A GUIDE TO
GOOD AGRICULTURAL PRACTICES
(GAP) FOR
APICULTURE
A Guide to Good Agricultural Practices (GAP) for Apiculture

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The good agricultural practices (GAP) manual for beekeeping presents a set of guidelines aimed at promoting best practices in apiculture. The principal aim is to minimize the risk of contamination of the bees, hives and honey by bacteria and other microbial pathogens, pests and chemicals during the primary production activities.

The compilation of these manual would not have been possible without the collective efforts of several people.

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Don McGlashan
Director General
Ministry of Agriculture & Fisheries
INTRODUCTION AND OBJECTIVES

Beekeeping is an activity that affects many aspects of our lives. It helps to bring together those interested in improved agricultural production, gardening, education and food. It is a diverse activity centered on the honeybee *Apis mellifera*.

If you are involved in beekeeping, then the sting needs to be considered. Hence the safety of the attendants, family and neighbours need to be taken into consideration. The well-being of the bees and safe handling of the products must at all times be monitored. Following a systematic approach to beekeeping will enable the beekeeper to identify and manage the risks involved. Using a flow chart design, food safety, personal health and safety, as well as environmental plus quality hazards, can be easily identified and managed.

*The flow chart layout is shown below-*:
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SCOPE

The information provided in this document is in no way prescribed but is recommended guidelines resulting in a collection of good agricultural practices. The information will be reviewed periodically, taking into consideration new developments and changes in technology.

FLOW CHART

Site Selection

- Select an area that provides a wide variety of flowering plants which support the foraging characteristics of bees. Flowering shrubs provide nectar and pollen for a continuous supply of food for maintenance of the colonies.

- The apiary site should be chosen preferably in the centre of the bee pasture (foraging area) to allow access to all flowers within a 3.5 to 4 kilometre radius.

- Do not select sites where the bees can gain access to hazardous chemicals or where volatile chemicals hazardous to bees are used or stored. These may result in high bee mortality and poor productivity of the colonies.

- Areas emanating high odours, whether pleasant or unpleasant must be avoided as honey in the
Hives may absorb these odours.

**Apiary Establishment**

- Protect beehives from excessive midday sun to prevent heat stress on the colonies. Hives may be partially protected by selecting a site under a high and wide canopy of trees not prone to breaking. Hive entrances must allow for the first rays of the morning sunlight, to allow bees a longer foraging period.

- Avoid placing the apiary in areas prone to flooding, land slippage or soil erosion.

- Do not place apiaries in areas that are exposed to rodents, termites, ants and toads. Beehives should be mounted 46cm (18in) from the ground to give adequate protection from toads. Nesting places of ants and termites must be immediately identified and destroyed.

- Avoid establishment of the apiary in proximity to heavy human traffic as bees may become a nuisance.

- Apiaries should be protected from animals with high odours such as horses, pigs and male goats, as the bees will attack these severely.
Apiaries must not be placed in residential communities and must be at least 100 metres from dwellings.

Ensure that there is ease of access for vehicular traffic into the apiary as this allows for easy loading and offloading of bee equipment and products.

An apiary can be established from any one or a combination of any or all of the following:

- **Complete colonies:** Hive consisting of 10 or more frames/combs of bees to include a queen bee.

- **Nucleus/Artificial swarm:** 4-5 frames/combs of bees with eggs and open brood which is encouraged to make its own queen bee or to which a queen is later added.

- **Packaged bees:** 0.5kg of worker bees with a mated queen bee.

- **Swarms:** Bees absconding or swarming from existing nests.

- **Feral colonies:** Bees collected in the wild.

It is recommended that bees from swarms and feral colonies be kept isolated for at least one year and...
the health status checked and verified before incorporating with healthy beehives.

**Obtaining Bees**
- Bees may be obtained from reputable or approved farms. It is best to request a physical inspection by the relevant apiculture extension officer to determine the pest status of the bees to be acquired.
- Start with queen-right colonies.

**Bee Housing**
- Bees must be kept in hives on movable combs. Fixed comb hives are illegal in Jamaica as they cannot be easily examined for pest-related problems nor can the combs be manipulated for increased production.
- The preferred hive is the langstroth beehive, as it provides for adequate/recommended bee space of 0.9cm or 0.35in.
- A standard beehive must be properly constructed with the bottom board and cover separately built.
- Each hive body to be used as a brood chamber is completed with 10 bee frames. The number of honey supers is dependent on the strength of the colony.
affordability and the beekeeper’s preference.

• The interior dimension of the hive body must be 47.3cm (18 15/16in) long x 37.94cm (14 15/16in) wide x 24.43cm (9 5/8in) deep or 16.51cm (6 1/2in) for shallow hive bodies.

• Bee hives must not be constructed from lumber that is treated with insecticides.

Registration of Apiaries

• New apiaries must be registered with the Ministry of Agriculture and Fisheries within 30 days of establishment with subsequent re-registration by January 31 of each year.

Transportation of Bees

• Permission to transport bees must be first had and obtained in writing from the Chief Plant Protection Officer – Apiculture Unit.

• Regular hive covers must be removed and replaced with meshed covers to allow for ventilation.

• Hive entrances should be blocked, preferably with a strip of mesh, and securely fastened.
Honeybees should be transported in sealed hive boxes stacked on pallets.

All hive parts (hive bodies, covers and bottom boards) should be securely fastened to prevent separation and escape of bees while in transit.

All honey should be removed from the supers to prevent breakage of combs, spilling of honey and to reduce heat stress.

The hives must be covered with a mesh screen to prevent any escaping bees leaving the vehicle.

It is best to transport bees during the cooler time of day (before sunup and after sundown).

**Apiary Management**

Adequate protective gears must be worn at all times when tending bees. These include ankle/calf boots, thick socks, long-sleeved shirt or overalls, and bee veil.

All beekeepers must be equipped with a bee smoker capable of producing puffs of thick mild smoke used for manipulating the bees.

A hive tool is critical and must be kept on hand for prying the hive.
parts apart when so desired.

- Beehives should be mounted on stands to deter predators and reduce strain on the back of the beekeeper as the supers are sometimes quite heavy.

- Overgrowth of shrubs concealing hive entrances must be cleared and all objects removed from the apiary floor to allow for easy access throughout.

- Apiaries should be free of discarded honeycombs. These will invite pests such as ants, wax moths and small hive beetles.

- All reusable materials/equipment must be promptly cleaned and stored. All unusable material/equipment must be burnt as these may invite pests.

- Restrict honeybee access to areas of toxic substances such as fields where chemicals were recently applied. This can be achieved by blocking all hive entrances with damp newspaper for 24 hours.

- Seek information on pesticide applications for mosquitoes, field pests, and others, then protect bees (as indicated above) during spraying to avoid poisoning.

- Encourage the use of bee-friendly chemicals, that is those not toxic
Follow the guidelines for the application of pesticides in beehives and use only those recommended for use locally.

Always keep records of activities and any observations worth recording.

Records on each beehive must be carefully maintained and preserved.

Select and maintain bees of good genetic quality, especially for hygienic and productive characteristics.

Clean water is used by the bees for diluting food substances and to regulate hive temperature. Therefore, the beekeepers must ensure that all bees have access to water. This may be achieved by placing a water trough on the outskirts of the apiary with floating sticks to allow for perching and prevent drowning of bees.

**Hive Management**

All beehives should be inspected fortnightly to observe colony strength, prolificacy of the queen bee, food supply, pest and disease status.

Always keep records of activities and any observations worth recording.
• Bottom boards should be checked periodically for the accumulation of fallen debris, which must be removed as these will encourage wax moth infestation.

• All overused combs (very dark black) must be replaced with new combs or comb foundation. Bee cells get smaller with each generation of bees and the queen bee will refuse to deposit eggs in blackened cells.

• Combs filled with honey should be removed from the brood chamber to the honey super and be replaced with comb foundation. This allows for more work by the bees to build new combs and is a means of preventing swarming.

• The brood nest is the centre of the brood chamber and begins at the third comb from either side. Every effort must be made to avoid frequent disruption of the brood nest as this will upset the harmony of the colony and set back colony activities for several hours.

• A double brood chamber ensures more space for rearing of brood which results in higher bee population. A strong colony is easier to manage and gathers
more food in a shorter time.

- Multiple entrances should be avoided in the beehive. One entrance only must be allowed for easy manipulation.

- Reduce hive entrances of weakened colonies to prevent robbing.

- All unoccupied combs in weakened colonies must be removed and replaced with sealed brood. Weak colonies may also be united with strong ones.

- Queen bees should be replaced every two years to allow for younger and more vibrant queens that are able to lay at a more rapid rate.

- Queen excluder should be placed on top of the brood chamber to confine the queen bee to the brood chamber and the honey supers placed upon the queen excluder.

- Ensure that there are no more than two unoccupied combs in the uppermost chamber before adding supers.

- Nine frames in the honey supers, evenly spaced, produce bulkier combs which are easier to uncap and extract.
Pest and Disease Management

- The beekeeper and his attendants must be able to identify pests/disease symptoms in the apiary/beehive.

- On observation of any unusual or unrecognisable symptoms, the Apiculture Unit of the Ministry of Agriculture and Fisheries must be contacted.

- Beekeepers/attendants must be trained in pesticide application in the beehive.

- Apply Integrated Pest Management (IPM) system to your operations; contact your extension officer.

- Pesticide application records must be kept stating date of application, type, brand, method of application and pre-harvest interval. These will be useful for future reference.

- Identify the type of pest present, immediate and potential damage; contact the relevant apiculture extension officer in cases of uncertainty.

- All American Foulbrood diseased hives must be promptly destroyed by fire after consultation with the extension personnel.
Apiary/Hive Sanitation

- The apiary must be free from debris, brush and vines. Grass must be kept low.

- All tools/equipment must be cleaned and kept in working condition; beekeeping equipment must be kept sterile.

- Apiary/beehives and extraction facilities must be kept free of rodents, roaches, flies etc.

- All combs not protected by bees in the hive must be removed and placed in stronger colonies as unoccupied combs will attract wax moth.

Pre-harvesting

- Honey for extraction should not be removed from the brood chambers. A supply of honey must be left in the chambers to maintain the colony.

- Only ripened honey should be removed from the honey supers. This is manifested in combs that are completely capped or more than 2/3 capped.

- Ripe combs may be removed by application of bee repellent to honey supers, the use of bee escapes or by simply removing the frames and brushing bees off with a bee brush.
Empty hive bodies with covers must be on hand to place the honeycombs being removed for extraction.

**Harvesting Extraction of Honey**

- Extraction facility must be properly ventilated and bee tight.
- Remove honeycomb cell cappings with the use of a honey uncapping knife or a honey scratcher.
- The frames are methodically placed in honey extractors and honey removed by centrifugal force.
- Combs which are unattached to frames are left to drain over a mesh cloth or the honey is removed using a honey press.
- The extraction facility and equipment must be kept in sterile condition at all times.

**Post-harvesting**

- Filtering of honey must only be done if desired by the market.
- Honey must be strained to remove excessive extraneous materials.
- Strainers must be of food-grade material.
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- Allow honey to settle for 14 days to remove minute impurities that escaped while straining.

- Do not expose honey to humid conditions, open liquid or high odour. Honey is hygroscopic and will absorb moisture from the air.

- Excessive heating of honey accelerates a number of natural processes and should be avoided.

Storage
- Storage containers/tanks should be of food-grade material, stainless steel quality is preferred as they are more easily cleaned.

- A gate valve/honey gate is fixed to the lower end of the containers to allow honey to be removed without disturbing sediments at the top.

- Honey should be stored in air-tight containers away from substances likely to cause tainting.

- Honey should be stored at room temperature.

Waste Disposal
- Facilities should be provided for waste disposal and storage.

- Covered receptacles should be
used for holding beekeeping waste until final disposal.

- Honey or honey products unfit for human consumption should be kept in covered containers with a label until disposed of appropriately.
- Waste-disposal areas should be properly identified and designed for easy access.
- Waste-disposal areas should not be a harbourage for pests/rodents/diseases or aid in contamination/pollution of premises or water.

**Employee Welfare and Safety**
- Employees should be informed about the terms and conditions of employment.
- Salaries paid should be reasonable (not exploitive).
- Persons known to be allergic to bee stings should not work in or take up beekeeping.
- Employees should be properly trained in personal hygiene and sanitation.
- Sanitation/personal hygiene policies should be documented and accessible by all employees.
- Beekeepers/attendants who are ill
or suffering from a communicable disease should not be allowed to work in honey-handling areas.

- Children must not be employed.

Personal Hygiene
- Beekeepers/attendants should practise good hygiene since strong odours (good/bad) irritate bees.
- Protective clothing should be clean when working in the apiary.
- Ideally, the beekeeper should possess a food-handler’s permit for extracting honey.
- Jewellery should not be worn during the processing of honey.
- Beekeepers/attendants known to be suffering from any illnesses/broken skin should not work in honey-handling facilities.
- Dark/colourful clothing should not be worn when working in the apiary.

First Aid
- A first-aid kit containing antihistamine and topical anti-itch medication should be readily available to the beekeeper/attendant.
Record Keeping/Traceability

- Up-to-date records must be kept of all activities in the apiary.

- Conditions and activities affecting each hive should be documented and kept for reference.

- All pest and disease infestation observed should be documented.

- All pesticides/medications administered should be documented to indicate date, type, methods of application and reason for treating.

- Honey should be labelled stating place of origin. This helps since honey picks up flavour from flowers and nectar in local environment.

- Harvesting dates should be documented.
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References

- Agri Facts Practical Information for Alberta’s Agriculture Industry, Alberta Agriculture Food and Rural Development.

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Glossary

**Agriculture extension officer**: an officer of the Ministry of Agriculture & Fisheries’ Rural Agricultural Development Authority and Veterinary Services Division assigned to a region and who provides advice and support to farmers. This includes sharing information on agricultural best practices as well as collecting data on animal husbandry, acreage, crop production and farmer registration. Referred to as “the farmers’ doctor”.

**American foul brood (AFB)**: Contagious disease of bee larvae caused by spore-forming bacterium Paenibacillus larvae (formerly Bacillus larvae).

**Antihistamine**: drug used to counteract the effects of histamine, a compound released in response to an allergy. Bee stings may cause an allergic reaction in some people.

**Apiary**: group of bee colonies kept in one location (bee yard).

**Apiculture**: the science and art of studying and using honey bees for man’s benefit.

**Apis**: the genus to which the honey bee belongs.

**Apis mellifera**: scientific name of the Western honey bee.

**Artificial swarm**: The artificial swarm is a technique employed by the beekeeper to stop the loss of bees (and honey crop) due to the bees swarming.

**Bee frames**: man-made beehives. A hanging rack in the beehive containing honey combs.

**Beehive, hive**: domicile prepared for colony of honey bees.

**Bee smoker**: Apparatus used to produce smoke for application to bees to break communication.

**Bee space**: a space (1/4- to 5/16-inch) big enough to permit free passage for a bee but too small to encourage comb building. Leaving bee space between parallel beeswax combs and between the outer comb and the hive walls is the basic principle of hive construction.

**Beeswax**: A secretion of wax glands/wax plates of the honeybee abdomen; molded by bees to form honeycomb.

**Bottom board**: floor of beehive.

**Brood**: immature or developing stages of bees; includes eggs, larvae.
Brood chamber: the area of the hive where the brood is reared; usually the lowermost hive.

Brood nest: area of hive where bees are densely clustered and brood is reared.

Cappings: beeswax covering cells with honey which are removed before extracting/COVERS OF BROOD CELLS.

Cell: hexagonal (six-sided) compartment made of beeswax which, when amassed, forms the comb. Cell size is determined by its intended use such as broods, storing honey or pollen.

Centrifugal force: force used to push or move something away from the centre (original object, much like water being extracted from clothes in a washing machine, or mud spinning off a tire). Used to extract honey.

Colony: social community of several thousand worker bees, usually containing one queen, with or without drones. (See social insects).

Comb: (See honeycomb).

Comb foundation: thin sheet of beeswax impressed by mill to form bases of cells; some foundation also is made of plastic and metal.

Extractor: machine that rotates honeycombs at sufficient speed to remove honey from them (see centrifugal force).

Feral colonies: colonies of bees not a part of a farm. Probably escaped from a hive and established in the wild. These feral colonies of bees can be used to gauge the health of bees and the evolution of resistance to diseases.

Foundation: (See Comb foundation).

Gate valve: a valve that employs a sliding gate to open or close the passage in it usually restricting the flow of fluid (also honey gate).

Hive beetle: a small brown-black beetle infecting beehives and which can cause severe damage to the comb, stored honey and pollen.

Hive body: (see hive boxes).

Hive boxes: also called hive bodies. When used to hold broods, they are referred to as brood chambers. Forms the casing of the beehive and
houses the frames, combs, and bees of all stages. Usually rectangular in shape, hollow, with neither cover nor bottom.

**Hive tool:** used for dismantling beehives or removing frames from beehives. It has a scraping edge and a nail-removal feature.

**Honey gate:** a gate valve made particularly for drawing off honey, molasses, or other thick liquids from barrels, extractors, etc. (see also gate valve).

**Hives:** (see beehive).

**Honey:** sweet, viscous fluid elaborated by bees from nectar obtained from the nectary of flowers or ovary plants or substance deposited by plant sucking insects.

**Honeybee:** genus *Apis*, family *Apidae*, order *Hymenoptera*, an insect that collects pollen and nectar from flowers to make honey and wax.

**Honeycomb, comb:** comb built by honeybees with hexagonal back-to-back cells on median midrib.

**Honey extractor:** (See Extractor).

**Honey super, super:** part of a beehive used to collect honey; consists of a wooden box in which frames are hung. Contains the foundation (drawn comb) in the honey is to be made. Referred to as hive boxes when intended to be used as the brood chamber.

**Hygroscopic:** absorbing moisture from the air.

**Integrated Pest Management (IPM):** is a pest-control strategy that uses a variety of complementary strategies, including: mechanical devices, physical devices, genetic, biological, cultural management, and chemical management. These methods are done in three stages: prevention, observation, and intervention. It is an ecological approach with a main goal of significantly reducing or eliminating the use of pesticides while at the same time managing pest populations at an acceptable level.

**Langstroth:** a religious minister from Pennsylvania who first discovered the bee space and patented the first hive incorporating bee space thus providing for removable frames. The modern hive frequently is termed the Langstroth hive and is a simplified version of similar dimensions as patented by Langstroth.

**Langstroth frame:** the standard bee frame used in beekeeping. The frame is 23.5cm x 48.0cm.
Nectar: a sugar-rich secretion of living flowers intended to attract pollinating animals. Pollination increases as the flower is visited.

Nucleus (Nuke, Nuc): a small colony of bees resulting from a colony division. Also, a queen-mating hive used by queen breeders.

Packaged bees: a quantity of bees (2-5lb) with or without a queen shipped in a wire and wood cage to start or boost colonies.

Pollen: male reproductive cells of flowers collected and used by bees as food for rearing their young. It is the protein part of the diet. Frequently called bee bread when stored in cells in the colony.

Prolificacy: fertile, production of many offspring.

Queen, queen bee: sexually developed female bee. Usually the mother of all bees in the hive.

Queen excluder: device usually made of wood and wire, with opening 0.163in, which allows worker bees to pass through but restricts (excludes) queens and drones. Used to confine the queen to certain parts of the hive.

Queenright: a colony of bees with a properly functioning queen.

Robbing: bees from one beehive will steal honey from other hives – a common problem when nectar is not available in the field.

Sting or stinger: a sharp organ of defence found at the rear of the worker and queen bee. Because it is barbed in the worker, the sting will remain in the flesh of a relatively large target, resulting in the bee’s death.

Super: see honey super.

Swarm: a group of bees, including a queen and worker bees, which leaves the hive to form a new colony.

Capping knife, Uncapping knife: knife used to remove the caps on honey cells to allow extraction of the honey.

Wax moth: lepidopterous (four-winged) insect whose larvae feed on the hive wax and other debris; they work at night and if allowed to get out of hand, they destroy the brood comb in a very short time.

Worker bee: sexually undeveloped female bee.