EXTENSIVE BEEKEEPING

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Intensive agriculture

It is commonly assumed that intensification of agriculture is the key to increasing profits. This is not always true. Let us consider the example of fish farming. As the density of fish in a pond is increased, the wastes increase, the oxygen levels fall, and the natural assimilative capacity of the pond cannot maintain the water quality. In a traditional, low density system the pond's natural biological productivity (algae, higher plants, zooplankton and bacteria) serve as biological filters that convert the wastes through natural biological processes. *Intensive* systems do enable large yields, but additional energy inputs in the form of labour, water exchange, aeration and feeds are all required to sustain these systems. There is a point where the incremental returns are not worth the additional inputs and risks, and 'Increasing the intensity of the system does not necessarily reflect an increase in profitability'[1].

In this article we argue that where natural environments can provide everything that honey bees require, *extensive* beekeeping is more profitable than *intensive* beekeeping. It will be more sustainable, more resilient and less risky. The resilience of an ecosystem is its capacity to return to its pre-condition state following a disturbance, including maintaining its essential characteristics, taxonomic composition, structures, ecosystem functions, and process rates'[2]. In this era of climate change and the globalisation of honey bee pests and diseases, resilience is a great benefit of *extensive* beekeeping.

How are *extensive* and *intensive* beekeeping different? There are many approaches to beekeeping: the least intensive methods differ little from how bees live in nature, while in the most intensive, many honey bee colonies are maintained in a single apiary, feeding and the application of medicines are the norm, queens are selected, bred and replaced annually, and bees are manipulated in various ways.

In this article we are considering the *extensive* beekeeping systems employed by the beekeepers living and working in the savannah woodlands of Central and East Africa[3,4,5,6]. The beekeepers disperse hundreds of locally-made hives in trees, wait for some of them to be naturally occupied by honey bee colonies, and subsequently harvest honeycombs (from which honey and beeswax are obtained) by breaking ripe honeycombs from those hives in which honey bees have established colonies. One accusation often levelled at this type of beekeeping is that colonies are killed during harvesting. This does happen, but not always. Even if it does, we argue that where honey bees and their habitats are still abundant, the wider population of honey bees is not harmed significantly. However we believe that it is now essential for beekeepers everywhere to always endeavour to harvest honey without harm to bees: careful harvesting of high quality honey and beeswax without harm to bees is of paramount importance.

Extensive and *intensive* beekeeping can be compared on a number of levels. Here we consider profitability and sustainability – where sustainability is the ability to endure and provide resources for future generations.

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The whole honey bee population, not just a single colony, lies at the heart of extensive *beekeeping*

A honey bee *colony* is one family of bees consisting of one queen, thousands of female worker bees, and a number (depending on the season) of male drone bees.

A honey bee *population* is the entire population of honey bees in any area, made of tens, hundreds or thousands of honey bee colonies.

Profitability

Every beekeeping system requires bee hives, labour for placing hives and harvesting, equipment for harvesting honey and beeswax, and buckets for storage. *Intensive* beekeepers will spend time and money also on management, manipulation, protection, feeding, disease control and queen rearing, whereas an *extensive* beekeeper spends little on these activities.

Considering the honey bee population as a whole

A conventional cost-benefit analysis can be applied to both systems but it is essential that the *extensive* system takes a population approach to the analysis and does not base calculations on a single colony: this consideration of the honey bee *population*, as opposed to a single honey bee *colony* lies at the heart of *extensive* beekeeping.

For *extensive* beekeepers, their production resource is the entire, local, wild, honey bee population living in their hives – and in those of their neighbours. Distinction between the wild population of honey bees, and beekeepers' bees, is a false one.

To tell an *extensive* beekeeper that their yield per colony is lower than that of an *intensive* beekeeper is an irrelevance.

Intensive beekeepers will count their unit of production as one, single colony – for example the National Agricultural Research Institute in Argentina worked out that each colony must produce at least 27 kg per year to give the beekeeper a profit[7].

The *extensive* beekeeper is utilising **the whole honey bee population** - or at least the part of the population that happens to be living in their hives at any one time. The *extensive* beekeepers' cost-benefit analysis will consider all their input costs and their income from the total volume of honey and beeswax sold. Harvesting from large numbers of hives involves considerable time and effort, and *extensive* beekeepers make their own judgements about likely returns from their labour. However, changing to a more *intensive* system incurs far greater costs (and other considerations) and may not be worthwhile.

Sustainability and healthy honey bee populations

There is much more to *extensive* beekeeping than just a positive cost-benefit analysis in the right environment. Other assets in every beekeeping system include the bees, their genetic characteristics, the means of population increase, and bee health. It is when considering these assets that we learn more about what 'taking a population approach' means and the sustainability of the system can be fully understood. Bee health is probably the biggest gain of the *extensive* system. Medication and control of honey bee health are nowadays major costs in *intensive* systems.

In an *extensive* system, the population increases through natural swarming. For this to work best, some colonies must be left undisturbed (unharvested) as *mother* colonies. This may require a deliberate decision on the part of the beekeeper, alternatively these mother colonies may be simply wild 'un-owned' colonies. Achieving increase through swarming is not only free but has many health implications too[8]. The strongest queens are selected naturally, while very weak colonies will not reach sufficient size for fission by swarming to take place and will therefore not be reproduced. Repeated building of new nests (whether necessitated through swarming, absconding or migration of honey bee colonies) works against the persistence of pathogens and, for example, where *Varroa* is present, the brood-free period caused by swarming breaks the *Varroa* population's growth cycle too. There is increasing evidence to show that the 'survival of the fittest' approach leads to *Varroa* tolerance[9].

In extensive *beekeeping a single hive (one colony) may seem to have low production, however each beekeeper will have tens or hundreds of low cost, low effort hives, and it is the total production from all of these which should be considered.*

By contrast, *extensive* beekeepers work to prevent swarming, instead using hive technologies to encourage bees to invest in honey production rather than reproduction. The honey bee ecologist Professor Tom Seeley of Cornell University describes that this approach undermines genetic fitness, explaining that "... the tendency of honey bee colonies in beekeepers' hives to refrain from colony reproduction and instead to stockpile several times as much honey as they need for winter survival. This shunting of resources into storage and away from reproduction benefits beekeepers,... but hurts the bees, whose genetical fitness would be greater if they concentrated more on reproduction and less on honey storage"[10].

Extensive beekeepers rely on the natural ability of their bees and the process of natural selection to remain healthy. They do not use medicines, they have no management control – so cannot check for diseases. They do not prop up ailing colonies. If a colony succumbs to an illness or weakness then an *extensive* beekeeper is likely to just let this happen. The outcome is survival of the fittest. This approach to bee health is free in terms of financial outlay. Some might argue that this is possible only where the bee population is relatively free from pests and diseases. However, we suggest that the coincidence of *extensive* beekeeping and healthy bees is not an accident of good fortune. In an in-depth analysis of the status of African honey bees one study concluded that the health and resilience of indigenous honey bees on the continent could be attributed to "beekeeping management (small *versus* large-scale), absence of breeding, high genetic diversity and .... less stress that allows honey bees to defend themselves against parasites and diseases"[11]. The *extensive* approach also **supports** bee health in the following ways:

- Less interference means less stress for the bees, enhancing their intrinsic ability to resist disease.
- No import and movement of equipment, no re-use of old combs, reduces the chances for beekeepers to maintain and spread honey bee diseases.
- The live and let die approach allows for natural selection and survival of the fittest – an important element when it comes to

tolerance of ubiquitous pests and challenges such as periodic drought and changing climate.

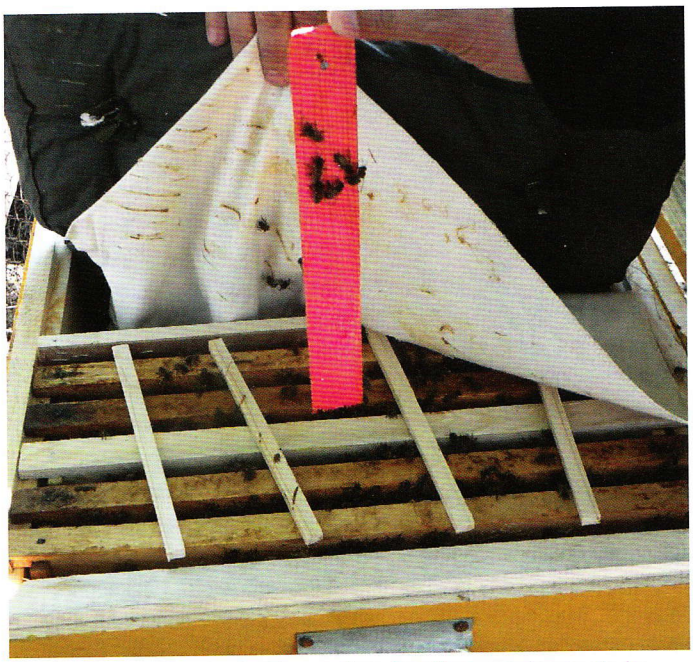
- Mimicking the natural way bees live also allows bees to adapt and use their own defence and survival mechanisms. For example, the siting of hives in trees copies the bees' own way of protecting themselves from ants and other predators. Accepting that tropical bees migrate seasonally and abscond when disturbed, maintains a healthy population. *Extensive* beekeepers accept that these defence mechanisms present certain challenges, but have learnt to adapt their management systems to incorporate these bee-derived defence mechanisms because they require no financial outlay, and are highly effective.
- The siting of bees well apart from other colonies also reduces the spread of diseases and reduces localised pressures on food and water. When discussing the incidence of *Nosema ceranae* on *Apis mellifera* in Chile, one expert on organic beekeeping commented: "part of [the] problem is related to the structure of a commercial apiary, with a considerable concentration of colonies which does not occur naturally"[12].
- The bee health benefits of swarming already mentioned above.

One quickly appreciates that *extensive* beekeeping is most viable where natural environments have not been degraded and population pressures (of the human kind) are not excessive. However, it must be noted that the *extensive* beekeepers of the savannah woodlands of Africa do not practice *extensive* beekeeping because somehow they are 'lucky'; the beekeeping systems they use serve to protect and maintain the resilience and health of honey bee populations.

To summarise, an *extensive* system is cost effective because nature provides many of the elements of the sustainable beekeeping system at no financial cost to the beekeeper. Like the fish system described above, a traditional, low density, *extensive* system is profitable because the costs are low, and much of the income is profit. Where this is the case – in many parts of Angola, Ethiopia, Mozambique Tanzania and Zambia, the existing traditional beekeeping systems (that are *extensive* systems) are highly sustainable, resilient and profitable.

The unique, resilient and sustainable characteristics of *extensive* beekeeping need to be more widely appreciated and understood, while the beekeepers who maintain these systems need to be encouraged in their work, and not constantly exhorted to 'modernise'. Truly modern beekeeping must be resilient, sustainable and financially viable: three characteristics of *extensive* beekeeping.

Intensive *beekeepers count each honey bee colony as their unit of production*



Medication and control of honey bee health are major costs in intensive *beekeeping*

References

1. Tilapia farming (2012). (accessed 15 May 2012) http://www.fishfarming.com/tilapia.html
2. HOLLING,C.S. (1973). Resilience and stability of ecosystems. *Ann Rev Ecol Syst* 4: 1-23.
3. FISHER,E. (2002). Beekeeping, livelihoods and rural development. *In* Strengthening Livelihoods; exploring the role of beekeeping in development. Bees *for* Development, Monmouth, UK.
4. FISHER,E. (1996). The social sustainability of beekeeping. *Bees for Development Journal* 39.
5. WAINWRIGHT,D. (1991). Forest honey in Zambia. *Bees for Development Journal* 39.
6. BRADBEAR,N. (2009). Bees and their role in forest livelihoods: a guide to the services provided by bees and the sustainable harvesting, processing and marketing of their products. *FAO Non-wood forest products No 19*. FAO, Rome, Italy.
7. GRAHAM,J.M. (ed.) (2010). US Honey crops and market. *American Bee Journal*. (Section on Argentina, page 440).
8. HAVERSON,J. (2012). Swarming bees are healthy bees. *BBKA News*. April: 16-17.
9. MANRIQUEZ,A. (2010). France a *Varroa* challenge. *ApiNews*. 02 November 2010.
10. SEELEY,T.D. (1985). *Honeybee ecology; a study of adaptation in social life*. Princeton University Press, USA.
11. DIETEMANN,V.; PIRK,C.W.W.; CREWE,R. (2008). Is there a need for conservation of honeybees in Africa? *Apidologie*: 40 (3).
12. BEES FOR DEVELOPMENT (2010). Organic beekeeping – a discussion (contribution from Ulrich Broker). *Bees for Development Journal* 96.