects and vectors.
23. Describe the process of determining the causal organism for the disease and its treatment
24. List the natural enemies of common pests.
25. Explain the importance of applying the recommended treatment as per the prescription and maintaining the record of their use.
26. Explain the importance of using the recommended PPE while applying harmful chemicals.
27. State various ways to minimise pollution caused by the overuse of pesticides.

UNIT 4.1: Nature and Classification of Weeds

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Recognize noxious weeds which are permanent menace at the farm.
2. Describe weeds of cotton crop and integrated control measures.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Say

- Mention that you feel sure of everything being in order and everybody feeling comfortable. Assure them that there's no reason why they should not be enjoying a high level of confidence at this stage of the training.

Relate an Inspiring short story from Ramayana, Mahabharata, Bible, anywhere.

Example:

- **Shake off Your Problems:** A man's favorite donkey falls into a deep precipice. He can't pull it out no matter how hard he tries. He therefore decides to bury it alive.
- Soil is poured onto the donkey from above. The donkey feels the load, shakes it off, and steps on it. More soil is poured. It shakes it off and steps up. The more the load was poured, the higher it rose. By noon, the donkey was grazing in green pastures.
- After much shaking off (of problems) and stepping up (learning from them), One will graze in green pastures.
- **The Elephant Rope:** As a man was passing the elephants, he suddenly stopped, confused by the fact that these huge creatures were being held by only a small rope tied to their front leg. No chains, no cages. It was obvious that the elephants could, at anytime, break away from their bonds but for some reason, they did not.
- He saw a trainer nearby and asked why these animals just stood there and made no attempt to get away. "Well," trainer said, "when they are very young and much smaller we use the same size rope to tie them and, at that age, it's enough to hold them. As they grow up, they are conditioned to believe they cannot break away. They believe the rope can still hold them, so they never try to break free."
- The man was amazed. These animals could at any time break free from their bonds but because they believed they couldn't, they were stuck right where they were.
- Like the elephants, how many of us go through life hanging onto a belief that we cannot do something, simply because we failed at it once before?

Elaborate

- What is crop-weed competition
- Economic significance of weeds – the kind of losses inflicted by weeds
- Types of weed classified variously by life cycle, season, eco-geography, botanical class, etc.
- **Side uses of weeds by farmers :** Farmers have learnt to live with some of the weeds by converting them into nutritious food, like Bathu (Chenopodium), Chulai (Amaranthus), kulfa (Portulaca oleracea).

Demonstrate

- With the help of PPT, charts or live samples, show types of weeds for identification.

UNIT 4.2: Methods of Weed Management

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain importance of weed control is important in crop plants.
2. Determine how to achieve good control of weeds.
3. Compare different strategies and methods of weed management.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Do

Organize the discussion on the following lines:

- Prevention of weeds
- Weed Control Methods
- Weed management

Explain

Weed Management Strategies

- Integrated Weed Management (IWM)
- An IWM system uses a combination of methods, whereby we can implement the most economical and sustainable way to manage weeds.
- Field characteristics such as soil type, soil pH, water conditions, climatic conditions (hardiness zone), rotational crops, and, most importantly, weed species should be considered when selecting effective weed management strategies.
  - ❖ Prevention
  - ❖ Cultural Control
  - ❖ Mechanical Control

Implements for control of weeds

- Tools and implements used for assisting in cultural, manual or chemical methods of weed management are termed as weeding implements.
- Hand Hoe, bullock driven, tractor driven, tined, cultivator type
- Improved weeders
- For reducing labour requirement in weeding and to reduce human drudgery, improved bakhar (angular sub surface action), rotary type weeder and tyned weeders were developed ergonomically suitable for local labour.

- **Rotary weeder:** Rotary or push weeder - Mention Salient features
- **Genetic control or Biotechnological control: There** are genes that impart resistance in crop plants to specific herbicides, which would kill the weeds but not the crop plant. Thus we have the Roundup Resistant and RR Flex Cotton varieties (as also soybean,m wheat, rice etc.) which are not killed by weedicides Roundup which is therefore a chief agent to control weeds in cotton especially where genetically modified varieties are cultivated. In 2016, 95% of cotton grown in USA was RR type coupled with Bt & starlink genes (BR, IR types).
- Genetic control by genotype (viz., Roundup Ready system). An off shoot of this system is Liberty Link system. Liberty Link cotton with hooded sprayers or post-directed .
    - ❖ Biological control of noxious weeds Parthenium and Lantana

Notes For Facilitation

- Encourage participants to listen and learn from each other's experiences and perspectives.
- Summarize the key points covered in the session
- Encourage participants to ask questions and clarify any doubts they may have.
- Get participants to open up their participant handbooks and solve the exercises given at the end of the unit. Discuss the answers.

UNIT 4.3: Chemical Control of Weeds

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain chemical control of weeds in cotton.
2. Describe classes of weedicides.
3. Describe weed control by herbicides pre-emergence weedicides.
4. Select appropriate post-emergence weedicides.
5. Explain methods of herbicide application.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Explain

- Chemicals that kill plants including weeds are called herbicides.
- The kind of objections that are attached to chemicals for control of insect pests don't, generally apply to herbicides except when products like Roundup, Glyphosate which are known to cause cancer in human beings.
- Describe classification of herbicides plants.
- Timing, method of application, etc.
- **Precision weedicide applicators in pipeline:** It's a new development in pipe line. It will certainly be welcome information to participants that precision herbicide applicator is being made in India at tshe Maharana Pratap Univ of Agri & Tech, Udaipur.

Demonstrate

- Types of sprayers & different types of nozzles suited to specific situations when spraying.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Any unwanted plant growing in the field of a planted crop.
   Noxious weed- These are certainly harmful for human beings too and cause health hazards, a glaring.
2. Example -Parthenium, which is very widespread in India and has been a difficult weed to suppress. Biological control- Eradication by cutti ng it up before flowering and composting it or using it as fuel for cogeneration.
3. Harrow is a device consisting of a heavy framework having several disks or teeth in a row, which is dragged across ploughed land to smooth or break up the soil, to remove weeds or cover seeds; while hoe is an agricultural tool consisting of a long handle with a flat blade fixed perpendicular to it at the end, used for digging rows. Hand hoeing is used widely as a method of weed control across various crop plants and in different locations across the country. Hand hoeing is faster than hand weeding and works well against creeping perennials.
4. Nut grass or motha (Cyperus rotundus), a grass and bindweed or hirankhuri (Convolvulus arvensis).
5. Weeding implement: improved bakhar (angular sub surface action), rotary type weeder and tyned weeders were developed. These are inexpensive and often reduce labour expenses by 50- 75%. There are also ergonomically suitable for classical labour work. For details, pls. refer section 5.2.1 of PHB.
6. Different type of sprayers: Multi nozzle sprayers, single nozzle sprayer. Multiple nozzles are highly conducive to cover long large areas speedily –they enhance application area, efficiency and accuracy. The nozzles fitt ed in this system are Flat fan type and as many as 3 to 6 nozzles are fitt ed to the boom keeping an overlap of thirty percent. Spacing will depend on boom height and the angle rating of the spray tips. Before spraying make sure that the boom is aligned in a straight line, nozzle interspacing is equal.
7. Pre- emergence weedicide- Stomp, Pendimethalin, Cotoron, Feuron etc.

A. Fill in the Blanks

1. 1- 3 to 6 nozzles
2. Flat fan nozzle
3. Flat fan
4. Knap sack
5. Post emergence
6. Broad leaved
7. Herbicides
8. Manual /hand weeding

B. Multiple Choice Questions

1-a, 2-c, 3-a

Notes

UNIT 4.4: Ancient Wisdom on Pests & their Management

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Identify different insect pests of cotton.
2. Recognise the symptoms of pest attack on cotton plant.
3. Describe cultural practices of pest control.
4. Practice seed and seedling treatment methods.
5. Describe chemical control methods.
6. Explain mechanical control methods for insect pests.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Indian Farming Magazine (English and respective State language) articles on cotton diseases and pests and their control.
- Package of Practices for cotton cultivation of local Agicultural University.
- Web download from CICR Nagpur for various topics.
- Web based searches on IPM.
- PPT and pictorial material on cotton pests and diseases in India and the world.
- A good trainer is sharp witted, a story teller, with an anectode for every situation or action or innovation for application at appropriate point in time. Web search for inspirational stories.

Say

Greetings to the participants and thank everyone for their participation in the program.

Do

At the outset, provide an overview of the status of cotton as a crop that consumes the highest amount of pesticides in India, the losses that cotton incurs due to diseases and pests (an average of 23 %) Many farmers' suicides associated with loss of cotton crop almost entirely year after year.

Overview can comprise of :

- Insecticides, fungicides, on cotton (Rs)
- Hybrid seed cotton market (Rs)
- Fertilizers on cotton(Rs)
- Raw Cotton Exports(Rs)
- Textile and Apparel Market(Rs)

Say

- **A nice PPT should be used to discuss this subject:**
  - ❖ The identifying features for the following have been given in the handbook of Cotton Cultivation.
  - ❖ This topic should invite maximum interactive discussion.
  - ❖ How soon the infestation is identified during the crop growth period.
  - ❖ How many already recognize the pests and their damage causing growth stages.
  - ❖ How many of them have experienced self or by neighbours a successful timely measure.

Major Insect Pests of Cot on Crop

Insect pests of coton with national and regional significance:

- Leaf hopper *(Amrasca devastans Distant)*
- Whitefly *(Bemisia tabaci Genn.)*
- Thrips *(Thrips tabaci Lindeman)*
- Aphids *(Aphis gossypii Glover)*
- Leaf roller *(Sylepta derogata Fabricius)*
- Red cott on bug *(Dysdercus cingulatus*
- Dusky cott on bug (Oxycarenus hyalipennis)
- Semi-looper *(Anomis flava)*
- Stem Weevil (Pempherulus affinis)
- Shoot weevil (Alcidodes affabe)
- Mirids (Creontiades biseratense, Campylomma livida) (Central & North Zone)
- Mealybugs (*Phenacoccus solenopsis*)
- (*Paracoccus marginatus*) South Zone
- Tobacco caterpillar (*Spodoptera litura's*)
- Pink boll worm (*Pectinophora gossypiella*)
- Spott ed and spiny bollworm (*Earias vitt ella .*)
- (*Earias insulana Boisd.*)
- And of course the famous *Helicoverpa bollworm*
- (*Helicoverpa armigera Hub.*)

Explain

With the help of participant handbook, explain:

1. Pest control practices in different zones like pitcher trap and plant extract for termite control
2. Chemical control measures for cotton insect pests
3. Which spray equipment to be used

Elaborate

- Overuse of pesticides is a worse affliction than the occurrence of crop pests.
- **Remember and recognize:** Insects can develop resistance to Bt. cotton but they can also develop resistance to chemical or organic pesticides as well.
- **Let the class appreciate that:**
  - ❖ The biggest gain from Bt. cotton technology is the reduced insecticide use.
  - ❖ Share of pesticides on cotton at 46% in 2001 was halved to 21% during 2011.
  - ❖ While Bt. hybrids helped control bollworms.
  - ❖ There is need to continuously develop new genes / transgenic to better manage diseases & pests.
  - ❖ The resurgence of sucking pests is a matter of serious concern.
  - ❖ Before going over the subject and the session further advise the participants about.
  - ❖ Pesticides or pesticide formulations Restricted or banned in India.
  - ❖ Today it seems possible to control three major invasive and inundative weeds by insect pests Parthenium weed, *Zygogramma bicolorata* a sucking pest of young *meristematic* tissue Water Hyacinth, *Neochetinaeichhorniae.*

Ask

- Ask farmers and cotton farmers in particular to learn how to recognize useful predators and parasitic insects & grow insectaries over a small area aound village residence or in pastures.
- **Debrief:** These and many other similar findings concerning the control of menacing pests by predators or parasites, or the natural enemies (NE) became a science. At that stage of science, man pursued natural methods of controlling the menacing pests, viz.,
  - ❖ Conserving Natural Enemies of pests.
  - ❖ Classical Bio-control.
  - ❖ Augmentation of natural enemies or crop defenders by growing insectaries, having flowering plants and strips of land to harbor pest predators) In the Insectaries advise them to grow attractive sjhort duration flowers every 15 day intervals round the year. It is also necessary to keep a source of drinking water for insects in this area.

UNIT 4.5: Insecticide Resistance Management (IRM) Strategies

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Identify insecticide resistant management strategies.
2. Choose disease resistant varieties.
3. Identify alternate host plants.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Ask

- How soon the infestation is identified during the crop growth period.
- How many already recognize the pests and their damage causing growth stages.
- How many of them have experienced self or by neighbours a successful timely measure.

Explain

Major Insect Pests of Cot on Crop

Insect pests of coton with national and regional significance:

- Leaf hopper *(Amrasca devastans Distant)*
- Thrips *(Thrips tabaci Lindeman)*
- Leaf roller *(Sylepta derogata Fabricius)*
- Dusky cotton bug (Oxycarenus hyalipennis)
- Stem Weevil (Pempherulus affinis)
- Mirids (Creontiades biseratense, Campylomma livida) (Central & North Zone)
- Mealybugs (*Phenacoccus solenopsis*)
- Tobacco caterpillar (*Spodoptera litura's*)
- Spotted and spiny bollworm (*Earias vittella*.)
- And of course the famous *Helicoverpa bollworm*

Whitefly *(Bemisia tabaci Genn.)*
Aphids *(Aphis gossypii Glover)*
Red cotton bug *(Dysdercus cingulatus*
Semi-looper *(Anomis flava)*
Shoot weevil (Alcidodes affabe)
(*Paracoccus marginatus*) South Zone Pink boll worm (*Pectinophora gossypiella*)
(*Earias insulana Boisd.*)
(*Helicoverpa armigera Hub.*)

Explain

With the help of participant handbook and relevant web sources following topics:

1. Use of border crops
2. Use of respective disease resistant varieties
3. Elements of effective resistance management
4. Rule for designing insectaries

Elaborate

Zone wise recommended pest control measures:

- The phylogeny of cotton crop in different zones is vastly different, depending on as small an entity as a cultivar or a variety.
- Different zones are therefore obviously not likely to have much similarities in nature timing or magnitude of pest incidence on cotton. Accordingly, package of control practices is vastly different.

Do

- First give the factual practices recommended for insect pest control based on recommended packages in different zones (as given in Handbook on cotton cultivation).
- Then discuss the difference amongst the zones.
- This could also be done with the help of assignment to prepare coloured charts &/ or by group discussion making groups of 2-3 or 3-4 participants.
- Before entering into group discussion, provide guidelines for group discussion.
- **Don't mind repeating that:**
  - ❖ Some of the insecticides which are banned or which are dangerous to human health must be avoided.
  - ❖ If any dealer is selling the banned chemicals, it is illegal.
  - ❖ Also, the product may be spurious or beyond the expiry date.
- **Emphasise**
  - ❖ That repeated application of the same pesticide within a crop season is a tendency which is counter- productive & must be avoided.
  - ❖ Make special mention of white fly, jassids, mealy bug and myrid bugs - all sucking pests, as major pests in Bt crops Jassids and white fly casue growth to slow down, mealy bug stagnates growth and Myrid bugs Cause growing tips, young flowers, squares and bolls to fall down with sunken sockets as symptom. Acephate 75SP@1 g/l OR Profenophos 50 EC @ 2 ml/l OR chloropyriphos 20EC @ 2ml/l OR fipronil 5SC@ 1 ml/l, are good tocontrol sucking pests.

UNIT 4.6: Integrated Pest Management & Pesticide Residues

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Apply cultural, mechanical, biocontrol practices.
2. Recall integrated pest & disease management in cotton.
3. Explain about residual effect of pesticides.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Explain

IRM strategies with the help of participant handbook and relevant visual aids:

1. Use of border crops
2. Use of resistant varieties
3. How to operationalize IRM
4. Key elements of effective resistance management
5. How to Maintain insectaries

Field Visit

- Plan and take the participants to nearby insectaries for practical exposure on its working and maintenance.

Elaborate

1. Beneficial insects or predators and their feeding rate on crop pests
2. Economic Threshhold Level (ETL) for major pests
3. Cultural and Mechanical practices to be followed under IPM

Do

- Use safer, newer insecticides: Use information from participant handbook and relevant website about new and banned pesticides and their toxicity levels affecting human beings.
- Make available or prepare chart for Zone wise recommendations for IMP in cotton and share with the participants.
- Prepare a list of indicators or points that could be used to minimize pesticide residue effect.

Say

- **Important Points for cotton pest management:** Don't go for any or many insecticides.
  - ❖ Spinosad, Emamectin benzoate and Indoxacarb are highly effective on pyrethroid resistant H.Armigera. & E.vittella and jassids preferred first over Indoxacarb. Both insecticides have a high selective toxicityt owards the target pests while being less toxic to many beneficial insects in the cotton ecosystem.
  - ❖ Remember these (above) three insecticides are ideally suited in eco-sustainable insecticide resistance management programmes.
  - ❖ Destruction of crop & weed residues, Don't stack cotton stalks near fields. Off - season hosts must be discouraged. Weeds such as Parthenium, Sida sp., Abutilon sp and Xanthium sp. Must be uprooted to prevent initial build-up of spotted bollworm, mealybug, whitefly and CLCV.

- **Avoid growing American cotton in orchards**
  - ❖ Use new insecticides with greater pest toxicity and less human toxicity.
  - ❖ Scouting is necessary for Spotted bollworm (can cause damage during the first two months) and removalof affected parts helps in minimizing future damage.
  - ❖ De-topping at 70-80 DAS effectively removes bollworm eggs and terminal parts affected by the spotted bollworm.
  - ❖ Handpickingoflarvae2-3 days after insecticide sprays effectively eliminates any surviving population, which can cause future resistance problems.
  - ❖ Always use insecticides as need based applications as per threshold levels (ETL).

UNIT 4.7: Management of Cotton Diseases

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe different diseases of cotton.
2. Identify the symptoms of different diseases of cotton.
3. Describe the cultural practices of control diseases.
4. Explain the chemical and non-chemical approaches for disease management.
5. Describe seed treatment.

Resources to be Used

- Available objects such as participant handbook, PPT and visual aids relevant to crop disease identification, white board, marker, laptop etc.
- Power point slides, pictures/posters etc.

Say

- **Deal with this topic in a very broad perspective**
  - ❖ Cotton is vulnerable to pest attack which cause losses may add up to 87% in crop yield.
  - ❖ Some of the pests are obstinate because they have alternate hosts. So they donot get killed as a whole and soon return.
  - ❖ In such cases, IPM which demands a lot of patience from the farmer, is the best means.
  - ❖ To keep the pest at bay is the best approach.
  - ❖ Refuge is one such approach to live and let live.
  - ❖ Divert the pests elsewhere and don't let them enjoy a stay in cotton.

- **Best course is cultural practices**
  - ❖ Do not miss talking about catch crops, trap crops, mixed cropping, intercrops, multiple intercrops, these are the measures that will yield some benefit and not just going there to spray chemicals.

Explain

- Bacterial and Fungal diseases
- Bacterial leaf blight is perhaps most important and then grey mildew (dahiya). Easy to manage but not to be ignored are Alternaria blight, Myrothecium leaf spot, and rust. An integrated disease management strategy must be adopted.

Nematodes

- Symptoms of nematode injury on cotton get expressed as leaf chlorosis, slowing down or stagnation of growth, reduced boll size and reduced lint percentage. IPM would be the best strategy for nematode management as no single method may be effective alone.

Tips

- Please adopt the same approach as described under the Unit 4 & 5 to deal with the subject of diseases, as given in Units 4 & 5 for insect pests.
- It is important to clarify that some plant conditions looking like disease are not having any pathology angle to the condition.
- Nutrient deficiency symptoms also look like disease sometimes.
- The only difference is that while disease spreads gradually or rapidly, the symptoms of physiological or nutritional disorders are more localized in the field.

Explain

- Different diseases of cotton and their symptoms.
- Cultural control measures of diseases.
- Chemical and non-chemical approaches for disease management.

Field Visit

- Plan a nearby field visit for practical exposure to different types of prevailing cotton plant diseases.

Do

Some of the following practical or activities could be planned for efficient performance outcome on disease management.

- Ask the participants to identify & enlist various cultural measures for disease control.
- Arrange demonstration of different cultural practices of disease control in field/ microscopic observation.
- Ask how to find out if a seed has received treatment (coatings of seed treatment generally come out in colour or particles if soaked in water for some time, say 2 hours).

- Recapitulate fungicides and their doses for control through seed treatment.
- Demonstrate the knowledge of various approaches of disease control viz., chemical approach and non- chemical approach.
- Plan pictorial and field demonstration of different approaches to disease management.
- Arrange periodic field visit at different growth stages to identify and observe the occurrence of diseases in field.
- Arrange visuals & specimens demonstration of infected samples, identify diseases associated with cotton.
- Pictorial display of disease through crop calendar; demonstrate knowledge of disease calendar.
- Visuals showing mode of transmission of different diseases; identify mode of transmission.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Refer PHB for complete detail.
2. Yes. Imidaclopid can be used.
3. Imidaclopid and Aeris

B. Mention True/False for Following Statements

1-True, 2-True, 3-False , 4-True

C. Fill in the Blanks

1. Root Zone
2. Entomopathogenic fungi (EPFs) such as Metarhizium brunneum
3. Extracts of Polygonum plant and Pongamia leaves at a concentration of 5% and the microbial insecticide spinosad
4. Treating the seeds with 10g Imidacloroprid 70WS

D. Match the Following

1-iii, 2-i, 3-v, 4-iv, 5-ii

Notes

5. Irrigation Management for Field Crops

Unit 5.1 - Water Management in Cotton

Unit 5.2 - Micro Irrigation

AGR/N0111

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. State the timing and method of irrigation appropriate for a given soil type and climatic conditions.
2. State the quantity of water required for the specific crop and its effect on the yield.
3. Explain the importance of sampling irrigation water through an authorised lab to determine its quality.
4. Explain various measures to be followed to improve the water quality.
5. Describe the process of setting up different types of irrigation systems such as surface irrigation, drip irrigation, sub-surface irrigation system.
6. Explain the advantages and disadvantages of different types of irrigation systems.
7. Explain the importance of irrigating the field according to the recommended irrigation schedule for the crop and the factors to consider in scheduling irrigation.
8. Explain the recommended practices to be followed to prevent over and under irrigation.
9. Explain the recommended practices to be followed for effective drainage of excess water from the field.
10. Explain the importance of maintaining the recommended level of water in the soil to prevent the harmful effects of inappropriate levels of moisture in it.
11. Explain various practices to be followed to optimize the usage of water and prevent its wastage.

UNIT 5.1: Water Management in Cotton

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe the water requirement for the cultivation of cotton.
2. Explain the soil texture, porosity etc.
3. Describe the effects of water clogging and poor drainage in the field.
4. Explain the required optimum moisture level in the field for cott on cultivation.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.
- Cotton cultivator participant handbook; PPT prepared for the coverage of agenda in hand,
- PPT on micro-irrigation. Web search material for relevant examples of national and local importance on irrigated cotton. Inspiring short story in audio-visual or oral. See Web for Inspiring stories Whiteboard, marker, laptop, projector, note pad, pen etc.

Say

- Extend Greetings for a good day.
- **Tell that you feel sure**
  - ❖ That everything is fine & everybody feels comfortable. Assure them that there should be no reason why they should not be having a high level of confidence as the course gets along.
- **Say you also feel sure**
  - ❖ That participants have in the mean time learnt to live with the environment they have maintained for the past few days and with every passing day there has been more comfort and more confidence amongst them.
  - ❖ Address difficulties, if any.

Explain

Mention

- That irrigation for cotton is not a luxury it as essential as having two kids instead of one.
- Irrigation has the potential to double the income from the farm.

What if there is no water resource around?

- If water is not available naturally or through canal water course, there must be an individual or a collective effort to harvest water and create a resource. There are a number of schemes under which the government provides incentives for this kind of farm work.

Do

- Let the class deliberate on what might be the yield of cotton be like if irrigation was not there. Many would respond "It would not be possible to grow cotton then".
- If the course is being held in a rainfed area let the class deliberate on "What would my cotton crop yield like if I had irrigation resource.
- It is every farmers' wish that irrigation water be available. But that would be possible if appropriate efforts are made. At least farmers at the lowland end of a watershed should not find it difficult to harvest and recycle the rainwater for agricultural benefit (leveling, a little more of digging to collect runoff for at least a protective irrigation or better still, for two crops / year.
- Water is a resource which come with the least risk & also empowers the plants to catalyses acceleration of some other yield enhancing attributes.

Define:

Crop water requirement:

- The crop water need (ET crop) is defined as the depth (or amount) of water needed to meet the water loss through evapotranspiration.
- In other words, it is the amount of water needed by the various crops to grow optimally throughout their life cycle.

Crop factor

- Referred to as Kc, is the measure to evaluate specific crop water needs.
- Kc would be different for different crops and would not be the same throughout the growth season of one type of crop.

Thus, the crop evapotranspiration is to be evaluated as:

- ET0 = KC x Etc
- Both ET0 and ETc are designated in mm/day.
- WR=IR+ ER (Ms – Me).
- In which, WR = seasonal water requirement, mm.
- IR = total irrigation water applied, mm.
- ER = seasonal effective rainfall, mm.
- Ms = moisture percentage at the beginning of the season.
- Me = moisture percentage at the end of the season.

- There can be several approaches to decide when to irrigate a cotton field.
  - One is by field indicator plants.
  - There could be a lysimetric aid.
  - Pan-evaporimeter approach or it could be simply a specific growth stage irrespective of other factors.
  - Irrigation scheduling.
- Schedule irrigation is best done by pan evaporation approach, keeping a 0.6 IW/CPE throughout the crop growth as the time of irrigation.
- All irrigations to cotton should be 5 cm (2") irrigations because cotton does not enjoy too wet conditions in the rhizosphere.
- Avoid flat flood irrigation as far as possible.
- Adopt furrow method of irrigation with following specifications.
- Adopt Alternatively Alternate Furrow Irrigation (AAFI) in heavy soils (Vertisols), which saves time, labour, irrigation water (to the extent of 30%) and minimizes the long term ill effects of irrigation on soil properties. In lighter soils like red lateritic soils, furrow irrigation is advisable.

Elaborate

Critical growth stages for irrigating cotton crop

- Water availability at specific growth stages is conducive to higher yield output of cotton.
- So, opt for selective irrigation, light irrigation and if possible, growth specific irrigation.
- The crop growth stages given in the table above are such that water deficit at these stages must be avoided and if irrigation is needed based on soil condition, it should be provided.
- Heavy and frequent irrigation enhances the vegetative growth leading to ineffectiveness of plant.
- protection measures, resulting in higher incidence of pest/diseases.

S.No.	Critical Stages of crop growth	Days after sowing (DAS) – May Vary According to Zone & Cultivar Parameters
1.	Sympodial branching and square formation stage	45 -50
2.	Flowering and fruiting stage	75 - 85
3.	Peak boll formation	95 - 105
4.	Boll development and boll opening stage	115-125

Table 7.1.1. Growth stages of coton with critical irrigation need

- Under canal command areas where in the canal opening is not assured at scheduled time,
- ensure early sowing with protective irrigation by open/bore well water.
- Irrigate cotton according to availability of water
- Stage 2 out of the four listed above is the most critical. If water is available only for one
- supplemental irrigation, then this is the stage to choose.
- The order of importance for the rest of them is 1,4,3 Depending on amount of irrigation available:
  1. Irrigation only : Stage 2
  2. Irrigations : Stage 1, Stage 3
  3. Irrigations : Stage 1, stage 2, stage 3
  4. Irrigations: Stage1, Stage 2, Stage 3, Stage 4

Water use Efficiency

- Plant water use efficiency (WUE) can be defined as that amount of plant growth produced per unit of water consumed by the plant (kg/mrn).
- It is important to accept the idea that in isolation plant WUE (biological efficiency) remains constant, independent of the amount of water available for growth.

Notes

- Cotton is very drought and heat-tolerant. Cotton does NOT require excessive amounts of water. In fact, cotton uses less water than many other major crops produced in this country. Water for more than 85 % of India's cotton land is supplied by natural rainfall only.
- Excess water leads to either a steep stagnation or collapse of the crop plants or in some case, may induce rank growth which aggravates disease and pest problems.
- On the other hand, water stress adversely affects the production of flower buds and boll setting, and can reduce yield by reducing boll size.

UNIT 5.2: Micro Irrigation

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Select the irrigation and fertigation methods for cott on crop
2. Adopt water conservation and recycling for cott on crop for higher returns

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Explain

Micro irrigation is of two types:

- Drip or Sprinkler irrigation
- The best of course is the drip system of irrigation which comes handy both as a regular pumped power outlet system or the other pepsee cheap drip system.
- Depending on the resource available the suitable and affordable system can be adopted. In either case an overhead or elevated water tank is needed.

Fertigation – a bonus with drip irrigation

- One of the big plus features of drip system is that it is simultaneously programmed for fertilizer scheduling called fertigation.

Ask

- If any one of them have seen or used micro irrigation system. In case of yes, ask to share the experience.
- If they can explain critical growth stages for cotton for scheduling irrigation.

Explain

Recommended irrigation practices in cotton zones

- Tell the participants that they must follow the recommendations as described zone wise in handbook. Handling a prolonged drought Often inspite of our best efforts it becomes difficult to get irrigation water for the crop while the monsoon ditches the area and crop is left to suffer the consequences of a prolonged drought.

Drought mitigation in cotton

- Water stress is the most ubiquitous stress factor. An integrated drought management system has following ingredients.

Notes

- The trainer has a big responsibility to advise the trainees on the need for utmost water economy use of efficient systems of irrigation and to adopt micro-irrigation systems with an added goal of making available water cover greater area cropped with cotton. As a cotton farmer, it is expected of the trainees to devote considerable effort in this direction.
- Unless we take steps to first make more water available by conservation, and then to "economize efficiently" on its use, we will be failing in our duties as cotton farmers and also as citizen of India.

Field Visit

- A nearby field visit may be planned for exposure to drip or sprinkler irrigation systems and its working. Duration of the visit will depend on the location from the study centre.
- A tentative costing on this investment may also be discussed with the participants so as for planning to implement in their fields.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

For 1-9 Refer to PHB for details.

B. Fill in the Blanks

1. Yield per unit of water applied
2. 74-80m depending on soil type
3. 35%
4. Physiological drought, wilting point
5. 50%
6. 3 cm
7. weed

C. Multiple Choice Questions

1-a, 2-d, 3-c, 4-b, 5-b, 6-b

D. Match the Following

1. Punjab-85, 2. Haryana, 3. 57, Karnataka-54, 4. Tamilnadu-69, 5. Gujarat-60

Notes

Skill India
कौशल भारत - कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASCI
Agriculture Skill Council of India

6. Harvest, Post - Harvest Management and Marketing of Cotton

AGR/N0206

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. State the ideal climate and conditions for harvesting cotton.
2. Explain how to assess the maturity of the cotton crop.
3. Explain the manual and mechanical methods of harvesting cotton and the use of relevant tools, equipment and machinery.
4. State the recommended practices to be followed to prevent dry leaves from sticking to cotton fibre while harvesting it.
5. Explain the importance of maintaining different grades of harvested cotton separately.
6. Explain how to protect the harvested cotton from moisture.
7. State the appropriate temperature for storing the harvested cotton.
8. State the appropriate packing material for cotton such as jute bags, Polypropylene (PP) pouches High-Density Polyethylene (HDPE) packaging, etc.
9. Describe the process of identifying and negotiating with potential buyers.
10. State the appropriate mode of transport for transporting cotton.

UNIT 6.1: Harvesting Criteria

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain how a clean harvest of seed cott on can be achieved at the farm.
2. Explain the Do's and Don'ts during crop harvesting/picking.
3. Explain the picking schedule for different sowing time.
4. Compare manual and mechanical harvesting of cotton.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Say

Say you feel sure

- That participants have in the mean time learnt to live with the environment they have maintained for the last so many days and with every passing day they must have felt more comfortable than before and more confident too.

Address difficulties, if any relate

- An Inspiring short story from Ramayana, Mahabharata, Bible, anywhere.
- Tell them they are at a phase which is comparatively less taxing to the brain but touches the most awaited operation on which depends what kind of money it will fetch to the cotton farmer after the arduous labour in the last few months.

Demonstrate

- How to get ready to go to the field with container bags, aprons, gloves or covers for heads, hands and fingers which will encounter rough and tough cases of bolls while picking the soft fluff.
- Timing of picking in the field.
- Tricks and measures for speedy progress of the picking operation.
- How group work is more efficient.
- How cleanliness is important.
- How dry leaf or sticks and loose plastic or hair as also any other contaminants including dust or dew etc. have to be certainly kept out from the picked cotton fluff.
- Keep dogs and animals away so they would not drench or spoil the harvested stuff it with their excreta.
- All filled bags must be properly closed at the top before any small creepy insects, scorpions or snakes etc. get into the bag.
- The bags need not be too loose filled or too tight either.

Notes

- Take special care of Class differences in the seed cotton fluff.
- Be sure to get more in the market if you can keep bright looking cotton separate from slightly faded or off- white or yellowish looking harvest.
- For this, one of the group follows the front leaders who would pass on poorer looking produce to the separate bags.
- Laxity in keeping classes separately fetches lower market price.

Do

Give clear instructions to learners on precautions to be taken during harvest:

- Dos and don'ts during crop harvest:

Efficiency of cotton pickers

- A major cost factor in cotton production is the labour required for cotton picking.
- The follow suggestions might help to increase the efficiency of cotton picking, and to ensure a high-quality harvest:

Do's

- Use a long sack so that the weight rests on the ground.
- Keep the sack permanently open with a ring of flexible wood, plastic or non-ferrous metallic rings.
- Pick two rows at a time.
- Keep a separate, smaller bag for second-grade cotton.
- **Using cotton picking aprons:** Robe with a light weight sac at the back; easy to make it at home too for anyone with a little knowledge of sewing.
- The sack with half inch foam belts, resting on two shoulders, reduces the stress of carrying the weight of picked cotton, making it easier for women to pick cotton.

Precautions to be taken in picking: (Picking Don't's).

- Picking should be started when bolls are fully mature not before.
- Picking should not be done while the bolls are wet from dew or rain.
- Don't pick bolls spoiled by rains, or damaged by insects, or otherwise damaged, with healthy bolls.
- These may be removed 10 to 15 days ahead of the first picking, separately and discarded.
- Moist cotton should not be picked; reduces its worth. Further, damp cotton requires more processing in the gin.
- Don't store or stack away the picked only until it is completely dry .

UNIT 6.2: Post - Harvest Storage of Cotton

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Detremine ideal storage conditions of harvested cotton.
2. Recognise different cott on modules.
3. Handle cleaning process of cott on in the ginning factory.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Ask

- Have they ever seen cotton warehouse? if yes, ask how it looks like and how the cotton is stored.
- Have they ever visited ginning factory?

Explain

With the help of participant handbook and relevant visual aids, describe:

- Warehouse at home
- Storage at home in properly constructed ware houses is a good idea because it is best to wait for the market trends before disposing off all the harvest.
- Humidity and temperature control are important because high humidity and high temperature are both harmful for keeping a good quality for long time.

Cotton modules

- Plastic made bags of large size called modules can be used, like the ones in USA. Some farmers get it made with contamination avoided but that is the prerogative of those with considerable marketable surplus.

Need for storage of cotton harvest

- Seed cotton is stored in piles on the ground, or in sheds, trailers or modules, maybe well protected from weather damage (rain) and from excessive ground moisture.
- It is sometimes covered a high-quality tarpaulin.
- **UV exposusre:** Module cover can breakdown or be damaged if there is more than normal exposure to UV rays. Change the cover before this happens.

Transportation from the farm

- Cotton bolls are plucked manually and are put in a sac made of polypropylene or jute which are either put in open form in godown and then transported to ginning industry or to procurement center as per the farmer's decision on the kind of revenue / monetary return expected.

Handling of cotton within ginning factory

- Foreign materials such as human hair, coir pieces, cloth pieces, jute threads, wood pieces, pieces of cigarettes, bidis, tobacco pouches, dusts and stone etc. are cleared.

Pressing and Baling

- The job of the ginning factory is also to compact the separated lint into bales of standard weight and packed dimensions as: Weight: 170kg; Length 1.37 to 1.4 m; Width 0.51 to 0.53 m; height 0.84m.

Field Visit

- Plan a filed visit to cotton storage warehouse and ginning factory to have practical exposure to the workplace and understand the working.

Notes for Facilitation

- Use as many as visuals and videos if possible for better learning.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Leaves, stems, branches and burs.
2. Seed Cotton
3. Ginning
4. Mechanical spindle pickers or brush strippers harvest cotton.
5. Use more than one picking bag and separate cotton of different grades. Harvest the two halves parallel rows.
6. After the morning dew has dried up and before the dew begins to accumulate in the evening.

B. State True or False (T/F) Against Each of the Following Statements

1-False, 2-False, 3-True, 4-False, 5.-True, 6-True, 7-False, 8-False, 9-False, 10-False

UNIT 6.3: Market Platform for Cotton Sale

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Identify suitable market channels for cott on crop.
2. Identify if any e-channel marketing advantages can be availed.
3. Determine appropriate time and place for marketing of produce.
4. Recognise existing advisory services through ICT mode.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Notes

- This session will focus on markets channels and pricing system.

Explain

With the the help of participant handbook and PPT, discuss about:

- Price and Procurement
- Minimum Support Price
- Procurement agencies
- Marketing channels
- Cott on milling and products

Discuss following points in detail:

❖ Market price stability

❖ Price and Procurement

- Farmer is the only entity in the market chain who buys in sellers' market sells in buyers' market and pays for transportation both ways – up and down.
- Any one who starts with such a disadvantage, has to be doubly conscious and doubly smart to be able to shoulder extra burdens of farming as a business.

- The prices of cottons with similar fiber properties tend to be equal at a particular location and time.
- The government fixes MSP which is essentially respected and honored by CCI and wholesalers. But intermediaries try to take advantage of market situation.
- Most cotton in national & international market is classed by visual and manual scrutiny only. Instrument-classing on a sample basis is gradually picking up. Instrument testing might eventually secure or improve farmer's market share, as a significant premium over the industry standard price (tied to the Cotlook A Index).

Marketing Channels:

- Existing marketing channels in cotton may be represented as follows :
  - Farmer > Village Trader > Moving Trader > Whole sale Trader
  - Farmer > Commission Agent > Whole Sale Market > Mill owner
  - Farmer > Cooperative Marketing Institution > Cotton trading market
  - Farmer > State Cooperative Marketing Institution > Cotton trading market
  - Farmer > Trader/ wholesaler > Exporter
- The regulated market yard APMC is available to farmers for marketing cotton. Auction of various lots of cotton is conducted in presence of farmer or his representative.

Marketing Costs:

- *Marketingcostswouldnormallyinclude:*
- *Assemblingcharges*
- *Handlingchargestocustomers*
- *Profitmarginsofdifferentintermediaries*
- *Perishable nature of the produce.*

Handling charges at local point
Transportandstoragecosts
Secondary services (financing, risk, etc) taking
Marketintelligence
Costlyandinadequatefinance.

Constraints in coton marketing:

- Lack of storage facility (Market committee offers facility for temporatry, rental storage).
- Financial support is often available from Govt, non-govt agencies), against the produce. It could help prevent distress sale by farmer and obtain better price.
- Distant & fewer collection centers set up by CCI.

Do

- Tell participants to obtain information from the fellow farmers who may have already accessed market or by recce. The cotton can be pre-sold under contract farming with CCI.
- Ask them to Analyse information and get the market trends (current and near future) on arrivals and prices from professional marketing sites.
- Make the class aware of this useful body called Small Farmers' Agri-Business Consortium SFAC.
- The cotton Handbook provides good graphic presentations of export, import data, the trade partners, the mill products made by India and their potentials for home use in handloom, milling industry and export. Use these pictorials for a detailed discussion.
- Also spend some time on the picture giving forward and backward linkages in cotton & make the cultivators feel that they are part of the whole set up and not isolated in the value chain.

Elaborate

Cover in detail the following about ICT :

- Make it abundantly clear to trainees that these services are foremost in eyes of central govt. The govt does not only want farmer to be digital savvy but derive maximum benefits from it.
  - *Computerization* — *Transforming rural India withthehelpofdigital technologies:*
  - *ICT and agriculture* — *Information to farmersonseeds, fertilizers, pesticides*
  - *mKisan Portal:* — *National mission on agricultural extension and Technology:*
  - *Advisory services:* — *Marketinformation(commoditypricesandstocks)*
  - *thee-Choupal* — *Creating rural markets*
  - *Weatherforecasts* — *Accenture Connected Crop Solution MAIS*

- **Tell the participant about services offered by various non-govt organizations as well:**
- **Information and Communication Technologies (ICTs):** can play a significant role in combating rural and urban poverty and fostering sustainable development, viz., ICTs for Soil Quality Assessment, ICTs for Market Information, etc.
- **Some Successful ICT initiatives in India:** In India ICT applications such as *Warana, Dristee, E-Chaupal, E-Seva, Lokmitra, E-Post, Gramdoot, Gyandoot, Tarahaat, Dhan, Akshaya, Honeybee, Praja* are quite successful in achieving their objectives.

Do

Ask the participants to:

- Obtain information from the fellow farmers who may have already accessed market or by recce. The cotton can be pre-sold under contract farming with CCI.
- Analyse information. Get the market trends (current and near future) on arrivals and prices from professional marketing sites.

Ask them to Explore Available Portals on Cotton Marketing on the Web

- Utilize the market information for decision making
- Approach the market when it would yield max profit based on ruling and expected prices. How much to retain for possible future benefits and how long or simply sell everything now itself
- Negotiation is an element that hardly ever enters the area of cotton selling by farmers but aggregated produce can bring enormous advantage.

Make the class aware of this useful body called Small Farmers' Agri-Business Consortium SFAC.

- "Society promoted by Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Govt. of India" SFAC is an exclusive Society focused on increasing incomes of small and marginal farmers through aggregation and development of agribusiness. Pioneers Farmer Producer Organizations/Farmer Producer Companies across the length and breadth of country. SFAC is establishing an eco system for FPOs/FPCs to make them sustainable and viable. SFAC offers Schemes like Equity Grant and Credit Guarantee Fund Scheme to FPCs, promotes development of small agribusiness through value added processing and marketing linkages & implementing the National Agriculture Market Electronic Trading (e-Nam) platform for agricultural products with much higher price discovery for farmers.

Say

- Extend Greetings for a good day.

Say you are confident

- That everything is in order and every body is feeling comfortable.
- If they are excited that we are closing in to the last leg of the course work.

Tell them

- That you expect a high level of confidence amongst the participants.

Say you feel sure

- That participants have in the mean time learnt to live with the environment they have maintained for the last so many days. Address difficulties, if any.

Explain

- Please don't go by names or words, but think of it as an example only. Why should Yeotmal cott on go to Vadodra or Surat for ginning, spinning, weaving, fabric making or to Tamil Nadu for making fabrics, apparels and garments?
- Why not Yeotmal the cott on producing hub become a manufacturing hub by itself?
- Farmers themselves and their families should get together to form a manufacturing hub around the bulk of cott on produced by them. Let them become managers, engineers, wholesalers, retailers, financiers. They should federate themselves and become stakeholders in the cott on value chain.
- Ask the government, consultants, bankers to support the effort. They are and will always be with you. You may possibly like to skill yourselves for the job that you think you are capable of doing in this most ancient and prosperous value chain of India.
- **Cot on Storage:** Cott on is stored as kapas in village homes. Being voluminous, it needs large space for storage. Farmers generally store in farm houses, storage godowns and dwelling houses. The duration of storage varies maybe 1 to 3 month depending on capacity for retaining marketable surplus for sustained selling.
- **Cot on Transport:** Sometimes, this is done by carrying head-loads like from farm to village warehouse. The common carriers of cott on are animal or tractor driven carts or lorries. Lorries are used to transport the cott on at intra-state level. Railways form an important mode of transport for moving full-pressed bales from pressing centres after ginning to terminal markets or consuming centres. Railways are used mostly for inter state trading of cott on.
- **Cotton Marketing:** Marketing occupies an all important place in providing the a commodity its monetized value. Cotton is quite and important commercial crop of India, that holds a significant status in the agri-industry scenario of the country's economy. Major markets for cotton abound in all cotton growing areas. But these mandies, shandies, or whatever you call them, are not farmer-friendly, driven primarily by interests of intermediaries and the industry.

- **Cotton Market:** Can be called primary (village/taluka level), secondary or wholesale markets, or terminal markets where the consumer buys the raw seed cotton or cotton lint. This is where industry, mill, exporters, inster-state traders assemble to negotiate final deals on a wholesale basis. In some ways, cotton is unique, as there exist "Mill Markets" or "Spinners' Markets" catering largely to handloom or mill industry of various sorts.
- **Marketing charges:** Rate and levy of various market charges vary from market to market maybe even in same region. The sellers and buyers pay charges and deductions during transactions, viz., commission, brokerage, handling and weighing, storage, rent for containers, taxes and market fees Cooperative Marketing societies either don't charge or charge only minimal amount under these various heads, so farmers prefer this kind of market facility.
- **Grading:** Grading is the labeling the commodity according to quality, size etc. The quality of cotton, as it quality of cotton usually as adjudged in the market is subject to annual variations at any market or among the markets. Grading bring this disparity under control.
- **Cotton class:** Grade + staple length (also fineness, strength, uniformity) = class. Officials of the State Department of Agriculture provide grade classification for nominal charges. Another system of classifying the kapas and lint is "Karunkanni" and "Cambodia" cottons, accepted by the general trade. At present, the market reports published by the Regulated Market Committee Coimbatore, carries prices for five grades viz., Grade I, Grade II, Grade III, Grade IV and poor. The CCI, MSP and direct sale (sale without intermediaries) unfortunately, can't cover cotton purchase extensively. Normally it has 1-4 procurement centers per district. Selling cotton to CCI directly is definitely beneficial to cotton growers. Also, if farmers can't aggregate requisite quantities they can supply their cotton directly to Millers. Elimination of intermediaries enables them get much better price and greater share.

Facilitative Organisations in Cotton Marketing

- **Regulated Markets and Cooperative Marketing Societies:** Act as facilitative organizations in cotton marketing. They extend physical facilities for the handling the commodity, for bringing buyers and sellers together and also aid for grading etc., including the arrangements for payment of various charges & levies. They do not interfere with or participate in the process of sale-purchase agents, speculators or processors.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Place where traders, wholesalers and retailers can trade among themselves.
2. Pls. refer unit 10.1 in PHB.
3. Marketable surplus refers to the total amount of a product that a producer has available for sale in the market after fulfilling their own consumption needs. Marketed surplus, on the other hand, refers to the portion of the marketable surplus that is actually sold in the market.
4. The factors affecting marketable surplus include the level of production, the availability of infrastructure, the accessibility of markets, the level of technology used, government policies, and the availability of credit and finance.
5. The main features of Krishi Upaj Mandi, also known as Agricultural Produce Market Committee (APMC), include the regulation and control of the sale and purchase of agricultural produce, the provision of market facilities, the setting of minimum support prices, the provision of market information, and the settlement of disputes between buyers and sellers.

B. Fill in the Blanks

1. Primary
2. Fixed, vary
3. Routes
4. Price
5. Analyse and reduce
6. Transporation cost
7. Greater
8. Left
9. Sold
10. Less
11. Regulated

C. Mutiple Choice Questions

1-d, 2-a, 3-d, 4-a

D. Write True or False Against the Following Statements

1. True, 2-F, 3-True, 4-True, 5-F, 6-F, 7-True, 8-True

Notes

7. Engagement in Collective Farming/Activities

Unit 7.1 - Collectivization and Aggregation to form Group Organizations

AGR/N9922

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Describe the process of preparing for the Producer Groups (PGs)/Farmers Interest Groups (FIGs)/ Self-Help Groups (SHGs) operations such as fundraising, induction of Subject Matter Experts (SMEs), investing in Information and Communication Technology (ICT) products, etc.
2. Explain how to obtain access to the relevant government development programmes and funds.
3. Describe the process of commodity convergence with the relevant developmental programmes.
4. Explain the importance of planning optimal production to meet the market and household food security needs.
5. Explain the importance of setting the group objectives and deciding the group income-generating enterprises/ activities, methods of operation, benefits, etc.
6. Explain the importance of organising the PG/FIG/ SHG meetings and training sessions to resolve common concerns and get information about the latest developments in the field of work.
7. Explain the benefits of various capacity building exercises such as skill development and training programmes.
8. Explain the importance and process of conducting field trials to identify and resolve problems encountered by farmers in the field operations.
9. Explain the concept of the groupowned bank to provide quality seeds, fertilisers, pesticides, tools and equipment to the member farmers.
10. Describe the process of using the group's credit facility.
11. Explain various core collective farming activities such as procuring inputs in bulk, large-scale farming, etc.
12. Explain the concept and benefits of forming forward and backward linkages.
13. State the relevant value addition practices such as processing, packing, upgrading the quality, etc.
14. Explain the benefits of connecting with similar groups to address common problems on a large scale.

UNIT 7.1.: Collectivization and Aggregation to form Group Organizations

Unit Objectives

- Explain the concept of holding meetings and group organisation.
- To Explain the benefits of various capacity building exercises like skill development and training programmes.
- To determine the objectives of the group and the activities, operations of the group income generating enterprises.
- Describe the procedure for availing the credit facility of the group.

Resources to be Used

- Participant handbook, power point slide, writing board with pen/ chalk, pictures, posters, newspaper clippings related to the subject under study, Projectors, Laptop, Internet connections (if available).

Ask

Before starting the session ask the participants following questions-

- About their current understanding of collectivization and aggregation and its importance in forming group organizations.
- Ask the participants about their experience with group organization such as producer groups (PGs), farmer interest groups (FIGs), and self-help groups (SHGs).

Write down the participants answer on the whiteboard. Discuss the answers and start the session.

Do

- Encourage the participants to actively participate in the discussion and share their own experiences with group organizations.
- Have the participants develop a plan for setting up a group organization in their own community.

Explain

- The concept of collectivization and how it brings farmers together to form group organizations.
- Importance of planning optimal production to meet market and household food security needs.
- The process of preparing for Producer Groups(PGs)/ Farmers Interest groups(FIGs)/ Self-help groups(SHGs) etc.
- Process of using group's credit facility.
- Concept and benefits of forming forward and backward linkages.
- The benefits of connecting with similar groups to address common problems on a large scale.

Field Visit

- Organize a field visit to a local group organization for the participants to observe their operations, methods of operation and benefits.

Example

- Provide examples of successful group organizations and their impact on the community.

Elaborate

- On the benefits of capacity building exercises such as skill development and training programs for farmers.
- On the importance of setting group objectives and deciding group income generating enterprises/activities, methods of operation and benefits.
- On the concept of group-owned bank and how it provides quality seeds, fertilizers, pesticides, tools and equipment to member farmers.
- On various core collective farming activities such as procuring inputs in bulk, large-scale farming and others.
- On value addition practices such as processing, packing, and upgrading the quality of agriculture produce.
- On the measures taken by the government to promote the formation of SHGs and FPOs.

Facilitation Notes

- Encourage active participation from all participants.
- Encourage the participants to ask questions and share their experiences throughout the training.
- End by urging participants to open up their participant handbooks and solve the exercises given at the end of the unit. Discuss the answers to the exercise in the class.

Exercise

Key Solutions to PHB Exercise

1. SHG stands for Self Help Group and FPO stands for Farmer Producer Organization.
2. (a) Supply of seed
   (b) Fertilizer and machinery
   (c) Market linkage
3. FPOs are generally mobilized by promoting institutions/resource agencies. Small farmers' Agribusiness Consortium is providing support for the promotion of FPOs.
4. NABARD, SFAC, Govt. departments provide financial or technical support to the Producer Organisaton Promoting Institution for promotion and hand holding .
5. A good business plan is the engine that drives the FPO to the destination it has envisioned.

B. Fill in the blanks-

1. Adding value to the raw product and high engagement levels of participating members
2. Pradhan Mantri Kisan SAMPADA Yojana
3. Refer to PHB
4. Concentrate
5. Aspirant

C. State whether True/False.

1. True
2. False
3. True
4. True
5. True

Notes

8. Hygiene and Cleanliness

Unit 8.1- Personal Hygiene Practices

Unit 8.2- Cleanliness Around the Workplace

AGR/N9903

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the requirements of personal health, hygiene and fitness at work.
2. Describe common health-related guidelines laid down by the organizations/ Government at the workplace.
3. Explain the importance of good housekeeping at the workplace.
4. Explain the importance of informing the designated authority on personal health issues related to injuries and infectious diseases.

UNIT 8.1: Personal Hygiene Practices

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe the process for maintaining good hygienic practices at workplace.
2. Explain the follow the workplace sanitization norms including distancing from sick people.

Resources to be Used

- Available objects such as a participant handbook, white board, duster, flip chart board/paper etc.
- Slides in power point presentation showing relevant images.

Say

- Greet the participants and before beginning the session, recapitulate the previous session discussions.

Ask

- Do you understand by the term "Hygiene".?

Explain

Explain with the help of PHB :

- Workplace Hygiene
- Personal Hygiene
- Washroom Hygiene
- Security measures for the safety of employees and other

Activity

Purpose: To understand the need for personal hygiene
Methodology: Discussion for 15 minutes.
Expected Outcome: Participants have to list the external parts of the body that need to be kept clean and healthy, while explaining why it is needed.

- Put up the power point slide and start a discussion around the subject – what is personal hygiene and why it is needed.

Do

- During the activity, encourage the participants to ask questions and have active participation.
- At the end of the activity, clarify the doubts the participants.
- Provide your own expert advice and opinion regarding the topic.

Notes of Facilitation

- Conclude the unit by calling for volunteers to sum up one by one the learning on importance of sanitizing the workplace, the procedure to sanitize and disinfect work area.
- Encourage active participation and engagement from students, such as through group discussions and hands-on exercises.
- Provide a balance of both theoretical and practical information on the use PPEs, Cleaning disinfectants and other objects needed in this process.
- Get participants to open up their participant handbooks and solve the exercises given at the end of the unit. Discuss the answers.

Exercise

Key Solutions to PHB Exercises

A. Short questions

1. One of the best ways to protect yourself from getting gastro or infectious diseases.
2. Wear face mask, frequently wash your hands, avoid touching your eyes, nose, etc.
3. Barrier face covering, surgical masks, N95 Respirators, etc.

B. Multiple Choice Questions

1. Personal Protective Equipment
2. 2019
3. Homemade face mask

C. Fill in the blanks-

1. Work environment
2. 2014
3. Before start the work

D. State True/False.

1. True
2. True
3. True

UNIT 8.2: Cleanliness Around the Workplace

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe the importance of workplace safety.
2. Explain about PPE equipment/kit.
3. Explain cleaning, disinfection and pest control measures.
4. Describe the importance of drainage and waste disposal around workplace.
5. Describe the importance of labeling and risk assessment practices in workplace.

Resources to be Used

- Available objects such as participant handbook, white board, duster, flip chart board/paper etc.
- Slides in power point presentation showing relevant images.

Say

- Greet the participants and before beginning the session, recapitulate the previous session discussions.

Ask

- Have you ever heard about PPE ?

Elaborate

- Inspection of Personal Protective Equipment (PPE).
- Cleaning and disinfection
- Pest Control system
- Drainage and Waste disposal

Activity

Purpose : To perceive the topic and time will be 20 minutes.

Methodology : Pen and paper

- Divide the participants into groups
- Ask the participants to label the chart paper "TIPS FOR CLEANLINESS".
- Now discuss the points of every group.

Notes for Facilitation

• Encourage active participation and engagement from students, such as through group discussions and hands-on exercises.

•Provide a balance of both theoretical and practical information on the use PPEs, Cleaning disinfectants and other objects needed in this process.

•Get participants to open up their participant handbooks and solve the exercises given at the end of the unit.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. **Workplace Safety Inspection Checklists**
   - Employer posting of safety guidelines in a public and visible place
   - Record-keeping of safety permits, occupational injuries and employee training records
   - Safety and health program existence, consistency and participation
   - Medical services and first aid availability, proximity and response
2. **Methods of Disinfection**
   - Chemical Disinfectants
   - Chlorine and chlorine compounds
   - Formaldehyde
   - Glutaraldehyde
   - Hydrogen peroxide
   - Lodophors

3. Risk happens across all the organizations whether it is public, private or semi government. The process of assessing, monitoring, and responding to the risks in order to reduce their impact is achieved through the implementation of a risk management framework.Risk management framework is a basic conceptual structure used to address the risks faced by an organization. Refer section 12.2.9 in PHB.

B. Multiple Choice Questions

1. Both of the above
2. All of the above
3. All of the above

C. Fill in the Blanks

1. To decrease
2. Soil and organic material

D. State whether True or False

1. True
2. True
3. True

9. Safety and Emergency Procedures

Unit 9.1 - Health and Safety at Work Place

Unit 9.2 - Methods of Safe Use of Pesticides

Unit 9.3 - Safety in Use of Agricultural Machinery

AGR/N9903

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. List the Personal Protective Equipment (PPE) required at the workplace.
2. Describe the commonly reported hazards at the workplace.
3. Describe the hazards caused due to chemicals/ pesticides/ fumigants.
4. Describe the basic safety checks to be done before the operation of any equipment/ machinery.
5. Describe the common first aid procedures to be followed in case of emergencies.
6. State measures that can be taken to prevent accidents and damage s at the workplace.
7. Explain the importance of reporting details of first aid administered, to the reporting officer/ doctor, in accordance with workplace procedures.
8. State common health and safety guidelines to be followed at the workplace.

UNIT 9.1: Health and Safety at Work Place

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Recognise importance of safety precautions at farm site.
2. Recall chemical application process and take health safety measures.
3. Undertake precautions while handling farm machinery.

Resources to be Used

- Available objects such as participant handbook, white board, duster, marker etc.
- Power point slides, pictures/posters etc.

Elaborate

Using pictorial or video material, and details given in participant handbook:

- Safe use of pesticides
- Make it very clear at the outset that while dealing with safety at work place, don't take chance. If there is slightest indication or symptom of problem, Immediately, Immediately go to a doctor/hospital as the need be.
- Hazard Symbols
- Degree of Exposure
- Use of Safety procedures

Do

Share what to practice:

- Surplus insecticide solution can be disposed of safely by pouring it in to a pit latrine or a speciallydug hole in the ground.
- General hygiene
- Do not eat, drink or smoke while using insecticides.
- Keep food in tightly closed boxes.
- Use suitable equipment for measuring out, mixing and transferring.
- Use protective coverings
- Clean blocked nozzles with a soft probe .
- Use suitable equipmen tor measuring out and mixing insecticides.
- **Nervous system:** Headaches, Dizziness, Confusion, Restlessness, Muscle twitching, Staggering gait, Slurred speech, Fits, Unconsciousness.
- Did contamination occur?
- How much was bested?

UNIT 9.2: Methods of Safe Use of Pesticides

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Apply knowledge and practice of safety while working with pesticides.

Resources to be Used

- Participant handbook, PPT, audio visual aids, projector, laptop, PPE, first aid kit.

Say

- This session will discuss about safety precautions being undertaken while spaying chemicals / pesticides in the cotton field.

Explain

Using the details given in the handbook on cotton cultivation and appropriate illustration material, explain:

- Safe use of pesticides
- Make it very clear at the outset that while dealing with safety at work place, don't take chance. If there is slightest indication or symptom of problem, immediately, go to a doctor/hospital as the need be.
- Hazard symbols and degree of risk.
- Use of safety procedures.
- Cleaning used pesticide containers: Pesticide containers should be rinsed as soon as they are empty, completely filled with water, and allowed to stand for 24 hours.

Demonstrate

- Appropriate way of disposing empty pesticide containers.
- Appropriate way of disposal if surplus tank mixture.

Do

- Invite a certified First aid trainer for first hand interaction with participants and clear how to conduct personally the various emergency activities to save a victim of pesticide poisoning.

UNIT 9.3: Safety in Use of Agricultural Machinery

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe the safe use of machinery during harvesting and threshing.

Resources to be Used

- Participant handbook, PPT, audio visual aids, projector, laptop, checklist, PPE, first aid kit etc.

Say

- This session will discuss about safety precautions being undertaken while commencing harvesting and threshing activities in the cott on field.

Do

1. Prepare a check list of do's and don'ts related with agriculture machinery work and share with Trainees.
2. Give them clear instructions for not lubricating, cleaning, adjusting, or unplugging harvesters when the machine or engine is running.

Ask

- Ask the participants to do thorough inspections before use of machinery to avoid any accidents.
- Ask them to follow health and safety precautions during harvesting and threshing machinery
- Ask the participants to ensure during harvesting to wear tight clothing and secure their hair to avoid entanglement.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Refer to Participant handbook for details.

B. Fill in the Blanks

1. PPE
2. Operation
3. Close fit clothing without loose ends
4. Washing with clean water
5. Spectacles with sides covered
6. Plastic or rubber
7. Going out into open with fresh air

C. Mutiple Choice Questions

1-c, 2-d, 3-c, 4-b, 5-d, 6-d, 7-d, 8-c, 9-c, 10-d

Notes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
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Skill Development
Corporation
Transforming the skill landscape

ASCI
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10. Employability Skills (30 Hours)

To access content on Employability Skills, click here:
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DGT/VSQ/N0101

11. Annexures

Annexure I
Training Delivery Plan

Training Delivery Plan			
Program Name:	Cotton Cultivator		
Qualification Pack Name & Ref. ID	AGR/Q0202		
Version No.	**3.0**	**Version Update Date**	**17/11/2022**
Pre-requisites to Training (if any)	8th Class with 1 year of relevant experience OR 5th Class with 3 Years of relevant experience OR Ability to read and write with 5 Years of relevant experience OR Certificate-NSQF Level-3 (in Agriculture/Horticulture related Job Roles) with 6 Months of relevant experience		
Training Outcomes	**After completing this programme, participants will be able to:** • Describe the process of selecting and preparing the site and sowing the cotton seeds • Demonstrate the process of carrying out macro and micronutrient management of field crops • Demonstrate the process of integrated pest and disease management for cotton crops. • Demonstrate the process of performing weed and integrated pest and disease management for cotton crops. • Demonstrate the process of carrying out harvesting, post-harvest management and marketing the cotton. • Describe the process of undertaking employability and entrepreneurial practices. • Describe the process of engaging in collective farming/activity • Demonstrate various practices to maintain personal hygiene, cleanliness, and safety at the workplace.		

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
1	Introduction to the role of cotton cultivator T: 5:00 (HH:MM)	1. Orientation	• Introduce fellow participants •Build rapport with fellow students and their trainer •Explain the overall training outcomes of the programme	Bridge Module	Team activity: Number game	Chairs, round table in U shape sitting shape	T: 1.30
		2. Overview of cotton	• Explain when cotton cultivation started and how it spread across the world • Explain the scope and opportunities in cotton cultivation • Describe suitable agro climatic conditions • Identify importance of cotton crop for the farmer and for the textile industry.		Lecture, stage presentation, group presentations and discussion	Participant handbook (PHB) Projector, system facilitating power point presentations, microphone, camera, round tables arranged in U shape for healthy discussion, white board, marker pen of different colors	T: 3:30

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
2	Cotton seed preparation and site selection T:10.00 P:15:00 (HH:MM)	1. Requirements for good seed	• Explain the factors associated with good quality healthy seed • Explain the methods of seed treatment before sowing in cotton	AGR/N0204 PC1, PC3, PC5, PC6, PC10, PC13, PC14, PC15, PC18-PC21, KU1-KU9, KU11, KU13-KU16, KU18,GS1-GS9	Lecture, stage presentation, role plays, group presentations and discussion	PHB, Projector, system facilitating power point presentations, microphone, camera, round tables arranged in U shape	T: 3:00 P: 3:00
		2. Classical cotton varieties and hybrid seeds	• Identify indigenous and improved cotton cultivators in India • Identify Bt cotton cultivars for different growing season		Lecture, stage presentation, role plays, group presentations and discussion	PHB, White board, duster, flip chart board/paper etc. PPT with relevant images of young age silkworms	T: 2:30 P: 4:00
		3. . Cotton varieties for industry needs and seed production procurement	• Explain Bt varieties & hybrids with resistance to boll worms • Explain different species of Gossypium • Explain importance of seed • Explain economic importance of seed production • Explain the importance of isolation distance and roguing		Lecture, stage presentation, discussion	PHB, available objects such as a white board, duster, flip chart, paper, pen, marker etc. PPT showing relevant images of different late age silkworms.	T: 2:00 P: 4:00
		4. Land levelling, field preparation, sowing and planting system in cotton	• Describe about tillage types and its methods • Describe about different tools, machinery and tillage equipment • Explain the diversity and versatility of planting methods		Lecture, stage presentation, role plays, group presentations and discussion	PHB, Chart papers, pencil, eraser, sharpener, scale, Projector, system facilitating power point presentations	T: 2:30 P: 4:00
3	Macro and micro nutrient management for field crops T: 10:00 P: 20:00 (HH:MM)	1. Soil sampling & analysis for essential nutrients	• Describe soil sample collection process • Explain the essential nutrient requirement based on soil analysis report.	AGR/N0108 PC3, PC4, PC6, PC8, PC11, KU1-KU4, KU7, KU9-KU12, KU14, KU16, KU17, KU19, GS1-GS9	Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, projector, display screen, round table sitting arrangement, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 2:00 P: 4:00
		2. Macro and micro nutrients for cotton crop	• Explain the nutrient problem of cotton in the field • Describe the symptoms of nutrient deficiency and apply proper remedial measures		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, projector, display screen, round table sitting arrangement, white board, duster, flip chart board/paper.	T: 3:00 P: 3:00

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
		3. Sources of organic and inorganic fertilizers	• Describe sources of organic and inorganic		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, Projector, display screen, round table sitting arrangement, white board, duster, flip chart board/paper etc., PPT and relevant audio visual aids	T: 2:00 P: 3:00
		4. Methods and time of fertilizer applications	• Explain the methods of fertilizer applications • Explain proper time of fertilizer application • Describe balance dose of fertilizers for cotton		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, Projector, display screen, round table sitting arrangement, white board, duster, flip chart board/paper	T: 1:00 P: 4:00
		5. Integrated Nutrient management (INM) in cotton	• Explain how to use data on nutrient status of soils • Describe methods of balanced application of various fertilizers • Describe recommended dose of fertilizers for different varieties of cotton		Lecture, activities, role plays, group presentations and discussion, field visits, demonstrations etc.	PHB, Projector, display screen, white board, marker, duster, paper, pen PPT and relevant audio-visual aids	T: 2:00 P: 6:00
4	Weed and integrated pest management for cotton crop T: 15:00 P: 45:00 (HH:MM)	1. Nature and classification of weeds	• Describe noxious weeds • Describe weeds of cotton crop and integrated control measures	AGR/N0205 PC2, PC4, PC6, PC7, PC8, PC10, PC13, PC16, PC17, KU3-KU9, KU11, KU12, KU15-KU21, KU23, KU25, KU27, GS1-GS10	Lecture, stage presentation, role plays, group presentations and discussion	PHB, projector, display screen, round table sitting arrangement, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 3:00 P: 4:00
		2. Methods of weed management	• Explain importance of weed control in crop plants • Elaborate how to achieve good control of weeds • Demonstarte different strategies and methods of weed management		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, projector, display screen, round table sitting arrangement, white board, duster, flip chart board/paper.	T: 2:00 P: 5:00
		3. Chemical control of weeds	• Explain chemical control of weeds in cotton • Describe classes of weedicides • Describe weed control by herbicides • Demonstrate method of herbicide application		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, projector, display screen, round table sitting arrangement, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 1:00 P: 7:00

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
		4. Ancient wisdom on pests & their management	• Describe about different insects pests of cotton • Describe cultural practices of pest control • Describe chemical control methods • Explain mechanical control methods		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 2:00 P: 5:00
		5. Insecticide resistance management(IRM) strategies	• Describe insecticide resistant management strategies • Explain alternate host plants • Demonstrate disease resistant varieties		Lecture, group presentations and discussion, field visits	PHB, projector, display screen, sitting arrangement, white board, duster, flip chart, board, paper, pen, marker etc., PPT showing relevant images and other audio visual aids	T: 1:00 P: 6:00
		6. Integrated pest management & pesticide residues	• Explain cultural, mechanical and biocontrol practices • Demonstrate and Practice integrated pest and disease management in cotton • Explain about residual effects of pesticides		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 1:00 P: 7:00
		7. Management of cotton diseases	• Describe different diseases of cotton • Explain the symptoms of different diseases of cotton • Explain the chemical and non-chemical approaches for disease management • Describe seed treatment		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 2:00 P: 6:00
		8. Recap	• Recapitulate complete module learning		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, projector, display screen, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 3:00 P: 5:00

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
5	Irrigation management for field crops T: 10:00 P: 20:00 (HH:MM)	1. Water management in cotton-I	• Describe the water requirement for the cultivation of cotton • Explain the soil texture, porosity etc.	AGR/N0111 PC3, PC4, PC6, PC7, PC9, KU1, KU5-KU9, KU11, GS1-GS8	Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, White board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 3:00 P: 4:00
		2. Water management in cotton-II	• Describe the effects of water clogging and poor drainage in the field • Explain the required optimum moisture level in the field for cotton cultivation		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, White board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 2:00 P: 6:00
		3. Micro Irrigation	• Explain the irrigation and fertigation methods for cotton crop • Describe water conservation and recycling for cotton crop for higher returns		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, White board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant Images, audio-visual aid	T: 2:00 P: 5:00
		4. Recap	• Recapitulate complete module learning		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, projector, display screen, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 3:00 P: 5:00
6	Harvest, Post-Harvest management and marketing of cotton T: 15:00 P: 45:00 (HH:MM)	1. Harvesting criteria-I	• Explain how a clean harvest of seed cotton can be achieved at the farm • Explain the Do's and Don'ts during crop harvesting/picking	AGR/N0206 PC1, PC2, PC9, PC14,PC15, KU1-KU3, KU6-KU10,GS1-GS8	Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, White board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 3:00 P: 4:00
		2. Harvesting criteria-II	• Explain the pickling schedule for different sowing time • Compare manual and mechanical harvesting of cotton		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, White board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant Images, audio-visual aid	T: 2:00 P: 5:00

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
		3. Post-Harvest storage of cotton-I	• Determine ideal storage conditions of harvested cotton • Demonstrate different cotton modules		Demonstration, field visit, practical	PHB, projector, display screen, pen, Different tools and equipment required for mountages and mounting process.	T: 1:00 P: 7:00
		4. Post-Harvest storage of cotton-II	• Describe cleaning process of cotton in the ginning factory		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 2:00 P: 5:00
		5. Post-Harvest storage of cotton-Practical	• Demonstrate different post harvesting process of cotton which includes Storage of cotton harvest, transportation from the farm, handling of cotton in ginning factory, pressing and baling.		Demonstration, field visit, practical	PHB, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images of process towards quality and safety of produce, audio-visual aid	T: 1:00 P: 6:00
		6. Market platform for cotton sale-I	• Demonstrate suitable market channels for cotton crop • Elaborate if any e-channel marketing advantages can be availed		Lecture, demonstration, discussion, field visits	PHB, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 1:00 P: 7:00
		7. Market platform for cotton sale-I	• Describe appropriate time and place for marketing of produce • Explain existing advisory services through ICT mode.		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 2:00 P: 6:00
		8. Recap	• Recapitulate complete module learning		Lecture, stage presentation, role plays, group presentations and discussion, field visits	PHB, projector, display screen, white board, duster, flip chart board/paper etc., Slides in power point presentation showing relevant images	T: 3:00 P: 5:00

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
7	Practices of collective farming and creating farmer groups T: 10:00 P: 20:00 (HH:MM)	1.Collectivization and aggregation to form group organizations-I	• Explain the concepts of holding meeting and group organizations • Describe the procedure for availing credit facility of the groups	AGR/N9922 PC1,PC2, PC5, PC6, PC9, PC10, PC13, PC16, PC18, PC21, KU1, KU2, KU5-KU10, KU12, KU14, GS1-GS7	Classroom lecture, activity, group discussion, practical	White board, PHB, laptop, projector, flip charts/paper, audio-visual aids	T: 3:00 P: 4:00
		2.Collectivization and aggregation to form group organizations-II	• Explain the benefits of various capacity building exercises like skill development and training programs.		Classroom lecture, activity, group discussion, practical	PHB, audio-visual aids, ppt slides with related images	T: 2:00 P: 6:00
		3.Collectivization and aggregation to form group organizations-II	• Determine the objectives of the group and the activities, operations of the group income generating enterprises.		Classroom lecture, Demonstration, activity, group discussion	White board, PHB, laptop, projector, flip charts/paper, audio-visual aids	T: 2:00 P: 5:00
		3. Recap	• Recapitulate complete module learning		Lecture, activities, role plays, group presentations and discussion, Activities	PHB, projector, display screen, white board, marker, duster, paper, pen PPT and relevant audio-visual aids	T: 3:00 P: 5:00
8	Hygiene and cleanliness T: 05:00 P: 05:00 (HH:MM)	1. Personal hygiene practices	• Describe the process for maintaining good hygienic practices at workplace. • Explain the follow the workplace sanitization norms including distancing from sick people	AGR/N9903 PC1,PC4, PC6, PC7, KU2, KU8, GS1-GS9	Classroom lecture, discussion, demonstration activity	Whiteboard, marker, pen, note pad, participant handbook, related power point presentation, etc.	T: 3:00 P: 2:00
		2. Cleanliness Around the Workplace	• Importance of workplace safety. • Explain the know abouts of PPE kit. • Explain cleaning, disinfection and pest control measures		Classroom lecture, discussion, demonstration, activity	Whiteboard, marker, pen, note pad, participant handbook, related power point presentation, etc.	T: 2:00 P: 3:00

S.No.	Module Name	Session Name	Session Objectives	NOS Refernce	Methodology	Training Tools / Aids	Duration
9	Safety and emergency procedures T: 10:00 P: 10:00 (HH:MM)	1. Health and safety at workplace	• Explain importance of safety precautions at farm site • Describe chemical application process and health safety measures	AGR/N9903 PC5, PC8-PC10, PC13-PC16, PC18-PC20, KU1, KU6-KU10, KU12-KU16, GS1GS9	Classroom lecture, activity, group discussion, practical	White board, PHB, laptop, projector, flip charts/paper, audio-visual aids	T: 3:00 P: 2:00
		2. Methods of safe use of pesticides	• Explain about practice of safety while working with pesticides		Classroom lecture, activity, group discussion, practical	PHB, audio-visual aids, ppt slides with related images	T: 2:00 P: 3:00
		3. Safety in use of Agricultural machinery	• Describe the safe use of machinery during harvesting and threshing		Classroom lecture, Demonstration, activity, group discussion	White board, PHB, laptop, projector, flip charts/paper, audio-visual aids	T: 3:00 P: 2:00
		3. Recap	• Recapitulate complete module learning		Lecture, activities, role plays, group presentations and discussion, Activities	PHB, projector, display screen, white board, marker, duster, paper, pen PPT and relevant audio-visual aids	T: 2:00 P: 3:00

S. No.	Module Name	Session Name	Session Objectives	NOS References	Methodology	Training Tools/Aids	Durations
10.	Employability Skills (30 hrs)	Introduction to Employability Skills	• Describe the importance of Employability Skills • Preparea note on different industries, trends, required skills	DGT/VSQ/ N0101	Team Activity: Interactive discussion	White-board and Markers Chart paper and sketch pens LCD Projector, Laptop for Presentation, audio visual aids, note pad, paper, pen, computers etc.	1 hr
		Constitutional Values: Citizenship	• Detail the principles of the constitution of India • Identify the various environmentally sustainable practices		Class room lecture, discussion, Demonstration, practical		1 hr
		Becoming a Professional in the 21st Century	• Discuss relevant 21stcentury skills required for employment • Practice critical thinking and decision making skills		Class room lecture, discussion, Demonstration, practical		1 hr
		Basic English Skills	• Read English text with appropriate articulation • Practice basic English words, sentences and punctuation		Team Activity: Role play, video session		2hrs

S. No.	Module Name	Session Name	Session Objectives	NOS References	Methodology	Training Tools/Aids	Durations
		Financial and Legal Literacy	• Discuss various financial institutions, products, and services • Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax	DGT/VSQ / N0101	Class room lecture, Group discussion, demonstration , activity		4 hrs
		Essential Digital Skills	• Detail the use and features of various MS Office tools, like MS Word, MS Excel, MS PowerPoint, etc. • Demonstrate how to operate digital devices • Create an e-mail id and follow e-mail etiquette to exchange e-mails Describe the role of digital technology in day-to-day life and the workplace	DGT/VSQ/ N0101 -			3 hrs

S. No.	Module Name	Session Name	Session Objectives	NOS References	Methodology	Training Tools/Aids	Durations
		Financial and Legal Literacy	• Discuss various financial institutions, products, and services • Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax	DGT/VSQ / N0101	Class room lecture, Group discussion, demonstration, activity		4 hrs
		Essential Digital Skills	• Detail the use and features of various MS Office tools, like MS Word, MS Excel, MS PowerPoint, etc. • Demonstrate how to operate digital devices • Create an e-mail id and follow e-mail etiquette to exchange e-mails Describe the role of digital technology in day-to-day life and the workplace	DGT/VSQ/ N0101			3 hrs

Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

(For Updated 'Assessment Criteria', please refer to Qualification Pack of this Job role available at https://www.nqr.gov.in/)

Assessment Criteria for ASCI- Cotton Cultivator	
Job Role	**Cotton Cultivator**
Qualification Pack	**AGR/Q0202**
Sector Skill Council	**Agriculture**

S.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.	Assessment will be conducted for all compulsory NOS, as well as the selected elective NOS/set of NOS.
4.	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5.	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria.
6.	To pass the Qualification Pack , every trainee should score a minimum of 50% of aggregate marks to successfully clear the assessment.
7.	In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

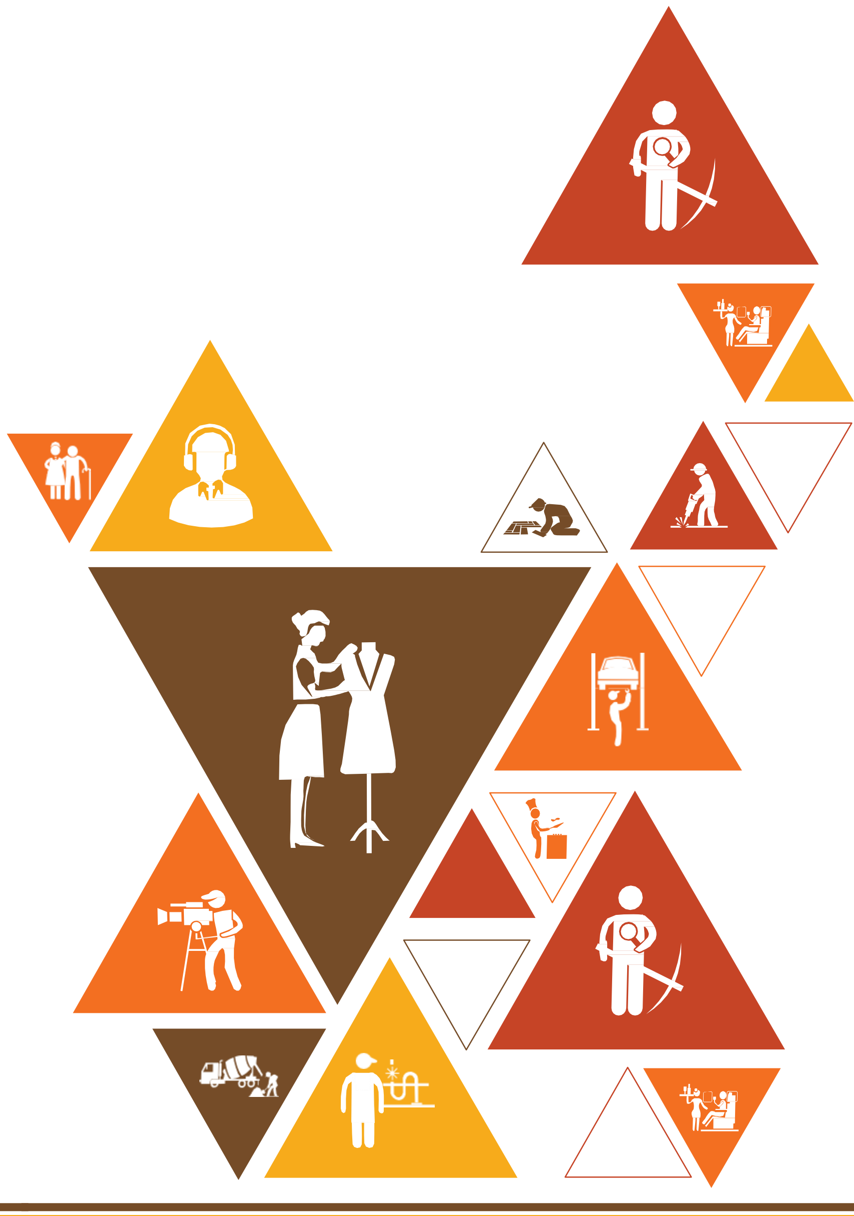
National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
AGR/N0204.Select and prepare the site and sow the cotton seeds	30	40	0	30	100	20
AGR/N0108.Carry out macro and micronutrient management of field crops	30	40	-	30	100	20
AGR/N0205.Perform weed and integrated pest and disease management for cotton crop	30	40	-	30	100	20
AGR/N0111.Perform irrigation management for field crops	30	40	-	30	100	10
AGR/N0206.Carry out harvesting, post-harvest management and marketing of cotton	30	40	-	30	100	15
AGR/N9922.Engage in collective farming/activity	30	40	-	30	100	5
AGR/N9903.Maintain health and safety at the workplace	40	25	-	35	100	5
DGT/VSQ/N0101.Employability Skills (30 Hours)	20	30	-	-	50	5
Total	**240**	**295**	**0**	**215**	**750**	**100**

Annexure-III

QR Codes – Video Links

Chapter No.	Unit No.	Topic	URL Link	QR Code
Chapter 1: Introduction	Unit 1.1 - Overview of Cotton	Cotton Cultivation started in India	https://youtu.be/4shG6_aq-Uo	Cotton Cultivation started in India
		Bt Cotton in India	https://youtu.be/9k8FbJ9yFgQ	Bt Cotton in India
Chapter 2: Cotton Seed Preparation and Site Selection	Unit 2.4 - Seed Production Procurement	Manual hybridiatio n of cotton flowers	https://youtu.be/YcZt9vki3aw	Manual hybridiation of cotton flowers
	Unit 2.5 - Land Leveling & Field Preparation	Land leveling through lase leveler	https://youtu.be/kRAwyr6oK7Q	Land leveling through lase leveler
	Unit 2.6 - Sowing and Planting Systems in Cotton	Sowing and planting system in cotton	https://youtu.be/m6uo7-77yi4	Cowing and planting system in cotton
Chapter 3: Macro and Micro Nutrient Management for Field Crops	Unit 3.1 -Soil Sampling & Analysis for Essential Nutrients	Collection of soil sample	https://youtu.be/3_U9Z3fy0Ig	Collection of soil sample

	Unit 3.5 - Integrated Nutrient Management (INM) in Cotton	Integrated nutrient manageme nt	https://youtu.be/o3Cmy7mCAZ4	Integrated nutrient management
		Plant growth regulators	https://youtu.be/9k5vrI5z5gY	Plant growth regulators
Chapter 4: Weed and Integrated Pest Management for Cotton Crop	Unit 4.2 - Methods of Weed Management	Weed control strategies in cotton	https://youtu.be/KDvCfcmGSKw	Weed control strategies in cotton
Chapter 8: Hygiene and Cleanliness	Unit 8.1 - Personal Hygiene Practices	Cotton harvesting	https://youtu.be/PyR12y7JZ0A	Cotton harvesting



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ASCI
Agriculture Skill Council of India

Address: 6th Floor ,GNG Buildin ,Plot No.10
Sector -44, Gurugram - 122004,Haryana, India
Email: info@asci-india.com
Web: www.asci-india.com
Phone: 0124-4288322, 4047488, 4046678
CIN No.: U93000HR2013NPL048073