



BEEKEEPING LEVEL-II

Learning Guide

Unit of Competence: - Assist Beekeeping Work

Module Title: -Assisting Beekeeping Work



Learning Guide -01

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LO 01: Prepare materials, tools and equipment for
beekeeping work

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This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Identifying required materials tools and equipment
- Reporting insufficient or faulty material, tools and equipment
- Correcting manual handling techniques when loading and unloading materials to minimize damage to self, others, load and vehicle
- Selecting and check Personal Protective Equipment (PPE)
- Providing work support according to Occupational Health and Safety (OHS) requirements and supervisor instructions.

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to** –

- Identify required materials tools and equipment according to supervisor instructions.
- Report insufficient or faulty material, tools and equipment to the supervisor
- Correct manual handle techniques when loading and unloading materials to minimize damage to self, others, load and vehicle
- Select and check Personal Protective Equipment (PPE)
- Provide work support according to Occupational Health and Safety (OHS) requirements and supervisor instructions.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” **in page -.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

**1.what is materials?**

The term 'materials' broadly describes everything we use to manufacture everyday objects from cars to bridges, toys to aero planes

Beeswax

- ✓ Beeswax is the substance used by bees to make their combs to store their honey.
- ✓ Beeswax is often the second most valuable product after honey.
- ✓ It is harder than other waxes such as paraffin wax and has a low melting point (64 degreescentigrade).
- ✓ Beeswax is not a plant product but a bee secretion

Where does it come from?

- ✓ The wax bee (a worker bee aged between 12-18 days) makes perfectly hexagonal wax cells and cappings in the hive to store new honey, pollen and brood.
- ✓ These honeycombs are made from beeswax secreted from wax glands on the underside of the abdomen of a worker bee. Wax can be seen as small flakes on the underside of bees.
- ✓ Bees are stimulated to produce wax when the queen needs space to lay more eggs when the colony is expanding during the buildup.
- ✓ Bees are stimulated to produce wax when there is surplus honey to be stored during the honey flow and a lack of honeycomb in which to store it.
- ✓ t Beekeeping using traditional hives or movable combs can result in high yield of beeswax.

Comb Foundation

Comb foundation is a thin sheet of beeswax stamped with a pattern of hexagons of a size equal to the base of natural brood cells. Providing beeswax foundation accelerates comb construction, thus making better honey harvests possible. It also leads the bees to construct comb whose cells are of a uniform size.

The overall dimensions of comb foundations available on the market are calculated to fit standard frame sizes: full-depth, three-quarter depth or half-depth. While foundation types vary, medium-brood plain foundation offers reasonably good performance under normal conditions.



Making comb foundation is a complicated task, requiring not only skill and experience but also a costly foundation mill, preferably of the type composed of two precision-engraved rollers, used by manufacturers. While a few large-scale beekeeping operators and cooperatives may be in a position to own such a mill, most beekeepers find it more convenient to buy their foundation ready-made.

1.2 What is a Tool?

Any physical item that is used to achieve a goal but is not consumed during the process can be defined as a tool. Tools are often also referred to as machine, apparatus, implements, instruments or utensils. The knowledge of obtaining, constructing and using tools is known as technology. Tools can perform a variety of functions such as cutting and chopping, moving, shaping, fastening, guiding, enacting chemical changes, fastening, information and data manipulation, etc. There can be specific tools designated for specific purposes whereas most tools can serve a combination of uses.

Pollen Trap. As its name implies, the pollen trap is used to scrape pollen pellets from the legs of foragers as they return to the hive. When a pollen trap is set at the hive entrance returning foragers have no way of entering the hive but to pass through the trap. As they do so, the pollen pellets attached to their hind legs are scraped off and fall into a receiving tray.



Figure 1: Pallone Collectors

Queen Excluder. The purpose of the queen excluder is to confine the queen to the brood box while allowing the workers to have access to the super, in order to ensure that the honey combs contain no brood. It is also used in producing royal jelly, in queen-rearing and in forming multi-queen colonies. The conventional excluder is designed to be inserted horizontally between the super and the brood box of a multi-storey hive, but vertical models also exist that can be placed between frames of brood and honeycomb in single-storey hives.

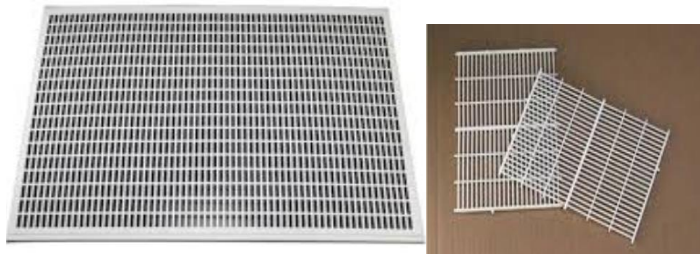


Figure 2: Queen Bee Excluder

Feeder. At certain times of the year the beekeeper may wish to feed his colonies with sugar syrup as a food supplement, or to medicate them using syrup as a carrier. Among various types of feeders existing, two simple models can be recommended: the **division-board feeder** and **the feeding pail or, jar.**

In the broad sense, the division-board feeder is a rectangular syrup container whose length is the same as that of a frame; it is designed to be placed within the hive in the same manner as a frame. To prevent the bees from drowning, chips of wood or Styrofoam are placed in the feeder as floats.

Alternatively, plastic or glass pails or jars holding from 2 to 4 litres of liquid can be used as feeders, provided that they have relatively large and tight-fitting lids in which small holes can be pierced. When in use, the pail containing the sugar syrup is turned upside down and placed on the frames, allowing the syrup to seep through the holes. An empty super is installed between the hive cover and the honey chamber, in order to close the hive.



Figure 3: Division-Board, Jar and Pail Bee Feeder

Hive Tool. Honeybees use propolis to seal frames and covers to hive bodies and supers. In order to separate these various pieces (e.g. to open the hive or remove a frame for inspection) the beekeeper prizes them apart with a hive tool, which is also useful in scraping excess propolis or wax from hive parts. It consists basically of a length of iron or steel, flattened at

one end. A good commercial hive tool may be made of spring steel, but the sawn-off end of a crowbar can furnish equally satisfactory leverage.



Figure 4: Bee chisels

Smoker. The bee smoker, used to calm bees, consists of two principal units: a metal fire-pot with a funnel-shaped cover, and a bellows. Some good models are equipped with a shield for protection against the heat generated. A smoke-releasing fuel (e.g. dried leaves, grasses, wood shavings, rice hulls, etc.) is burned in the fire-pot, and air is injected into the pot by operating the bellows; the smoke is then directed at the bees through the funnel.



Figure 5: Bee Smoker

Bee Brush. A soft camel-hair brush, used to brush the bees off combs and supers being manipulated, is considered one of the most necessary tools for harvesting frames of honey comb, particularly in small-scale beekeeping. In less sophisticated operations, a handful of grass or leaves may be used.



Figure 6: Bee Brush



Uncapping frock and Knife. Worker bees seal honey-storage cells with a thin layer of wax, known as capping, which must be removed from the combs as a first step in honey extraction. Although normal long-bladed kitchen knives can be used for this purpose, the operation can be carried out with greater ease if heated knives are used. The beekeeper may use two knives and plunge them alternately in hot (preferably boiling) water, or he may decide to obtain a specially designed electrically heated knife or steam knife.

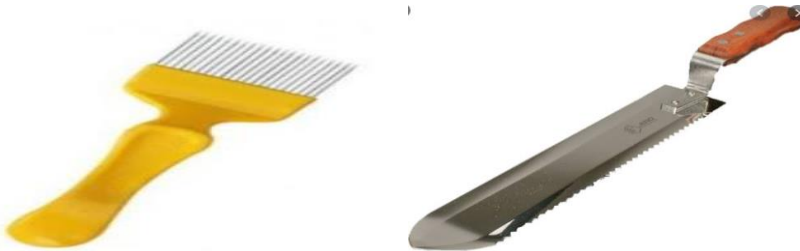


Figure 7: Honey Uncapping

Water Sprayer

Used to spray water on bees (especially at low land areas like Gamble) to reduce-

- Aggressiveness
- Immediate evacuation from their nest.



Figure 10: Water Hand Sprayer

1.3. What is Equipment?

The idea of equipment represents all sorts of machinery, functional devices or accessories which serve an individual, household or a community purpose. Usually, a set of tools that are designated for a specific task is known as equipment.

Bee hive

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- ❖ **Bottom board** - wooden stand on which the hive rests. Set bottom board on bricks or concrete blocks to keep it off the ground.
- ❖ **Frames and foundation** - wooden frames that hold sheets of beeswax foundation and are imprinted with the shapes of hexagonal cells. Bees use the foundation to build straight combs.
- ❖ **Hive body** or brood chamber - large wooden box (called a "super") that holds 10 frames of comb. This space (the brood nest) is reserved for the bees to rear brood and store honey for their own use. Either one or two hive bodies can be used for a brood nest. Two hive bodies are common in cold winter regions. Beekeepers in areas with mild winters successfully use only one hive body.
- ❖ **Queen excluder** - placed between the brood nest and the honey supers. This device keeps the queen in the brood nest, so brood will not occur in honey supers. An excluder is usually not necessary if two hive bodies are used.
- ❖ **Honey supers** - shallow supers with frames of comb in which bees store surplus honey. This surplus is the honey that is harvested.
- ❖ **Inner cover** - prevents bees from attaching comb to outer cover and provides insulating dead air space.
- ❖ **Outer cover** - provides weather protection.

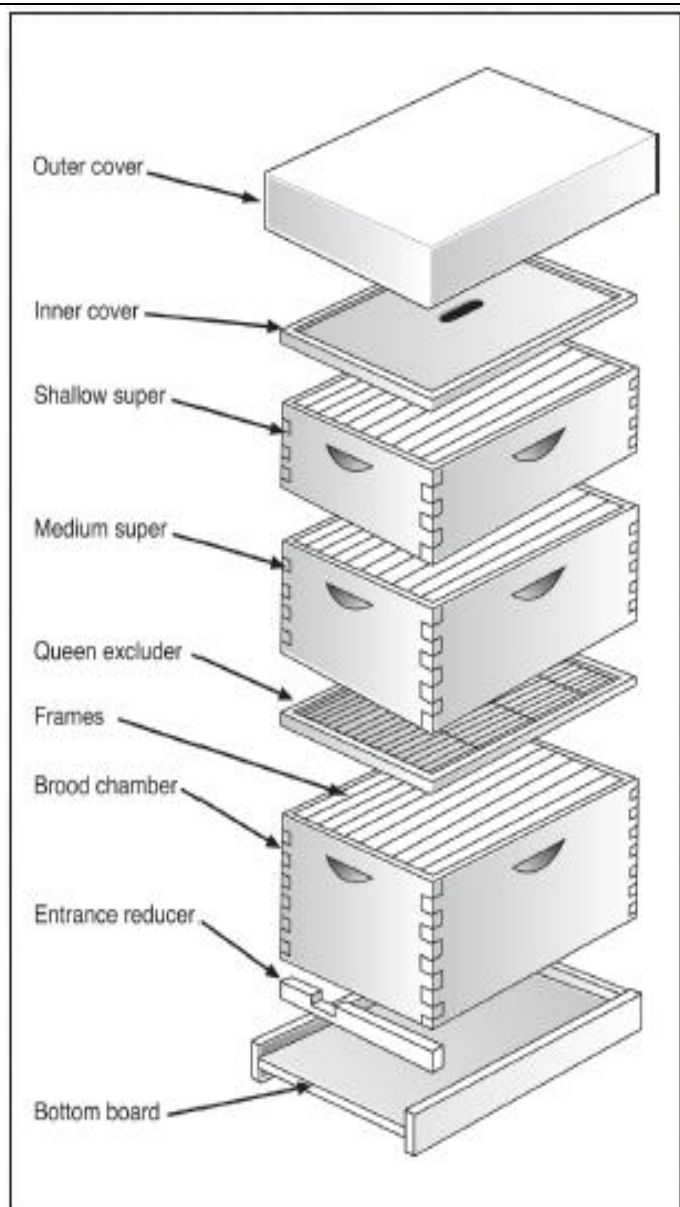


Figure 9: Bee hive Bodies

Comb foundation press/molding cast

A comb foundation press is made of sand and cement, cemented into a wooden frame (Figure 10). The upper and lower surfaces are imprinted deeply with a comb cell pattern. Melted wax is poured onto one side and the frame closed. The solidified sheet can be pulled off the cement base and has a raised pattern of cells on both sides. Comb foundation can also be made using iron rollers with an imprinted cell base pattern. Plain wax sheet is rolled between the rollers which print a cell base pattern on both the sides of the sheet

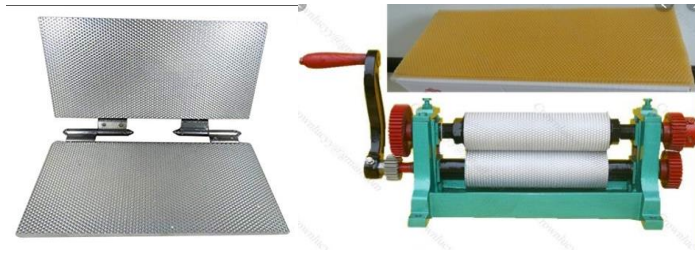


Figure 10:Moulding Casting

Honey Extractor. It has been estimated that in making 1 kg of wax for building comb, the bees consume 8 kg of honey. The honey extractor makes it possible for the beekeeper to save the comb for re-use by the bees and to increase his honey crop accordingly.

Basically, the honey extractor is a device that spins the combs so rapidly (up to 300 rpm) that the honey is flung out of them by centrifugal force. Different types and sizes are available, ranging from the motor-operated extractor accommodating hundreds of frames (see Fig.11) to the manually-operated two-frame extractor. Normally, the beekeeper working with several hundred hives will find a hand-operated extractor adequate for his needs (see Fig. 5/16); stainless steel models (see Fig. 5/12), although somewhat costlier than those built of other materials, seem to offer enough advantages in their operation to justify the higher price.



Figuer 11: Honey Extractor

Honey Strainer. After its extraction from the combs, honey is passed through a strainer to remove impurities. A large funnel lined with layers of cheese-cloth or fine wire mesh can serve the purpose in small apiaries, but larger operators may find it preferable to own a compact honey strainer, consisting of two or three "baskets" of different mesh sizes, fitted one within the other. Honey passes through the innermost, 12-mesh, basket and then through one or two others with finer meshes. Such strainers work well for most beekeeping operations.



Figure 12: Honey Strainer

Storage Container. Honey is a delicate, perishable product, and after it has been extracted and strained it must be properly stored. The beekeeper should be aware of some of its special properties: it can absorb moisture from the air, it reacts with metals, it changes colour if exposed to light over long periods, and its taste changes on heating, so that it must be neither heated nor stored in an excessively warm room.

If it is not bottled for sale immediately after extraction, honey should be stored in clean, non-corroding, tightly-sealed containers strong enough to withstand its weight (honey is about 1 1/2 times the weight of water). Glass-lined steel drums, off-white opaque heavy-duty polyethylene cans, and lacquer-coated or galvanized-iron cans are among the popular containers used.



Figure 13: Honey Container

Wax Melter. Beeswax is a valuable hive product, and it should be melted down with care. The equipment used in rendering it from cappings and broken combs, after all surplus honey has been extracted from them, includes solar wax melters, steam chests and presses. Since the first two of these can only recover from a third to half of the wax contained in the residue, a press is needed to obtain as much of the remaining wax as possible; steam-heated, underwater, screw-type or hydraulic presses are used for this purpose.



Figure 14: Wax Melter

Hand Held and digital Honey Refractometer

I. Hand Held Honey Refractometer

This refractometer will allow you to quickly and easily measure the moisture content of your honey.

We have finally found high quality analog refractometers that are affordable for every beekeeper. If you have begun selling or entering your honey in competition, a refractometer is a must. Make sure your honey is low moisture, so that you can feel confident about your honey! Includes refractometer, case, adjusting screwdriver, sample pipette, calibration fluid/stone and full instructions. No batteries needed

II. Digital honey refractometer

Made in the China and offers unbeatable accuracy, through its digital readout. The digital Honey Refractometer features a precision-machined stainless steel sample well with a cover that helps prevent further absorption of water. At the bottom of the sample well, a sapphire prism, the next hardest substance to diamond, provides a virtually uncatchable measurement surface.



Figure 15: Hand Held and Digital Honey Refractometers

Self-Check -1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List some materials used for beekeeping work?
2. What mean beekeeping materials?
3. What mean tools for beekeeping works?
4. List all tools that need for beekeeping works?
5. What is the important of pollen trap?
6. What mean equipment for beekeeping works?



7. List all equipment for beekeeping work?
8. Write uses of refractometer?
9. Write the main body of modern beehive?

Note: Satisfactory rating - 18 points

Unsatisfactory - below 18 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions

**Information Sheet 2****Reporting insufficient or faulty material, tools and equipment****Reporting and Monitoring**

The performance of bee keeping equipment needs to be carefully monitored in order to ensure that they are operating at the highest capacity. Consumption of spare parts, lubricants and fuel is monitored in detail for each piece of equipment. Equally, it is important to monitor the usage of the equipment, thus

- (i) providing management with information on the specific activities to which the equipment was assigned, and
- (ii) avoiding misuse.

Monitoring of fuel and oil consumption is also a good indicator for the mechanics in charge of servicing the equipment. Equally, the service intervals need to be noted down to ensure that they actually take place at the right time and on a regular basis. With a proper reporting system, it is also possible to calculate the operating costs for the equipment. Monitoring of equipment basically consists of carrying a separate logbook for each piece of equipment and the vehicles.

The logbook would contain two forms, one in which the work activities and fuel consumption is entered, and a second, keeping records of all repair and maintenance provided to the equipment. The daily movements of the equipment should always be recorded and signed by the operator. Repairs and service activities are logged and signed by the mechanic or whoever carried out this work.

Self-Check -2**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why do we need to report faulty materials, tools, and equipment?

Note: Satisfactory rating - 2 points

Unsatisfactory - below 2 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____



Short Answer Questions

Information Sheet 3	Correcting manual handling techniques when loading and unloading materials
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Manual handling' means any activity where a person is required to exert force to lift, lower, push, pull, carry or otherwise move, hold or restrain any animate or inanimate object. Employers should consult with employees and employee representatives when identifying, assessing and controlling risks in manual handling tasks. Consultation is required by occupational health and safety legislation in most parts of Australia.

- I. Employees carrying out manual handling tasks are likely to have ideas about safer or more efficient ways to do the job. Employees are also usually the first to notice difficulties, and may experience discomfort or pain during their work. To enable prompt assessment and risk control, employees should be encouraged to report these problems to management or employee representatives as early as possible. Workplace occupational health and safety committees, where they exist, may be an appropriate forum for staff to discuss solutions to such problems. By working together, it is possible for employees and employers to find successful 'in-house' solutions to many manual handling problems.
- II. Awareness of manual handling problems, and the willingness to minimize risk, should occur at all levels in organizations regardless of size. In small stores, decisions on work arrangements can be easily made in consultation with employees and employee representatives. In larger retail organizations, decision makers such as store planners, architects, facility designers, human resource planners, buyers, merchandisers, work method engineers, equipment and fitting purchasers, maintenance managers, delivery planners and training managers are often based at regional or head offices. Major decisions affecting outlets are often made at such central offices, and the opportunity for employees to contribute to decision making is minimal. In such situations, large organizations need to ensure that representative consultation occurs when addressing manual handling problems. Employers should ensure that decision makers receive information about the results of risk assessment in retail outlets. This feedback will help develop more effective solutions for reducing manual handling risks.
- III. Consultation should occur at the planning and design stage, and continue during the introduction of new work methods and the installation, trial-use and evaluation of new

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equipment and fixtures. This will ensure that new equipment and work practices are appropriate and acceptable, and that any risks associated with their use are minimized.

3.1. DESIGN

1. It is safer, more productive and less costly to reduce the risk of manual handling injuries at the design stage. Additional costs for modifications may be incurred if risk factors are not considered during the original design stage.
2. Guidelines and policies for the selection, design and installation of fixtures, equipment, work procedures and store layout should incorporate ergonomic design principles. For example, it should be ensured that staff can reach to the back of the top shelf for filling and facing up stock. This can be achieved by lowering the height of the top shelf, or by staff using appropriately designed stepping aids. Lowering shelf height has an additional advantage in that customers, who do not have access to stepping aids, can reach stock more easily. Based on this principle, many large supermarkets have reduced the height of their top shelves.
3. Ensure that workplace layout, work practices, equipment and fittings are designed and installed to be, as far as practicable, without risk to health and safety. The following principles of stocking store shelves are a good example of safe design in the workplace:
 - Weight of product. Lighter items should be placed on higher shelves. Heavier items should be placed on shelves between shoulder and mid-thigh height, ideally at waist height.
 - Type of container. To reduce the risk of breakage, avoid placing glass containers on the bottom or top shelves where possible.
 - Days of supply. Restrict the amount of any one product on display, dependent on sales.
 - Product display on top shelves. To enable easy reach, products on the top shelves should not be stacked on top of each other. To support a safer store environment for customers and staff, brand name promotion, which often influences shelf stocking, should take these principles into account.
4. Work organization, packaging systems and the characteristics of stock are important considerations in the design of manual handling tasks. For example, the way in which weight, size, shape and wrapping influences the manual handling of stock should be considered before purchase. The type of packaging system, for example, containers, pallets and skips, will also affect manual handling of delivered stock. Delivery schedules should take account of space and staff availability at the time of delivery.

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5. A period of trial use and evaluation should be allowed prior to the installation of new equipment and changes to workplace layout and work practices.
6. Careful assessment of staffing levels should be made during the design, trial-use and evaluation stages to ensure they are adequate.

3.2. Risk identification

I. Risk identification is the first stage in reducing the risk of manual handling injuries. Risk identification involves the identification of tasks likely to be of risk to health and safety. To identify

those tasks, employers should:

- keep and analyses records of injuries to identify the types of injuries, and where and when they have occurred;
- consult with employees and employee representatives about problems in specific tasks; and
- directly observe particular tasks and identify the risk factors involved in those tasks.

III. A recording aid for identifying risk factors in particular tasks is given in the 'Safe Manual Handling Checklist' on the following pages.

Self-Check -	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is manual handling materials, tools, and equipment?

Note: Satisfactory rating - 2 points

Unsatisfactory - below 2 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions



Information Sheet 4	Selecting and check Personal Protective Equipment (PPE)
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4.1 Personal Protective Equipment (PPE) issues from the accident studies

Use of a safety helmet, high visibility vest and safety boots was mandatory on all sites visited, with supplementary use of protective eyewear, gloves, harnesses and respiratory protective equipment (RPE) expected depending on task type. Adverse comments were made about PPE in a large number of the accident studies. Criticisms related to poor fit and comfort; inappropriateness for actual task requirements; poor quality, care or condition; problems with availability and excess cost. Comments concerning safety helmets focused on their frequent poor fit and comfort. Remarks were made about the lack of lining or padding, insecurity (due to lack of a chin strap), poor ventilation (especially in summer) and being too small. Interviewees reported that helmets were regularly dislodged or fell off, induced headaches and interfered with work on looking up. In two of the accidents the injured persons' helmet fell off when they bent down, both then struck their head on something when they stood up. Many interviewees accepted or were resigned to wearing a safety helmet, seeing them as a 'necessary evil' and in a number of the accidents' helmets helped to reduce the extent of the injury. However, it was also said that they are not always needed, with some frustration at the lack of flexibility over when helmets needed to be worn.

... With the hat you're more likely to hit your head, as you don't account for the extra height when walking underneath different structures ...

In many of the accidents where the hands were at risk, the injured person was not wearing protective gloves. There were also complaints about the comfort and fit of gloves, with operatives not wearing them as they interfered with ability to operate tools and the speed with which they could undertake their work. Operatives reported inadequate supplies of gloves (necessitating use of worn out protection), inadequate durability and lack of a suitable size range. There were also reports that gloves are frequently mislaid with constant taking off and putting on. In some cases, the gloves worn were not adequate to provide protection from the risk. Fall arrest harnesses were discussed in a small number of accident studies (only specified trades require use of this PPE), yet among those who were in a position to comment, there was a consensus of criticism about the equipment. These included complaints about comfort and fit (especially when used for longer than 30 minutes), concerns about restriction of mobility and inadequate supplies (leading to harness hoarding among site



operatives). Interviewees were also worried that the 2-metre lanyard length was inadequate and that they would experience physical injury from the harness itself should they experience a fall.

As with other PPE, it was acknowledged that harness use was necessary, but interviewees felt that they should be permitted greater discretion over when to wear fall arrest equipment. With regard to other PPE, protective eyewear was said to steam up and caused difficulties when performing certain tasks and under particular lighting conditions. There were problems with protective eye-wear for those needing to use 'prescription' glasses, although suitable prescription safety glasses are available. RPE users mentioned problems with fatigue and being impeded when undertaking certain operations. There were some complaints about high-visibility vests, concerning the obstruction they pose when trying to access tools from waist belts and a lack of fabric breathability, causing discomfort in hot weather. Many interviewees reported having to buy their own protective footwear and in one case another reported purchasing his own protective eyewear. Interviewees reported receiving little instruction as to the maintenance of their PPE, although when asked about this respondent thought that care was 'down to the individual', or instruction unnecessary as they had used it for a long time. Interviews with supervisor/managers indicated that PPE and its availability were viewed differently than by those in operative grades. These respondents were concerned about the lack of care given to PPE, with reports of finding new and expensive PPE treated badly, left lying around or improperly looked after. Ordering and choice of PPE was in a number of instances undertaken by 'Head Office' although in other cases supervisor/managers were involved. Only a few had tried ordering new styles, prompted by recommendation, observation of use by other construction teams, or through information provided in supply catalogues. One interviewee reported working with glove manufacturers to trial new products and another, in the case of a new short peaked hat, had tried it themselves to assess the product.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Veil: Always wear a veil, even if you are approaching a hive for simple, quick tasks.

Clothing: Wear clothing that covers all skin. Periodically inspect bee clothing for tears or openings.

Gloves: Wear gloves to protect your hands and wrists to avoid stings. Tight fitting gloves are best because they allow you to move nimbly within the hive and avoid crushing bees.

Footwear: Boots or work shoes are recommended when working with bees to protect your legs and ankles. Tuck coveralls or pants into footwear or close pant legs with strapping to keep crawling bees out.

Body Odor: Scents in perfumes, shampoos, soap residues, cologne, etc. can attract or irritate bees, which are highly sensitive to scents. Do not apply anything with a scent.



Self-Check -4

Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define PPE and give examples for beekeeping works?

Note: Satisfactory rating - 2 points

Unsatisfactory - below 2 points

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Short Answer Questions



Information Sheet 5	Providing work support according to Occupational Health and Safety (OHS)
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Occupational health and safety (OHS) relate to **health, safety,** and welfare issues in the workplace. OHS includes the laws, standards, and programs that are aimed at making the workplace better for workers, along with co-workers, family members, customers, and other stakeholders.

3.1 Health and Safety Policy

Your Company Name is committed to the goal of providing and maintaining a healthy and safe working environment, with a view to continuous improvement. This goal is only achievable by adherence to established objectives striving to exceed all obligations under applicable legislation, and by fostering an enthusiastic commitment to health, safety and the environment within Your Company Name personnel, contractors and visitors.

In particular:

- Management, working in cooperation with the Joint Health and Safety Committee, will strive to take all reasonable steps to reduce workplace hazards to as low as reasonably achievable.
- Supervisors and managers are held accountable for the health and safety of all employees under their supervision. This includes responsibility for applicable training and instruction, appropriate follow-up on reported health and safety concerns, and implementation of recommended corrective action. This accountability is integrated into the performance appraisal system.
- Supervisors, workers and visitors are expected to perform their duties and responsibilities in a safe and healthful manner, and are accountable for the Health and Safety of themselves and others.
- Your Company Name is committed to providing all necessary training and instruction to ensure that appropriate work practices are followed on the job, and to promote their use off the job.
- If necessary, Your Company Name will take disciplinary action where individuals fail to work in a healthy and safe manner, or do not comply with applicable legislation or corporate policies and procedures. Health, safety, the environment and loss control in the workplace are everyone's responsibility. Your Company Name expects that everyone will join in our efforts to provide a healthy and safe working environment on a continuous day to day basis. Only through the dedication and efforts of all individuals can Your Company Name succeed in providing a healthy safe working environment.

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3.2. Occupational Health and Safety in Workplaces Duties of Workers

3.2.1. Occupational Health and Safety and You

One of your most important responsibilities is to protect your Health and Safety as well as that of your co-workers. This booklet will discuss some of your duties under the occupational Health and Safety legislation and help you to make your workplace safer and healthier.

What the law requires

Workplaces under the jurisdiction are governed by your provincial legislation. The legislation places duties on owners, employers, workers, suppliers, the self-employed and contractors, to establish and maintain safe and healthy working conditions. The legislation is administered by your provincial legislation. Your officials are responsible for monitoring compliance.

Duties of Your Employer

Your employer is responsible for providing you with safe and healthy working conditions. This includes a duty to protect you from violence, discrimination and harassment. You must cooperate with your employer in making your workplace safe and healthy.

Your Responsibilities

You must also comply with the legislation. You have responsibilities to:

- protect your own Health and Safety and that of your co-workers;
- not initiate or participate in the harassment of another worker; and
- co-operate with your supervisor and anyone else with duties under the legislation.

Your Rights

The legislation gives you three rights:

- the right to know the hazards at work and how to control them;
- the right to participate in Occupational Health and Safety; and
- the right to refuse work which you **believe** to be unusually dangerous.

You may not be punished for using these rights. An employer can be required to legally justify any action taken against a worker who is active in Health and Safety.

Your Right to Know

The Act requires your employer to provide you with all the information you need to control the hazards you face at work. For example, chemicals at the workplace must be listed. You are entitled to review this list. Your employer must train you to safely handle the chemicals you will work with. If you are inexperienced, you must receive an orientation which includes;

- What to do in a fire or other emergency;

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- First aid facilities;
- Prohibited or restricted areas;
- Workplace hazards; and
- Any other information you should know.

You must also be supervised closely by a competent supervisor.

Your Right to Participate

You have the right to become involved in occupational Health and Safety. The legislation encourages employers and workers to work together to maintain a healthy and safe workplace. Employers at workplaces with (ten or more – consult your provincial act) workers must set up an occupational health committee of employer and worker representatives.

Committees Have Duties To:

- Regularly inspect the workplace;
- Conduct accident investigations;
- Deal with the Health and Safety concerns of employees;
- Investigate refusals to work;

Meet at least (four times a year – consult your provincial act); and return minutes of each meeting to the Division. Committee members are entitled to five days (consult your provincial legislation) of unpaid educational leave each year to take occupational Health and Safety courses. They may attend courses provided by the Division without loss of pay or benefits. Certain types of workplaces with less than (ten – consult your provincial act) employees must have a worker Health and Safety representative. The representative must be selected by the workers at the workplace. He or she has many of the responsibilities of an occupational health committee.

Your Right to Refuse

You have the right to refuse to do work which you believe is unusually dangerous.

The unusual danger may be to you or to anyone else. An unusual danger could include such things as:

- a danger which is not normal for your occupation or the job;
- a danger under which you would not normally carry out your job; and/or
- a situation for which you are not properly trained, equipped or experienced.

To exercise this right, use the following guidelines. Once you believe that the work you have been asked to do is unusually dangerous, you should inform your supervisor. Make sure that the supervisor understands that you are refusing to do the disputed job for health and safety reasons. Work with the supervisor to attempt to resolve the problem. If the problem cannot be resolved by the supervisor to your satisfaction, and no worker health and safety representative or occupational health

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committee exists at the workplace, your supervisor should phone the Division and ask for advice. You also have the right to contact the Division at any time. The supervisor has the right to assign you to other work (at no loss in pay or benefits) until the matter is resolved.

Do not leave the site without the permission of your employer.

If a committee exists at the workplace, contact your local representative and ask for help. Your supervisor should contact the co-chairpersons and ask them to investigate. They will try to resolve the matter. If they cannot resolve the matter to your satisfaction, they will convene for an emergency committee meeting. The committee will investigate and prepare a report on the refusal. You have the right to continue to refuse until:

- measures have been taken to satisfy you that the job is now safe to perform; or
- Your occupational health committee has investigated and ruled against your refusal.

If the committee rules against your refusal, you have the right to appeal the ruling to an occupational health officer. The officer will investigate and prepare a report on the disputed work. If you disagree with the decision of the officer, you may appeal to the director of the Division. An employer cannot assign another worker to do the disputed job unless the replacement worker is advised in writing:

- of the refusal and the reasons for it;
- of the reasons why the employer believes that their placement worker can do the disputed job safely;
- that the replacement worker also has the right to refuse; and
- of the steps to follow when exercising this right

Self-Check -5	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. what is OHS in the context of assisting bee work?

Note: Satisfactory rating - 2 points

Unsatisfactory - below 2 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions



Operation Sheet-1	Techniques of determining quality of bee honey
--------------------------	---

Determining honey moisture quality bee honey

1. Open the slide cover and
2. put a drop of honey sample and cover.
3. Hold against light, view from the eye
4. piece and adjust accordingly until you get a dark border line; where it marks is the percentage of the water content of that sample.
5. Then, clean the slide thereafter.

LAP Test	Practical Demonstration
-----------------	--------------------------------

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within

Task 1- Determining honey moisture quality of bee honey



List of Reference Materials

1948. Beekeeping for All

2008. A Practical Manual of BEEKEEPING

2011. Advanced Beekeeping Manual Ethiopian Beekeepers Association

2012. The National Bee Keeping

2018. Deliverable: Manual on Beehive Construction and Operation

2018. National Bee Unit Hive Cleaning and Sterilization



BEEKEEPING LEVEL-II

Learning Guide -02

Unit of Competence: - Assist Beekeeping Work

Module Title: -Assisting Beekeeping Work

LG Code: AGR BKGM2 06 0919 **LO 02-LG-02**

TTLM Code: AGR BKG2TTLM06 0919v1

LO 02: Undertake beekeeping work

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Information sheet	Learning Guide #02
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This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Following and clarification Instructions and directions
- Undertaking ***Beekeeping work*** in a safe and environmentally appropriate manner
- Carrying out Interactions with other staff, apiary site owners and customers a positive and professional manner.
- Reporting problems or difficulties in completing work to required standards

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to** –

- Follow and clarification Instructions and directions provided by supervisor when necessary.
- Undertake ***Beekeeping work*** in a safe and environmentally appropriate manner and according to enterprise guidelines
- Carrying out Interactions with other staff, apiary site owners and customers a positive and professional manner.
- Report problems or difficulties in completing work to required standards

Learning Instructions:

8. Read the specific objectives of this Learning Guide.
9. Follow the instructions described in number 3 to 20.
10. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
11. Accomplish the “Self-check 1” **in page -.**
12. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
13. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
14. Submit your accomplished Self-check. This will form part of your training portfolio.



Information Sheet-1

Following and clarification Instructions and directions

In addition to using specific hive best management practices (BMPs), successful beekeepers also adhere to four broad practices

1. Commit to Lifelong Learning

The first and most critical step in responsible beekeeping is a lifelong commitment to education. All beekeepers should have a solid understanding of honey bee biology and basic beekeeping methods. They also need to remain current on issues of colony health and management and stay informed of recommended changes in beekeeping practices. There are several ways to learn. These are essential for beginners, but still valuable, no matter how much experience you have.

Take a beekeeping course:

Many colleges, universities, and beekeeping associations offer introductory courses in beekeeping (often called a Bee Short Course). In many areas, master beekeeping programs are also available. These teach both basic and advanced skills.

Get a basic beekeeping book:

Several excellent books cover the basics of beekeeping. See the list provided in the Resources section of this chapter.

Join a beekeeping association or club:

Look for a club in your area that holds regular meetings where you can learn from expert speakers and club members. The Resources section at the end of this chapter includes links to directories of beekeeping groups.

Find a mentor:

Choose mentors carefully. Select someone in your area who has kept bees alive and healthy for years. There are multiple management systems and opinions on beekeeping practices, so it's often wise to learn from multiple people.

Attend field days:

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At field days or open-hive events, the bees will be your ultimate “teachers.”

Use the internet - carefully:

The internet offers a vast amount of information on bees and beekeeping. However, many sources are not always reliable nor accurate. Read all sources of information, including media reports, trade journals, science magazines, and scientific journal articles carefully and critically. Watch out for assertions that are not supported by evidence

b. Follow All Laws and Regulations

Beekeepers need to comply with all homeowner association, local, state, and federal ordinances, regulations, and laws about beekeeping. State laws and local regulations have the greatest impact on most beekeepers.

State laws

Almost all states have an apiary law that covers issues like inspection for honey bee diseases, registration, bee movement and entry regulations, permits and certificates, quarantines, and approved methods of treating diseased colonies. Some states have a fee associated with registration and inspection, though some beekeepers with a small number of backyard colonies are exempt.

A few states have special legislation for commercial beekeepers related to property taxation and right-to-farm or explicitly classifying beekeeping operations as livestock farming.

Local regulations

Some city, community, county, and state laws and regulations may ban beekeeping or have limits on beekeeping (setback distances, number of colonies, etc.). A few communities may explicitly permit beekeeping. Nearly all communities can regulate beekeeping via nuisance statutes. Check state and/or local bee association websites for information about apiary rules and regulations. See specific state-by-state listing of contacts on the Honey Bee Health Coalition website

Self-Check -1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the first and most critical step in responsible beekeeping?

Note: Satisfactory rating - 2 points

Unsatisfactory - below 2 points

Score = _____
Rating: _____



Answer Sheet

Name: _____

Date: _____

Short Answer Questions

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2.1. Bees wax Extraction

A. Traditional methods

The traditional methods of extracting honey and beeswax are unsuitable and unhygienic. The combs, including brood, unripe and capped honeycombs, are collected at night. They are all stacked on a wire mesh and a container is put underneath the pile of combs. Live embers are placed on the pile. The fire begins to consume the combs, and honey and wax trickle down into the container until all combs are completely consumed by the fire. The material collected is left untouched until the next morning. The beeswax which has hardened at the top of the honey is removed, and the honey is poured into bottles of about one kilogram.

The disadvantage here is that honey loses nutritional value and quality when exposed to high temperatures. In addition, the smoky fire employed is full of ashes, charcoal, dust and gravel which contaminate the honey. Such honey tastes bitter and smoky. The brood combs also add water to the honey, and such honey cannot be stored for long nor enter international markets.

B. The solar vex-melter

This is a simple device and can be made by local craftsmen. The melter is made of wood, lined with a galvanized metal plate and has a glass or clear plastic cover. The base is airtight. The melter can be painted black to absorb more heat.

On a sunny day, the wax extractor is capable of generating a temperature of 61°C, enough to melt down a bee comb so that both honey and beeswax flow into a container inside the box.

C. Hot bath method

In the absence of a wax-melter, the hot-water bath process now in use by some African beekeepers may be adopted. This is the quickest method of obtaining the wax, but it can only be employed after the combs have been crushed and the honey removed. -



Equipment:

- a cooking pot
- sackcloth or a sack (preferably jute)
- string or twine (2-3 metres)
- a stick or a discarded top-bar
- a large spoon or ladle
- a mould for the wax

2.2. Apiary site

An apiary is the location of beehives or bee colonies in hives. Apiary management is the set of routine

activities in an apiary depending on weather or seasonal changes and the initial objectives of set up.

It

is important for a beekeeper to know and use Good Agricultural Practices (GAPs) in his/her apiary for

maximum yields and quality products. The location of honey bee colonies (beehives) is called an apiary. Beehives are hollow containers that can be closed and are purposely made to house bees, and these include:

- a. Traditional hives with fixed combs e.g. log hives and woven hives.
- b. Top bar hives with movable combs e.g. Kenya Top Bar (KTB) hives.
- c. Modern frame hives with movable combs e.g. Langstroth.

Apiary siting

A good apiary management starts with choosing a good site to hang or place hives. If you choose a poor site people and animals may be stung. If the site is insecure honey and hives can be stolen. The following are recommended practices for a good apiary site: -

- ✓ The site must be easy to get to and from in order for you to check the hives regularly.
- ✓ An apiary can house up to 20 hives depending on the availability of flowering trees in the area as bees forage up to 3 km from the apiary.
- ✓ A high hedge or fence should be put around the apiary to separate the bees from people and animals, as bees can be aggressive.
- ✓ The apiary should be away from human and livestock dwelling areas, roads and public areas.
- ✓ It should be safe from strong direct sunshine, be shaded during the hot part of the day but have sun in the morning. Shade must be constructed if none is available at the site.
- ✓ It should be safe from strong direct wind and allow good air circulation.
- ✓ It must be near a fresh water supply; this can be a river, pond or even a dripping tap.
- ✓ It must be near food sources such as trees/nectar bearing crops, and cash crops that need pollination.

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- ✓ Putting hives in a bee house/shed, which can be locked to prevent thieves stealing the honey, is one option. But there must be holes in the wall to allow the bees to get enough fresh air in and out of their hives.
- ✓ It is better if the apiary is away from areas where children play or any source of continual noise. Noise can disturb the bees and make them defensive.
- ✓ The apiary should be on higher ground, away from marsh or land liable to possible flooding. Humid conditions encourage fungal growth and prevent honey maturing and bees from foraging.
- ✓ The apiary must not be close to areas where pesticides are used as they may kill the bees and
- ✓ contaminate the honey.
- ✓ The bees will also appreciate being away from smoke, fire and unfriendly neighbors.
- ✓ There should be good water not contaminated one.
- ✓ Should not be near the road.
- ✓ Should be near good plantation like coffee plantations.

Remember that once the bees enter the hives it will be more difficult to change things so choosing a good site to begin with is most important!

2.2 Hive Hanging

- ✓ Hang hives using strong greased galvanized wires to protect the bees from pests.
- ✓ Hang hives in or under well-shaded trees.
- ✓ Suspend hives from wires so that predators such as the honey badger cannot push them over.
- ✓ Remember always when hanging hives that it is important to allow for ease of harvesting.

Honey

quality is improved by careful harvesting which is easier when the hive is within easy and comfortable reach.

- ✓ Use trees or solid poles to hang the hive.
- ✓ The hives should be hung at waist height above the ground. This is important in modern beekeeping as the beekeeper wears a bee suit making climbing difficult. Traditional hives are usually hung in trees.

2.3. Hive Placing

- ✓ Place hives on sturdy stands especially hives, which are not strong enough to hang.
- ✓ Place hives to allow you to approach the hives from behind.
- ✓ Placing hives on stands makes them accessible and easy to harvest and manage.
- ✓ Remember the stand should be sturdy and high enough for the hive to be at waist height.

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- ✓ The legs of the stand must be placed in cans of used engine oil to prevent pests such as ants getting into the hive. Alternatively put bands of grease around the legs and spread ashes around the stand to discourage grass growth.
- ✓ The legs of the stand must be fitted with rat guards.


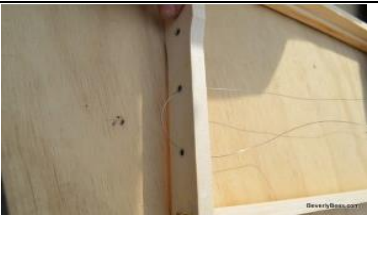


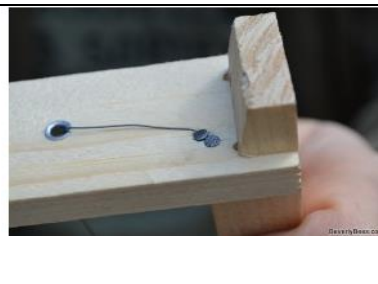


Alternatively, hives can be put under a shelter or in a bee house. This can be a simple hut with holes in the walls for bees to get in and out. A bee house is useful because it can be locked to prevent thieves



2.4. How to Wire aFrame?

Before you begin you need an assembled frame, frame wire, eyelets, an eyelet punch, a hammer, needle nose or lineman’s pliers and 5/8” frame nails.

Tools needed to wire a frame – A hammer, lineman’s pliers, frame wire, assembled frame, eyelets, eyelet punch and 5/8” frame nails.

<p>1. First, install the eyelets into the side bars of the frame using the eyelet punch. The eyelets prevent the wire from digging into the wood of the frame. Pick up the eyelets using the eyelet punch and install them into the holes on the sides bars. Push down until the eyelets fit snugly. Continue until all the holes on the side bars have eyelets installed. A deep frame has 8 eyelet holes.</p>	
<p>2. Next, partially hammer one 5/8” nail into the bottom bar of the frame, as seen in the picture below. The nail should be on one side of the groove. Do not hammer the nail in all the way. This nail will be used to hold the wire when wiring the frame</p>	
<p>3. On the same side of the frame, partially hammer another 5/8” nail into top bar adjacent to the 1 1/4” nail that is used to hold the frame together. Do not hammer this nail in all the way. This nail will also be used to loop the wire around when wiring the frame</p>	

<p>4. Now you are ready to wire your frame. Start wiring on the same side of the frame as the two 5/8" nails you just hammered. Thread the wire through the first eyelet starting at the bottom of the frame. Pull the wire across the frame and out the parallel eyelet on the other side of the frame</p>	
<p>5. Next, thread the wire up against the side of the frame and through the third eyelet. Pull the wire across the frame and out the eyelet on the same side of the frame you started the wiring process</p>	
<p>6. Continue this process until all eyelets have been threaded. For a deep frame you should have 4 wires going across your frame when you are finished</p>	
<p>7. Now that the wire is threaded through all eight eyelets, you need to secure it. Take the wire and tie a few loops around the nail near the top bar and hammer in the nail completely to secure the wire loop against the frame</p>	
<p>8. After the nail is hammered in, move the excess wire back and forth gently. It should break off at the nail leaving a clean break</p>	
<p>9. Now pull the wire to tighten it. Pull excess wire through the frame and out by the eyelet near the bottom nail.</p>	
<p>10. Once the wire is pulled tight through the frame you can cut the wire with the pliers</p>	
<p>11. Wrap wire loosely around the bottom nail to prevent the wire from coming out of the frame.</p>	

12. Now pull the wire very tight through the frame, pulling the all excess wire out the eyelet above the bottom nail	
13. Unloop the wire from the bottom nail and pull the wire tight	
14. Pull the wire as tight as you can and reloop the wire multiple times around the nail in the bottom of the frame.	
15. Use your pliers to turn the nail, twisting the wire around the nail. The wire will get tighter as the nail is turning	
16. When the wire is tight enough it should make a pinging sound when plucked.	
17. Once the wire is tight and makes noise when plucked, hammer in the nail on the bottom of the frame. Break off excess wire by moving it back and forth under the nail	

2.5. Foundation sheet

Foundation is a thin sheet of beeswax embossed with a honeycomb pattern and usually reinforced by wire. Foundation is used in the frames to encourage the bees to build or “draw” cells. It acts as a pattern for the bees to follow, allowing them to start building their combs faster and more efficiently.

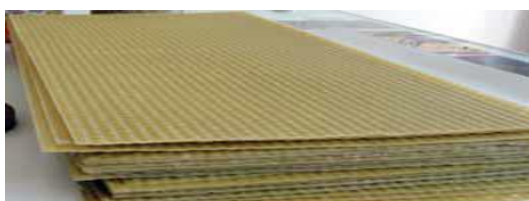


Figure 1: Foundation Sheet

a. Foundation types:

- **Duragilt:** Made with plastic inner core and coated on both sides with beeswax and metal edges to reinforce and strengthen.



- **Duracomb:** Made with plastic inner core and coated on both sides with beeswax. Support pins are needed to add strength.
- **Crimped wire:** Made with beeswax and eight vertical crimped steel wires to increase strength. Cross wires are recommended for deep frames.
- **Plasticell:** Made of plastic and may be purchased plain or coated with beeswax.
- **Medium brood:** Made with 100 percent pure beeswax. Cross wiring is needed.
- **Cut comb and thin surplus:** Made with 100 percent pure beeswax. Made for chunk honeycomb and comb honey cut from frame

2.6. Making foundation sheets:

Equipment Required

- **Double boiler** (e.g. a bowl floating in a pan of water) in which to melt the beeswax.
- **Mug or ladle** for pouring molten beeswax (DO NOT USE copper, brass, or iron - These discolour and harm wax) (A plastic mug or jug is inexpensive and does not cool the wax too much).
- **Board or metal sheet** of the size required as a template for finished sheets. (make this template slightly large to allow for shrinkage)
- **Knife or Pizza Cutter** to cut around the template.
- **Release agent** (e.g. rain water with a drop of liquid detergent two or three percent of alcohol and a spoonful of honey and/or a dash of lemon or lime juice may also be added if required).

Beeswax collected should be moulded in the following manner:

- ✓ Use a container with a rounded bottom and a mouth wider than the bottom with a very smooth inner surface. Many plastic containers are suitable.
- ✓ Place a small quantity of water (about a tablespoonful) in a cooking pot and put on the fire. Do not melt beeswax in a dry container. It should not be exposed to fire because it burns easily and can be damaged by too much heat. Melt beeswax and all bee combs outdoors.
- ✓ Add all the beeswax and watch carefully as wax melts down. Remove it from the fire immediately after the last lump of wax has melted.
- ✓ Pour melted beeswax into the mould and place in a cool, dry place to cool.

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- ✓ Remove the cakes of beeswax next morning.
- ✓ The dark material collected at the bottom can be removed with a knife and can be sold to a shoemaker. The clean raw beeswax is ready for the market.

2.7. Fixing non-embossed wax sheets in top-bar hives

The adoption of non-embossed wax sheets in the management of honey bee colonies in topbar hives could improve productivity.

Firstly, they will force bees to construct combs parallel to one another, suspended directly beneath each top-bar, facilitating their removal during inspection and harvest.

Secondly, they should improve honey and wax production. There are a number of ways by which wax sheets could be fitted on to top-bars. The method used will depend upon the type of wood working tools available. Some methods we have used are:

- A.** make a narrow, deep groove (lengthways) in the middle of the underside of the top-bar. Place the wax sheet into the groove and apply some molten wax to the line of attachment using a spoon. The wax sheet will be held in place when the molten wax has cooled;
- B.** make a saw cut along the center (lengthways) of the top-bar. This should cut through the entire length leaving about 5 cm uncut at both ends. Push the wax sheet through the opening in the top-bar from the underside and apply molten wax to help hold the wax sheet in place
- C.** make a cut through the middle (lengthways) of the top-bar from one end using an ordinary hand saw. This cut should go up to about two thirds of the length of the top-bar. Push the wax sheet into the saw cut and hold it in place with molten wax as above.

2.8. Transferring bee colonies

An established colony in nuclei box or in a traditional hive should be transferred to a standard movable frame hive or movable comb hive. This is because in these domiciles (dwelling place) the combs are crooked (run cross wise) or across-diagonally. As a result, they cannot be managed properly and they produce only small amount of surplus honey. Transferring bee colonies from fixed hives either wild or rustic (which is rough or unplanned) is an important method of obtaining bees in easy management situations. This is usually what transferring colony of honeybee's means.

Necessary preparations for Transferring bee colonies

To undertake Transferring bee colonies the following materials should be provided before hand

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- The hive to which the colony is going to be transferred with its full components
- Smoker- to smoke the bees out. To do this smoke the upside down because
- Knife to cut the honeycombs from the original hive.
- Bee brush to guide (draw) the bees to the new home
- Big dish (bowl) to collect the cut combs and others
- Water sprayer to hinder (cool down) the bees from flying up
- Straw mat/ plain iron sheet, or canvas to save the bees from falling on the ground or in the grass.
- Frame wire, sisal rope, or rubber band etc. to tie (attach) honey and brood combs to the frames top bars.
- The colony, which is going to be transferred, should be placed in its new site (place) at least three days in advance. This is very important to orient the bees to their new environment and foraging direction.
- The site (place where transferring will take place, and colony will be placed) should be cleaned
- The hive which will be used, as a new home for the colony has to be filled with wired and attached wax foundation frames/ or with wax smeared top bars.
- The smoker should be filled with fire and smoking materials at least 10 minutes in advance.
- The beekeeper must prepare his/her protective clothes dress them properly and also prepare the other necessary equipment.

Season (time) of transferring

The best time or season to transfer colonies of bees from one hive to the other is a period of honey flow. An ideal time is during honey bees plant bloom at the first week of active season (at the end of heavy rainy season or the end of dry season) in order that the bees could exploit the environmentally available flowering plants and build up their population.

2.9. Follow up after transferring

Once the colony is transferred to the new hive the beekeeper should:

- Under take external hive inspection always against the ant's attack
- Inspect the colony internally to check whether the colony started comb building
- Observe or examine for the egg laid by the queen
- Carry out the necessary hive manipulation for the building up of the colony fortnightly or once in a month.

2.10. Suppering and reducing

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Supering

This is the method of expanding a hive by adding boxes to the top. These boxes are called supers. As the colony grows, the beekeeper adds supers for honey storage. The queen will keep her brood nest in the region of the hive closest to the entrance at the bottom of the hive. That way, when the colony moves toward their honey stores in the winter, they are further away from cold air coming through the entrance. Thus, by supering, you are giving the bees space to store honey. Brood boxes stay in place on the bottom of the hive, and are most commonly 2 deep boxes. Medium boxes are commonly used for honey supers.

Making sure your bees have enough room to store honey is now a very important issue. If all has gone well, your young colonies will be large and still growing. If you initially purchased colonies of bees rather than nucleus colonies or packages, the same situation should apply. Your aim, therefore, is to ensure you have the maximum number of bees. You have undertaken most of the manipulations to maximize honey production (i.e. preventing swarming and keeping your colonies healthy) and, if good nectar sources exist, you should now give your bees sufficient room to store all this nectar. To begin with, you should add honey boxes to the hive – a process known as **supering up**.

Add a super when the nectar flow starts in your area and the bees begin to whiten the tops of the frames with new wax. Super frames should be complete with foundation so the bees can start drawing out the combs immediately. Add a second super to the top when the first is two-thirds full. Add new supers on top of supers already on the hive. Add the third super when the first is nearly full and the second is half full. Reverse the order of the first and second supers and add the third on top. If the third super is being drawn rapidly, put it next to the brood. Reversing supers keeps the bees working throughout the stack. If more supers are needed, follow the rotation suggested. Do not add supers too fast or add too many at one time. Remove each super as soon as it is completely capped. Add supers sparingly toward the close of nectar flow so there are fewer partially filled supers when the bees quit working.

When a super is completely capped over, move it to the top of the stack and place it on top of an inner cover that has a bee escape in the center hole. It takes about a day to clear the super of bees with this method. The next day the super can be removed from the hive. During the day in hot weather, do not leave on a super containing no bees. Without bees, the combs might melt.

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When opening hives and removing supers, be aware of the potential of bees to initiate robbing. To avoid robbing, do not keep hives open for extended periods of time. Always keep supers of honey covered, and do not expose combs, especially those not covered with bees

Reducing

Colonies start weakening starting from the time of honey harvest. This is because the honey they produced has been taken away at the same time the flowering season ends creating shortage of pollen and nectar. Such periods make the queen to down size its egg laying volume. As a result, the size of the colony reduces tremendously. Thus, the number of bees in the colony dwindle. Reducing the size of the beehive and feeding the colony are vital measures that should be taken at such

1.11. Harvesting honey bee products

I. honey harvesting

What do bees make honey from?

Honey is the primary product of the hive. Bees make honey from nectar which is a sugary secretion of flowers. Nectar contains 70-80% water. To make honey the bees add enzymes and reduce the water content of the nectar to that of honey (good honey contains less than 19% water). Bees transfer nectar from their stomachs to other bees that in turn pass it on to other bees. As it is transferred, the water content is reduced and the bees add enzymes from their honey sacks, which prevent fermentation of the nectar. The bees then place this into the cells of the honeycomb and continue to reduce the water content further by warming the honey to about 35 degrees centigrade (the temperature of human blood). The bees fan their wings to take any warm damp air out of the hive and to allow cooler dry air in. This evaporation process eventually reduces the water content to 19% and the bees then cap the honey. This process helps the honey to be kept for a long period in the hive.

Why do different honeys have different tastes and smells?

The different tastes, aromas and colours of honey are a result of the different flowers that the bees have collected nectar from. Colour is also affected by the age of the combs – old combs give darker honey than new combs. Honey mostly contains different kinds of natural fruit sugars (80-85%) that are easily and immediately absorbed by the body, are high in carbohydrates and give the body energy. The sugar in honey is not the same as refined granules (sucrose), which can have a negative

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effect on the health. Refined sugar is more difficult for the body to break down and can lead to diabetes in later life.

Honey also contains many vitamins and minerals from the pollen. Honey has medicinal properties and is used to help cure coughs, ulcers, wounds and sore throats. Generally, bees do a very good job of making honey and it is the beekeeper that tends to spoil the quality of the honey with poor harvesting, processing and marketing techniques. It is essential that the product being sold retains its properties, is of good quality and well presented.

How do we know when honey is ready to be harvested?

Honey is ready for harvest when the hive becomes heavy, smells of honey and bees may have become more aggressive and noisy than usual as they protect their stores. Look for ripe sealed honey with an even layer of sealing on the honeycomb. Regular inspections of the hives during the honey flow period will ensure that you harvest as soon as the honey is ready. Generally harvesting is related to the rains and harvesting should be done after the flowers have withered and fallen.

What should you consider when actually harvesting honey from the hive?

- ✓ The ideal harvesting time is in the cool of dusk, just before dark. Don't harvest during the day time unless apiary is located far away from public places.
- ✓ Do not crop honey during rainy weather as the honey draws moisture from the air and gets too watery.
- ✓ Use a bee suit and a smoker when harvesting, as usually the bees get upset!
- ✓ two people are better than one and 2 smokers are better than one. Don't harvest alone.
- ✓ Harvest combs that are at least 2/3 capped or sealed full of honey. Uncapped honey contains too much water and will start to ferment.
- ✓ Using a clean knife cut away the light-colored combs leaving about 2cms of comb for the bees to use to rebuild a new honeycomb.
- ✓ Leave the combs with brood, pollen and some honey for the bees to eat to enable future production of honey. In fixed comb hives only take away the combs at the sides of the hive.
- ✓ Always carry 2 clean and dry containers with airtight lids. The containers should be plastic or wood and NOT metal unless the metal contains stainless steel. Honey is corrosive and if put in a metallic container that is not coated, it will react with the metal. The metal dissolved in the honey may present a health hazard to the consumer. Place the honeycombs into a pot or bucket that can be closed to avoid robbing.
- ✓ Put combs with little or no capped honey into the other container. Keep this 2nd grade honey for

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local or home consumption, as it cannot be stored for a long period – eat it quickly!

- ✓ Make sure there is no dirt in the honey.
- ✓ Sometimes more money is paid for certain kinds or colours of honey than for a mixture so harvest this kind of honey separately. Separate the light and dark combs.
- ✓ Avoid propolis and too much pollen in honey if you are marketing your honey widely. These make the honey cloudy and many customers prefer clear honey.
- ✓ Honey presented for sale in the comb is seen to be pure and can fetch a good price. Select undamaged white sealed comb to sell as cut comb as dark combs do not taste so nice.

Self-Check -2	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. ----- is the primary product of the hive?
2. List at least five points that consider when harvesting honey?
3. Write three types wax extraction methods and write difference between each other.
4. What is apiary site?
5. Write in short and prices that to be consider during selecting apiary site?
6. Apiary site shall not be great than-----km?
7. Write materials that need to wiring a frame?
8. -----Made with 100 percent pure beeswax. Cross wiring is needed?
9. -----Made with beeswax and eight vertical crimped steel wires to increase strength. Cross wires are recommended for deep frames
10. ----- is a methods/work activity exchanging bee colonies from local hive to productive hive?
11. -----is an activity that done when colonies become weak or decrease in number?
12. ----- is an activity that done when colonies become strong or queen bees lay more eggs?

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

		Score = _____
		Rating: _____
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Name: _____

Date: _____

Short Answer Questions

Operation Sheet-1	Producing of wax mould
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Task 1. Extraction of beeswax

Procedure:

1. Put water (amount depending on the quantity of bee combs) into the cooking pot and heat over a fire.
2. Wash crushed bee combs to remove dirt and honey and place in the sack.
3. Make a good package by tightening the string around the sack.
4. By now the water should be quite warm. Put the package into the pot and use the stick to push it down to the bottom.
5. When it reaches a temperature of about 59°C, the wax begins to melt and a waxy scum begins to form on top of the water.
6. Use the stick to press the package. More wax will float to the top of the Water.
7. Use the ladle to skim off the melted wax and pour it into a mould. Continue this process until wax no longer rises to the surface.

Note: Do not subject beeswax to high temperatures. Prevent the water from boiling by reducing heat.

Operation Sheet-1	Producing foundation sheet
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Task-2. Making Foundation/printing wax

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Procedure:

1. Pour in approximately 500 ml of release agent to thoroughly wet both mould plates and the wooden surround.
 2. Close the mould to ensure even wetting. Then open a little and pour the release agent back into its storage pot.
 3. Before the release agent dries pour in the molten beeswax to cover base of mould. Close lid of mould quickly, but gently.
 4. Pour the excess wax back into wax pot.
 5. Leave the mould until the wax has cooled to a firm, but cheesy solid - (perhaps one to two minutes is suggested in the Steele & Brodie leaflet, but I find 30 seconds is enough.) There should be enough time to trim the previous sheet to size as in step (I).
 6. Open the mould. The solid sheet should stick to one side of the mould - usually the top.
 7. Trim the excess wax from the two sides and top (using a blunt knife). Use the bottom edge to pull the sheet away from the mould (start at one corner).
 8. Discard and re-melt the first few uneven sheets (caused by the mould warming up to the optimum operating temperature).
- NEVER use sharp tools or a wire brush to clean this mould. The mould plates are made from electro - formed copper. If they are marked or damaged in any way... All sheets cast will also be marked and damaged.
 - Allow the fresh sheet to cool for two to three minutes (for most of the shrinkage to take place). Place the foundation on a flat surface. Then using the template and knife (or pizza cutter), cut the sheet to the size required. Off cuts and unsatisfactory sheets can be returned to the molten wax reservoir (this helps to maintain the melt at just the melting point of the wax).
 - If the mould is really stuck shut, do not use excessive force, but allow to cool for 24 hours in a deep freeze.

LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within

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Task 1. Extraction of beeswax?

Task-2. Making Foundation/printing wax?

List of Reference Materials

1948. Beekeeping for All

2008. A Practical Manual of BEEKEEPING

2011. Advanced Beekeeping Manual Ethiopian Beekeepers Association

2012. The National Bee Keeping

2018. Deliverable: Manual on Beehive Construction and Operation

2018. National Bee Unit Hive Cleaning and Sterilization

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BEEKEEPING LEVEL-II

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Learning Guide -03

Unit of Competence: - Assist Beekeeping Work

Module Title: -Assisting Beekeeping Work

LG Code: AGR BKGM2 06 0919 **LO 03-LG-03**

TTLM Code: AGR BKG2TTLM06 0919v1

LO 03: Handle materials and equipment.

Information sheet	Learning Guide #03
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This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Handling Waste material produced during work
- Handling and transport Materials, tools and equipment according
- Maintaining Clean and safe work site

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

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- Handle Waste material produced during work according to supervisor instructions.
- Handle and transport Materials, tools and equipment according to supervisor instructions and enterprise guidelines.
- Maintain Clean and safe work site while working.

Learning Instructions:

- 1-Read the specific objectives of this Learning Guide.
- 2-Follow the instructions described
- 3-Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
- 4-Accomplish the “Self-check 1” **in page -.**
- 5-Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
- 6-If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
- 7-Submit your accomplished Self-check. This will form part of your training portfolio.

Information sheet- 1	Handling Waste material produced during work
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1. Proper handling and storage of machineries and equipment

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Materials, tools and equipment use is detailed and recorded in accordance with enterprise requirements. Standard Operating Procedures (SOPs), industry standards, production schedules, Material Safety Data Sheets (MSDSs), **work notes, product labels, manufacturers specifications, operator's manuals, enterprise policies and procedures (including waste disposal, recycling and re-use guidelines), Occupational Health and Safety procedures, supervisor's oral or written instructions, work and routine maintenance plans could be included in enterprise requirements.**

What may be involved in routine pre-operational checks of tools?

This may include routine safety and pre-start checks and preparatory procedures including cleaning, lubricating, and hand sharpening, priming pumps, clearing filters, tightening, basic repairs and adjustments. Materials, tools and equipment breakdowns, faults or malfunctions will need to be reported to supervisor for repair or replacement to achieve work plan requirements.

Records: Equipment procedures and maintenance guidelines should be kept in a central location for quick reference when needed. If missing, request complimentary copies from manufacturer or maintenance contractor.

Proper method of storing materials: Take care of your machinery and equipment, supplies by securing or storing them properly at the close of each business day. This is especially important since your ship. Keep your supplies in good condition, out of the way, and choose a moisture free environment. You will be responsible for a wide variety of materials, including ecclesiastical supply items that must be stored. Choose a moisture free environment:

3.2. Cleaning, securing and storing materials, tools and equipment

Materials, tools and equipment are **cleaned, secured and stored** to manufacturers' specifications and supervisors' instructions. Almost every home owner has their own lawn and garden equipment to maintain the work property. To help lawn and garden equipment to last longer it's important to store those items properly to insure that they will be in proper working condition for the next time that the owner wants to use them.

- A. **Choose a moisture free environment:** the area that you store your lawn and garden equipment should be free of moisture from rain and any type of precipitation because many pieces of lawn

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and garden equipment have electric motors that will not function correctly if they get wet and it also helps in order to avoid rusting of equipment's.

- B. Clean the equipment after every use:** before storing any piece of lawn or garden equipment it's important to clean that equipment thoroughly because it will be **easier to use for the next garden maintenance project.**
- C. Keep from children's reach:** depending on the piece of equipment it's important to store it out of a child's reach to insure that they won't want to play with and potentially get injured from that equipment.
- D. Cover if necessary:** many people don't have garages or storage sheds to store garden equipment. If this is the case with you make sure that you cover your equipment properly **to protect it from the elements like rain, snow, dirt and dust.**
- E. Keep your equipment within reach:** it doesn't matter if your home has a garage to store law and garden equipment or not. You must store your equipment in a way that makes it easy to reach when you need to use it.
- F. Take extra security measures if necessary:** If lawn and garden equipment has to be stored outside a home owner should take security precautions like investing in a lock and chain **to secure their equipment while they are away from their home.**
- G. Make sure gas tanks are secure:** Before storing a piece gas powered lawn and garden equipment it's important to insure that gas caps are securely screwed down onto gas tanks so gas won't leak out while it's stored for a long period of time.

3.3. Identifying and reporting malfunctions, faults, wear or damage to tools and equipment

Malfunctions, faults, wear or damage to materials, tools and equipment are identified and reported in line with enterprise requirements. Since factors vary among installation sites, equipment users must work closely with each of their suppliers to ensure that proper data is being collected, that the data is being provided to the correct supplier, and that the resulting solutions are feasible. All events (failures) that occur during inspections and tests should be reported through an established procedure that includes **collecting and recording corrective maintenance information.** The data included in these reports should be verified and then the data should be submitted on simple, easy-to-use forms that failures are tailored to the respective equipment or software.

Collecting the Data

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Many problems go unnoticed because insufficient information was provided. Example, someone was able to duplicate the problem being reported. There are **three common causes** for missing essential data:

- Inspection or testing began before a procedure will be in place to report problems.
- The reporting form will be difficult to use.
- The person who filled out the form will not be trained

Operators and maintenance personnel are usually the first to identify problems and, therefore, they should be trained to properly capture all of the information needed for an event report.

Self-Check –1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What activities done, to sustain live time of materials, tools and equipment?

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions



List of Reference Materials

1948. Beekeeping for All

2008. A Practical Manual of BEEKEEPING

2011. Advanced Beekeeping Manual Ethiopian Beekeepers Association

2012. The National Bee Keeping

2018. Deliverable: Manual on Beehive Construction and Operation

2018. National Bee Unit Hive Cleaning and Sterilization



BEEKEEPING LEVEL-II

Learning Guide -04

Unit of Competence: - Assist Beekeeping Work

Module Title: -Assisting Beekeeping Work

LG Code: AGR BKGM2 06 0919 **LO 04-LG-04**

TTLM Code: AGR BKG2TTLM06 0919v1

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LO 04: Clean up on completion of work

Information sheet	Learning Guide #04
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This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Returning to store or disposed Materials
- Maintaining and storing tools and cleaning equipment
- Reporting work outcomes to supervisor

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to** –

- Return to store or disposed Materials according to supervisor instructions.
- Maintain and storing tools and cleaning equipment according to manufacturer specifications and supervisor instructions.
- Report work outcomes to supervisor, noting feedback on performance and any required improvements for future action

Learning Instructions:

- 1- Read the specific objectives of this Learning Guide.
- 2- Follow the instructions described in number
- 3- Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
- 4- Accomplish the “Self-check 1” **in page -**.
- 5- Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
- 6- If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.

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- 7- Submit your accomplished Self-check. This will form part of your training portfolio.

Information sheet-1	Returning to store or disposed Materials
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1. Cleaning and maintaining workplace areas

1.1. Cleaning beekeeping equipment

Be aware that to clean and sterilize your hives and equipment properly can be hard physical work. You need to make sure that you have all the necessary tools and equipment ready for the task before you get started. You also need to have appropriate protective clothing, including eye protection, strong waterproof gloves, steel capped boots etc. If possible, arrange for someone to help you on the day. A good place to get support and practical help can be through your local beekeeping association. Note that not all treatments listed below are effective against foul brood spores, and please bear in mind that all are potentially hazardous to human health. When using chemicals, always read the precautions on the manufacturers' labels, and always and take suitable safety precautions. Take sensible precautions when working with fire Workplace areas are cleaned and maintained in line with Occupational Health and Safety and enterprise requirements.

Tools and equipment: Keeping and maintaining tools and other items of equipment are not only good for locating them for projects, but also helps to enhance the total image of the shop and enables the project to finish faster. Clean and repair all tools with problems Tools that are beyond repair should be removed from service and replaced with new ones so appropriately clean and store equipment's.

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When should you clean and sterilise your beekeeping equipment?

It is good practice to clean and sterilise beekeeping equipment:

- when you bring it in from the field for storage (e.g. at the end of the season) or reuse;
- when your colonies have experienced infection or infestation;
- before using/reusing spare or empty hives, **especially** any second hand items;
- when reusing any items which may have been associated with foul brood infection;
- whenever it is necessary to move items between colonies.
- Even apparently healthy colonies can harbour organisms that cause disease. The bacteria responsible for both EFB and AFB can exist in a colony's combs for long periods of time and remain capable of causing disease to develop. It is therefore important to maintain good standards of hygiene at all times, even when pests and pathogens are not obviously present in an apiary. Replace old brood combs with foundation for new drawn combs on a regular basis.
- Always clean hive tools between inspections.
- It is important to remember that it may not always be practical or safe to clean, disinfect and re-use beekeeping equipment once it has become contaminated, or is too old and/or damaged to withstand rigorous but necessary treatment.
- It is good practice to melt down or burn old combs and replace them with new frames of fresh foundation or new drawn combs, and to destroy other materials that cannot be properly cleaned.
- Methods for destruction are outlined in a separate section, below. Your local bee Inspector will help and advise you in respect of hives and colonies that have been infected with notifiable diseases AFB and EFB.

Work safely! Wear rubber gloves and eye protection when scrubbing with washing soda. Dispose of any waste responsibly. Beehive scrapings are great for lighting a wood burning stove

Wooden brood boxes and supers Scrape off beeswax and propolis. I use a carbide paint scraper. Save any clean wax. Burn any old wax/propolis mixture. It's ideal for lighting a fire. Scorch the timber all over with a blowlamp. Consider replacing the frame runners.

Smoker Remove any loose debris. Warm the inside with a blowlamp for 30 seconds, just enough to soften caked-on debris. Wearing work gloves, scrape the inside clean. Scrape inside the lid. Allow to cool. Make sure the lid opens and closes easily. Burn the scrapings.

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Hive tools:Scrub clean in washing soda solution. Many beekeepers store their hive tools in a plastic tub of washing soda solution, with a snap on lid.

Plastic feeders: Remove from the hive promptly, or they will go moldy. Clean in a dishwasher.

Wooden feeders: Ash forth/Miller/Brother Adam. Scrape off any dry sugar. Scrub clean with warm water. If in any doubt, check they don't leak before using again (Fill with cold water).

Bee suit: Wash your bee suit regularly. Seasonal bee inspectors wash their bee suits every day. Follow the maker's instructions. Bee suits can harbor stings. The alarm pheromones make the bees angry. zip up my Sherriff bee suit with the veil tucked inside, and wash at 60 °C maximum. Hang up to dry thoroughly before storing, or they may go mouldy. If your suit becomes mouldy, try soaking it in bio washing powder overnight, and washing in bio powder.

Gloves: Leather gloves are unwieldy to use, difficult to clean and they attract stings. Follow the maker's washing instructions. I wash gloves at 40 deg C maximum. Any hotter and they will probably shrink.

Honey extractor Remove: the cage and wipe clean. Rinse out the drum with warm water. Dry thoroughly and reassemble. Check cage spins freely. Never leave the extractor in the garden for the bees to clean. The bees will go crazy, and will start robbing.

Honey jars I wash 50 x 454g jars at a time in the dishwasher on a quick cycle. Allow to dry. I use a wooden crown board as a tray, holding 25 x 454g jars.

Honey jar lids: use gold plastic lids straight from the bag.

Timber framed wire queen excluders : use a Thorne's 10-slot wire excluder cleaner. Scrape the frame clean.

Zinc excluders: Scrape clean on a flat work bench. Do not use a blowlamp. The zinc may melt.

Glass quilts: Scrape wooden frame clean. Scrub glass clean with washing soda solution and rinse.

Correx varroa trays: Scrape off debris. Scrub clean with washing soda solution and rinse.

Crown boards: Scrape clean, scorch with blowlamp.

Mesh floors: Scrape woodwork clean. Do not blowlamp galvanize mesh. Zinc fumes are toxic. Scrub mesh clean with washing soda solution.

Metal and plastic frame ends: freeze 500g margarine boxes full of frame ends overnight, then empty them into a 15lb honey bucket or similar, kept for the purpose. Fit the lid and shake vigorously for 30 seconds. See before and after pictures.

Porter bee escapes: Working outdoors and wearing gloves,I clean two escapes at a time, holding back to back with pincers. Pour a kettle full of hot water into the spring mechanism. Be careful!

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Self-Check –1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List at least five major practice to sterilize beekeeping equipments

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

List of Reference Materials

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2018. National Bee Unit Hive Cleaning and Sterilization