



Appendix IV

Annual Report (2023) Healthy
Hives LATAM / Salud Apicola



Salud Apícola LatAm - Peru Progress report



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1. Introduction

The activities of Salud Apícola Latinoamérica (Bee Health Latin America) started in Peru after the completion of the contract from Fundación Fraunhofer Chile Research to Fundación UC Davis Chile Life Science Innovation Center. During various visits the project team organised the set-up of the monitoring activities in collaboration with the local Chamber of Commerce of the Lambayeque. The partner was chosen due to the lack of a viable university partner for the project. The project activities have raised interest of some local institutions which will be further explored during the project.

After the preparation phase the first monitoring was taken forward with teams that consisted of students and local beekeepers, trained for this purpose. The following chapters describe the first results. Due to the political situation and climatic conditions (flooding) the start of the second monitor had to be postponed, however, is now underway.

Based on the first results a capacity building programme has been developed that will be taken forward after the conclusion of the second monitoring. A newsletter was distributed to a database of beekeeper sin Latin America, and the website www.saludapicola.com was completely revised and updated. The social networks provide a constant source of communication with the beekeepers.

2. First bee monitor Peru

2.1 Background and production scenario for beekeeping in the territory.

In order to know the main factors leading to the loss of health of honeybee populations (*Apis mellifera* L.), in accordance with the objectives and methodology of the "Apicultural Health Latin America" project, 60 apiaries owned by the same number of beekeepers, all located in the Province of Lambayeque, Peru, were monitored. The study covered 300 hives (five hives per apiary), distributed in three districts: Lambayeque, Olmos and Motupe.

The Department of Lambayeque, located in the largest valley of the northern coast of Peru, is made up (90% of the territory) of the coastal plain bordering the Pacific Ocean, with three clearly differentiated zones: the coast, the coastal plain and the mountainous zone. In the territories studied, there is a predominantly dry, hot climate and a tropical desert scrub ecosystem, favourable for agricultural production, focused on the fruit export industry, such as mango, avocado, lemon, blueberries and passion fruit, all intensive crops dependent on pollination by honeybees.

Blueberries, for example, are the second most important crop in the region, accounting for 21.8% of regional agricultural production in 2020, which increased by 103% by the end of 2022. The beekeeping sector participates in these results, with the transfer of beehives for pollination, a sector that in turn benefits economically, to the same extent that the fruit-growing hectares in need of the eco-systemic service that bees provide are increasing.

The Olmos district is recognised as the second largest desert in Peru. However, it has a semi-tropical or dry tropical climate, favourable for the development of a varied endemic or cultivated melliferous flora, the most important and numerous species being: the carob tree (*Prosopis* L. and *Ceratonia siliqua* L.), followed by the sapote (*Quarararibea cordata*), hawthorn (*Acacia tortilis*), pájaro bobo (*Tessaria integrifolia*), guaba (*Inga scop*), varieties of mango (*Mangifera* L) and citrus fruits such as lemon (*Citrus* L), among others. Covered by extensive areas of hills and forests rich in native flora, the district has become an area of interest for the development of beekeeping activities.

This scenario explains the increase of beekeepers and beehives in the area covered by the project, a growth stimulated not only by the pollinating activity demanded by agriculture, but also by the progressive increase in the consumption of bee products at local and national level, even though Peru is not one of the largest per capita honey consumers in the Region (Table 1).

It should be noted that the country's beekeeping sector gained momentum when it was recognised as an agricultural activity of national interest, which was endorsed in Law No. 26305 enacted in 1994, implemented through the National Beekeeping Development Plan 2015 - 2025.

Table 1. World per capita honey consumption per year, in selected countries and continents.

País / Región	Consumo per cápita
Perú	40 g
Chile	110 g
Argentina	30 g
Oceanía	710 g
Europa	610 g
América	280 g
África	180 g
Asia	140 g

Elaboración: Gino Mariño. Fuente: FAOSTAT, 2012.

2.2 Characterisation of human resources and production structure.

Of the total number of beekeepers surveyed (N = 60), two reported having only one year of experience in the sector and only one reported having 40 years of experience as a producer. Only seven have more than 20 years of experience in the activity and, despite the fact that on average beekeepers in the territory have 11.3 years of experience, the majority of the beekeepers (68.3%) are in the 2, 5, 10 and 20 year ranges respectively, a result that is close to the characterisation data reflected in the National Beekeeping Development Plan, which indicates that 86% of Peruvian beekeepers have less than 20 years of experience in the activity.

Despite the favourable floral offers for the development of beekeeping (without ignoring the diversity of factors that may be affecting the present honey potential), only 35% of the beekeepers surveyed maintain the activity as the main source of income for the domestic economy, while 65% practice beekeeping simultaneously with other activities, a result that coincides with the characterisation published by the Peruvian Agrarian Agency (November/2022):

"Beekeeping in Peru, in most cases, is a complementary activity to the main agricultural activity, constituting a secondary source of income for rural families".

The beekeepers included in the project can be considered small and medium-sized beekeepers (98%), with a predominance of owners averaging 84 hives, with only 16% of the total number of colonies monitored exceeding this figure. Of these, only 2% manage more than 300 hives, which explains why the trend in the number of apiaries per beekeeper is two (Mode), for an average of 1.6 apiaries (Mean) per beekeeper, with one apiary being the minimum number managed and the maximum three.

In this sense, any further analysis of the hive population must be focused not only on the number of hives and apiaries per beekeeper, but also on the territorial distribution of the apiaries and the structure or composition of the hives: number of combs per body, arrangement of the combs or frames in terms of honey reserves, pollen, brood of different ages and bee population, and the number of bees.

Both elements (among others) are essential as evidence of:

a) The good practices followed by the beekeeper;

- b) The health status of the bee families;
- c) The level of professionalisation of the sector.

Providing this information also makes it possible to infer the health risk of the bee populations targeted by the project and to direct the fundamental contents to be addressed in the planned training activities.

It is important to note that all the hives monitored are modern Langstroth type hives. Only one beekeeper reported having rustic hives in his apiary, which were excluded from the observations recorded, according to the methodology designed. 78% of these modern hives were found in brood chambers (1 body), while 22% were at 2 bodies and none were larger than this. This composition can be attributed to two factors: many of these hives were just coming out of pollination and the time of the monitoring coincided with a stage in which there was no nectar supply in the productive ecosystems.

Other causes to be considered are the professionalism and knowledge of the beekeepers to properly manage the hives, a fact that ultimately affects (and determines) the productive yields of the hives as an expression of health. It is necessary to consider that the historical records of honey production place the Department of Lambayeque in tenth place, contributing only 4% of the national honey production.

This observation coincides with the fact that 55% of the monitored beekeepers reported never having received any training, incorporating the knowledge to manage their hives by empirical transmission from beekeeper to beekeeper. As for the good practices that the other 45% may implement, they must be considered doubtful, if we assume that a significant number update their knowledge every two years or more.

As a result, it would be useful to recommend (for the purposes of the public policies to be implemented) that the training channels available to beekeepers in the territory, their frequency and systematicity, the most urgent topics to be included and the certified qualification of those who take it on. As an additional element, it is worth mentioning the strong interest of beekeepers in learning and improving their work, which is supported by local institutions committed to the development and professionalisation of the sector.

2.3 Beekeeping management

The way in which beekeepers manage beekeeping is a decisive turning point in the epidemiological condition, both individually and collectively, of the bee populations that are related to each other in the same productive ecosystem. In our case, 65% of the beekeepers surveyed have apiaries close to their sites, and 60% of them estimate that they are located less than three kilometres from each other. This element, added to the active transhumance of beehives that 60% of those surveyed maintain and the constant movement of beehives for pollination, allows us to affirm that beekeeping in the area is at risk in the event of an outbreak of an infectious-contagious or invasive disease.

No less important for the health of the hives is the proximity of apiaries to intensive crops. Only 8% of the beekeepers indicated that they have no crops nearby, i.e., 92% of the apiaries are at risk of pesticide

contamination, and 80% of the apiaries are located 500 metres or less from crops such as blueberries and avocado trees, all with systematic pesticide applications. In this case, it is worth noting that even if there are no massive bee deaths, residues can enter the hive matrix, causing lethal effects in the short or medium term, with important consequences for the health of the hives and the development of the sector.

Another factor of health concern in the management of beekeepers is the lack of effective disinfection methods to sanitise beekeeping equipment. 55% of beekeepers do not carry out any disinfection at all and those who said they do, do not practise a method capable of eliminating possible aetiological agents circulating in the hives.

Despite the active participation of beekeepers in the pollination of the crops present in the territory, 88% produce honey, with productive yields and an economic efficiency that is not possible to measure, because 90% do not keep records of the activities. However, based on the data obtained, it could be thought that current productive yields are being affected, among other factors, by the fact that the multiplication of the hives is carried out by making nuclei, just when the flow of nectar begins, when the productive strategy should be focused on the growth and development of the families, to ensure any productive purpose.

The aspect should be further analysed, considering that most beekeepers multiply the hives in order to offer pollination services. It is necessary to evaluate the composition and development or strength of these families of bees (those destined to pollinate) and the health conditions they will have because of this productive management.

If today 83% of the beekeepers surveyed report honey production, and 42% of them produce two harvests per year, it is not unreasonable to suppose that, by changing certain production strategies, improving management practices and training beekeepers, substantial increases in honey production (kg/honey/hive/year) can be achieved, improving income, while still meeting the pollination needs required for the agricultural development of the territory.

Two other essential aspects linked to the beekeeper's management, productivity and consequently the health of the hives are: the replacement or renewal of the queen bee and the management of supplementary feeding (energy and protein), including the supply of water for the systematic consumption of the families of bees. Regarding supplementary feeding, the need to supply the hives with protein feed without neglecting the energy feed was favourably viewed by the respondents, a subject which, due to its importance, should be included detail in future teaching materials.

As already mentioned, not having records that allow systematising and knowing the productive activities determines being able to reliably follow up the necessary change of queen bees in each hive and the productive behaviour of the bees that are introduced. Although 78% of beekeepers report that they change their queens, 40% do not do so frequently enough. Special attention needs to be paid to the origin, genetic quality, and health certification of the queens. Only 60% of the beekeepers report renewal of queen bees, another aspect to be studied during the training process.

2.4 Preliminary considerations.

1. The beekeeping in the region has potential for the sustainable development of the sector, with economic impact on agriculture and beekeeping.
2. To estimate the potential for agricultural and beekeeping development in the three monitored departments, it is recommended (in the short term) to look for training, administrative and public policy alternatives that allow for a virtuous relationship between farmers and beekeepers.
3. As a result of the baseline obtained, the training activity planned as part of the project should be focused on enabling producers to identify and solve all those deficiencies in good practices that constitute sanitary gaps, with a focus on prevention.
4. From a sanitary point of view, considering the data obtained, it can be affirmed that beekeeping in the territory is at health risk, both due to the action of pesticides used in agriculture and to the absence of public policies that implement Veterinary Programmes for the sector with a preventive and/or counter-epidemic approach.

2.5 Recommendations.

1. Take advantage of the scientific and technical capacities of the educational institutions present in the Department of Lambayeque for the training of human capital specialised in apiculture. Pay special attention to the training of doctors and veterinary technicians specialised in beekeeping, addressing the epidemiology of this productive species.
2. To channel actions for future projects that, guided by the academy, address the genetic improvement of the local bee, leading to the certification of the genetic and sanitary quality of the queen bees that are marketed.
3. Propose new projects that make it possible to: identify and map the distribution and potential of the melliferous flora present in the various ecosystems and the total number of beekeepers, apiaries, and hives present in the territory, so that it is possible to carry out the sanitary and environmental management of this agricultural species, on a scientific basis, with a holistic and preventive approach.

3. Capacity building plan

The capacity building sessions are planned from 15/05/23 to 11/06/23. The beekeepers will be organised in the same three groups as during the monitoring, the local coordinators will contact the municipalities to request support for the project and to ask them to provide space. It should be considered that in each group there should be approximately 30 beekeepers and that the chosen places should be easily accessible, as well as having a lunch provider nearby. Five sessions are considered for each group, the locations may vary. The information obtained in the surveys will be considered to define the days in each territory. From each group and on a voluntary basis, a demonstration apiary will be selected to carry out the practical demonstration activities.

For the selection of the demonstration apiary, in addition to the willingness of the owner, the following aspects will be taken into account:

- a) Accessibility
- b) It should have not less than 8 hives.
- c) Possibility of improving the beekeeping material.

Beekeepers from their own territory who, although not initially part of the project, show an interest in learning, may join the training sessions. The content of each training will be provided in printed material as a simple guide, which will allow the beekeepers to review the fundamental concepts shared and to consolidate their knowledge through individual study. Once the training is over, there will be a closing or conclusion activity per group, where the attendees' impressions (positive, negative, and interesting) will be collected. At this event, a certificate of attendance and recognition for participation and attendance will be awarded. The contents of each meeting are:

- **Training Session 1: (Day 1 morning)**
 - Welcome to the course.
 - Introduction to the course.
 - Introduction and socialisation of participants
 - Summary of the results of the monitoring of the hives.
 - Conclusions of the study
 - Handing out of materials (technical content of the 1st meeting).
 - Objectives of the training programme - formulation of individual objectives: What do I want to learn?
 - Organisation of the workshops, registration, materials, etc.
- **Training Session 2: (Day 1 in the afternoon)**
 - Topic 1. The honeybee, the hive, and the apiary. Interrelation of bee families with ecosystems.
 - History of beekeeping.
 - The honeybee and the environment.
 - Food basis of the honeybee. Bee and pollination.
 - The Africanised bee and the process of Africanisation. Social importance and challenges of Latin American beekeeping.

- The honeybee. Brief description of the anatomy of the insect. The castes and their functions in the bee colony.
- The modern hive. Origin and development. Structure (measurements) and organisation of the modern hive: by bodies and time of year. Internal dynamic equilibrium: temperature regulation, food reserves and distribution of combs with food and brood reserves.
- Man as an intermediary between the honeybee and productive ecosystems. Relationship of the development of the modern hive to the floral calendars of the various ecosystems.

- **Training Session 3: (Day 2 in the morning)**

Theme 2: One Medicine, One Health

- Quality, safety, and traceability. Concepts.
- Health and disease. The epidemic triad.
- Factors influencing bee health in modern intensive beekeeping.
- The modern Langstroth type hive [?] video
- Castes and their roles in the bee colony. [?] video
- International regulations for the bee products market.
- Preventive measures. Sanitary gaps in the production process.
- Integrated management for the prevention and/or control of diseases.
- Territorial management

- **Training Session 4: (Day 2 in the afternoon)**

Topic 3: The apiary. Choice of location and orientation of the hives.

- Organisation and hygiene of the environment.
- Collective exercise: Growth curve of the hives in correspondence with the local productive ecosystem.

- **Training Session 5: (Day 3 in the morning)**

Theme 4. Production in beekeeping.

- a) Inter-harvesting work.
 - Organisation of the brood chamber.
 - Feeding.
 - Changing queen bees.
 - Wiring and laminating
 - Increasing the number of hives.
- b) Harvesting work
 - Introduction of stamped wax sheets.
 - vertical growth Swarming control.
 - Management of combs and supers.
 - Merging of hives.
 - Castration. Equipment and hygienic-sanitary process.
- c) Timing and methods for the introduction of printed wax foil.

- **Training Session 6: (Day 3 in the afternoon)**

- Practical step in the apiary: Evaluation and organisation of the apiary and hives according to what has been learned.
- Preparation of the demonstration apiary among all participants.


- **Training Session 7: (Day 4 in the morning)**

Activity: Evaluation of the changes observed in the hives, based on the work carried out in the previous meeting.

Explain in a practical way:

- Evaluation of the food reserves in the colony.
- Feeding methods and how to prepare supplementary food for the bee families.
- Drinking water. Construction of a drinking trough for bees.
- Method of introducing the queen bee.
- Methods of merging hives.
- Method of multiplying a hive.
- Method for vertical growth
- h) Preparation of a hive for transhumance.

Topic 5: Diseases

- Varroa destructor - diagnosis and control guidelines
- Drone trap hive  video
- Diagnosis of diseases. Diagnosis methodology.

- **Training Session 8: (Day 4 in the afternoon)**

Pollination: Open invitation to farmers in the territory.

- Standards for pollination hives
- Evaluation of hives for pollination
- Responsibilities of the farmer and the beekeeper during pollination

- **Training Session 9: (Day 5 in the morning)**

- Future challenges & opportunities
- Products of the hive - Video
- Value addition
- Conclusion of the training
- Performance evaluation.
- The positive, the negative and the interesting.
- Expectations of the participants.
- Disinfection of beekeeping material - video

- **Training Session 10: (Day 5 in the afternoon)**

Practical step: Disinfection of beekeeping material

4. Communications

A newsletter was released (<https://saludapicola.com/nuestro-primer-boletin-de-2023/>) and distributed to a database of beekeepers and other stakeholders. The website was updated. Besides, the distribution of information on social networks has been reinitiated with weekly publications (Facebook, LinkedIn, Instagram). The project is present on the following social media:

- <https://www.facebook.com/SaludApicola>
- <https://www.linkedin.com/company/35650382/admin/>
- https://www.instagram.com/salud_apicola_latinoamerica/