SECTION 1 – WHY BEES?

Bees are familiar insects to most people and it is likely that people have hunted and robbed their wild nests since the beginning of his existence. Cave paintings, drawn around 8,000 years ago are early proof of this activity.

Today, in many parts of the world, honey hunting still takes place. Bees are robbed of their honey, nests are destroyed and all too often the bees are killed in the process. However, beekeeping techniques have evolved which conserve the bees and allow regular harvesting of crops of honey and wax. Indeed, people started creating homes, or hives, for bees about 6,000 years ago.

Bee species and races

There are over 20,000 species of bees (Apoidea) in the world. Most of these are solitary bees where each female makes her own nest and lays her eggs but does not usually live in it. A few bees are social, they live in a community known as a colony. Social bees make honey which is their food store. Bees that produce enough honey to make harvesting worthwhile belong to two sub-families – honey bees (Apinae) and stingless bees (Meliponinae).

Apinae has only one genus – *Apis* – of which the species *Apis mellifera* is of much the greatest economic importance.

Apis mellifera in Africa are smaller than in Europe. Their colonies produce many more

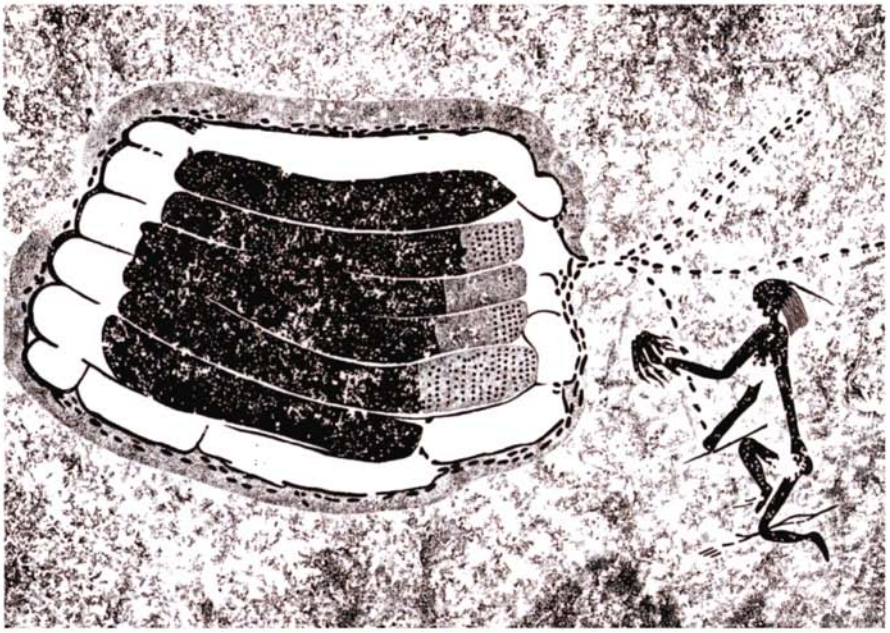

FIG. 1. Rock painting of a honey hunter using smoke to drive bees from their nest. Matopo Hills Zimbabwe, date unknown. (drawn by: Harald Pager).

swarms and are easily alerted to sting and attack. There are two main races of African honey bee – *Apis mellifera adansonii* which predominates in West Africa, and *Apis mellifera scutellata* which dominates in East Africa from Ethiopia to Southern Africa. There are other races but these two are the most important to beekeepers.

Habitats

Bees flourish wherever there is sufficient pollen, nectar, shelter and water to fulfil the needs of the colony. The climate can vary enormously and bees are found in habitats ranging from deserts to forests. However, they do have difficulties in rain forests where humidity and the rain keep them sheltering most of the time.

Pollination

Bees have a vital role in increasing food production and overall agricultural productivity. This is often forgotten but is important in tropical countries where beekeeping can provide pollination. Honey and beeswax are but a bonus to the added value bees can give to crops. It is estimated that more than 75% of the crops in warmer countries benefit from bee pollination.

Pollination is a vital step in the reproduction of flowering plants and involves the transfer of pollen from the male part of a flower to the female part of a flower. It is necessary for all seed and fruit production. In some crops, it is the seed that is harvested for food, for example: oilseed crops, nuts, legumes such as beans and peas, and cereals like rice and maize. In other crops we eat the fruit which develops with the seed, for example: citrus, mango and tomato. Seed is also required for production of the next generation of annual crops and seed production allows plant breeding programmes to select improved varieties.

All seed production and most fruit production thus depend on pollination.

Plants require pollen to be transferred from the anthers (the male parts of the flower) to the stigmas (the female parts) either on the same plant or on a quite separate plant which may be some distance away. Each plant species has evolved its own technique for this important transference of pollen and many species depend upon insects to transfer pollen from one flower to another as they forage. Of these pollinating insects, bees are recognized as the most generally efficient because bees have hairy bodies which easily pick up grains of pollen as they move about in flowers.

During a single day, one honey bee may visit several hundred flowers of one plant species, collecting nectar and/or pollen and transferring pollen grains from one flower to another as it goes. Furthermore, bees are consistent foragers and tend to work one kind of flower at a time.

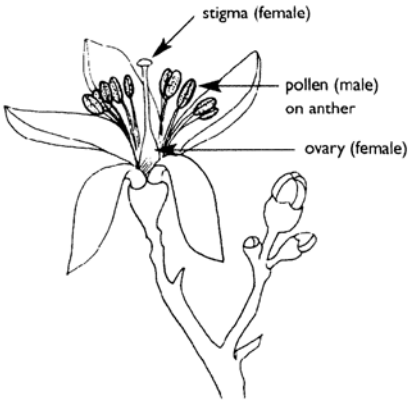

FIG. 2. Flower structure. Pollen from the anthers is trapped in the hairs covering the bee and carried to the stigma of the same plant or another of the same species. This is the first step towards fertilization and the production of seeds and fruit.

FIG. 3. Bee foraging for nectar and pollen.

Crops vary in the extent to which they benefit from cross-pollination brought about by insects. Some crops can be self-pollinating but give better yields if pollinated by insects (for example field beans, coffee, mango); many give a substantially increased yield when pollinated by insects (for example passion fruit, cowpea, sesame, lychee, mustard, cashew) and others are completely dependent on pollination by insects and will not otherwise produce crops (examples are clovers, runner beans, almonds, melons).

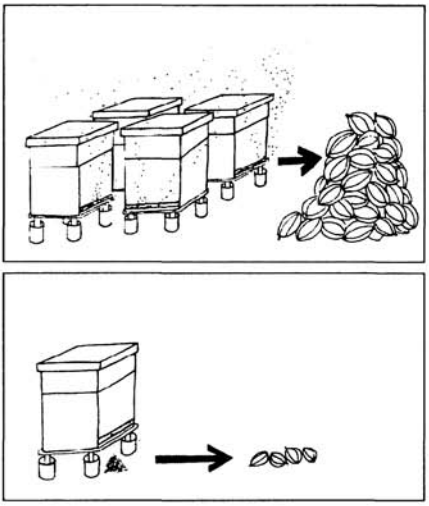

FIG. 4. Bees are important to crop growers. On many crops more bees mean better pollination and higher yields. If bees are killed the value of crops will be reduced.

An important point, often overlooked, is that adequate insect pollination affects the quality of the crop: uneven and small fruit are often an indication that pollination has been insufficient. Adequate pollination by insects also ensures that early flowers set seed; this results in a uniform and early harvest and gives the crop the maximum possible length of time to mature.

Certain types of modern agriculture result in monocultures. If such crops require insect pollination it is unlikely to be adequate unless special arrangements are made – usually the introduction of hives of bees. Similarly, crops grown on irrigated desert land will have no wild bees or other native insects to serve as pollinators.

It is in everyone's interest to maintain strong populations of honey bees and other pollinating insects. Some honey bees are managed in hives by beekeepers but they can also be found living in the wild.

Farmers can help by:

- Selecting and using pesticides with great care. If wild pollinating insects are destroyed, there is the risk of losing good crop yields in the future.
- Never use pesticide when flowers are open. Foraging insects work on open blossoms and will be killed if sprayed at this time. If pesticide must be used, it is best sprayed early or late in the day when crop flowers are closed.
- Allow wild plants to flower on waste pieces of land. These will help support populations of wild foraging insects when cultivated crops are not flowering.

FIG. 5. The toxicity of a pesticide (how poisonous it is) is different for different pests. Always try to choose a pesticide that attacks the pest but will not harm bees.

FIG. 6. A pesticide is more likely to kill bees if it is applied to flowers during the day while the bees are on them. If spraying has to be done it is best carried out at dawn or dusk and when there is no wind to drift the spray onto other flowering plants or onto the beehives.

Everyone can help by:

- Being aware of, and teaching others, the important value of pollination by insects.
- Increasing local forage by making sure that nectar-bearing bushes and trees are included in planting schemes.

FIG. 7. Everyone needs to know about the value of pollination.

- Preventing unnecessary use of pesticides.

The forage available to bees in an area changes. Bees harvest what they can but are unable to control what is available to them except by migrating. Sometimes, it is possible for beekeepers to move their hives to different bee forage in order to maximize honey flow and to improve crop pollination.

Most foraging is done within one or two kilometres of the hive (about one mile), although much greater distances have been recorded but this is not efficient if the hives are properly managed. Also, the foraging area is not a neat circle with the hive at the centre. The area will be highly irregular and will depend on the lie of the land, the vegetation (bees have their likes and dislikes) and the weather.

Honey bee pollination has been proved to increase the seed or fruit yield of these crops:

- almond
- apple
- apricot
- asparagus
- avocado
- *Brassica* species such as cabbage, cauliflower, Chinese cabbage, mustard, oilseed rape, sarson, swede and turnip
- buckwheat
- cardamon
- carrot
- cherry
- clover species such as ball, crimson, Persian, red, sweet, white
- coconut palm
- coffee
- coriander
- cotton
- cucumber/gherkin
- dill
- eggplant
- feijoa
- field bean
- gourd species such as pumpkin and squash
- grape
- hairy vetch
- horse gram
- kenaf
- kiwi
- lespedeza
- longan
- lucerne, alfalfa
- macadamia
- mandarin orange
- mango
- melon
- niger
- onion
- papaya
- peach
- pear
- pimento (allspice)
- plum
- radish
- rambutan
- runner bean
- safflower
- sainfoin
- soyabean
- strawberry
- sunflower
- sweet chestnut
- sweet vetch
- water melon

Honey bees and other insects are involved in the pollination of these crops:

- *Acadia*: various species
- acerola
- adzuki bean
- angelica
- anise
- arrowroot
- artichokes: various species
- ash gourd
- ber
- beet, sugar
- bergamot
- berseem
- borage
- box elder
- butter bean
- bottle gourd
- carambola
- caraway
- cashew
- celery
- cassava
- castor
- chayote
- cherimoya
- chestnut, Japanese
- chicory
- chives
- citrus fruits such as lemon varieties, satsuma, pomelo, orange, grapefruit, citron, tangerine
- clove
- clover, strawberry
- cluster bean
- cocoa
- coconut palm
- cress, rocket
- date palm
- derris
- durian
- endive
- Eucalypt: various species
- fennel
- fig
- flax
- granadilla, giant
- groundnut: some varieties
- guava
- haricot bean
- hemp
- henequen
- horse bean
- indigo
- jujube, Chinese
- kudzu
- leek
- lettuce
- loofah
- lupin
- lychee
- marjoram
- medick, black
- mesquite
- milkweed
- mint, garden
- mung bean
- nutmeg
- oil palm
- okra
- parsley
- parsnip
- passion fruit
- pawpaw
- pea: various species
- peppermint
- persimmon
- pili nut
- potato: some varieties
- potato, sweet
- pyrethrum
- quince
- quinine
- rice bean
- rosemary
- rubber, para
- saffron
- sesame
- silk-cotton tree
- sisal
- sword bean
- tamarugo
- tea
- tephrosia
- tobacco
- tomato
- tonka bean
- toria
- tung: 2 species
- vetch, kidney
- wattle, black
- willow
- yam
- yucca

FIG. 8. Migratory beekeeping is a way of providing pollinators where they are most needed to give good crop harvests.

Honey can only be made after the bees have collected the nectar from the plants. If the nectar is inaccessible, not sweet enough or the plant is difficult for the bee, then they will not wish to work those plants but will look elsewhere.

An area may be over or under-populated by bees at any one time. The increasing trend to grow one crop on a large scale can mean that an area could support 50 colonies for a short period and not provide enough for one or two colonies for most of the year. In some places, beekeeping is becoming more dependent on migration and many countries could do yet more to exploit their nectar sources by using this method of apiculture.