

# High altitude Beekeeping: Experiences from Nepal

## 高海拔養蜂：尼泊爾借鏡

Lekhnath Kafle, PhD (卡雷納)

帶農業暨國際合作系, 國立屏東科技大學, 屏東, 台灣

Hari B. KC, PhD

尼泊爾政府農業和畜牧發展部, 加德滿都, 尼泊爾



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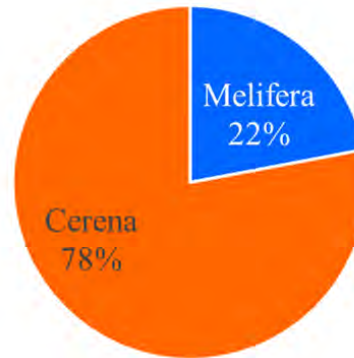
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# 1. History of beekeeping

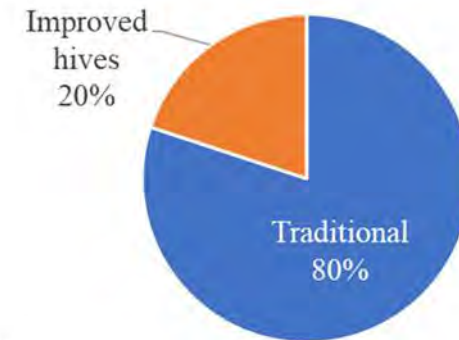
- 1968: First training on beekeeping through by Dept. of Cottage Industry and Remote Area Development Committee, Government of Nepal.
- 1975: Vocational Entomology Section established to look after beekeeping and sericulture.
- 1978: *Apis mellifera* introduced but unsuccessful possibly due to infestation by the parasitic mites *Varroa jacobsoni* and *Tropilaelaps clareae*.
- 1978-1990: Commercial beekeepers imported *A. mellifera* because of greater productivity and to overcome problems with Thai sacbrood virus in *A. cerana*.
- 1980: Beekeeping Development Section created to provide training and extension.
- 1990-1992: 200 colonies of *A. mellifera ligustica* introduced from Kashmir and northern India. Formic acid or sulphur dust were applied to control mites.

- *A. mellifera ligustica*: Performing well in tropical parts of the country but did not do well in the hills and mountains.
- *A. mellifera carnica* and *buckfast* bees have also been introduced but they also did not perform well in the hills and mountains.
- At present, 275000 beehives and 5000 MT honey production per year.

Beekeepers: 5150  
Districts: 32



Composition of bee hives in Nepal

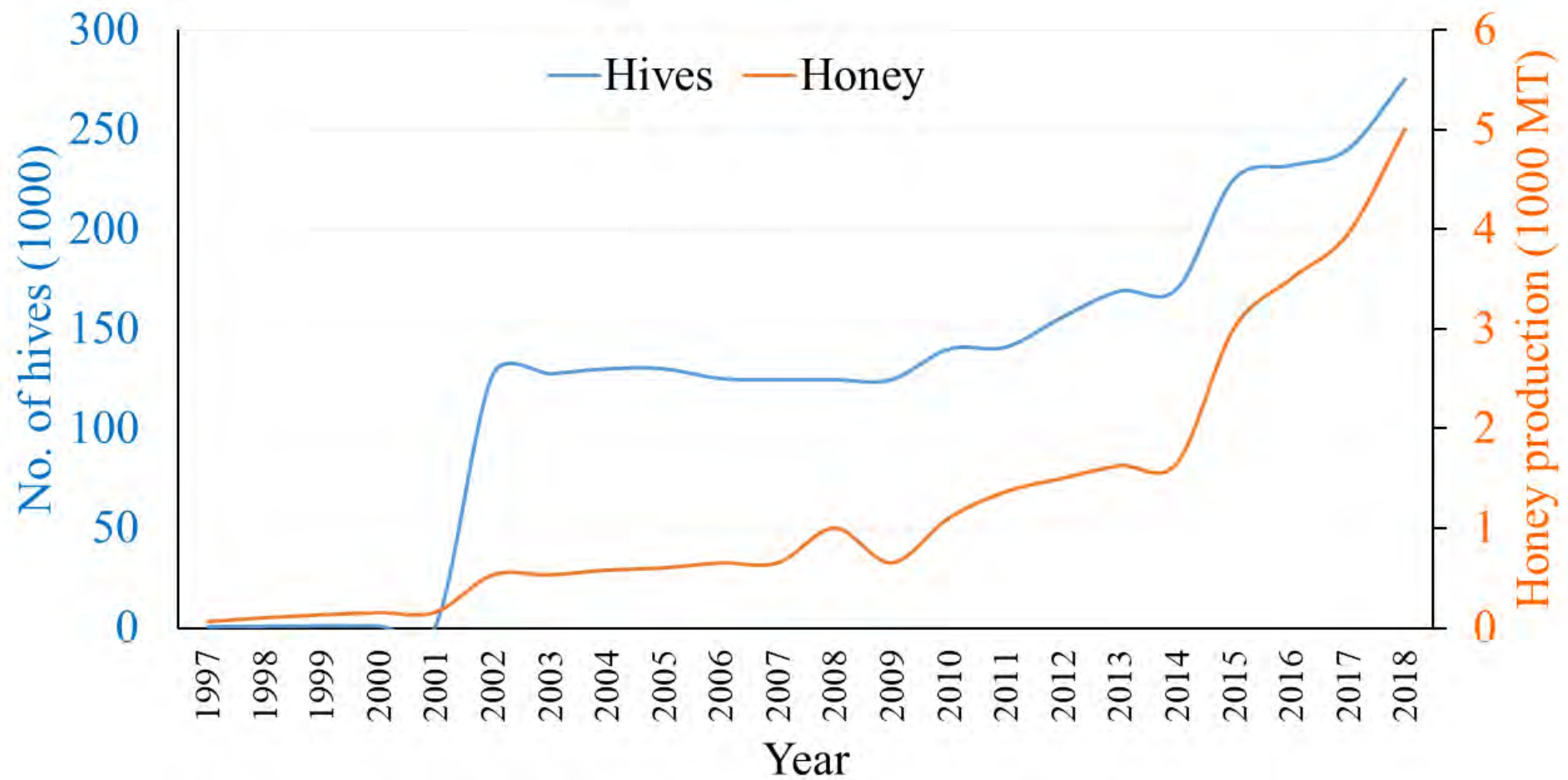


## Honey types (Based upon nectar sources)

1. Buck wheat (*Fagopyrum esculentum*)
2. Mustard ( *Brassica nigra*, [\*B. juncea\*](#), [\*B. hirta\*](#))
3. Rudhilo ([\*Pogostemon benghalensis\*](#))
4. Chiuri (Indian Butter tree) (*Diploknema butyracea*)
5. Litchi (*Litchi chinensis*)

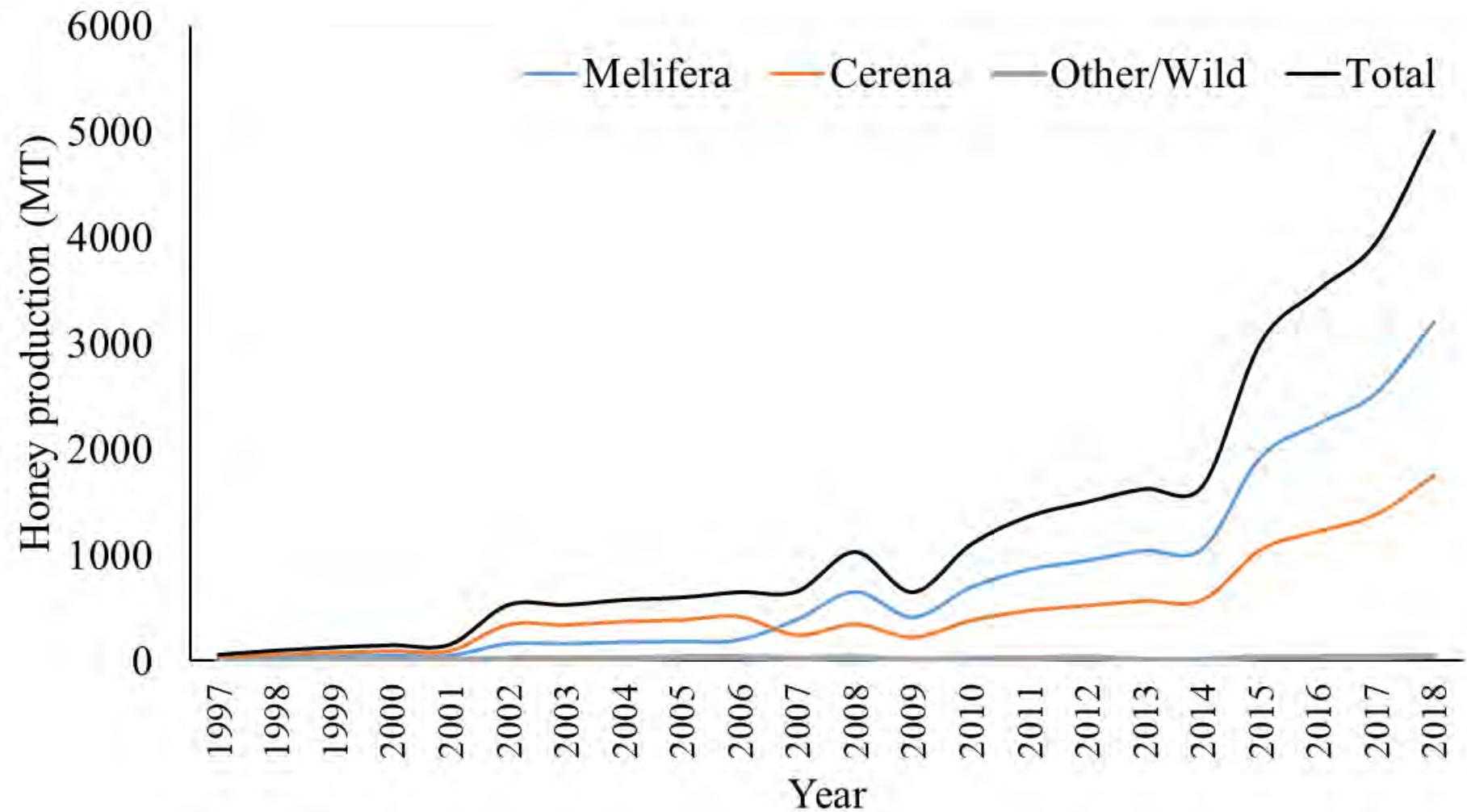
## Nepal honey (\$/kg)

- Farmer's price: 2 - 3 \$
- Collector's price: 3.2 - 3.6 \$
- Processor's price / Trader's price: 4 - 6 \$
- Exporter's price: 6 - 8.5 \$

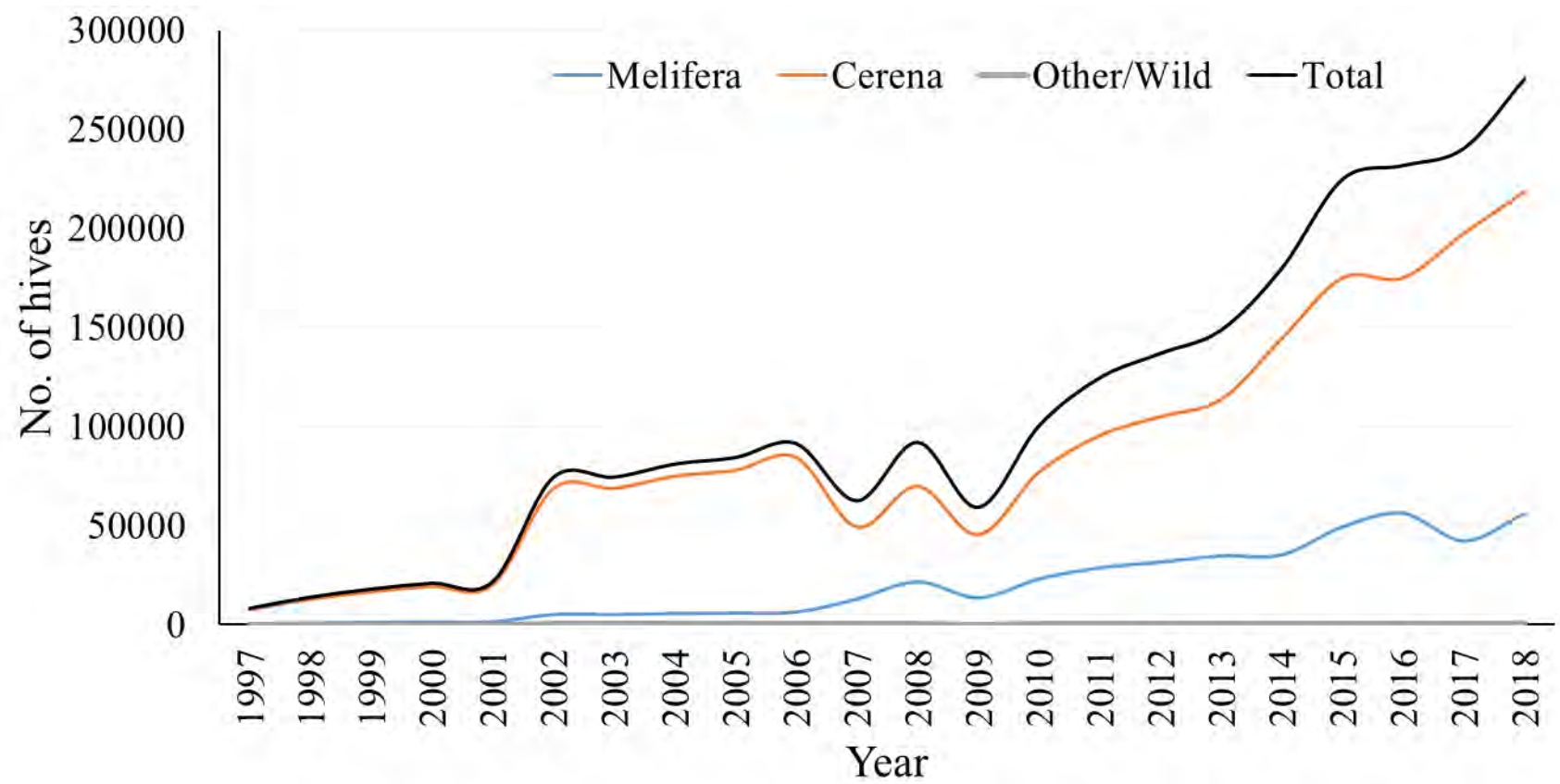


## Number of hives and honey production

Anonymous (2017)



**Honey production by cerana and melifera**



**Beehives of cerana and melifera**



## 2. Bee diversity in Nepal

*A. cerana indica*



*A. cerana cerana*



*A. cerana himalaya*



*A. dorsata laboriosa*



*A. dorsata dorsata*



## *Apis dorsata laboriosa* (Himalayan cliff bee )

Himalayan cliff bee is the largest honeybee of the world which bears only a single large colony at open space and is native to Nepal.

Distribution: 1500 - 3600 m (forages at up to 4100 m).

Productivity: 25 - 60 kg/Year.



Allen (1995), Otis (1996), Joshi *et al.* (2004), Gurung *et al.* (2012), Panthi (2013), Pokhrel *et al.* (2014)

<https://wiki.nus.edu.sg/display/TAX/Apis+%28Megapis%29+dorsata+-+Common+Giant+Honey+Bee>

## *Apis dorsata dorsata* (Giant honey bee )

A giant honey bee is native to Nepal with a single large comb at open place built on tree, buildings and water tanks. *A. dorsata* colonies seasonally return to the same old nesting sites.

Distribution: 190 - 1350 m

Productivity: 5-50 kg/Year



Three honey bees (worker). From left: *A. dorsata*, *A. cerana*, *A. florea*. © 2016 Z. Y. Tan

<https://wiki.nus.edu.sg/display/TAX/Apis+%28Megapis%29+dorsata+-+Common+Giant+Honey+Bee>



फोटो ३. खाग मोरीका गोलाहरू

Allen (1995), Thapa and Wongsiri (2011), Thapa (2012), Pokharel (2010), Pokharel *et al.* (2012), Panthi (2013), Gurung *et al.* (2012), Kafle (2011)

## *Apis cerana* (Asian honey bee)

A part of the natural heritage of mountain communities

Distribution: up to 3500 m

Productivity: 8-20 kg/Year

*A. cerana indica*



Plain & foothills

*A. cerana cerana*



Jumla region

*A. cerana himalaya*



Hills

<http://www.icimod.org/?q=1509>

<http://www.atlashymenoptera.net/page.asp?id=238>

Joshi (2002), Thapa *et al.* (2000), Gurung *et al.* (2012), Allen (1995 )



*A. dorsata dorsata* (left) and *A. dorsata laboriosa* (right). © 2016 Z. Y. Tan

## *Apis florea* (Dwarf honey bee)

Single comb species at open areas and nests in bushes. It is efficient pollinator of crop and natural flora.

Distribution: up to 1200 m

Productivity: 1kg / year with high medicinal value



Joshi (2002), Thapa *et al.* (2000), Gurung *et al.* (2012), Allen (1995 )



## *Apis mellifera* (European honey bee)

Introduced in 1990s. It builds multiples parallel comb. With introduction of this bee commercial beekeeping was started in Nepal. More susceptible to diseases and parasites.

Distribution: up to 1500 m but it need migration to plain area during winter season.

Productivity: 28 - 40 kg/Year



## Characteristics of four different domesticated honey bees of Nepal

Species	Size	Proboscis (mm)	Forewing (mm)	Comb frames	Honey (kg/year)	Pollen (kg/year)	Wax (kg/year)
Indica	Smallest	4.58-4.78	7.42-7.78	3-5	10-15	1	0.5
Himalaya	Medium	5.14	8.03	5-8	20	1.5	0.8
Cerana	Bigger	5.25	8.63	8-10 (16)	30 (90)	1-2	1
Melifera	Biggest	6.3-6.6	9.21	16-20	50 (150)	3-3.5	

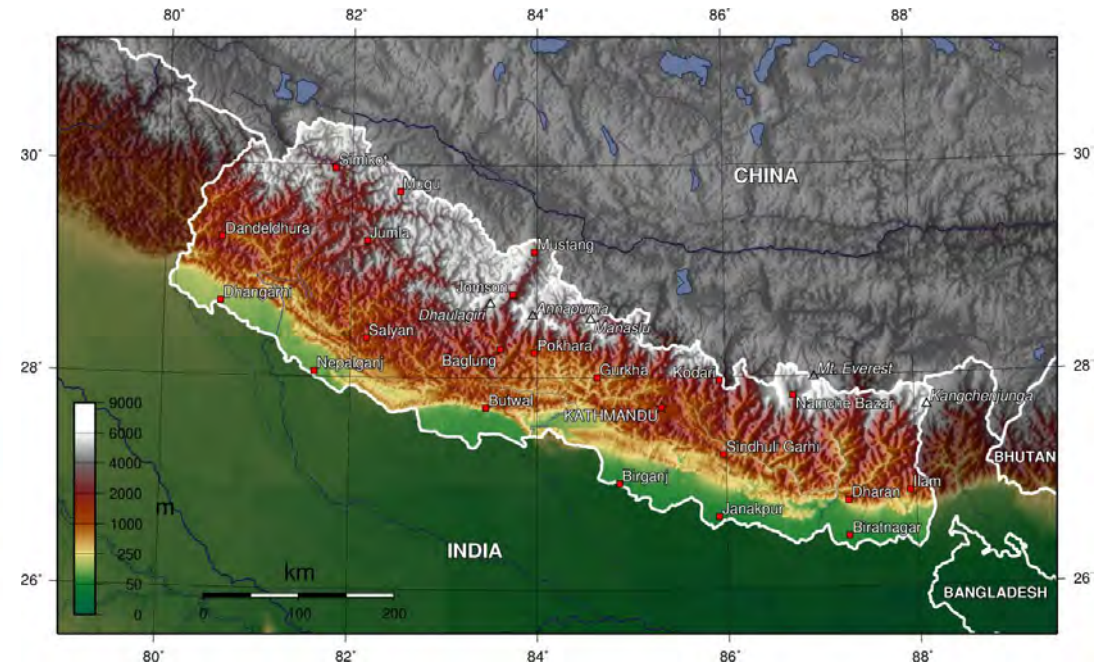
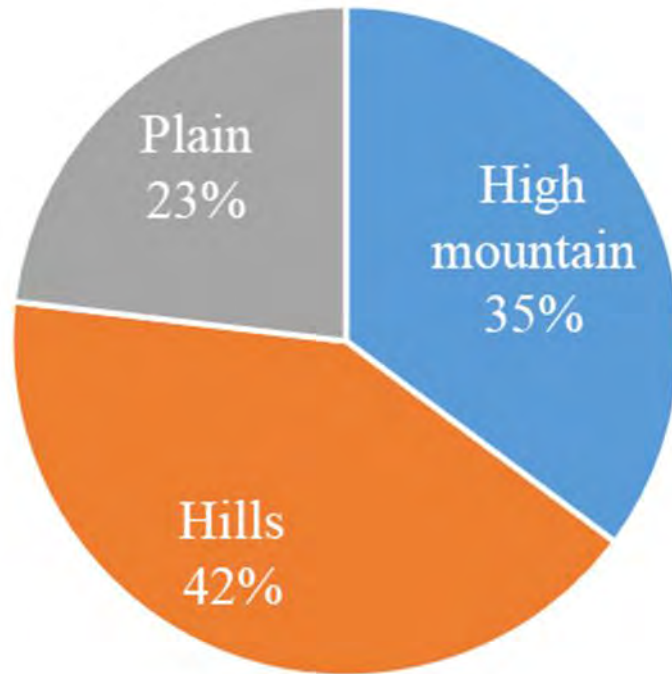
Abrol (2010)

<http://www.beesfordevelopment.org/media/2847/honeybee-species-diversity-in-chinese-himalayas.pdf>



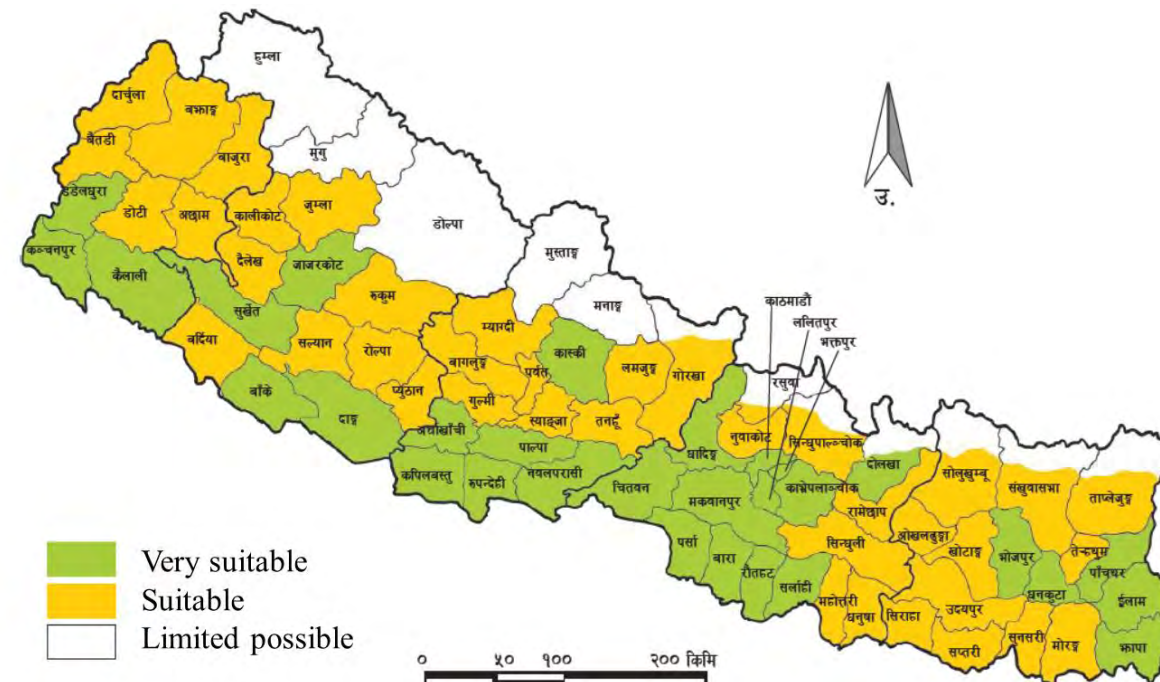
# 3. Beekeeping in high mountains

Allen (1995), Saville and Upadhaya (2002), Pudashaini (2018), Thapa *et.al* (2018)



Ecological zones of Nepal

# Bee zones



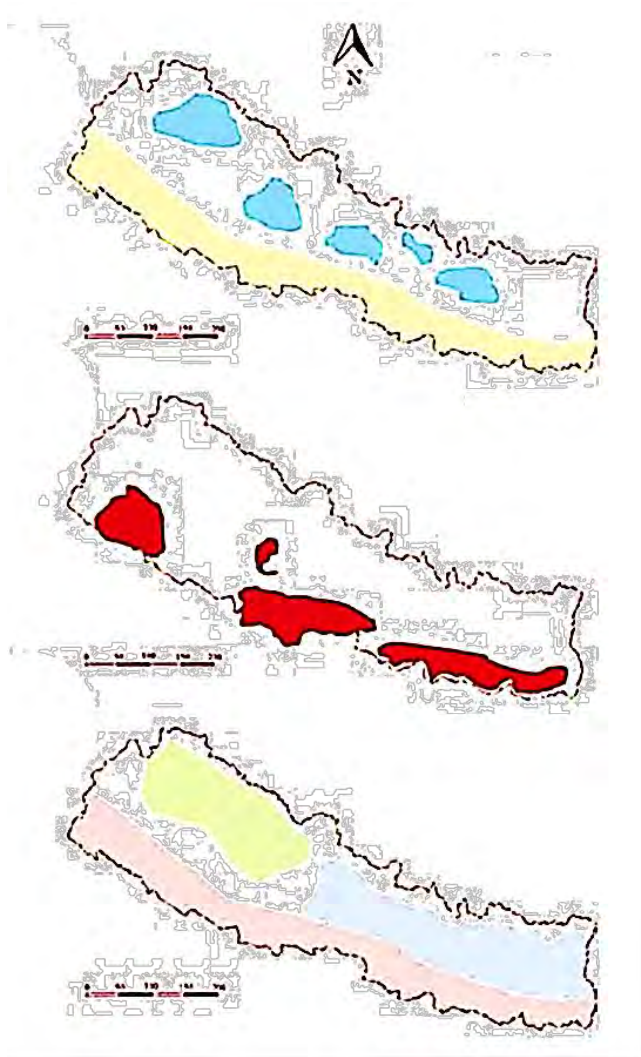
5150 beekeepers from 32 districts



**FEDERATION OF BEEKEEPING NEPAL**







*A. dorsata dorsata*  
 *A. dorsata laboriosa*

*A. florea*

*A. cerana himalaya*  
 *A. cerana cerana*  
 *A. cerana indica*



## Distribution of native honey bees in Nepal

Aryal *et. al* (2018)

### 3. Cerana bee keeping

#### Jumla

Altitude: 1,500 -7,300 m.

Weather goes bellow 0°C

- *A. cerana* can survive in low temperatures ( $<0^{\circ}\text{C}$ ) because their beehives (log hive) can protect themselves from the cold.
- *A. cerana* is resistant to *Varroa destructor*.
- *Cerana* bee keeping does not require a lot of management like sugar feeding, disease control and migration.
- Local people's own indigenous knowledge on *Cerana* beekeeping.

Allen (1995), Saville and Upadhaya (2002), Thapa *et.al* (2018)

### 3. Cerana bee keeping

- Several mountain communities are lacking of physical infrastructures. Migratory beekeeping with *Mellifera* becomes highly expensive, vulnerable and high-risk activity.
- Stationary beekeeping with *A. cerana* fits well in these circumstances.
- Farmers from high altitude areas usually do not have land for rice growing.
- They sell honey to buy rice, other grains and stuff.
- Beekeeping is a major income sources for beekeepers.

## a. Hives

- Traditional hives
- Modern hives



## i. Traditional log hives

66.75 cm long x 30.2 cm breath (dry hollow log from the ends), closed with circular wooden plates and plastered with a mixture (3:1) of red soil and dried rice coats.



<http://ai.stanford.edu/~latombe/mountain/photo/nepal-2017/nepal-2017-1.htm>

Simikot, 2,910 m



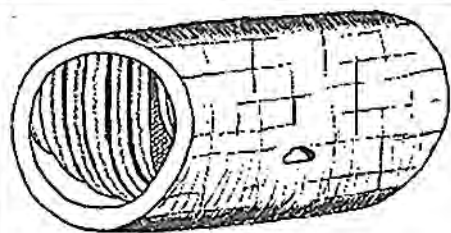
<http://4.bp.blogspot.com/-Jdx8XiOBL78/VEfXPQqcC6I/AAAAAAAAAX4/PhohMA8tiYQ/s1600/DSCN2452.JPG>



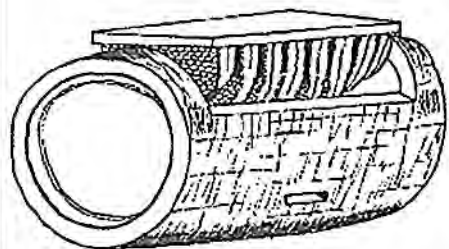
<http://www.fnbk.org.np/>

Thapa *et al.* (2018)

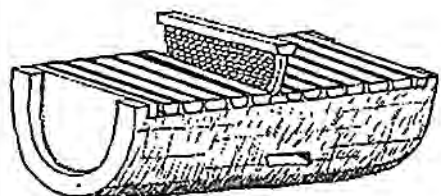




सग्लो मुढे घर



मुढेघारमा सामान्य सुधार



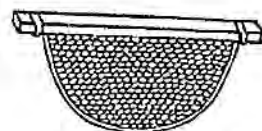
मुढेघारमा शिर्षबाराको प्रयोग



मुढेघारमा छाउरा र  
भण्डार कक्षको व्यवस्था



मुढेघारको चाका अड्याउने फ्रेम



मुढेघारमा चोयाको  
आधारमा चाका निर्माण

चित्र नं. ४७ : मुढे घरमा सुधार



Kafle (2011)

## i. Traditional log hives



Himalica village, Taplejung, 1400 m

<http://www.icimod.org/?q=21585>

## ii. Wall hives

- 45 × 45 cm and 30 cm deep, usually constructed on the second floor.
- A flat piece of wood, ~5 mm thick, is fixed on the ceiling to provide support for combs construction. The inner surface is varnished with red soil.
- The rear end is used to harvest honey.
- In mid and high hills, where the temperature drops  $<0^{\circ}\text{C}$  in the winter, house wall hives are frequently used.
- This type of hive are not common in tropical or sub-tropical areas.





[https://www.google.com/imgres?imgurl=https%3A%2F%2Fwww.evacranetrust.org%2Fimage\\_cache%2F8%2F9%2F1%2F2%2F2%2F89122eef4e9e8dd1a89d77bb36036c4fc4f2372f.jpg&imgrefurl=https%3A%2F%2Fwww.evacranetrust.org%2Fgallery%2Fnepal&docid=FjDLZgTAYFq4zM&tbid=jeR111EadSrdQM%3A&vet=10ahUKEwi4j-Kp9Z3lAhXEGaYKHSvoDSkQMwhSKAUwBQ..i&w=300&h=300&safe=active&bih=722&biw=1536&q=wall%20hive%20in%20nepal&ved=0ahUKEwi4j-Kp9Z3lAhXEGaYKHSvoDSkQMwhSKAUwBQ&iact=mr&uact=8](https://www.google.com/imgres?imgurl=https%3A%2F%2Fwww.evacranetrust.org%2Fimage_cache%2F8%2F9%2F1%2F2%2F2%2F89122eef4e9e8dd1a89d77bb36036c4fc4f2372f.jpg&imgrefurl=https%3A%2F%2Fwww.evacranetrust.org%2Fgallery%2Fnepal&docid=FjDLZgTAYFq4zM&tbid=jeR111EadSrdQM%3A&vet=10ahUKEwi4j-Kp9Z3lAhXEGaYKHSvoDSkQMwhSKAUwBQ..i&w=300&h=300&safe=active&bih=722&biw=1536&q=wall%20hive%20in%20nepal&ved=0ahUKEwi4j-Kp9Z3lAhXEGaYKHSvoDSkQMwhSKAUwBQ&iact=mr&uact=8)

## Seven wall beehives, Humla, ~3000 m

<https://images.app.goo.gl/GHxErQrNoEC99QQBA>

## Modern beehives

- The Newton hives are commonly used for Cerana bee keeping.
- Newton type-A: Higher hilly areas
- Newton type-B: Low land
- The Newton type-A hive is smaller than Newton type-B.

## Top bar hive

Introduced in 1980 but fail to keep *A. cerana*.

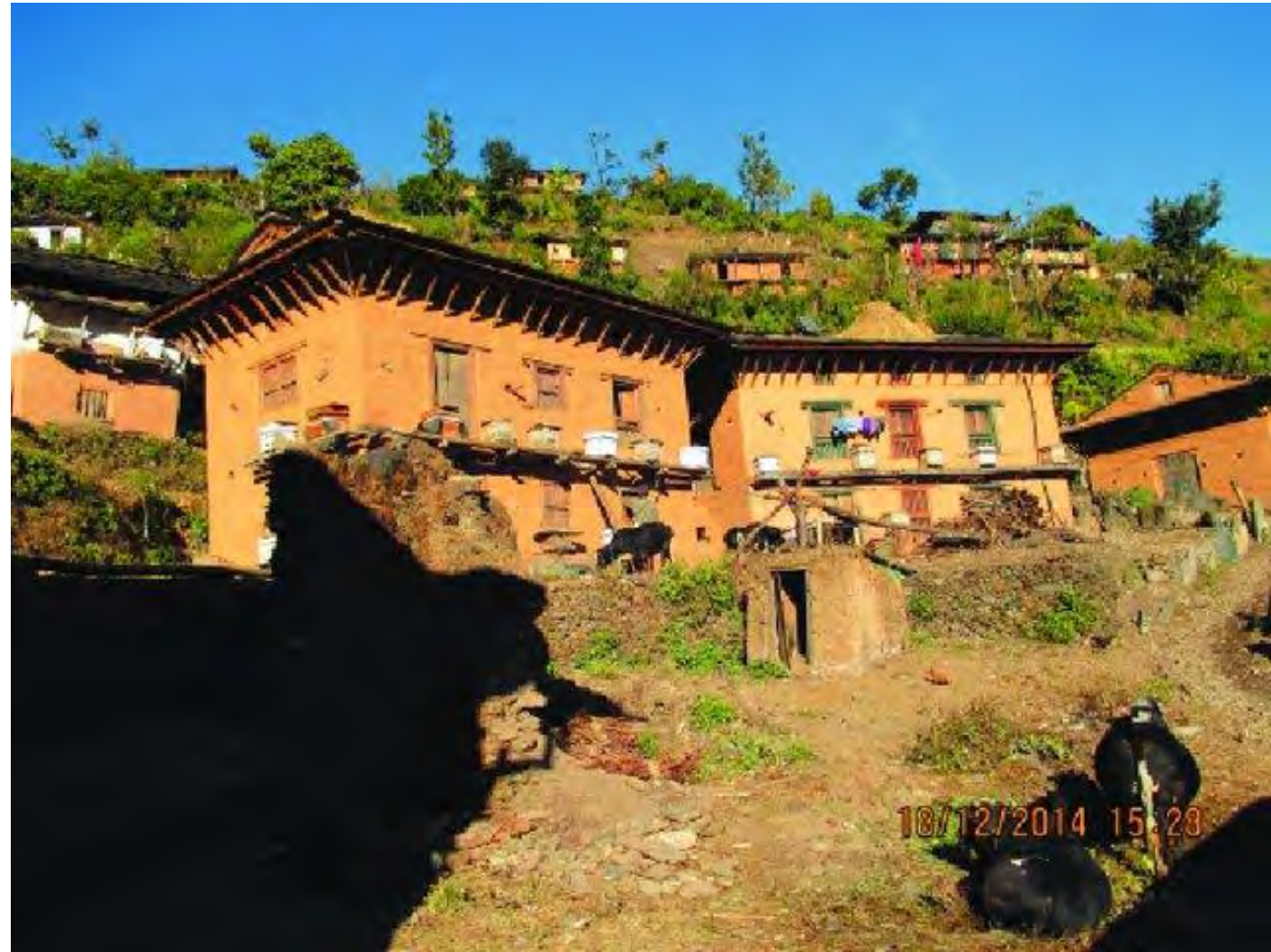
Modified from [Langstroth hive](#)



Thapa *et al.* (2018)



### iii. Modern beehives



Kalpat, Dandagaun, Jajarkot, 2200 m

[https://www.researchgate.net/publication/317040119\\_Compendium\\_of\\_Selected\\_Case\\_Studies\\_in\\_the\\_MSFP\\_Lot\\_VI\\_Districts\\_Kathmandu\\_Nepal/figures?lo=1](https://www.researchgate.net/publication/317040119_Compendium_of_Selected_Case_Studies_in_the_MSFP_Lot_VI_Districts_Kathmandu_Nepal/figures?lo=1)

## **i. Hive preparation**

- Hive types: Cylindrical and square cross-section log hives
- Wood: Dry hollowed logs only
- Thickness: 5-6 cm
- Preferred timber:
  - *Ilex dipyrena*, *Juglans regia* and *Pinus wallichii* (Jumla)
- Life: a good-quality hive last for at least 25 years

## **ii. Bee collection**

- Baiting wild colonies in the forest and in pastures on cliffs
- For baiting lure used to lure bees to come and stay
- A lure is locally called “Gosard” contains different ingredients based upon beekeepers.
- They rub their hives with lure or some beekeepers use raw honey only
- Before baiting, they clean the hives and dry to remove damp, mold or bad smells.



### iii. Composition of lure

- Old combs mixed with walnut leaves, cow ghee (clarified butter), wild rose flowers (*Rosa moschata*), dhoopi (*Juniperus spp.*), de-husked rice (roasted), barley (roasted), mustard oil, cloves and cumin
- Old combs are often first dry-fried in a pan over a fire. Then the ingredients are ground in a large wooden mortar and mixed with honey.
- It is important to use entirely dry ingredients in order to avoid the lure going moldy.

#### **iv. Swarm management methods**

Once drone activity is high, traditional beekeepers prepare themselves for swarm catching. Swarms are transferred to log hives by hand or using any container that is convenient for scooping up bees (eg. small basket).

If bees need to be moved from a place, a local *Artemisia* species known as 'titepatti' (*Artemisia vulgaris*) is placed near the bees and rubbed to give off a strong scent.

Beekeepers also destroy the queen cells.



चित्र नं. ४६: मौरीले हूल निर्यास गरेको



चित्र नं. ४७: हूल निर्यासलाई समात्ने र राख्ने तरिका



क) हूल निर्यास पक्रने भोलाले हूल समातेको



ख) डालोले हूल समातेको



ग) हूल निर्यास पक्रने बैलीलाई मौरीसहित भुण्ड्याएर राखेको



घ) हूल निर्यास पक्रने बैलीबाट आधुनिक घरमा मौरी सारेको

## **v. Honey harvesting**

- A smoker is made out of old cotton cloth tied into a roll. Some farmers use specific herbs to produce a good smoke that encourages bees to leave the combs without inducing too much disturbance.
- Once the bees abandon the combs, the combs are cut from the top using either a flat spoon or a 'khukuri' (sharp knife).
- Bees are brushed off the combs.
- Bees saturated with honey are cleaned by water. So, very few bees die in the process.
- Most beekeepers only cut honeycombs from one side of the hive. Some change sides every few years, whilst others believe that the queen always resides on one side and so never cut there.

## **vi. Honey processing**

- Best sealed honey as raw honey for use as medicine and to sell at a high price.
- The remaining unsealed honey and older black combs are mashed up and cooked to reduce water content and preserve.
- Cooked honey is sold more cheaply than raw honey and is not valued as a medicine.

## **viii. Winter colony management**

- Most of beekeepers feed their bees by leaving some combs of honey back for bees.
- Natural sugar are often used for feeding bees.
- Farmers use artificial diets as rice powder or buckwheat cake.
- Feeding duration: December - April
- Feeding during the raining season is not practiced.

## **viii. Winter colony management**

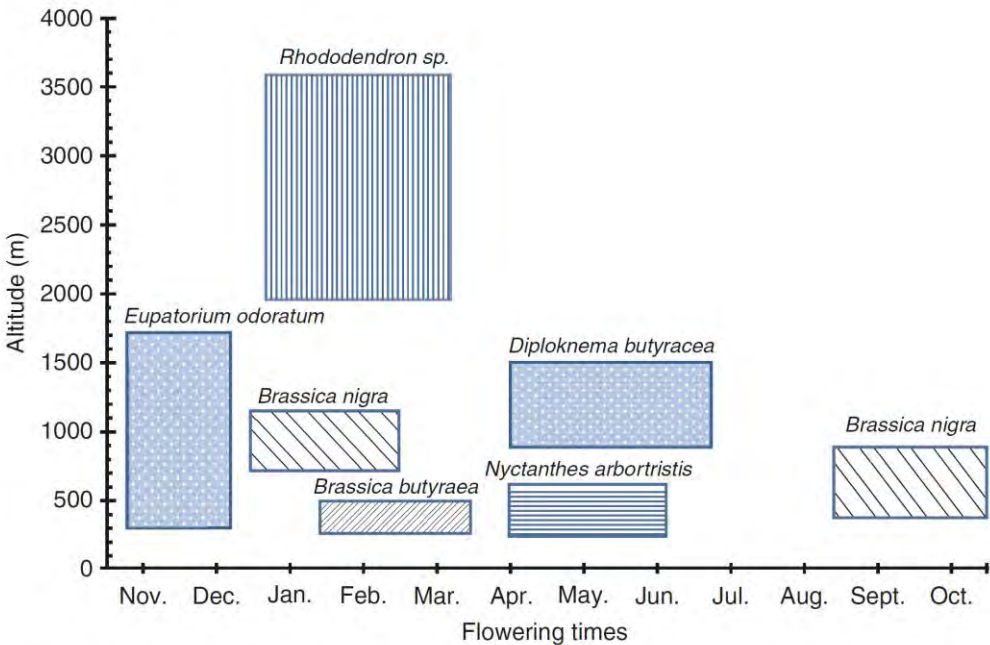
### **Inner husk of rice power**

- Rice is beaten for a long time and beekeepers sprinkle this flour on a plank leading to the hive entrance.

### **Buckwheat-honey cake**

- A kind of edible 'dummy board' that probably significantly increases the insulation of bees in winter. The bees chew up the candy-like substance and obtain nutrition usually leaving just the hard dark cooked surface by the end of the winter.

Major honey floral resources and their flowering times based on altitude



Number of honey bee flora species reported from various parts of Nepal			
Location	Altitude	Total no. of plant species	References
Kathmandu	1,400 m	156	Kafle (1984)
		113	Partap and Verma (1996)
Jumla	915 - 4,679 m	103	Partap (1997)
Dolkha	300 - 5000m	119	Bista (2001)
Chitwan	300 - 2000 m	85	Devkota (2003)



# Pests and Diseases of Honey Bees

## Sacbrood disease

- In 1980s, Thai sacbrood disease killed 95% of *A. cerana* colonies in Nepal.
- Sacbrood disease is transmitted to *A. mellifera* by *A. cerana*.
- American foulbrood disease has not been reported yet.

**Control:** Farmers apply smoke, most used 'dhoopi' (*Juniperus spp.*).

## Honey bee mites

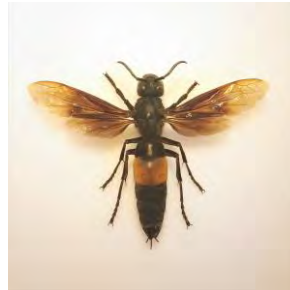
- *A. mellifera* were attacked by two mite species, *V. destructor* and *T. mercedesae*.

## Other pests

*Vespa velutina*



*Vespa tropica*



*Vespa mandarinia*  
*magnifica*



Pseudoscorpions  
(*Ellingsenius indicus*)



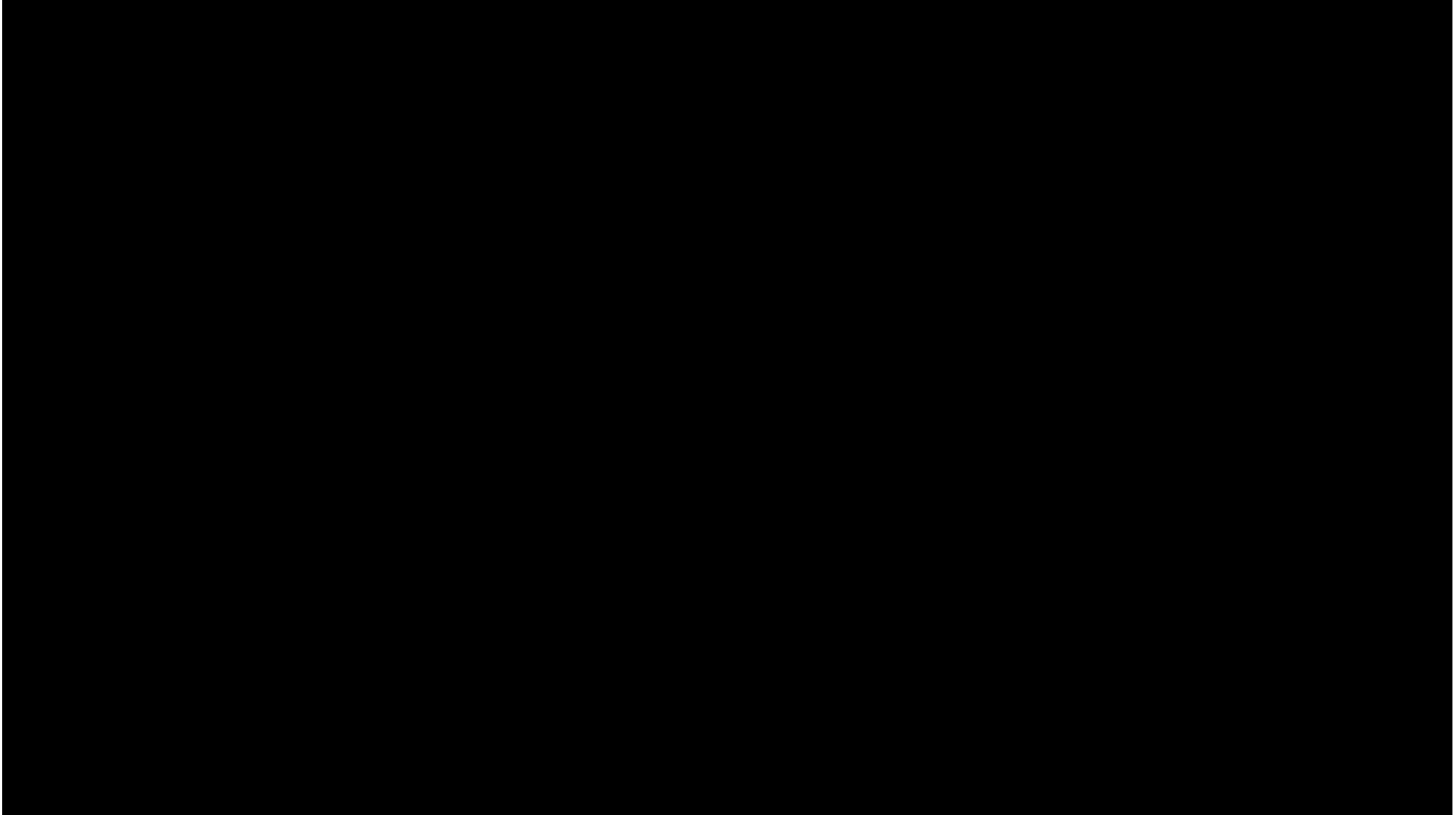
Death's head moth  
*A. Atropos*



# Nepal Standard (Nepal Honey Standard)

SN	Parameters	Unit	Limits	
			General	Specific (Honey with following declaration)
1	Moisture Content	%	20	23
2	Total Reducing Sugars	%	60	65 blossom honey
3	Fructose Glucose ratio	Min		0.95
4	Sucrose Content	%	10	5 blossom honey
5	Water Insoluble Solid Content (by mass, maximum)	%	0.1	0.5 Squeezed honey, honey from wild honey bees
6	Mineral Content as ash	%		0.5
7	Electrical Conductivity	mS/cm		Max 0.8
8	Hydroxy Methyl Forfural (HMF)	Mg/kg, max		40
9	Diastase Activity	Schade units, min	8	4 Honey with a low natural enzyme content
10	Invertase Activity	Invertase number (IN), min	10	4 Honey with a low natural enzyme content
11	Proline content	Mg/kg	Min 180	Maximum 180, if declared source has a low proline content
12	Total count of pollen and plant elements/g	No/g	Max 50,000	Minimum 50,000 Squeezed honey, honey types known to have overrepresentation of pollen grains
13	Acidity (expressed as formic acid)	g/100g, Max	0.2	

# Himalayan giant bee honey hunting



<https://www.youtube.com/watch?v=hLlmbJCSWhQ&t=445s>

# Summary

- Native to Nepal: Asian bee (*A. cerana*), dwarf bee (*A. florea*), giant bee (*A. dorsata dorsata*) and Himalayan cliff bee (*A. dorsata laboriosa*).
- Asian bee is the most common bee in Nepal used for beekeeping from tropical plain areas up to 3000 m.
- Three sub-species of Asian bee: *A. cerana indica* (plain areas), *A. cerana cerana* (high hills), and *A. cerana himalaya* (valleys of mountains and hills).
- *A. mellifera ligustica* introduced in Nepal from India in 1990.
- Himalayan cliff bees also found in mountain areas from 1500 m - 4000 m in Nepal.
- Traditional beekeeping, low productivity.
- Cerana beekeeping in mountain/hill areas in Taiwan might possible

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