



HAND PRINT™
action towards
sustainability

The Buzz on Honey Bee Economics



A Share-Net Resource Book

Reading-to-learn curriculum materials to support
Social Sciences, Technology, Natural Sciences,
Economics & Management Sciences and Language learning areas



Acknowledgments

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Knowledge and activity support materials have been adapted from various sources including the Internet, and web addresses have been provided for readers to access any copyright materials directly.

For this particular resource book, a very big thank you to Dr Garth Cambray (PhD in Biotechnology) who gave us invaluable insight and fascinating stories about bees. Most of the knowledge resources were based on information that he shared with us. Thanks also to Jim Cambray for the use of his photograph.



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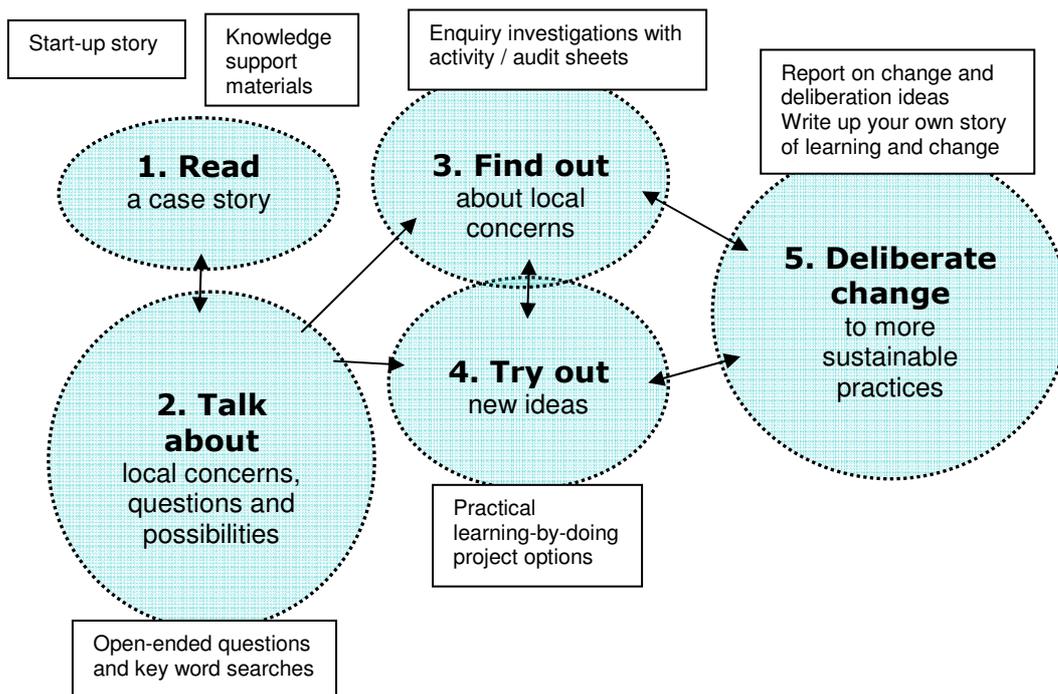
RESOURCE BOOKS

The **Handprint Resource Books** have been designed for creative educators who are looking for practical ideas to work with in the learning areas of the National Curriculum. The focus is on **sustainability practices** that can be taken up **within the perspective that each learning area** brings to environment and sustainability concerns.

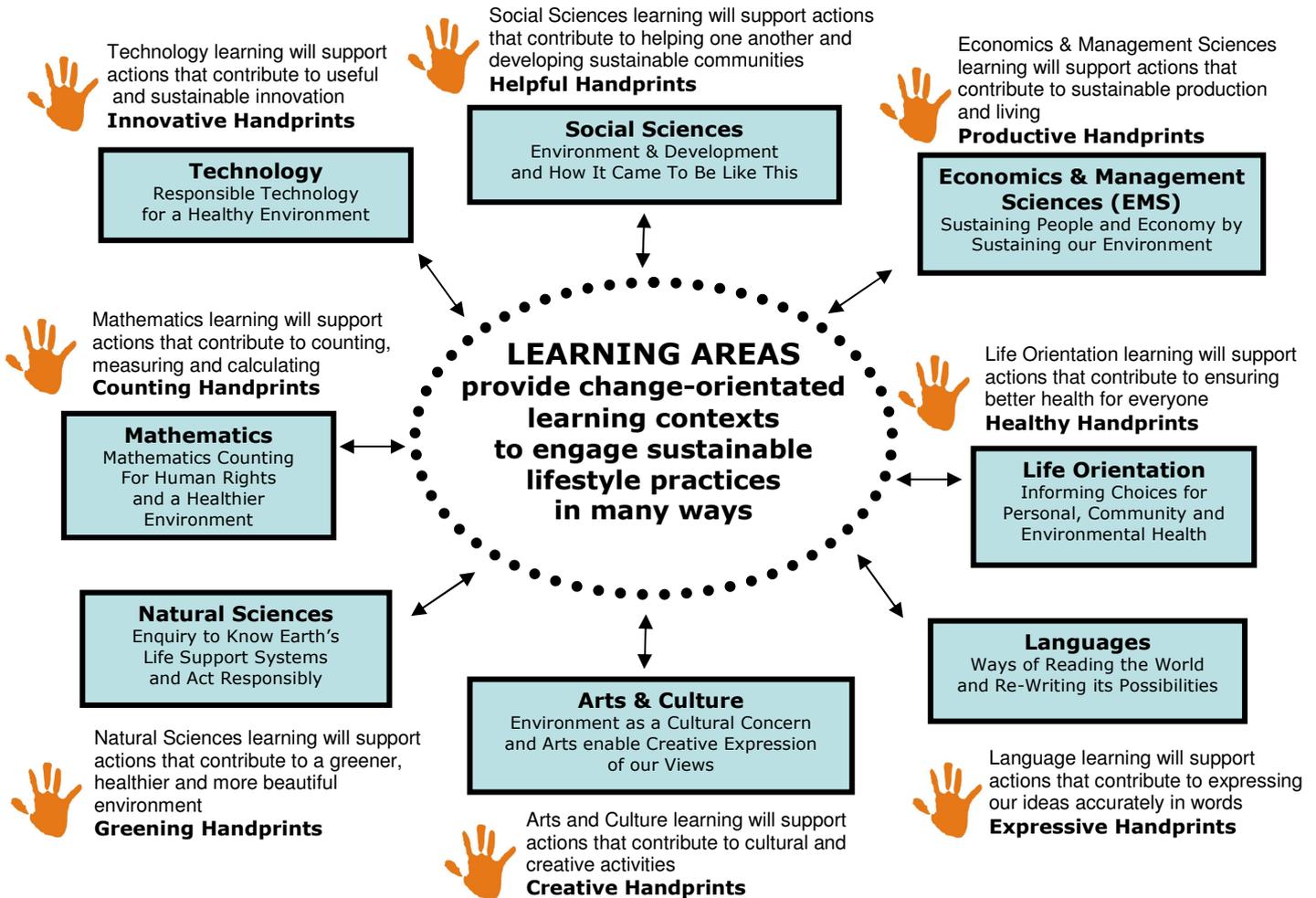
The resource books are intended to provide teachers with authentic start-up materials for change-orientated learning. The aim is to work towards re-imagining more sustainable livelihood practices in a warming world. Each start-up story was developed as a **reading-to-learn** account of environmental learning and change. Included are copies of the knowledge resources that informed those involved in the actual learning experiences described here. Working with local cases of learning and change has allowed us to develop the resource books around **locally relevant knowledge resources** and **practical learning activities** that relate to our African context. We are grateful to teachers and Eco-School support groups who have willingly shared their learning experiences and activities.

The **Handprint Resource Books** are an attempt to work from authentic cases of environmental learning and change. They combine some of the best teaching and learning tools that are being used to support change-orientated learning in the everyday realities of our South African schools. The resource books include:

1. **Start-up stories** with **knowledge support materials** (*Reading for information to build up a picture*)
2. Questions to **talk** about (*Talking to clarify issues and to plan local enquiry*)
3. Tools to **find out** about local concerns (*Writing about and reporting on local issues*)
4. Things to **try out** (*Writing up and reporting on what has been tried out*)
5. Ideas to **deliberate** (*Discussing, weighing up and recording decisions that will allow us to 're-imagine and re-write' our sustainability practices in a warming world*).



Change-orientated learning & the curriculum



The activities in this book can be used to support learning in the **Natural Sciences, Technology, Mathematics** and **Language** learning areas, and can contribute to the development of **Greening, Innovative, Counting** and **Expressive Handprints**.

Teachers should consult the learning outcomes and assessment standards and should adapt the activities to suit their grade requirements.

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Ideas and Tools for Local Learning

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The Buzz on Honey Bee Economies

Key words

Biodiversity economy Fermentation Mead Pollination Preserved Sustainable



You often hear talk on television about climate change and threats to the environment. It's always on the news. The news also looks at the economy and issues

of jobs and income. At school we recently started looking at the concept of the biodiversity economy in social sciences. This concept makes a connection between the health of an ecosystem and the health of an economy. I found this very interesting but I noticed this connection never seemed to be made on the news. Either the economy was discussed, or the environment, or else they were seen to be in opposition. However, what our teacher was telling us was that the natural environment is foundational to everything: both our society and the economy. A sustainable healthy economy is dependent on a healthy, sustainable natural environment because the earth supplies all we need to live.

For the next two weeks we each had to choose a topic to research that linked to the biodiversity economy. Examples we could choose from included rooibos tea, ecotourism, carbon sequestration, bees. I've always been fascinated by bees, ever since I'd learnt that they communicate to each other through special dances. And I love honey! I'd heard rumours that bee populations have been decreasing which threatens honey production and the pollination of plants. I therefore decided to research the link between bees and the biodiversity economy. I found out some very interesting stuff.

I am fortunate to live in Grahamstown, where a young scientist passionate about bees, has set up a business making mead from honey. A number of people I'd asked to guide me with this project, said that I **MUST** go and speak to him as he has some fascinating stories and is very knowledgeable about bees.

He worked a couple of kilometres out of town, but I convinced my mother that I could get there on my bicycle. The whole experience was fascinating. Garth showed me the huge tank where the honey is fermented, using the root of an indigenous succulent plant, which contains a lot of yeast. This converts the sugar in the honey to alcohol which creates the mead. Garth shared with me a wonderful story of how scientists think honey mead could have originally been made in South Africa. I tried to write down as much information as possible, but then Garth remembered that he'd written it up as an article, which he gave to me (**SM 1**). What I found particularly interesting was that honey doesn't ferment in its natural form because it is too concentrated. It will only start to ferment when diluted with water. Garth explained that many things are preserved by adding sugar. This is why jam can last a long time outside the fridge – it has a lot of sugar in it.

Garth then described many different bee products, including honey, pollen, bees wax and propolis. He gave me a web address to which explains these products in detail (<http://www.ighilika.co.za>). I downloaded this a few days later (**SM 2**). I learnt a new word – propolis. This is like a scab that plants produce when they get hurt to protect themselves from

things like bacteria. Bees are amazing – they collect these scabs and use them to fix cracks, paint the inside of the hive and keep out draughts.

A theme that Garth kept talking about was the importance of a healthy ecosystem to ensure that healthy bees which can therefore make all these products. The article, on the history of *iqhilika* that he wrote, also mentioned an ecosystem rich in biodiversity close to Oudtshoorn. This is an important reason why agriculture in the area flourishes. This is because the crops are pollinated by bees. I was amazed at Garth's knowledge, but I was also a bit fearful when he started talking about the importance of bees to modern agriculture and the threats that bees are currently facing. It seems to be very complex but if the bee population collapses, which is possible, then human society will have some very serious problems. Albert Einstein even believed that if bees die, then we humans only have four more years left to live. This is because bees pollinate about a third of the crops that we eat, including apples and avocados which I love. I did some follow-up research and cut and paste about a page of quotes that express the importance of bees to our society as well as the threats they are facing **(SM 3)**. I didn't know that in parts of China, the bee population has already collapsed because of the heavy use of pesticides. You now get 'human bees' who are hired to pollinate the pear blossoms by hand, using homemade

brushes. The cost, effort and time is enormous compared with when bees pollinate crops.

I asked Garth if there is anything that can be done. He said we can all do our bit: instead of being exploiters of the earth, we can rather be stewards who increase its fruitfulness. Our relationship with bees provides an excellent analogy. Garth described 'bee harvesters' as greedy thieves who take honey that isn't theirs and too much of it. This causes whole hives to collapse because there is not enough honey left to sustain the bees. Garth has started a project where he is teaching people to rather become 'bee keepers'. They use knowledge and skills to improve the productivity of the hive and take only the excess honey. He gave me an article he'd written that had been published in our local newspaper called "Bee harvesters to bee keepers" **(SM 4)**. I realised this is what we should all be doing. Instead of taking from the earth we should rather be using our creativity, capacity for knowledge, hard work and ability to care and enhance the fruitfulness of the earth. If this happens both humanity and the rest of life will be able to flourish.

Later that day when I spread some honey on my bread, I thought about the bees that had made this possible. But I also realised that the apple I would have after my honey sandwich and the vegetables for supper (and even

chocolate) was only possible because of the honey bee.



Glossary

Biodiversity economy: an economy that is directly based on the goods and services provided in the natural environment.

Fermentation: when the sugar in a substance is converted to alcohol through yeasts.

Mead: a traditional honey-based alcohol (fermented honey).

Pollination: fertilization of the future seed. This happens when the pollen from the male anthers is transported to the female stigma in a plant.

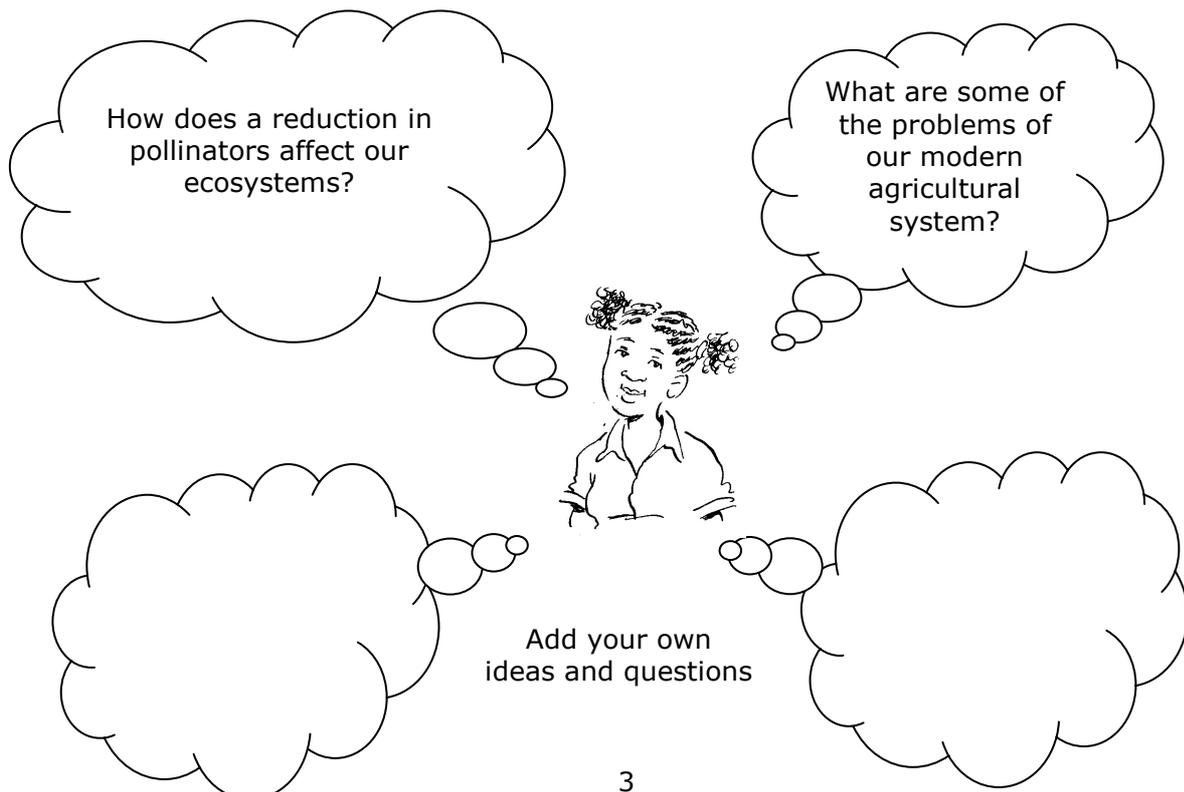
Preserved: something that is treated so it lasts a long time. Food is often preserved with salt or sugar.

Sustainable: something that is able to continue indefinitely into the future.

Comprehension Questions

1. What does both society and our economy depend on?
2. What did the indigenous succulent plant contain that caused the honey to ferment?
3. Why doesn't honey ferment in its natural form?
4. What are some of the products that bees produce?
5. How many of our crops do bees pollinate?
6. Did you find anything interesting about the history of early honey trade and *Iqhilika*? **(SM 1)**
7. What did you learn about products that bees make? **(SM 2)**
8. How important are bees to our society? What threats are they facing? **(SM 3)**
9. What is the difference between a bee harvester and a bee keeper? **(SM 4)**

Discussion Points



FINDING OUT ACTIVITIES

Activity 1: Using the Internet, books and/or common sense ask your learners to list all the wind pollinated plants (this will include grasses, grains and some trees) and then all the insect pollinated plants (including apples, almonds, pumpkins). This exercise will help learners realize how crucial insect pollinators are.

Plants exclusively pollinated by bees include: almonds, apples, avocados, blueberries, cranberries, cherries, kiwi fruit, macadamia nuts, asparagus, broccoli, carrots, cauliflower, celery, cucumbers, onions, legume seeds, pumpkins, squash, sunflowers, canola, rape seed, safflower, soybean.

Activity 2: This activity aims to find out about the relationship between pollination and the size of apples. The size of an apple is directly proportional to the amount of seeds inside and the larger the apple the higher the price they can be sold for. Seeds are formed from being pollinated. Therefore, the more times the apple has been pollinated, the more seeds it will have and the larger it will be.

The teacher should buy a variety of different sized apples. Classify the apples into large apples, medium apples and small apples. You could measure each apple to be very accurate. Then cut each apple into two and count how many pips each one has. From this information you could plot a graph that shows the rate of pollination (i.e. the number of pips in the apple) in relationship to the mass of the apple. You could take this exercise further by working out the price of the different sized apples and plotting this on a graph.

TRYING OUT ACTIVITY

An experiment to see how much carbon dioxide (the by-product of fermentation) is produced in honey when water and yeast are added.

Materials needed

1 plastic cup
Warm water (50° C)
Thermometer
1 teaspoon of honey
1 teaspoon of dry active yeast
Masking tape
Marker
Clock
Ruler
Measuring spoon
Jug

- Place a piece of masking tape on the cup vertically.
- Mark the tape with 1 cm measurements with zero at the bottom of cup.
- Place a thermometer in a jug and fill with tap water until it reads about 50 degrees Celsius.
- Fill the cup with warm water up to the 3 cm mark.
- Add 1 teaspoon of dry yeast to the cup of warm water.
- Add 1 teaspoon of honey.
- Stir ingredients with a clean teaspoon.
- Record amount in the cup; this is the 0 minute measurement.
- Record amount in the cup (including "foam") every five minutes.
- Record final amount after 45 minutes.



DELIBERATION IDEAS

To deliberate is to think carefully about, to consider, to discuss in a focused way, to weigh up and debate. Here are some ideas to support this process in your learners.

- Deliberate ways you and your learners can support environment friendly honey? You could use **SM 1** to introduce the theme.
- Deliberate ways learners can move from being bee harvesters (exploiters of the earth 'stealing' its bounty) to bee keepers (stewards of the earth increasing its fruitfulness).



HISTORY OF EARLY HONEY TRADE AND *IQHILIKA*

The history of early honey trade is set in a magical, unique, special part of our country – the red sandstone hills in Outeniqua. It's unique and special because it's the meeting point of three biomes: fynbos, succulent karoo and valley thicket. It's magical because the abundance of flowers from these three biomes at different times of the year means there is a year round supply of the liquid gold bees produce.

The Khoi San lived in this area, close to Oudtshoorn and would harvest this honey. Outeniqua in English means the land of the honey gatherers. When there was a surplus they would travel a hundred or so kilometres and trade it with the Xhosa further south. The backpack they would make to carry the honey was made from a springbuck skin, turned inside out. You can imagine the springbuck running through the veld would have picked up a number of different pollen grains on their fur. These contain yeast, which is a microorganism that causes things to ferment. Sometimes when the Khoi San were travelling down South, it would rain and water would enter the springbuck backpack and mix with the honey and pollen grains. Honey also contains a lot of yeast which isn't active when strongly concentrated. However, when honey is diluted the yeasts start to work and begin to ferment the honey.

When the Khoi San arrived at their destination the honey they were carrying would have turned into a delicious fermented drink. The sugar in the honey would have turned to alcohol. This drink would be more valuable to exchange with the Xhosa than ordinary honey. Imagine the first time this would have happened and the excitement people would have felt to discover this golden drink. This is how scientists believe *iqhilika*, the Eastern Cape local name for honey brew, was first made and discovered.

Today people are still maximizing this unique part of our country. The diversity of flowers, flourishing bee population and year long supply of honey has added value to the biodiversity economy. The biodiversity economy looks to optimize ecosystem services. In the modern economy there are now bee keepers who live in Outeniqua. For two weeks of the year they move the bees to Oudtshoorn to pollinate the lucerne fields. They then take their bees back to the richly diverse red sandstone hills and leave them to make honey for the rest of the year. Bees are thus supporting modern agricultural practices. However, this is only able to happen because a diverse, healthy ecosystem is allowed to flourish. From an ecological perspective bee keeping is thus a great way of deriving a livelihood as bees benefit rather than harm the local indigenous fauna and flora.

Reference

Interview with Dr Garth Cambray, PhD in Biotechnology, Rhodes University and owner of the Makana Meadery.



BEE PRODUCTS

Honey: Honey is a sweet sugary substance made from concentrated nectar from flowers. Flowers pay bees to help them get pollinated. The bees get paid with nectar which contains sugar. The proceeds of this activity are nectar and pollen which they take back to the beehive and convert into honey and bees. The honey is a concentrated sugar solution like jam or syrup which does not rot or ferment. It is stored in wax. Honey sealed into beeswax is called honeycomb. The beeswax keeps water out of the honey and that keeps it fresh.

Beeswax: Beeswax is a semi plastic wax made by the bees by mixing various secretions of special glands. It is produced by the metabolism of the bees and is very expensive to them in terms of energy used. Humans don't understand it and often sell the stuff for a lot less than it is worth. It takes the bees anywhere up to 13g of honey to make 1g of wax, hence beeswax should be at least 13 times more expensive than honey - it is normally only about twice as expensive. Beeswax is made and moulded by the bees. Two different secretions are mixed together and undergo complicated chemical reactions forming a strong, durable wax.

Pollen: The bees are a bit devious in their duties as dating agents to the flowers! Instead of using all the pollen produced by the flower to pollinate, they actually take most of the pollen and collect it. The collected pollen is packed into special pollen baskets on their back legs and taken back to the beehive. Here it is ripened, fermented and eaten, providing protein, vitamins, roughage and various other dietary ingredients to the bees. Those strange little yellow spots that appear on your car are what is left after the pollen has been used (i.e. bee poo).

This bee is gathering pollen and sticking its proboscis deep into the flower to suck out the sweet sugary nectar in the flower.



Photo – Jim Cambray

Propolis: Every time a plant gets hurt it produces a special scab, just like a person does, to keep the world out of the cut. If it did not do this, worms, bacteria, viruses, fungi and all the other scary things out there would pour through the cut and infect the plant, eventually killing it. The bees send special workers out into the wild and these workers find plant scabs and pull them off. They use the sticky medicine rich product made from these scabs to seal cracks, paint the inside of the hive and to make the doorway of the hive draught proof. Propolis is a useful human medicine, hence beekeepers gather propolis and then sell it to companies such as Colgate who put it in their toothpaste. The propolis in the toothpaste helps stop people's teeth rotting so that makes good business sense as they will buy more toothpaste.

Reference

Makana Meadery. Downloaded December 2008. A light hearted guide to beekeeping and bee products. <http://www.iqhilika.co.za/beekeepingguide1.htm>

IMPORTANCE OF BEES



TO MODERN AGRICULTURE & THREATS WE FACE

"If the bee disappeared off the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man." (Albert Einstein)

"Most crops—87 of the world's 115 most important ones—require pollination to develop fruits, nuts and seeds. Those crops account for about \$1 trillion of the approximately \$3 trillion in annual sales of agricultural produce worldwide. They also provide 35 percent of the calories consumed by humans each year, and most of the vitamins, minerals and antioxidants. Every blueberry, cherry, apple, grapefruit, avocado, squash, cucumber, macadamia nut and almond depends on the ministrations of a bee for its existence. Even crops such as lettuce and broccoli need insect pollination to produce seed for the following year's supply." (Jacobsen 2008)

"The honey bee is one of the most important pollinators known to man. Honey bee pollination is responsible for the growth of all fruits and many vegetables as well as livestock feed. It is estimated that bees pollinate 1/3 of American food and 3/4 of the plants, including crops, fruits, vegetables, seeds, nuts, even cotton that is used in fabrics. The value of the honey bee in United States crops alone is said to be about 15 billion dollars. The truth is that without pollination provided by the honey bee much of the food that we eat and now take for granted would disappear." (Smith 2007)

"The honey bee is now disappearing at a sudden and alarming rate (called colony collapse disorder). It is estimated that 24 billion bees have disappeared since Spring 2006. In the United States, up to 25% of the managed honey bee population has disappeared in twenty four states..... Scientists have no idea why millions of bees are abandoning their hives and flying off to die (they cannot survive as a colony without the queen, who is always left behind)." (Smith 2007)

"For 3000 years, farmers in China's Sichuan province pollinated their fruit trees the old-fashioned way: they let the bees do it. Flowers produce nectar that attracts bees, which inadvertently transfer sticky grains of pollen from one flower to another, fertilizing them so they bear fruit. When China rapidly expanded its pear orchards in the 1980s, it stepped up its use of pesticides, and this age-old system of pollination began to unravel. Today, during the spring, the snow-white pear blossoms blanket the hills, but there are no bees to carry the pollen. Instead, thousands of villagers climb through the trees, hand-pollinating them by dipping "pollination sticks"—brushes made of chicken feathers and cigarette filters—into plastic bottles of pollen and then touching them to each of the billions of blossoms." (Jacobsen 2008)

"The leading theory is that colony collapse is caused by a combination of viruses, pesticides, the parasitic varroa mite, drought and stress triggered by commercial colonies' overwork and poor nutrition." (Jacobsen 2008)

"Many of the negative factors affecting honey bees are born from the shift towards large scale agriculture. When most farms were small family affairs, pollinators would come from nearby wildlands. But the spread of industrial farming, increased use of pesticides,

and loss of habitat, led to declines in the role of wild insect populations such that they are now reported to account for just 15% of global crop pollination. In response farmers started to hire in honey bees to pollinate their fields, thus creating a market for pollination. Demand soon spawned an industry which today sees honey bees over exploited, plagued by parasites, exposed to pesticides, and ill adapted to the conditions they work in." (Benjamin & McCallum 2008)

"While a diversity of factors threatens the honey bee's wellbeing, the scientific community has yet to agree a single coherent theory explaining how bees are being killed.....(Probably) no single factor is entirely to blame. As many top researchers are now saying the global bee crisis is likely due to multiple factors acting in combination or apart." (Benjamin & McCallum 2008)

References

Benjamin, A. & McCallum, B. 2008. A World Without Bees. Review of this book by Cannell, E
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Jacobsen, R. 2008. Stung By Bees. NEWSWEEK <http://www.newsweek.com/id/141461/output/print>

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FROM BEE HARVESTERS TO BEE KEEPERS

In our relationship with bees you can either get bee harvesters or bee keepers. Bee harvesters do nothing to improve the productivity of honey, but rather just take honey from the bees. Honey can only be harvested to a certain point, after which the whole bee colony will collapse as there is not enough honey left to feed the bees. This can change whole ecosystems because bees are keystone species in flower dominated ecosystems. If you don't have bees you lose one of the main pollinators. This has happened in the Transkei. People were harvesting too much honey which significantly reduced the bee population. This changed the ecosystem from being an insect pollinated, flower filled landscape to a wind pollinated grassland. Garth Cambray, famous in Grahamstown for his honey projects, has a plan to change bee harvesters into bee keepers. He explains that bee harvesters are like thieves – they take what is not theirs and destroy ecosystems in the process. This will ultimately negatively affect them as they will no longer live in land that produces honey. Bee keepers are more like stewards. Using knowledge of how bee colonies work they can actually increase the production of honey. They then take the excess honey, like a commission and leave the rest for the bees. A look at the Iliqilika website that explains Garth Cambray's work (<http://www.iqhilika.co.za/beekeepingguide2.htm>) explained what beekeepers do.

"Beekeepers provide rental apartments and cluster housing to bees. These homes are called beehives and are designed to be better than wild real estate (as far as the bees are

concerned). Bees like to be close to flowers, hence beekeepers often move the beehives from one place where there are flowers to another, so that the bees always have work.

By working with the bees, beekeepers help the bees lead a better quality of life than if they did not have help. As a result they are able to make more honey, propolis and pollen. The beekeeper can then take a certain percentage of this as rental income in exchange for looking after the bees. If the beekeeper takes too much, the bees are being cheated and they will leave - and then the beekeeper is not a beekeeper as the bees have left."

This is a brilliant analogy for the two ways we can relate to the earth. We can either be exploiters, taking as much as possible and in the process destroy whole ecosystems. Or else we can use our God-given creativity, skills, and knowledge and increase the fruitfulness of ecosystems. If we do this, then both humanity and the rest of life is able to flourish. There is an inspiring concept that has come out of India – the ecological handprint. You may heard of the ecological footprint which is a measure of our destructive impact on the earth. The ecological hand print is much more positive being a measure of one's actions that make the world more sustainable. A challenge to all of us is let's move, step by step, from being bee harvesters to being bee keepers.

Reference

Cambray, G. Personal Communication, PhD in Biotechnology, Rhodes University and owner of the Makana Meadery



WHICH HONEY WOULD YOU CHOOSE?



1. Think about: The honey badger (or ratel) eats mice, reptiles and other small prey. It also breaks open beehives to get to the nutritious bee larvae. This can affect commercial honey producers. Although there are better and more humane solutions to this problem, some beekeepers poison or set traps for honey badgers. Every year, many badgers are injured or killed, and they are now becoming endangered. Would you buy honey from farmers who injure or kill honey badgers?



2. Think about: It is easy for commercial honey producers to make cost-effective badger-proof hives, instead of using poison or setting traps. They can make higher, sturdy stands that put their beehives out of the badger's

reach. Or they can use lower, tightly secured stands that cannot be toppled. The cost ranges from R30 – R200, depending on whether they are homemade or bought. Many "badger-friendly" beekeepers have been protecting their hives for decades. But a small number of beekeepers continue the illegal practice of trapping badgers.

Is the honey you buy badger-friendly?

For more info: Visit the website: www.honeybadger.com or e-mail Joan Isham at joanisham@bermar.co.za or Keith and Colleen Begg at ratel@iafrica.com.

Look out for these genuine badger-friendly logos: Only labels displaying the logos of the NGOs EWT, Green Trust, WESSA can be trusted.



Reference

Wise Buying Series. Produced in collaboration with the Rhodes University Environmental Education & Sustainability Unit.



NOTES



NOTES



NOTES



Handprint resource books available from Share-Net

TITLE	LEARNING AREAS COVERED (BROADLY)
 1. Reusing Shower and Bath Water	Language Natural Sciences Technology
 2. The Buzz on Honey Bee Economics	Language Natural Sciences Social Sciences Technology Economics & Management Sciences
 3. Have you Sequestered your Carbon?	Language Natural Sciences Technology Mathematics
 4. Did you Grow your Greens?	Language Natural Sciences Social Sciences Life Orientation Arts & Culture
 5. Clearing Invasive Weeds	Language Natural Sciences Technology
 6. The Secret of a Spring	Language Natural Sciences Social Sciences Life Orientation Technology Mathematics
 7. The Secret of the Disappearing River	Language Life Orientation Social Sciences Economics & Management Sciences
 8. Creative Garden Design	Language Natural Sciences Technology
 9. Recycling, Waste Reduction and Creative Re-use	Language Social Sciences Life Orientation Arts & Culture Technology Economics & Management Sciences
 10. Worming Waste	Language Natural Sciences Technology
 11. Growing Mother-tree Seedlings	Language Natural Sciences Technology
 12. Rooibos: a Biodiversity Economy at Risk	Language Natural Sciences Economics & Management Sciences

Many more Handprint resource books are in the planning stages. These resource books and many others for teacher educators and teachers are available electronically in pdf format on www.tessafrica.net. The Handprint resource books can also be downloaded from www.handsforchange.org.

The adaptive use of these resource books for educational purposes is encouraged. Anyone wishing to develop their own resource or adapt one, can contact Share-Net sharenet@wessa.co.za for a version in Microsoft Word.



HAND PRINT™
action towards
sustainability

This handprint is of a 10-year-old girl, Srija, from a school in Hyderabad, India, who was involved in a project taking action for sustainability. Her handprint can be taken as a symbol for positive action.

Increase your handprint. Decrease your footprint.

Human impact on the Earth has tripled since 1961 and our human footprint is now 25% bigger than the planet can support. In other words we are using 25% more natural resources and services than the planet can create and provide. The 'Ecological Footprint' is one way to measure what area of land and water the whole human population requires to produce the resources it consumes and to absorb its wastes, and we now need 25% more area than is available on the whole planet. This means that the planet is simply being damaged beyond what it can repair, and this cannot continue without causing very serious threats to all life, including our own.

Education is a key way to achieve the changes we need to live in a manner that the planet can support. Environment and Sustainability Education (an environmentally focussed approach to Education for Sustainable Development – ESD) is a move away from seeing education just as a means of producing the skills to carry on doing what we are doing. It develops the abilities needed to address the big issues affecting the planet, and builds the capacity in communities to make important decisions about their future. Environment and Sustainability Education calls for action.

The Handprint is one measure of Environment and Sustainability Education action. The idea is to decrease the human footprint and to make the world more sustainable. The Handprint is a new approach or 'tool' being developed by the Centre for Environment Education (CEE), in Ahmedabad India, with many partners across the globe. The purpose of the Handprint is to help measure **positive action for change** at different levels. We all need to decide **what we can do** at the individual, community, national and global level in order to increase our Handprint, and decrease our Footprint.

“Through our actions, we add substance and vigour to the quest for sustainable living.”

The Ahmedabad Declaration 2007: A Call to Action, 4th International Conference for Environmental Education



www.handsforchange.org