

# THE 'POLLINATION' DANCE - GETTING YOUR MONEY'S WORTH



*This extract serves to unpack the intensive year-long beekeeping management required to prepare for pollination as presented at the pollination webinar of 31 May 2022.*

Deciduous fruit, berry and seed plantings are expanding rapidly each year, driving the need for the beekeeping industry to expand at an even faster pace to service these industries.

Currently, an estimate of 100 052 pollination units are required for stone and pome fruit alone, and the impact of substantial growth in the berry industry cannot be over-estimated. The deciduous areas planted, amount to 54544 hectares of which 30% is stone fruit 70% pome. Apples, pears, fresh apricots, and plums account for 82% of the total stone and pome fruit planted, the majority of which is spread around the Western and Eastern Cape. Of particular importance is the industry's increasing reliance on pollination. The projected expansion in the deciduous fruit industry over the next five years will increase the number of pollination units needed to in excess of 110 000. As a highly regulated and legislated export-oriented industry, it is imperative that a value-chain approach with greater awareness around environmental sustainability be followed to ensure that the best possible quality product reaches the consumer. As part of this value-chain approach, proper pollination procedures, standards and beekeeping management practices have a significant role to play in sustaining the commercial viability of the stone and pome fruit industry.

Pollination standards are very necessary to ensure that both beekeepers and producers agree on practices which are acceptable, practical, and achievable simultaneously benefitting both parties. In South Africa, only honeybees are used as commercial pollinators. Fortunately, they are adaptable and easy to manipulate and manage. Honeybees constitute about 94 – 98% of all pollinators and are well-suited to their task. Their bodies are covered in fine hairs which develop static electricity attracting pollen grains. Bees need a balanced diet of nectar (carbohydrates) and pollen (proteins) and will only visit flowers for such a reward. Field bees are sent out to collect nectar and pollen which are 'tested and analysed' by the colony to decide upon its suitability. Some bees will forage for pollen and others for nectar. They can forage within an average radius of 3km for better sources of food, implying that they might ignore some nearby crops producing a poor quality or limited quantity of pollen and/or nectar. It becomes a challenge when moving hives between orchards within 3km since the bees will return to their previous location resulting in loss of workforce. Beekeepers generally work on a '40-day' rule in preparing the colony for pollination. It takes a worker bee around 18-20 days from egg stage to emerge as a fully formed bee and approximately another 20 days to mature as a field bee ready for foraging. There are several stages during the honeybee life cycle when the requirement for pollen is high.

- 1 Day three after the egg hatches until the larva gets capped (covered with a layer of wax) for its pupation - a period of about 5 to 6 days – is a critical stage during which the young larva is fed with pollen.

- 2 After 21 days the young bee emerges needing pollen as a protein source for further development.
- 3 Slightly older bees also require pollen to produce royal jelly which is necessary to feed young larvae.
- 4 Pollen is also needed to produce beeswax and some pollen is stored in the cells in the hive.
- 5 Some pollen is also consumed by bees and stored in the bee's body as fat for later use.

The older field bees rely on nectar as their major source of energy.

A good pollination unit comprises of:

- 1 a Langstroth-type hive with 9 or 10 removable, wired frames allowing for easy manipulation and monitoring. The wiring provides support to stabilise the wax comb on the frame particularly during transportation.
- 2 The hive should be able to be sealed to prevent 'leaking' of bees during transportation.
- 3 The hive should bear the DALLRD registration number of the owner.
- 4 A super chamber is not essential but careful consideration should be given to the conditions inside the hive. The colony needs to maintain a constant temperature of about 34.5°C inside the hive. Adding a super will create an extra space which the bees will need to keep warm. Conversely, a swarm confined to a small space can overheat and suffocate during transportation.
- 5 The colony must be in a condition which would allow them to forage normally within 24 hours after placement.
- 6 An active laying queen is essential for a good pollination unit. The main motivation for pollen collection is a substantial amount of open brood.
- 7 Monitoring of bee health is critical. The colony needs to be healthy with NO clinical symptoms of American Foulbrood (AFB) disease. A maximum of 50 cells per hive is allowed for Chalkbrood and European Foulbrood (EFB) disease and no more than 5 mites per 100 adult bees is allowed for Varroa mite. Small hive beetle is allowed to a maximum of 50 per pollination unit.
- 8 The average colony strength in any consignment (i.e. a load of pollination units being delivered) should be:
  - a at least 4 brood frames of brood in all stages of development, each of which must be covered 75% with brood or its equivalent.
  - b The hive should have at least 8 brood frames covered by calm bees

- c no more than 3 deep frames of stored honey and no more than 2 deep frames of stored pollen.
- d If a super is present, then it should have no more than 2 frames of honey.

Any surplus pollen and honey in the hive will limit the space needed for the queen to lay eggs.

- 9 Under no circumstances should the unit have less than 3 frames of brood or its equivalent or less than 6 brood frames covered by calm bees.

It is important to bear in mind that factors outside of the hive can affect pollination:

- 1 Rain and very cold temperatures limit the foraging activity of the bees.
- 2 Be mindful that fungal and foliar sprays negatively influence pollination and can also affect the bees. If spraying is unavoidable, use only according to the label. Consider ONLY doing this at night when bees are not foraging and by morning the chemicals would have dried and therefore be less harmful to the bees.
- 3 Monitoring bee activity during pollination forms part of good practice. This entails counting the number of bees leaving the hive per minute and whether the bees are working on the target crop or on alternative crops. This would necessitate counting the number of bees on the target crop. No scientific data is available for what these values should be, but the norm dictates that about 4 to 8 bees per tree and 60 bees leaving the hive per minute are acceptable. An important point to consider is the time of day when these counts are done. An early morning count will most likely yield a different result from an afternoon count, so reasonable caution should be exercised.
- 4 Some crops might be more difficult to pollinate than others and bees might have preference for some crops above others. Consideration should be given to environmental conditions such as the time the orchard starts receiving sunlight until the sun sets. This period will dictate the total daily time the bees have for foraging and could influence pollination to the extent that the same cultivar in a different position on the same farm could yield a different result.
- 5 Hive placement should be carefully considered outside the orchard in a way that allows for the sunlight to reach the hive as early as possible.

A good pollination unit can go a long way to ensure good fruit set and yield but within reason.

Environmental conditions, crop sprays, crop suitability to the bees, etc can influence the

effectiveness of pollination. The producer should have thorough knowledge of his/her crop, area, temperature conditions, yields, ease of pollination, etc. Building a history over time could assist in making better pollination decisions in the future which might include increasing or reducing the number of pollination units required per orchard.

Pollination is not good for bees; in fact, the unnatural moving of beehives to new locations stresses them out .



Providing an effective pollination service is not about just going to an apiary site, loading all the beehives, and dropping them off on a producer's farm. This type of cheap service will not ensure the kind of fruit set required for a good quality and quantity crop. On the contrary, providing pollination units to fruit producers each year is no easy feat. It takes experience, knowledge of bee behaviour, and a good measure of skill and hard work to navigate this mammoth undertaking.



Preparations for next years pollination season start immediately after this current season when producers need to spray their crop protection chemicals and we are required to remove our beehives from the pollination orchards to transit camps from where we later move them to summer sites. Our first challenge is to find sites with adequate forage to sustain the bees. Reliable bee forage is currently being mowed down at an alarming rate, forcing us to drive further afield to find alternative sites. Dwindling bee forage has made honey production 'a thing of the past'. Vandalism and theft add fuel to fire causing thousands of rands of damage each year further limiting once suitable apiary sites. Diverse nutrition is vital in keeping our livestock healthy. At great expense we are now feeding and supplementing our bees with artificial substitute diets for nectar and pollen throughout the year. The Western Cape summer ushers in another challenge in the form of veld fires which sees hundreds of beehives being destroyed annually. After the summer months we move our bees again; this time to healthy fynbos areas – those which have survived the summer fire season - where our bees will winter. We feeding continues during the winter months to sustain and keep our bees healthy and strong enough to protect themselves against pests and diseases. When flowering season starts again, they will be in peak condition to ensure effective pollination. Honey badgers/ratels pose a serious threat, especially in the winter months, breaking and destroying hives with absolute ease and necessitating considerable effort in protecting beehives from them.



What does it take to manipulate beehive colonies to meet the standards to provide a good pollination service? The Western Cape Bee Industry Association in consultation with experts has formulated a set of standards which guides what constitutes an effective pollination unit. These

standards create favourable conditions within the pollination hive to stimulate the need for large quantities of pollen which is used to mostly feed young bee larvae. A young larva needs 10 000 nurse bee visits during its entire development. Each larva is fed every 43 seconds with a pollen-based diet. It stands to reason then that we need many hungry bees and larvae in all stages of development to create the pollen demand that fuels the unintentional drive for bees to pollinate the fruit trees.



Canola flowers provides excellent nutrition for our bees. The incoming pollen and nectar will stimulate the queen to lay thousands of eggs per day resulting in large numbers of larvae in need of care. Achieving this takes considerable knowledge, experience and care. As the new pollination season approaches, we start moving all our beehives from various apiary sites to the canola fields. This is labour intensive and comes with exorbitant fuel costs. Identification of suitable locations around the canola fields entails consideration of, amongst others, the safety of people and livestock, as well as agro-chemical spraying. Communication is key to dealing with these critical issues. More than 2000 tyres are placed annually as hive stands to keep the beehives off the cold ground. Our exhaustive work in the canola includes feeding, disease inspection and treatment, equipment replacement and manipulation of colony strength until each unit satisfies the WCBA pollination standards. This intensive process requires 5 to 6 visits per beehive. Canola nutrition creates healthy bees, but it also makes them crazy, angry, and aggressive making it extremely difficult and dangerous to work with them.

Once our bee colonies are sufficiently strong and meet the standards, we add a super chamber to provide the extra space. This is needed to prevent swarming and overheating during transport resulting in the death of our bees caused by congestion and suffocation. We then tightly strap the beehives and close any small openings to prevent 'leaking' during transport and delivery for their pollination duties.

A grower needs to produce an equivalent of at least 80 tons/ha spread over his/her entire crop to remain sustainable in fruit production. Production costs on deciduous fruit average around R200 000/ha per annum. Pollination costs average around 1 – 2% for apples, 3 – 4% for pears and 5 – 6% for plums of the total annual input costs. Income generated on fruit bigger than 60mm is substantially higher and pollination has considerable impact on fruit size. There is a direct correlation between the number of seeds in a fruit and its size. The more seeds there are, the bigger the fruit; the better the pollination, the more seeds develop inside the fruit. The value of a high standard of pollination can never be overrated, yet many producers still claim that they can get away without pollination, relying largely on bees from neighbouring farms. It makes no financial sense to risk a R200 000 investment with the rental of substandard pollination units.

Average rounded costs to maintain one hive per year looks as follows:

Wages	R	390
Fuel	R	250
Hive replacement	R	80
Frame replacement	R	40
Feeding	R	144
Miscellaneous costs	R	119
Return on Investment (ROI)	R	138
<b>TOTAL</b>	<b>=</b>	<b>R 1161</b>

The WCBA has a pollination inspection service and can be contacted if there are any problems regarding pollination services or units.

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For more pollination information visit our pollination page - <http://www.wcba.co.za>