

# NYUKI NEWSLETTER

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## EDITORIAL TEAM



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**COVER PICTURE: BEEKEEPING OFFICERS OPENING HIVES DURING AN EXTENSION PROGRAMME**

## FROM THE EDITOR

The Nyuki newsletter is back in circulation after quite a break. This absence was not intended, but arose due to a number of logistical problems. However, during this brief lull, a lot has been happening in the beekeeping industry in the country.

The sub-sector continues to attract a lot of attention from a cross-section of stakeholders. One can say with a considerable measure of confidence that Apiculture is one of the fastest growing sub-sectors in the Livestock Industry in Kenya today.

Consumer awareness on the health benefits of hive products has also increased a great deal. Presently, more people are moving towards consumption of natural products and honey scores pretty highly in this regard.

Lack of adequate funding has for a long time been one of the main constraints facing Apicultural development in our country. Beekeepers have not been able to access credit to boost production.

Funds for Beekeeping extension have also been inadequate.

Luckily this trend is bound to change for the better starting later this year. Some

development organisations notably the African Development Fund and UNIDO are set to put in some significant funds to assist in rejuvenating bee farming especially in the drier regions of the country where most of the activity is practised. This is no doubt very good news and hopefully, it is going to mark the turning point of this important industry.

This edition is packed with information on various aspects of bee management, taxonomy of the African bees, pollination, quality considerations and many other informative articles. It is our hope that you will enjoy reading it.

As we have said before, this publication is meant to offer a forum for sharing ideas and experiences in the field of Apiculture.

Once again I appeal to our dear readers to share with us whatever they know and think about beekeeping through this newsletter.

Read on.

# COMMENTARY

## THAT LAND OF MILK AND HONEY

ROBIN M. MBAE

'More honey, more money'. This was a comment that was said by one of a Moshav when told poor farmers particularly from Africa may not afford Langstroth hives. This seems to be the driving force behind successful beekeeping in Israel. I think I should give you a brief before the story. People here live in three ways. The Kibbutz's who have adopted the Ujamaa style, the Moshav's and their co-operative; and the 'liberals' who say God is for us all. The first two are mostly agricultural. Wish to point here that almost all agricultural activities in this land are through irrigation. So we were staying in a place named Kibbutz Shefayim. This country can well be considered a developed country with water, power, tarmac road, telecom and technology within the midst of her people.

I would say beekeeping in this country is a domesticated art. Beekeepers keep bee colonies that they know and are sure of their performance. I still would want to refer to that moshav who narrated a story on how he intended to domesticate African bees in futility; to some level it was disastrous. I will tell you that another day. Keeping bees is a big business here. Pollination is the main activity of the industry, contributing to 28.1 times the value of honey production. In essence overall contribution of pollination in this country adds 46.1m dollars to GDP annually. As I said earlier since agriculture here is dependent on

Irrigation, the focus is to efficiently utilize the available resources to maximize production. Thus use of pollinators in both green houses and fields is a must for crops requiring this service. Crops in this category includes the following; citrus, cucumber, tomatoes, strawberry, mangoes, avocados, apples, sweet pepper, melons etc.

One of the key areas of importance to successful beekeeping industry in Israel is colony improvement through queen breeding and rearing. This is a well established programme and there is an excellent networking between the ministry (policy and extension), researchers and beekeepers. The beekeepers have an association where most of their needy issues are addressed that include; hive placement (distribution), products pricing, policy development, bee colony supplies, disease control etc. Talk of bee disease control and it's a hot issue that requires collective responsibility for all beekeepers. Common diseases and parasites include varroa mites, American foulbrood, European foulbrood sac brood, chalk brood, nosema, acute and chronic bee paralysis, tracheal mites. The common bee here is *Apis mellifera syriaca* which has been bred with Italian bee-*Apis mellifera linguistica*. Overall the industry is run and administered by a number of institutions, namely Beekeeping department of the ministry of Agriculture (develop technologies and disseminate to beekeepers including breeding stock and use of artificial insemination, Veterinary services (for disease and

Pest control), Agricultural faculty of Hebrew university (bee biology research), Beekeepers association (for official

and professional matters), and Israel Honey Board for registration and trade on honey.

There are about 700 beekeepers in Israel who owns about 70000 beehives mainly Langstroth. With continuous upgrading of the bee colony, farmers are able to obtain 50 – 60kg per hive/annum and most of their honey comes from orange blossoms. Honey processing is mostly done with large scale honey extraction equipments and it is highly mechanized i.e. from uncapping to packaging. The extraction equipment can handle up to 400 honey frames at any stage and mostly uses centrifugal force (see picture below).

The Israel government has set a minimum price of honey produced in their country. Since their production cannot meet the local demand, they are forced to import. Imported honey is taxed to the level of locally produced honey price. This is to avoid an influx of imported honeys to the local market. The concern of minimum residue levels is a big issue here. This is due to the treatment of bee diseases and spraying of horticultural crops that would result into honey contamination. However, they have identified and classified recommended chemicals for use with minimum residue effect.

Otherwise Israelites are honest and friendly people with a rich historical background. We had a chance to visit a number of biblical sites that make Israel the chosen/blessed land on earth. Interesting, exciting and unbelievable in observing their characteristic hardworking nature. Parts of the country like Dead Sea are below sea level by 400m and Galilee 200m. A lot of pilgrimage is made to these areas

including Jerusalem by people from all over the world. It was quite

astonishing to do float swimming in Dead Sea and not sink. Churches have been built particularly; Orthodox and Catholic in every place Jesus did a remarkable episode; but shocking enough, Israelites do not recognize Jesus as messiah. Asked about this, they shy away and are not ready for the discussion. Our tour guide by name Joe replied “but Jesus had his disciples who were Israelites; so he was not alone”. Note that their Sabbath is on Saturday and it’s a total holiday. Talk of the conflict between the Israelites and Palestine’s and the reply we got “These are our cousins”. “Then why do you fight” one asks. “We don’t know”. Anyway, it is a serious matter and every message is taken to protect particularly citizens from foreign countries. Escorts are a must, more so on the Southern part of the country. One of the most scaring visits is the Jerusalem museum, where 1.5m Jews children who were killed during Nazi regime were commemorated. One goes underground and passes a dark zone and up the sky are hundreds of stars representing each child. Then each star after the other would mention the name of each child massacred. Many people did not think of going back there.

And then there was that closing ceremony. Time was up. The Kenyan team stole the show. This ambassador song “Jambo, Jambo Bwana, Kenya hakuna matata”. A Nigerian gentleman became the soloist, perfected the song and it was finally modified to fit the 17 represented countries with 24 participants. Different languages from those countries were introduced to enrich the song. When Kenyan embassy officials were asked to comment, one said “They have sung it better than “Them Mushrooms” the original composers.

Now back home looking at the way forward.

# BEE LINES

## **NB:(LAST YEARS BEE LINES)**

### **Dear Editor,**

I requested for Nyuki newsletter and beekeepers guide book and be placed on mailing list also to be advised on how to keep bees.

H. H. Mandi,  
Box MSK 441  
Mbare-Harare  
ZIMBABWE

### **Dear Mr. Mandi,**

The production of these publications is very expensive. You can get them at a cost of US\$ 24 and US\$ 10 for guide book and newsletter respectively.

For advice of how to keep bees seek advice from organisations that are dealing with bees in your country.

You may also contact bees for development Troy, Mammoth NP 25 4AB UNITED KINGDOM.

### **Dear Editor**

I am a graduate from Oyo University and trained in Agronomy and Apiculture. I wish to do masters in your institute. How do I go about it?

Miss Ajani Olubunmi O  
P.M.B 4000, Ogbumuso  
Oyo state, NIGERIA.

### **Dear Miss Ajani**

Thank you for your letter. Unfortunately, there is no such institute in Kenya offering masters degree in Apiculture.

Below are the institutions which offer masters:-

1. University of Cambridge, Dept of Entomology, Pembroke Street Cambridge CB2 3 DX United Kingdom.
2. Department of Environment biology University of Guelph, Guelph Ontario , Ontario Canada N1G 2 W1
3. University College, Cardiff CF1 1XL, Dept. of Ecology. Att. Prof of Neurobiology.

### **Dear Editor**

I am a postgraduate student at JKUAT University. I want to establish beekeeping venture in western province as an income generation activity. Please advice.

Michael Mulolwe  
JKUAT – Biochemical & Envi. Engineering  
Box 62000-00200  
NAIROBI

### **Dear Mr. Mukolwe**

Your plans to establish a beekeeping venture in western province are hereby appreciated. Beekeeping is one of the low input and environmentally friendly enterprises that can uplift

the living standards of rural communities. We offer technical advice at our National Beekeeping Station off Ngong road next to Lenana School. You can arrange to visit us during working hours Monday to Friday.

**Editor.**

**Dear Editor**

I want to start beekeeping industry in Bungoma District, Tongaren Division Ndalu Location. Could you please arrange for me an induction short course at your Station?

Kariuki wa Ndegwa  
Box 365 Ndalu BUNGOMA

**Dear Mr. Ndegwa**

*THE EDITOR, NYUKI NEWSLETTER WELCOMES COMMENTS, QUESTIONS & VIEWS FROM OUR READERS, WE PROMISE TO RESPOND TO ALL ENQUIRES.*

Thank you for your letter concerning a course on beekeeping. The station holds one week, course every month. You may call through Tel.No.020-564302 and confirm the next date(s) of training.

Course starts from Monday to Friday. Time 8.30am to 5.00pm.

We do not offer accommodation.

*Editor*

## **MARVELS OF BEE DANCES**

### **DID YOU KNOW?**

- ❖ If bees have to fly around an obstacle (rocks or mountains) to the source of food, they will indicate by their dance the direction in a straight line which they have never flown and disregarding the detour they have made.
- ❖ Bees that are searching for a nesting site, dance even during the night into the morning correctly referring to the position of the sun at the time of dancing thus showing they are able to "calculate" the position of the sun during any time of night without being able to see it. Kalmus and Lindauer have shown that bees

orientation on the sun is inborn but their calculation of the path of the sun must be learned. It took 42 days for the bees from southern hemisphere to learn to compensate correctly for the northern reverse movement of the sun.

- ❖ Bees give direction in one horizontal plane only and do not show how high the source of food is in relation to the hive.
- ❖ Bees will have to dance even when they have to walk to the feeding place but they will start wag-tail dance considerably sooner than under normal circumstances.

## **FACTS ABOUT BUMBLE BEES**

- ♥ Bumble bees do not communicate forage locations as honeybees do.
- ♥ Bumble bees are willing to work flowers that have no nectar e.g. tomatoes. They are good pollinators
- ♥ Bumble bees work flowers on cool days

# THE BEE BUZZ

- ♥ Taking a break from the office – The Beekeepers of the Greater Kibwezi Division - Makueni District
- ♥ Survey of honey quality in Kenyan markets
- ♥ Beekeeping Beyond our Borders
- ♥ Congratulations National Beekeeping Station
- ♥ The Beekeeping Industry: District Focus – Siaya District

## TAKING A BREAK FROM THE OFFICE

### THE BEEKEEPERS OF GREATER KIBWEZI DIVISION – MAKUENI DISTRICT

WINNIE MUTISO

#### INTRODUCTION:

Beekeepers of Makindu, Kathyaka, Nthunguni & Masongelani in the Greater Kibwezi Division of Makueni District keep mainly traditional log hives. Few beekeepers keep clay hives in bee houses. Although the area has great potential, there are approximately 3,000 log hives.

The groups were composed of small and large scale farmers, some keeping up to 140 hives and others as low as 2 hives. The hives are of two sizes – small and large. The large hives are made from large Acacia spp. Such as *A. tortolis mellifera*, *A. xanthopholea*, while small hives are made mainly from *commiphora Africana* (soft wood). The large hives produce between 30-50kg while the small ones 5-8kg of honey. Team leaders of the groups were community development agents. The Technical Team was comprised of Prof. Musimba, Prof. Nyariki and Mr. Charles Ikutwa of University of Nairobi, Range Management Division – KARI;

and Ms Winnie Mutiso of National Beekeeping Station.

#### FACTORS AFFECTING PRODUCTION OF GOOD QUALITY AND QUANTITY OF HONEY AND OTHER HIVE PRODUCTS

- High temperatures in the months of January-March and August-October, in which honeybees are found clustering on the entrance.

The farmers were advised to put up a shade using grass or branches of trees with broad leaves, before drought sets in.

- Massive cutting down of bee plants, the Acacia spp for charcoal burning which again is the only alternative to survival. This reduces the bee forage in some areas mostly areas with high concentration of people. The beekeepers suggested to plant more Acacias; mostly *A. mellifera* & *Acacia tortolis* which are mainly the suppliers of both nectar and pollen during the honey flow season. Fast growing plants such as *Leucena leucocephala* and *Croton*

*megalocarpus* which do well there. Mr. Ikutwa promised to assist them with seedlings.

- Lack of skills and harvesting equipment such as bee suits smokers and others. A farmer in the Makindu group explained how he once was forced to abandon a harvesting exercise of his 10 hives. After harvesting the first hive, the bees in the second hive become so aggressive that he ended up harvesting the honey, bees and everything that was movable instead of just the ripe honey. For that reason some of the beekeepers sponsored by department of range management in collaboration with desert margins program in KARI brought them here at NBS for training in Beekeeping.

### **HONEY THEFT**

This was said to be causing a lot of frustration to old and new beekeepers. A farmer in Kathyaka with 75 hives and another from Nthunguni group with 80 hives have been affected to a point of abandoning the practise.

Thieves move at night with doom spray, kill and harvest the honey together with the dead bees. The farmers suggested the following.

- Be trained on how to work modern hives such as Langstroth, KTBH and clay hives housed near homestead to control thieves.

This training need however; as mentioned earlier has already been accomplished.

### **CONTROL OF HONEY BADGER, PREDATORS & PESTS**

Honey badgers was said to be such a threat during and before the harvesting period. Sugar ants mostly during drought.

More effective ways of controlling honey badger were discussed whereby the farmer embarks on fixing iron sheet on the bark or tree trunk 3 mtrs from the ground, so that if the honey badger

decides to jump it will fall on the iron sheet and slide. Also fixing of iron sheet on the top side of

the hive extending to the lids will control the badger the same way but there should be no side tree to act as a ladder to the main tree with hives.

### **MARKETING OF HONEY & OTHER HIVE PRODUCTS**

Bee Farmers in these four areas only sell honey. They were not aware of other hive products such as beeswax, propolis etc. The Nthunguni beekeepers have ready market for their honey. They market their honey through a group which operates a refinery at Mtito Andei. The refinery buys comb honey at Kshs70.00 a kg, process, pack and sell the moist combs to "miti ni dawa" dealers in Nairobi. They refined and packed honey in jars of 500gm; this honey is sold around Mtito Andei town at a price of Kshs100.00 per jar. Some farmers of this area complained of low prices and wished it to be increase from 70/= to 300/=. They were advised that honey prices depended on or are guided by international honey market prices which a kilogram of refined honey analysed, processed, packed labelled and delivered to a port of entry will fetch 150/ per kg. This explains why no exporter of honey in Kenya benefited from the AGOA Initiative, reasons being low production/high prices.

Makindu and Kathyaka groups complained that honey prices start at 80/= per kg and go down to 20/= per kg due to brokers involvement. They were all advised to form groups in order to control brokers from exploiting them and also market their honey in combs.

### **MIGRATION OF BEES**

Nthunguni bee farmers belief low production of honey is also caused by mass movement of bees during dry

period. These bees move to Kyulu hills and come back on the onset of rains. The beekeepers also belief they go to Kyulu hills to breed. This was explained as seasonal movement from low lands with thigh temperatures to high lands with cooler temperatures and a good supply of forage.

# SURVEY OF HONEY QUALITY IN KENYAN MARKETS

B.P.OKINYI, R.M.MBAE, Z. W. RUHI (NBS) & J. MBITHI (HILL PLAZA)

## INTRODUCTION

This survey was conducted by Apiculture and Emerging Livestock Division in the Ministry of Livestock. The Division is charged with the responsibility of assisting farmers to produce high quality honey and other bee products which meet the expectation of the consumers.

The department and other stakeholders in Apiculture have been exploring possibilities of exporting honey and other bee products from Kenya to the European Union (E.U) market. Our products met a snag when the E.U. demanded that all food products to that region should conform to their set limits for maximum residue levels (MRL). As a result, a honey monitoring plan approved by E.U. was set in place, and this survey was therefore meant to operationalise this plan so that Kenya can begin exporting honey to the E.U. The survey would also provide an opportunity to advice farmers, honey processors and traders on honey quality.

## OBJECTIVES OF THE SURVEY

The objectives of the survey were identified as:

1. Assess the overall safety status of Kenya honey along the value chain.
2. Advice on honey quality standard requirements.
3. Establish a beekeepers/processors/trader register for traceability.

4. Fulfil the E.U. requirements for honey export, and,
5. Ensure that residue levels and standards set in the monitoring plan are met and observed.

## EXPECTED OUTPUTS

1. Awareness on good quality honey enhanced.
2. Good quality honey available on the market shelves.
3. A data bank on safety status and overall quality of honey in the country established.

## PROCEDURE:

The country was divided into three blocks considering their potentiality. Areas that supply the country's honey banks were focused. The first block included Eastern Province (covering Embu, Kiambere, Mwingi, Kitui, Machakos and Wote). The second block

Covered Rift Valley Province (including Naivasha, Nakuru, Eldama Ravine, Marigat, Kabarnet, Kerio Valley, Eldoret, Iten, and Molo). The third block was Nyanza and south Rift (covering Narok, Abossi, Kilgoris, Kisii, Nyando, Kericho, Siaya and Migori).

A team of officers with thorough knowledge of honey quality and surveying were dispatched to each of these blocks to purchase different honey samples in each region. At least 50 samples per region were purchased.

During surveying, producers, processors informed about the purpose of the survey and importance of maintaining original quality of the product. The samples so collected would be divided into three portions. One portion sent to KEPHIS (Kenya Plant Health Inspectorate Services) to

analyse presence of bacterial contaminants; another portion analysed by the University of Nairobi, department of Pharmacology and Toxicology for presence of antibiotics. The third portion analysed at NBS laboratory for levels of moisture, total reducing sugars, sucrose, acidity and HMF.

**A) EASTERN PROVINCE**

Eastern Province is one of the high potential provinces in honey production in the country. However, the survey carried out in Embu, Mbeere, Mwingi, Kitui, Machakos and Makueni Districts showed that honey production was very low during this time of the year (November). This was attributed to the long spell of drought from July to early November. We also observed that clearing of vegetation for farming and charcoal burning had a negative effect on honey production. However, there was hope because some parts of the province had received heavy rains especially in Embu, Mwingi, Mbeere and Kitui. Farmers we met were optimistic that honey flow season was to begin by mid-December and hive occupation and colony build up was rising.

Most of the processing centres we visited were handling extraction as the method of honey processing. All except Mwingi and Embu processors were dealing with honey obtained from Langstroth hives. Noted also was TARDA which had OAC straining equipment and had specific customers who supply honey from log hives particularly in Kitui. We noted that despite NGOs introducing Langstroth as the production technology. There was lack of support of the required accompanying extractors. We thus noted desperate efforts from farmers seeking assistance

to acquire honey extractors. Overall a total of 32 samples were collected in Eastern Province.



The Rift Valley Survey Team, Mrs Mbithi & Mr Okinyi at a typical honey vending shop at Radat Centre – Koibatek District

**B) RIFT VALLEY PROVINCE**

A total of 51 samples were collected from the Rift Valley Province. Sampling areas covered include Naivasha, Nakuru, Eldama Ravine, Radat Centre, Marigat, Mogoswok, Kabarnet, Kerio Valley Development Authority Refinery, Iten, Eldoret and Molo.

The target sample collection points were the supermarkets and large retail shops where honey is sold, honey refineries, processors and road side honey kiosks like Radat in Koibatek. Most dealers we met were willing to provide the information after realising the relevance of the survey. At Radat centre, we encountered an enthusiastic crowd who thronged us to both sell their wares and provide the information we sought. This exercise was nothing new to them since we had conducted a similar one the previous year and sent them a report. Sting less bee honey harvesting and selling is also gaining momentum though methods are still crude and destructive. Due to logistical handicaps, Nyanza and South Rift block could not be surveyed.



The survey team flanked by Radat Honey Vendors

### **PRELIMINARY RESULTS**

So far, only preliminary results for a few samples could be obtained

#### **1. KEPHIS:**

Results from Kephis showed that Kenyan honey contain no harmful bacteria that can threaten human health. Instead, it is antibiotic that can aid in fighting some bacterial infections in our bodies.

#### **2. UNIVERSITY OF NAIROBI (UON):**

Results from UON indicated that there are no significant levels of chemical antibiotics in Kenyan honey. All of them were far below the 50mg/kg level required for an antibiotic to be harmful. The honey is only a natural antibiotic that need to be tapped to treat various ailments that afflict our bodies.

#### **3. NATIONAL BEEKEEPING STATION (NBS):**

Results from NBS ascertained that Kenyan honey performs poorly on sucrose and HMF levels. Most

samples passed the moisture, TRS (total reducing sugars) and Acidity tests, yet some failed in these tests. According to the NBS surveys since 1998, only 30% of Kenyan honeys are of good quality, if based on the five (5) parameters analysed at NBS.

After final results are ready, they will be submitted to the E.U. to study and accept Kenyan honey as fit for human consumption in the EU market. Preliminary results had already been sent.

### **CONCLUSION:**

It is welcome news to all Kenyans that action is being taken to market our honey outside. The Division of Apiculture and Emerging Livestock, in collaboration with other stakeholders; The Kenya Honey Council, The Kenya Bureau of Standards, ICIPE and other bodies are working round the clock to ensure that Kenyan honey gets accepted in the outside markets. In the African continent, only Zambia exports to the EU because it is the only country that has met their quality standards. Uganda is building an ultra modern honey processing facility at Arua, in North Western Uganda as a means of meeting EU STANDARDS. Chinese honey exports to the EU was halted in 2002 due to their rampant use of antibiotics to treat bee diseases in their hives thus contaminating their honeys.

Hence, it is a worthwhile move to ensure that our bee products attract competitive prices. This will aid in alleviating the penury of our farmers who have habitually been pathetic victims of blackmail.



At Mogoswok Refinery with the Chairman and a member of the New Mogoswok Beekeeping Society, Baringo District

# BEEKEEPING BEYOND OUR BORDERS

ABRAHAM K. BIWOTT

## SPOTLIGHT ON ETHIOPIA

### Area Description

Ethiopia is located in the North-eastern part of the African continent. Kenya borders it to the south, Somalis to the East, Sudan to the West, Egypt and Djibouti to the North and North-East respectively.

## Map of Ethiopia?

Beekeeping is a major agricultural activity with much of it being concentrated on the South and South-western region. The main vegetation is tropical wood and thorn bushland, also grassland and Savannah. Almost all the major forests of Ethiopia are located here. The region has two honeybee races; *Apis mellifera scutellata* and *Apis mellifera woyi-*

*gambella*. The former occupies the humid midlands, and the latter the lowlands. Most of the areas with good potential for beekeeping are located within the region.

### Keeping Bees

Beekeepers use their indigenous knowledge and locally available materials to keep honeybees. More than 99% of the honeybee colonies in Ethiopia are managed using traditional local methods. Beekeeping takes place mainly in the forests. It is interesting to note that beekeepers in some regions share the existing natural forest amongst themselves exclusively for beekeeping. This portion of forest is not used by other beekeepers without the permission of the owner. Ownership passes from generation to generation. It is common to observe 20-30 hives hung on a single big branched tree. Beekeepers may own between 10-600 colonies; the number is part of the criteria used to determine a beekeeper's social standing within the community.

### Hives

Beekeepers use log, bark and bamboo hives. Log hives and bark hives are made mainly from *Ficus sycomorus*, *Albizia schimperiana*, *Acacia abyssinica*, *Cordia africana* and *Ficus vasta*, while bamboo hives are made from the stems and leaves of bamboo. Log hives are preferred to bamboo hives for a number of reasons;

- ✚ Log hives are more durable (can be passed down from generation to generation)
- ✚ Easier and requiring less time to make (10 log hives to one bamboo hive are made per day)
- ✚ Easier to open and harvest the honey
- ✚ Cost of log hive is lower than a bamboo hive

However, some beekeepers complain that honeybee colonies in log hives abscond more frequently than those in bamboo hives. Log hives also become heavier and more difficult to hang in a tree when they have been in use for long periods.

### **Swarm Catching**

Beekeepers mostly acquire their colonies by trapping swarms to attract swarms, bait hives are smoked either with leaves from *Clausena anisata* or *Oleo europaea* or the bark, *syzygium guineense* or leaves and chips from *Cordia africana*. Hives are hung on *Syzygium guineense* or *Cordia africana*. Local beekeepers believe that these specific trees together with the smoking of the bait hives attract swarms. The occupation rate of the bait hives in the forestland region is about 67% per year.

### **Honey Harvesting**

Regarding honeybee management, no attention is given to the colonies. Beekeepers only visit colonies in the honey flow period. During honey harvesting beekeepers climb up the tree and send the hive to the ground either by means of a rope tied around the centre of the hive or by throwing the hive down, thereby destroying the colony. When the first method is used, smoking materials such as Teff straw, a bundle of sticks and sometimes (though rarely), cow dung is used to calm and chase away bees. Beekeepers remove all the contents from the hive and mix the pollen, brood and honey for slae, or for making **TeJ** (honey wine) for their own consumption.

The colour of honey in the region varies accordingly from season to season and from place to place. This is caused by the honey plants flowering at the time and place. White honey is cropped during April to

May when *Scheffera abyssinica* flowers abundantly, while yellow or amber honey is harvested during September to November *Bidens spp*, *Vernonia spp.*, *Syzygium guineense*, *Albizia gummifera* and other plants. White honey fetches a higher price than other types of honey. Honey is one of the main sources of income for farmers. However marketing of honey has not been well developed except some honey dealers found in a few towns. The market value of beeswax is unknown to most beekeepers and thus it is not separated from honey. “**Tej**” makers are the only ones who benefit from beeswax; they buy crude honey cheaply from beekeepers and make “**Tej**”. After fermentation they sieve the “**Tej**” and collect beeswax “**Sefef**” which is then sold to beeswax collectors who shanel this product to refineries in Addis Ababa.

In the extreme south-western part of the region (Gambella) brood is second only to honey as the main product from the harvest. Beekeepers harvest brood from colonies which do not produce a lot of honey. This is very important for the Mazangir tribe. Bee brood is the main source of protein for farmer beekeepers, and children are fed bee brood as a substitute for milk.

### **Honey Hunting**

Most of the Agnuwak tribe do not keep honeybees, as they are nomadic. However, they are honey hunters and the honey is used only for their own consumption and is not sold unlike other tribes of the area. Like Masanagir people, they also eat bee brood.

Honey hunters roam through the forest and mountainous areas searching for bees nests. They look for holes in trees, bee activity or use the honey guide birds (*indicator indicator*). Honey hunters call the honey guides by whistling. The honey guide directs the hunters to the honeybee nest by flying back and forth between the hunters and the nest. The honey guide can lead the hunters to the

hives hung in a tree or wild nest situated in a tree hole, termite mound or cliff.

Honey hunters never rob hives, as stealing honey from hives in Agnuwak and Mazangir is culturally unacceptable. Thus hunters encourage honey guide birds to lead them to other wild nests. When bees are situated in a hole in a tree, excessive smoke and fire are used to force the bees out. If the nest is inaccessible to the hunters, the tree is cut down and nest contents are collected. Some honey

and brood are given to the honey guide birds as a reward for their services. A honey hunter could harvest 3-4 wild honeybee nests per day. Honey hunters are blamed for causing forest fires and for the decline of honeybee colonies.

Reference:

Bees for Development Journal 73 December 2004.

## SUMMARY OF AN ANALYSIS REPORT ON KENYA'S APICULTURE

MWANGI

The analysis on the Beekeeping sub-sector arose from the recognition that there was very little reliable data and information on the sub-sector. The analysis which included a National survey was commissioned by the United Nations Industrial Development Organisation (UNIDO) under the Integrated Industrial Development Programme.

The survey and analysis was carried out by Benflo Consultants from.....to.....2004. Existing data on the honey value chain was collected and collated through desktop studies and visits to the districts.

During the field visits, detailed reviews/interviews with local communities, traders, agents, extension officers and support institutions were undertaken.

The findings revealed that there is a lot of untapped potential for Apiculture development in Kenya and that if this is fully exploited, the people especially in the marginal areas and the country as a whole will benefit considerably.

The study specifically focused on four broad categories namely: policy review, production, processing and marketing.

Key issues addressed in each of the categories are summarised as follows

### POLICY REVIEW

A study of the existing, policy documents revealed some gaps; some of the policy interventions proposed to improve the Apiculture Policy include:-

- a) **Organisation of the Apiculture Industry** – Through formation of a National co-ordinating body to be known as “Kenya Apicultural Board” be established to co-ordinate, develop and promote the industry
- b) **Setting up an Institutional Framework** – to ensure that relevant bodies necessary for growth of the sub-sector are in place for instance a market development authority, a monitoring plan for honey residues, a code of practice, self organisation/regulation through formation of groups/Associations, producer, processor and marketing levels.

### **PRODUCTION:**

The analysis recommended that priority in development of Apiculture be focused on Beekeeping high potential areas which were identified as the Eastern and Rift Valley regions. Development efforts in these regions should target the poor who live in the Arid and Semi-Arid Lands (ASALs). Cottage industries in forms of honey processing refineries and equipment workshops need to be initiated to create employment and improve income levels of the communities

Production activities should aim at increasing productivity of honey and beeswax and also improve quality and diversity of the hive products. Some of the major activities that should be undertaken were identified as awareness creation and information dissemination, training, credit provision, capacity building for private institutions providing equipment and mobilisation of farmers.

### **PROCESSING**

The analysis found out that most of the honey produced is sold in raw form. In order to add value to honey it is recommended that the following processing activities be put in place; capacity building at processors level, provision of appropriate processing equipment, avail credit to

processors and honey traders and upgrade capacity of institutions that offer quality control services e.g National Beekeeping Station, Kenya Bureau of Standards and KEPHIS/

### **MARKETING**

An analysis of the market demand, competition, risk factors and possibilities on niche markets was carried out. Forward and backward market linkages were denined.

Current constraints facing market expansion were analysed and interventions proposed to improve market access. These include:

- ❖ Formation of farmer/beekeeper organisations and institutions to undertake marketing of apicultural products and inputs be encouraged and supported.
- ❖ Access to credit by small-scale producers, traders and marketing institutions be enhanced.
- ❖ The Kenya Bureau of Standards (KEBS) capacity be enhance to enhance trade regulations through application of appropriate procedure, sanitary and health standards.
- ❖ Organisation of honey consumption promotion campaigns among potential consumers and advertising at the retail outlets.
- ❖ Make specific studies on the possibilities of exporting semi-refined or refined and pre-packed domestic honeys to nearby African countries and the Middle East.

## ***MARVELS OF BEE DANCES***

### **DID YOU KNOW?**

- ❖ If bees have to fly around an obstacle (rocks or mountains) to the source of food, they will indicate by their dance the direction in a straight line which they have never flown and disregarding the detour they have made.
- ❖ Bees that are searching for a nesting site, dance even during the night into the morning correctly referring to the position of the sun at

the time of dancing thus showing they are able to "calculate" the position of the sun during any time of night without being able to see it. Kalmus and Lindauer have shown that bees orientation on the sun is inborn but their calculation of the path of the sun must be learned. It took 42 days for the bees from southern hemisphere to learn to compensate correctly for the northern reverse movement of the sun.

❖ Bees give direction in one horizontal plane only and do not show how high the source of food is in relation to the hive.

❖ Bees will have to dance even when they have to walk to the feeding place but they will start wag-tail dance considerably sooner than under normal circumstances.



## CONGRATULATIONS!!!

### IT'S A SCOOP FOR THE TOP AWARD ONCE MORE FOR NATIONAL BEEKEEPING STATION

J. M. NDOLO

It was honour once more for the National Beekeeping Station to receive the first price for "The Best Small Local Manufacturers Stand" for the second time since 1999 when the Stand first entered the judging category.

The Nairobi International Trade Fair opened its doors to show enthusiasts 29<sup>th</sup> September 2004. At the Bee Farming Stand mammoth preparations were made to fit the show theme of "**Building an Agricultural and Industrial Working Nation**".

#### Photos - show

The theme was interpreted as Bee farming promotes the building of an Agricultural and Industrial working Nation in order to address Bee Farming issues.

Preparations started quite early with well groomed flowerbeds, large potted plants by the entrance and at strategic places in the Stand. Walls of the building were repainted, and murals completely

redone.

Inside the Stand, the displays formed a nexus of information that made every visitor feel their moneys' worth. As usual

exhibits were arranged per section. Generally every section had new and unique exhibits on display.

Monday 29<sup>th</sup> September was the day everyone was waiting for. About 2.30pm came the judging time, two smartly dressed judges came calling. Mr. Ndolo who had been appointed to take the judges round, took his responsibility well, transforming the already jaded and gloomy judges to happy enthusiasts. The judges were pleased with the simple but practical nature of the exhibits. With a few questions at the apiary the judges left no doubt that what they had seen had marvelled them, confirming it later with a first prize for the Stand.

Visitors came clocking after learning of our achievement. The trophy was presented officially by His Excellency the President.

Worth mentioning was the marked improvement in Processing section, Mode, Quality Control, Marketing and overall presentation of the Stand. It is the hope and determination of the NBS staff that this trophy will be retained here for another year. Once more keep it up, National Beekeeping Station Staff.

#### Photos - show

# THE BEEKEEPING INDUSTRY

## DISTRICT FOCUS - SIAYA DISTRICT

ABRAHAM BIWOTT

Siaya District is one of the districts that form the Nyanza Province. It is a total area of 1,773 sq km out of which 1263 sq km (80%) is arable land. It neighbours Butere-Mumias to the North, Busia to the Northwest, Vihiga to the North East and Kisumu to the East. South is bordered by Bondo District.

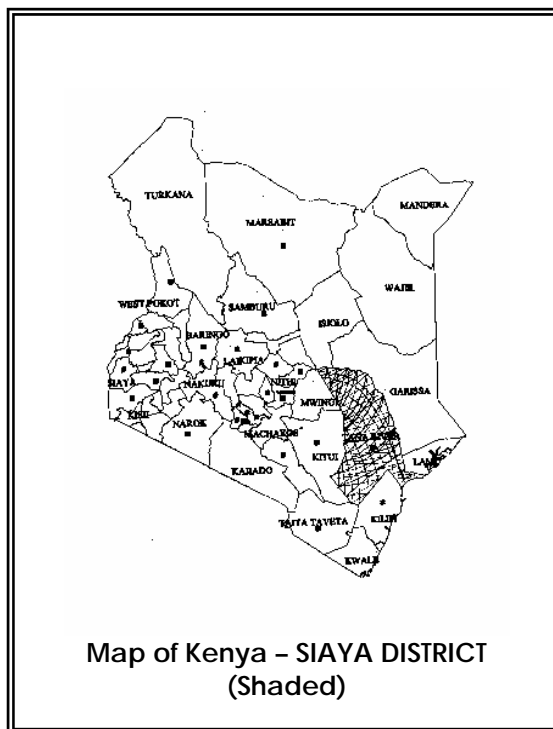
It's headquarter is Siaya town and it has seven divisions; Yala, Wagai, Ugunja, Ukwala, Uranga, Boro and Karemo.

Ecologically, the district spreads across agro-ecological zone LM<sub>1</sub> to LM<sub>3</sub> with a small area UM<sub>1</sub>.

The altitude range from 1140m to 1420m. The highest regions comprise Ukwala, Ugunja, Yala, Boro and Uranga Divisions.

A bimodal rainfall pattern with long rains occurring between March and June and short rains between September and December. However, the short rains in the lower zones are less pronounced and are not very reliable. The temperatures range between 15°C and 30°C with a mean annual temperature of 21-75°C.

Beekeeping is an upcoming farming enterprise in Siaya District, thanks to the efforts of the local extension staff and a number of non-governmental organisations. Creation of awareness in this sector has resulted in many farmers adopting modern beekeeping production technologies such as Kenya top bar hives, Langstroth hives and protective clothing. Demonstration apiaries have been set up in Ugunja, Wagai, Ukwala and Uranga divisions.



Map of Kenya – SIAYA DISTRICT (Shaded)

### POPULATION OF KTBH, TRADITIONAL AND LANGSTROTH HIVES IN SIAYA DISTRICT

DIVISION	2002		2003		
	KTBH	LOG HIVES	KTBH	LOG HIVES	LANGSTROTH
Karemo	40	43	53	43	30
Boro	29	46	32	46	-
Wagai	32	5	35	5	-
Yala	-	32	38	32	90
Ugunja	28	24	31	24	-
Ukwala	27	18	27	18	-
Uranga	17	18	17	18	-
<b>TOTAL</b>	<b>211</b>	<b>189</b>	<b>233</b>	<b>189</b>	<b>120</b>

Langstroth hives were introduced in 2003. These were manufactured by “Tatro Women Group” whose members were trained extensively at Baraka Agricultural College, Molo through a World Bank Grant to Africa Now, a non-governmental organisation operating in the district.



# PRACTICAL BEEKEEPING

## TIPS ON HOW TO MAKE PROFIT AND HAVE LESS LOSS IN YOUR BEEKEEPING ENTERPRISE

LYDIA M. MBURUGU

1. Maintain few but strong colonies rather than many weak colonies. This is because bees from strong colonies produce more honey per bee during honey flow and eat less per bee during dearth. Hence strong colonies for output not numbers
2. Avoid swarming and maintain powerful force of foragers in good heart at the time the main nectar flow is expected in your area. You can do this by making division, creating nucleus colony to build to a strong colony or strengthening weak colonies. By so doing you will have lost no bees but will have gained by keeping all the foragers on sight and their nectar gathering capacity will be unimpaired. You will also have allowed the bees to work out their swarming impulse.
3. Harvest only the ripe honey and avoid harvesting brood for this will lead to loss of potential foragers.
4. Avoid disturbance of colonies during the honey flow season so that the bees can concentrate only in foraging and in honey storage.
5. Store your honey in airtight containers to avoid loss through fermentation.
6. Sell the honey when the honey flow season is over to ensure maximum profit for there is less competition.
7. Sell your honey at reasonable prices to avoid unnecessary hoarding of honey leading to overlapping of crops hence loss of opportunity.

**To be continued in the next issue.**

## HONEY MARKETING

PATRICIA N. NZANO

Naturalness of honey is its main selling point. It is important therefore to maintain the delicate flavour and aroma found in newly harvested honey. Though freshly harvested, honey is normally in liquid form, it is natural for most honeys to granulate (or crystallise) sooner or later. For best appeal, have the honey either liquid or granulated.

Honey appears in several forms

- ❖ Raw (unprocessed) honey
- ❖ Semi-refined honey

- ❖ Refined (liquid) honey
- ❖ Chunk honey
- ❖ Creamed honey
- ❖ Comb honey

Marketing covers all business functions including production and therefore there are many stakeholders involved, but for the industry to survive on its own, all players involved must have in place

strategies aimed at moving the product from the beehive to the consumer at an:

- acceptable quality
- attractive package
- affordable prices

To have the product cycle complete, all the 4P's of marketing must be exploited. These include:

- Product
- Place
- Promotion

- Price

**Product** - Quality and Presentation are vital

**Place** - Target marketing outlets e.g. Bakeries, Health shops, Food stores, supermarkets etc.

**Promotion** - To created awareness, interest and preference for the consumer

**Price** - Set a competitive price that will beat other brands in the mark.

**Market Penetration** can be achieved through:

- Formation of marketing associations/cooperatives
- Promotions – Quality Control – Marketing agencies – Appropriate packages/size
- Competitive pricing

## COLD COMFORTS FROM THE HIVE

PATRICIA NZANO

There is nothing as catchy as a common cold. The cold war is big business. People spend large amounts of money on different kinds of decongestants, syrups drops, tablets and pills to cure colds they get every year. Drugs come with side effects. Honey will certainly comfort you without dangerous side effects when you are cold ridden.

Indeed Hippocrates considered honey a great expectorant and according to Aristoxenus (320 B.C). "Anyone who eats honey, spring onions and bread for his daily breakfast will be free from all diseases throughout his life.

### Honey Sip

- Stir 1 tablespoon honey, 1 teaspoon pollen and 1 teaspoon fresh lemon juice into 1 cup of hot water.
- Stir vigorously and sip slowly.

### Natural Cough Drops

- Chew honey capping, or small pieces o honey dipped dry fruit, rather than sugary commercial drops.

**Suck on propolis** This sticky protective substance derived from tree barks which the bee uses as basic

building material is the most @powerful non-toxic antibiotic known to man...

### Garlic Honey

- Peel garlic cloves and put them in a jar. Add honey a little at a time over a couple of days until the jar is full.
- Set in a sunlit window until the garlic has turned somewhat opaque and all the garlic flavour has been transferred to the honey
- Garlic honey makes an excellent cough syrup. Take a teaspoon every few hours or whenever necessary. Remember that the honey has concentrated garlic power in it and one teaspoonful can represent many cloves of garlic. For a child, dilute each spoonful with water. Garlic honey also soothes a sore throat. As an application for acne or herpes it is healing, soothing and slightly anaesthetic.

## TEMPERATURE AS A PHYSICAL FACTOR OF THE ENVIRONMENT FOR HONEYBEES

JANE A. OKETCH

- ❖ Insects are peikilothermic and bees being one of the social insects are able to maintain a microclimate of their own, which is largely independent of the external temperature
- ❖ During cool weather heat is generated by an increase in muscular and metabolic activity. The heat Produced in this manner is conserved through the insulation provided by the bodies of tightly clustered honeybees.
- ❖ Excessive temperatures are moderated primarily by ventilation induced by the fanning of hive bees on the comb surfaces and at the entrance and by the evaporation of water within the colony.
- ❖ For optimum development, the immature stages of the honeybee require and environment with nearly constant temperature. This temperature does not vary under normal conditions more than 2°-3° about a mean of 94.5°f and may be less variable than this within individual colonies.

## TESTING YOUR BEEKEEPING KNOWLEDGE

R. A. MOHAMMED

### TRUE OR FALSE

1. Honeybees only need water in the dry seasons.
2. The best time to move a hive of bees is at night.
3. Honeybees pollinate mangoes, cucumbers and apples.
4. Sevin is a pesticide that is very toxic to honeybees.
5. A honeybee swarm is a natural biological function of a colony of honeybees.
6. Swarming is not the natural means of colony reproduction.
7. The best time of day to apply a pesticide in the garden is mid morning.
8. The presence of chlorine in a swimming pool will keep honeybees from visiting the pool for water.
9. Newly emerged larvae resemble adult honeybees in appearance.
10. During the pupal stage, the larval tissues break down and are transformed into adult tissues.
11. The honeybee larva undergoes 5 stages of growth during its development.
12. Approximately one day prior to emergence, the pupa undergoes a final mould.

ANSWERS: 1(F), 2(T), 3(T), 4(T), 5(T), 6(F), 7(F), 8(F), 9(F), 10(T), 11(T), 12(T)

# KNOW YOUR BEE PLANTS

## ***ACOKANTHERA SHIMPERI***

JARED MOCHORWA

COMMON NAME: POISON ARROW TREE

### OTHER VERNACULAR NAMES

**Kamba:** Kiñai                      **Kikuyu:** Murichu  
**Samburu:** Sonjoi                **Maasai:** Ol-Morigye  
**Meru:** Mururu                    **Nandi:** Keliot

**FAMILY:**                    -                    **APPCYNACEAE**

### Ecology:

A dense evergreen shrub or tree of dry woodland, thickets and grasslands, often at the margins of dry forest or forest remnants, as t Ngong. Prefers rich well drained forest soils but also grows on black cotton and poor soils of dry sites.

**Uses:** Spear shafts medicine, arrow poison (white latex from roots, leaf or bark), ornamental.

**Description:** A shrub or small rounded tree, with short bole.

**Bark:** Dark brown, grooved with age, young twigs flattened.

**Leaves:** Opposite, dark glossy green above, paler and duller below, young leaves reddish, texture stiff, size and shape variable in length, broadly rounded, apex often tipped with a sharp point margin entire.

**Flowers:** :- Tubular, about 1.5 long white or flushed with pink, in dense, fragrant axillary clusters.



**Fruit:** Oval berries, up to 1.5 cm long, turning from green to yellow, red, purple and black. The ripe fruit are eaten by children, birds and monkeys.

**NOTE:** Honey from Acokanther sp. Has an effect on expectant mothers, can cause abortion. All parts of the Acokanthera are highly toxic, especially in dry season, with the possible exception of the ripe fruit. The arrow poison used by many African tribes was made by boiling chips of the bark or the roots into a tar, which was often mixed with latex from the fig tree. A woting from an arrow dipped in the poison would lead to paralysis and death within a few minutes. Poisoning has been recorded from eating meat grilled over a fire made from Acokanthera sticks, and stock browsing on young leaves die very rapidly from heart failure. Fortunately such cases are rare, probable because of the very bitter taste of the sap.

**There is no known antidote.**

## ***RHUS NATALENSIS***

**COMMON NAME: POISON ARROW TREE**

**OTHER VERNACULAR NAMES:**

**Kamba:** Muthi                      **Kisii:** Obosungora

**Kikuyu:** Muthigi                  **Kalenjin:** Sariet

**Luo:** Sangla                        **Taita:** Kitarika

**Meru:** Mirikithu                  **Nandi:** Monjororoiyat

**Kiswahili:** Mkono Chuma

**FAMILY:**                      -                      **ANACARDIACEAE**

**Ecology:**

A bush or tree widespread in Africa usually in wooded Savannah, forest edges, besides rivers but also in coastal dunes in Southern Africa. Found in Kenya in all but the driest parts. It is a quick growing and drought resistant species.

**Uses:** Bee forage – provides nectar and pollen, fuel wood charcoal, tooth brush, timer, food (fruit), medicine (leaves).

**Description:** Usually bushy, many branched shrub with a tendency to scramble, occasionally a tree to 8m spreading in grassland and wooded Savannah, in all regions other than very dry areas. This species is very variable in all respect.

**Bark:** Grey-brown young branchlets paler, often covered with breathing pores. Branches are mostly angular, forming elbow shapes.



**Leaves:** Trifoliate, the terminal leaflets, up to 9cm in length, shape and colour variable, but leaves hairless, usually darker green above; apex rounded to pointed,

margin smooth, sometimes obscurely toothed, young leaves and shoots reddish.

**Flowers:** Very small, petals only 1.5mm, green-yellow, white in loose heads

**Fruits:** Small, oblong to kidney-shaped, smooth red, drying dull and papery, falling easily. The thin flesh has a sweet taste, and is popular with children herding cattle or goats.

# FEATURES

## GENDER IN BEEKEEPING

CHRISTINE KOECH

In high potential beekeeping areas beekeepers carry out their activities in a traditional way. In this case the beekeepers in some of these regions attach cultural practices to the routine work involved. This attitude becomes a constraint in the industry as the key players do not equally distribute tasks. In agriculturally potential areas, culture is less emphasised hence no gender bias.

The roles played by the household vary in that boys/men could be involved in e.g. hive construction, hanging, repairing, pest control, honey harvesting and marketing. On the other hand girls/women provide transport of hives to the apiaries and transport honey. This shows that men perform more tasks than women. This is a hindrance for women to fully participate in beekeeping development. The reasons behind these include:

(a) It is a taboo and against traditions for women to participate in certain duties.

(b) Nature of work is difficult for women

(c) Beekeeping is culturally a man's job.

The following are solutions to the above problems:-

✚ Creating opportunity of integrating women in extension whereby ways can be devised to train women in beekeeping for them to get the necessary skills.

NB: Considering the modern concepts of beekeeping that are not only less risky and tedious for women but also apply to all beekeepers in general.

✚ Extensionists should target women groups in this way men will gain confidence in their women capability and women will also gain confidence in themselves thus changing their attitudes.

✚ Beekeeping should be taught in primary schools as this would change the culture of such a community

✚ Gender sensitisation for both extension gent and the farming community

## BEE BREEDING IN TROPICAL COUNTRIES

BLAISE P. OKINYI

### INTRODUCTION

Bee breeding is the process of improvement of the existing local bee races. This involves queen

rearing by special methods such as "Grafting". Bee breeding has proved its importance in today's bee industry. Improving bees involves selecting

colonies with suitable traits such as adaptability to environment and disease resistance.

Aggressivity, absconding and swarming are major characteristics of the tropical honeybee races, that should be minimised through selection and breeding. This has gone along with reduction of products.

In most developed countries where bee breeding has been practised, production per colony per harvest ranges between 40-50kg of honey; while in colonies where breeding is not practised, honey yield ranges between 5-10kg per hive per harvest. Taking these into consideration, it follows that improvement of the local bees would enormously increase

honey production, both for local consumption and surplus for export.

The objective of bee breeding is mainly to improve quality of honeybee races through

Selection and queen rearing for higher honey production. Factors that often affect honey production include:

- a) Number or quantity of bees in the colony, which is influenced by queen egg laying capacity, longevity of bee's life span and brood viability.
- b) Foraging ability of bees
- c) Pests and diseases
- d) Absconding and swarming tendencies (very common in the tropics)
- e) Apiary, colony and hive management by the beekeeper.

Honey production therefore is a result of a combination of the above mentioned factors and characteristics which can be easily be measured.

#### **THEORETICAL ASPECT OF BEE BREEDING**

Many of the characteristics of honeybees that are of economic importance including honey production are quantitative traits usually involving many genes, each contributing some small effect.

The improvement of such characters can be done by selection in each generation where in the genes affecting the character is additive. This results in the modification of gene frequency and genetic structure of the population.

One of the objectives of quantitative genetics is the prediction of the outcome of a selection of breeding programme based on observations of existing population.

The phenotype (P) of a quantitative character (honey production) represents the sum of the effect of the genotype (G) and the environment.

$$P = G + E$$

This means that if variation due to environmental influence can reduce the phenotype, this would be influenced by the Genotype also.

Heritability: ( $h^2$ ) – Is one of the most important proportions of quantitative trait. It represents the ratio of the additive genetic variance to the total or phenotypic variance!

$$H^2 = \frac{V_a}{V_p}$$

where  $V_a$  = additive genetic variance

$V_p$  = phenotypic variance

The value of heritability ranges from 0 to 1. this means that no genetic influence on the trait and all variations of the trait are genetically determined for honey production,  $h^2$  is more or less 0.3.

#### **EFFECTS OF SELECTION**

There are two parameters that we can measure in a selection programme; one is the response to selection, represented by "R". This is the mean deviation of the offspring from the original as parental population before selection. The other is

the election differential (S), which is defined as the derivation of the mean parental value from the mean of the whole parental generation before selection.

The relationship of R to S is expressed as:

$$R = h^2 * S$$

For example, if an apiary has an S = 10kg honey and  $h^2$  is considered at 0.3, the expected improvement in the next generation will be:

$$R = (0.3)*(10) = 3\text{kg honey}$$

### **INTERVAL BETWEEN GENERATIONS**

In beekeeping, this is considered to be 1 year. This implies that in each year, the queens in a given population of colonies (apiaries) must be changed with daughters of the best colonies selected for honey production.

### **Methods of Measuring Honey Production**

Measurement of quantitative traits in honey production has three major requirements.

- a) Appropriate techniques for measuring the characteristic.
- b) Appropriate scale to show existing variation between colonies; and
- c) The distribution of measurement must be known.

A simple method for measurement of honey production of the colony in the short term consists of weighing the colony two times during the honey flow season.

### **Procedure:**

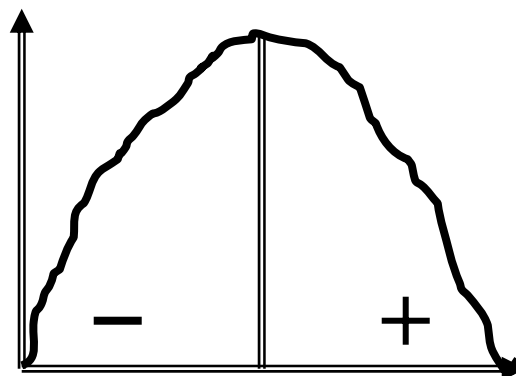
The colonies are weighed at the beginning of honey flow season, then after 7 days.

The colonies with the highest gain in weight are selected. This is done for 2-3 honey flow seasons

for best results. The final decision should be made after the next period of swarming and absconding in order to make selection against undesirable characters.

### **Measurement In The Normal Distribution Curve**

The measurement must be done in the normal distribution curve which falls symmetrically around the population mean



### **Selection Coefficient:**

This represent the number of colonies from the Apiary selected to produce the succeeding generations. This depends on the mating system recommended, as follows;

- 10% - Open mating system
- 20% - Closed mating system

A smaller selection coefficient assures a bigger selection differential (S). In open population, mating coefficient must be bigger in order to avoid inbreeding.

### **QUEEN REARING**

Queen rearing represent one of the most important aspects in Beekeeping that should be practised by both a mature and professional beekeepers.

The knowledge of queen rearing methods permits a systematic bee management and efficiency of selection.

There are three natural situations in which colonies rear queens – swarming, supercedure and emergency.

## 1. Natural Swarming:

In this situation the bees rear a queen for the multiplication of the colonies. It happens in the swarming season which is specific for each race and climatic area....

To be continued in the next issue.

# HONEY WITH CITRUS FRUITS

R. A. MOHAMMED

There is a good supply of citrus fruits available in our markets at the moment and as the saying goes when opportunity offers you a lemon make lemonade. Citrus fruits have high vitamin C content, an 8oz glass of fresh orange juice will provide you with 124mg of vitamin C (this is three times the recommended daily allowance. Citrus fruits will also supply you with Vitamin A and B in addition, essential minerals and amino acids.

Some pointers when buying fresh citrus are as follows:

- ☞ Choose those that have firm skins,
- ☞ Feel heavy and are free of any blemishes or soft spots.

Remember overall quality cannot be judged by skin colour – a greenish tinge or spots do not indicate immaturity, but rather show the “re-greening process which occurs after harvest; tan or brown speckling or mottling is called “russetting” and is often seen on oranges or grapefruit with thin skins and superior eating qualities. Tangerines often do not feel firm because of the loose “peel able” nature of their skin.

**Oranges:** Seedless *Navel* oranges are recognized by the navel-like formation at the blossom end. They are considered the finest eating orange in the world.

**Valencia** oranges are great for juice. They have a few seeds and their often green-tinged skin is thinner than Navels.

**Tangerines:** Mandarins, like the *Kinnow*, have a smooth, light orange skin with a mild flavour and a few seeds. A cross between a tangerine and grapefruit is called a *Tangelo*, their tart/sweet flavour is characterised in the *Minneola* which has a knob-like formation at one end.

*Tangerines* have thin, pebbly and very “peel able” skins. The stem and leaf are often still attached.

*Juicy Temple* or *Royal Mandarins* are Tangors, a cross between a tangerine and an orange. They are larger than other tangerines with a very sweet orange-like flavour and many seeds.

**Grapefruit:** Both pink and white *grapefruit* have no or only a few seeds, plus an eye-opening tart/sweet flavour. It is

believed that the pink fleshed varieties are sweeter, but experts say there is no difference.

## YOGHURT AMBROSIA

*Ingredients:*

- 2 tablespoons honey
- 1 tablespoon lemon juice
- 2 oranges, peeled and sectioned
- 1 red apple, unpeeled and diced
- 1 banana, sliced
- 1 pear, unpeeled and diced
- 100gm flaked coconut
- 1 cup yoghurt

*Method:*

Combine honey and lemon juice in a bowl. Add oranges, apple, banana, pear and coconut. Toss gently to coat fruit. Chill. Just before serving, add yoghurt and toss. Serve immediately. Makes 4-6 servings.

## FRESH ORANGE CAKE

*Ingredients:*

- ½ cup butter or margarine
- 1 cup mild-flavoured honey
- 2 eggs
- ¼ cup milk
- 2 tablespoons fresh orange juice
- 1½ teaspoons grated orange peel
- 2 cups sifted wheat flour
- ½ teaspoon salt
- ¼ teaspoon bicarbonate of soda

*Method:*

Preheat oven to 350°C (moderate). Cream butter/margarine; continue creaming while adding honey in a fine stream. Add eggs, one at a time, beating well after each addition. Combine milk, orange juice and peel. Sift together dry ingredients. Add to creamed mixture alternately with milk

mixture beginning and ending with dry ingredients. Beat after each addition. Pour into two greased 8-inch round baking trays. Bake 25-30 minutes or until done in centre. Cool on wire cake racks 5 minutes. Remove from trays. Fill and frost as desired.

## ADDING VALUE TO PROPOLIS

BY: R. A MOHAMMED

### PROPOLIS

Propolis is a dark brown or black resinous substance gathered by honeybees from the buds and bark of plants and trees; and used as their sealing, strengthening, lining and preserving material inside the hive and around it; protecting the hive from outside environment.

### PROPERTIES OF PROPOLIS

The composition of propolis varies from plant to plant and the method of collection by the beekeeper.

### CHEMICAL COMPOSITION:

Composition varies from sample to sample depending on the source.

Propolis comprises of 50-55% resin, 10-15% volatile/essential oils, 30% beeswax and 5% pollen. Propolis also contains minerals, amino acids and bioflavonoid (biochemical responsible for the healing process). Bioflavonoid are said to stimulate the white blood cells or lymphocytes, to produce *interferon* whose role is enhancing the body's resistance to virus infections. The colour of propolis ranges from yellowish/green to reddish to dark brown.

### USES OF PROPOLIS:

Propolis can be used as a safe non-toxic food supplement.

Propolis can also be used to make grafting wax used by gardeners and crop growers to seal the union of plant tissue.

Main uses of propolis are on natural supplements and herbal medicine (see Apitherapy). Bees need it for reducing or closing of unwanted cracks in hive, smoothening and varnishing of comb cells and strengthening comb attachments.

### THERAPEUTIC APPLICATION OF PROPOLIS

Propolis is non-toxic antibiotic effective against all microbes (bacteria, viruses and fungi).

At a recent medical seminar, propolis antibacterial power was hinted to be able to surpass penicillin because microbes have been unable to build tolerance to propolis.

A French medical expert Dr. Ruiny Cnauvin noted that propolis has 100% killing power on bacteria and predicted that its introduction could one day abolish most drug related chemicals in the medical world.

**Gastro Intestinal Disorders:** Propolis has undergone a lot of research in different parts of the world, and the action of

propolis against some micro-organisms e.g. *Staphylococcus aureus* (bacteria), *Candida albicans* (fungus) and many more have been documented by Grange and Davey (1990). This activity aids propolis in healing wounds, ulcers, gum diseases and preventing abscess formation.

**Anti-Viral Activity:** Propolis exhibits this activity against herpes virus, which is difficult to treat; eczema; psoriasis; acne; allergies and other dermatological disorders.

**Anti-Inflammatory Activity:** Flavonoids of propolis reduce inflammation.

**Vascular Protector And Anti-Oxidant:** The flavonoids in propolis are also known to play a key role in strengthening capillaries. Propolis has been found effective in treating

blood disorders such as hypertension, arteriosclerosis and coronary disease.

**Anaesthetic Activity:** Propolis is used for local anaesthetic. In general, this activity allows propolis

to be a potent medicine in treatment of haemorrhoid, dental and gum diseases, burns, skin rashes, throat inflammation etc. Propolis has also shown to be helpful with painful periods as well as with vaginal infections and sores.

**Coughs And Influenza** Propolis has been found helpful in protection against colds, coughs and flu.

Propolis helps in reducing stress.

Ointments containing propolis are claimed to be good for the treatment of tonsillitis, virus influenza and lung tuberculosis.

Relief and apparent cures were also claimed in 1963 for tuberculosis patients who had been treated by administering butter containing 15% propolis.

Ref. Bees & Development. Proceedings of International Apiculture Congress. Apimondia Symposium

## WHERE TO GET QUALITY BEE



NATIONAL BEEKEEPING STATION BOX 34188 NAIROBI, TEL.NO. 564302

GATANZA ENTERPRISES BOX 20548, NAIROBI. TEL.NOS. 072-757598/81

MAKAMBU INVESTMENT BOX 30114, NAIROBI. TEL.NO. 0072-737882

HONEY CARE AFRICA, BOX 24487 NAIROBI, TEL.NO. 574448.

SITE BOX 34336, NAIROBI. TEL.NO. 718155/716099

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ICIPE P.O. BOX 30772, TEL. NOS.802501/03/57

# PRODUCTS

## LEISURE

### HUMOUR

BENSON W. NJOROGE

The following short quiz consists of four questions and tells whether you are qualified to be a "professional". The questions are not that difficult so don't cheat by looking ahead!

**Question 1:**

How do you put a giraffe into a refrigerator?

**Answer:**

Open the refrigerator put in the giraffe and close the door.

**This question test whether you tend to do simple things in an overly complicated way**

**Question 2:**

How do you put an elephant into a refrigerator?

Wrong Answer: Open the refrigerator put in the elephant and close the door.

**Correct Answer: Open the refrigerator, remove the giraffe, put the elephant and close the door.**

**This test your ability to think through the repercussions of your actions.**

**Question 3:**

The lion is hosting an animal conference. All animals attend except one. Which animal does not attend?

**Correct Answer:**

The elephant, the elephant is in the refrigerator. Remember?

**This tests your memory.**

OK even if you did not answer the first three questions correctly, you still have one more chance to show your abilities.

**Question 4:**

There is a river you must cross but crocodiles inhabit it. How do you manage?

**Correct Answer: You swim across. Why? All the crocodiles are attending the animal conference...**

**This tests whether you learn quickly from your mistakes.**

## CHILD PHILOSOPHY

BENSON W. NJOROGE

A first grade teacher collected well known proverbs she gave each child in her class the first half of a proverb and their insight may surprise you.

1. No news is.....impossible

2. Amiss is as good as .....Mr.

3. Love all, trust.....me
4. Strike while.....the bug is close
5. Never underestimate the power of .....Termites
6. You can lead a horse to water but.....How?
7. Don't bite the hand that.....looks dirty

8. You can't teach an old dog new.....maths
9. If you lie down with dogs you'll.....stink in the morning
10. The pen is mightier than the.....pig
11. An idle mind is .....the best way to relax
12. As rich as .....daddy.

## EXAMS AND EMOTIONAL STRESS

JAMES M. MURIUKI

Pupils sitting GSCE or A-Level exams in UK will soon be earning 'free' marks from emotional stress!

The Guardian reported that the Joint Council for Qualifications, the equivalent of our own exam council has drawn up new guidelines that aim to measure emotional distress and its impact on the pupil's exam performance.

Under the guidelines, if a pupil's cat dies on the day of the exam, the candidate is awarded 2 per cent extra marks.

A severe car accident or death of a distant relative merits 4 per cent! And if the candidate has recently broken up with her

boyfriend (Gosh!), she gets 3 per cent extra marks.

The most a pupil could get is 5 per cent for a recent family bereavement or terminally ill parent.

Some of the ethical questions that the proposal has elicited are whether some youngsters could arrange an unfortunate accident for their pet in an attempt to gain a few, though potentially crucial marks. What do you think?.

**Adopted from 'the Daily Nation'**

## PRAYER OF THE YEAR!

JOHNSON M. NDOLO

Heavenly Father, we pray for comfort and peace for those directly affected by the tragic events of the year. For those who lost loved ones we pray that you would become their refuge and source of strength. For the children who lost a parent, we pray that their hearts remain tender and receptive to your word. We pray for those searching for answers. Please reveal your truth and help us all to understand that apart from you, there is nothing. In Jesus name we pray. Amen.

## TEN WAYS TO WRECK WORK

JOHNSON M. NDOLO

- ❖ Arrive late, leave early and talk all day
- ❖ When you report late for duty, deliberately refuse to make up for the lost time.
- ❖ Swear to do everything and do nothing

- ❖ Never welcome or assist a visitor
- ❖ Never express an opinion in a meeting but wait until you get outside to complain bitterly
- ❖ Get all you can and give nothing in return.

- ❖ Threaten to resign if anything does not suit you.
- ❖ Never give work any thought

- ❖ Fail to listen carefully and ignore your boss.

## START WITH YOURSELF

JOHNSON M. NDOLO

The following words were written on the tomb of an Anglican Bishop in the Crypts of Westminster Abbey

“When I was young and free and my imagination had no limits, I dreamt of changing the world. As I grew older and wiser, I discovered the world would not change, so I shortened my sights somewhat and decided to change only my country. But, it, too seemed immovable.

As I grew into my twilight years, in one last desperate attempt, I settled for changing only my

family, those closest to me, but alas, they would have none of it. And now as I lie on my deathbed,

I suddenly realise, if I had only changed myself first, then by example I would have changed my family.

From their inspiration and encouragement, I would then have been able to better my country and who knows, I may even have changed the world.

## THE WORLD! A PASSING CLOUD

(1 Corinthians 7:23,31)

JOHNSON M. NDOLO

“What I mean, brothers, is that the time is short. From now on..... those who use the things of the world (use them) as if not engrossed in them. For this world in its present form is passing away”

No matter how many times I need there truths of God's words. I know I don't yet fully understand. I know our time is short, but I continually gain my identity and become engrossed in my toys. Father forgive me!

It is time we turn our hearts to God in true revival and do ALL as unto the Lord. We can no longer give our lives to what is temporary and passing away. It is time we unashamedly worship Him and follow where He Leads. It is time we draw close to His presence and remember the eternal.

**From the Weekly Bread Week.**

**CARTOON FROM OKINYI**

## FROM THE BEEKEEPING OFFICER

### THE UNEXPLOITED BEE

OKINYI B. P.

Weaver birds chatter in the nearby thorn trees as farmer Akite Ogutu, sandals sliding on the loose gravel underfoot, climbs uphill in the sweltering noon day heat of Kenya's Nyanza Province, taking visitors to see his bees. A few meters away, his wife Masliana Auma dutifully prepares a pot of "Uji" in a boiling pot hoping that her visitors will appreciate the sugarless stuff. "This is a very dry area for crops; he says" So we are keeping goats and beehives. There is one. He points up at a long dark wooden cylinder hanging from an acacia branch some nine metres high.

"We climb up at night, when the bees are asleep, and smoke the hive with burning branches. Sometimes they aren't all asleep and they try to sting us, but we smear our bodies with soil so they can't pierce through", he says.

"During a good season, I get a debe (18litres) of honey from this hive. A debe sells for Kshs900.00. One kilo goes for Kshs50.00 at the farm. This means I can buy one goat from the sale of one good harvest. But sometimes the bees run away (abscond) when it is dry and it takes long before they come back".



As famer Akite's visitors sit doen to enjoy Masliana's uji, more to please her than for hunger, 500 miles away, in Kenys's Eastern Province, Mzee Namwai Mwani of Kitui has dreceived visitors interested in Bee Farming. His brain is a rich store of information gathered over the 90 years he has lived on earth. He narrates to his visitors how little changed since the periods of his grandfather. Traditional beekeeping is as alive now as it was then. He complains of dwindling harvest, bee colony attacks by pests and predators, especially honeybadger, hive vandlism and lack enough bee forage during lean years.

Mzee Mwani and Mr. Akkite, like many beekeepers in Kenya share the same challenges, but their problems are far from unusual in Africa. Apiculture, as an acient craft using traditional hives, has been present in rural African life from time immemorial. So have a whole series of handicaps that make life difficult for those who harves honey – obstacles which agroforestry could play a significant role in overcoming.

Photo of agro  
forestry trees – bee  
plants

### COMMON PROBLEMS

According to J. Corner of the CARE-UGANDA Apiary Rehabilitation Project, writing in his 1985 paper "Apiculture and Bee Management Problems in African Countries", typical African beekeeping problems include "random occupation of hives; swarming, migration, and defensive (aggressive) behaviour". Indeed, the various races of Africa's honeybee, *Apis mellifera adansonii*, are notorious for their fierce, attack-prone temperaments – so much so that bees are a more frequent cause of injury in rural areas than any other type of wildlife. Their migratory habits – actually a defence mechanism evolved to deal with African drought; also set them apart from their more stay-at-home European cousins.

K. M. Phoke; of Botswana Department of Agriculture, notes in his 1985 paper, "The Development of Apiculture has been difficult (in Botswana), mainly because of a shortage of qualified personnel to extend and consolidate beekeeping among farmers. This situation has been aggravated by three successive years of drought, as a result of which colonies abscond, from hives because of starvation.

"Wild bee colonies are also scarce, and honey and beeswax production are low. Many beekeepers have been discouraged because they are faced also with the problem of vandalism. People destroy a/or steal colonies. Donkey chains are put on the hives, but these are often ineffective"

In Tanzania, according to D.V.N. Kihwele of the Serengeti Wildlife Research Institute, honey and beeswax productions are also hampered by a scarcity of young beekeepers, poisoning of bees by insecticides, lack of transport facilities, poor and not streamlined marketing systems and lack of proper protective clothing to guard against stings.

The potential rewards of beekeeping, however, are as great as the challenges Africa poses for it. Not only is there a market for honey – whose current average world retail price hovers around \$10.00 per litre. Beeswax is also in demand, along with a host of honey or wax-based secondary products, from processed sweets and condiments to cosmetics.

Perhaps equally important, particularly in an agro forestry context, is the effect bees have on both tree and field crops.

"There are large operations in the tropics devoted to producing sunflower oil, for example", says Dr. Michel Baumer, a range management and marginal lands specialist with ICRAF in Nairobi. "We know that if you place four well-managed beehives per hectare in a field of sunflowers, you obtain a rise in production of sunflower seed on the order of 15% to 20%. In addition, each seed will give up to 2-3% more oil. The presence of bees, and their pollinating activity, is solely responsible for it.

"This is taken advantage of regularly in France, the United States and all the developed countries, in the peach, apricot and cherry orchards of France's Rhone Valley, they place hives everywhere. It is estimated that bees boost fruit production from 10-20% across the board.

This potential has barely begun to be tapped in Africa. In Tanzania, for instance, it has been estimated that beeswax exports could be increased ten-fold if the country's forests and woodlands were properly exploited. Beeswax export figures from Africa could potentially rise above 3,000 tonnes, if resources were fully utilised. Tanzania's honey export totalled 467 tonnes in 1985 while the potential yield could be as high as 184,000 tonnes per year.

As the International Bee Research Association's N. Bradbear puts it: "Compared with temperate zone countries, and considering the land area, the favourable climate, season length and flora available, the tropics and

sub-tropics are not achieving their full potential for honey and beeswax production”.

Agro forestry, however offers some solutions based on the symbiotic relationships between bees, field crops and trees. Says Dr. Baumer: Woody perennials are important sources of nectar and/or pollen for honeybees, and bees are important as pollinators. A system that combines Apiculture and Agro forestry – **Apiforestry**, in other words – is therefore likely to improve the quality of life and the revenue of many small farmers who would harvest hive products and would also probably have better yields from their trees as a result of better pollination.

“By growing appropriate trees, the period when nectar and pollen are available (Honey-flow period) can be extended. Woody plants are generally preferred to herbaceous species for this purpose because they are less affected by moderate climatic variations. This is especially important in arid or semiarid zones.

## LOG HIVES HANGING IN AN ACACIA TREE

### PARADOXICAL SOLUTION

The secret of extending the period when flowers are available to bees, Baumer explains, is paradoxical. Best results are achieved by planting trees which are actually somewhat ill-suited to their environment. “If you plant trees that are well suited to an area, they’ll flower when all the other trees flower.” He says “But those which are not at their ecological optimum, which are slightly marginal to local conditions, will often produce their flowers at a different moment than their neighbours. Some trees under these conditions even react by producing more flowers than normal.

“For Example, *Eucalyptus gomphocephala* gives better results in some places in North Africa than on its native sandy plans of South Western Australia. There are tons of thousands of flowers on an adult eucalyptus, and each one of them provides work for several bees over several months. Even one tree thus represents considerable source of nourishment for a bee colony.” The popular agro forestry species *Grevillea robusta* is also know as a prolific producer of honey yielding flowers. A tree of great potential for dry land beekeepers is the so-called Apple Ring Acacia, *Faitherbia albida*, also called *Acacia albida*. For beekeepers in the Sahel Sudan, it has the advantage of producing flowers at the end of the rains – most trees here flower before or during rainy season – and it is the main source of nectar and pollen during the critical months. Increased planting of this species could possibly provide valuable bee forage.

Some botanists theorise that the Apple ring’s off-season flowering is the result of its having originally evolved to fit a different climate regime which disappeared from its present range thousands of years ago, leaving the tree attuned to no-longer existing conditions.

In Israel, when eucalyptus were introduced to an area where ecological conditions did not correspond exactly with their optimal requirements, but where an irrigation scheme provided a water source for bees, the foraging period of bees was extended by several months with excellent results.

Planting such *melliferous* (honey yielding) species could do much to alleviate some of Africa’s chronic Apicultural handicaps. Providing a water supply and extending the period when flowers are available as bee forage could significantly reduce colony migrations and absconding. It would also boost the total honey output of the colonies affected.

Simultaneously, the increased presence of bees could lead to better pollination of both tree and field crops and thus to greater timber, fruit and crop yields. The latter, along with honey yields, would bring farmers, like Akite and Mzee Mwani, increased cash income with which to purchase, among other household needs like sugar and food, modern beekeeping equipment.



A photo of well-managed apiary site e.g. that from Israel

Some Apiculturists theorise that an increase in well managed beekeeping activity could even help to dampen African bees' aggressive tempers, though the use of pheromones and other chemicals, or simply by habituating them over time to less drastic human interventions.

Finally, beekeeping is infinitely less harmful to the environment than improperly managed goat-herding, particularly in semi-arid regions where the ubiquitous African goat is often allowed to roam at will and browses vegetation to the ground, preventing sprouts and seedlings from regenerating land covers.

Of course, planting of multipurpose tree species, like the leguminosae, labiatae, compositae, combretaceae and malvaceae, as noted by Dr. T. C. Ngethe (1985). Won't ease all of the difficulties of African beekeepers. Improved extension programmes, organisation of cooperatives and training in the use of modern hives and hiving techniques are also required. So are the improved transport systems whose absence is conspicuous every where.

“But even these constraints may become more manageable if incomes – and the cash available to spend on equipment – grow as a result of using agro forestry species,” writes Tom Pawlick (2002).

## GOODS AND SERVICES OFFERED AT THE NATIONAL BEEKEEPING STATION

G O O D S		
I T E M	U N I T ( K S H S )	P E R
1. Kenya Top Bar Hive (unassembled)	1,600.00	One
2. Kenya Top Bar Hive (assembled)	1,650.00	One
3. Langstroth Hive	3700.00	One
4. One Catcher Box	750.00	One
5. Observation Hive	500.00	One
6. Top Bar	30.00	One
7. Feeder Box	170.00	One
8. Queen Excluder	150.00	One
9. Hive Tool	50.00	One
10. Bee Brush	20.00	One
11. Smoker	500.00	One
12. Solar Wax Melter	1,200.00	One
13. Bee Veil	470.00	One
14. Pair of Gloves	600.00	One
15. Coverall	1,300.00	One
16. Polyester bag coverall	400.00	One
17. Polyester bag veil	200.00	One
18. Honey Straining Cloth	250.00	One
19. Cotton Wax straining bag	100.00	One
20. Video tape	1,000.00	One
21. Bee Farming Hand Book	500.00	One
22. Beekeepers' Guide	1,500.00	One
23. Empty Honey Jars	15.00	One
24. Bees (live or dead)	2.00	One
25. Honey (Refined)	260.00	Kg
26. Comb Honey per kg	500.00	Kg
27. Honeybee colony sale	1000.00	Colony
S E R V I C E S		
a) Training Charges per week	2500.00	Person
b) Training of schools/institutions (per day)	500.00	One day
c) Honey Analysis Charges	1,000.00	Per sample
d) Assembling of hive	50.00	One
e) Refining Charges for Semi Refined Honey	7.00	Kg
f) Refining Charges for Raw Honey	10.00	Kg
g) Re-waxing of top bars (per top bar)	3.00	One
h) Packing Charges- Honey	1.00	Jar
i) Pollination charges/colony	2,000.00	Per colony
j) Honey Sales Charges	5.00	Jar
k) Beeswax Processing	5.00	Kg
l) Honey extraction/comb	10.00	Comb

Contact: The Officer-in-Charge,  
National Beekeeping Station  
P.O. Box 34188  
Telephone No.020-564302, NAIROBI