

APIARY IMPLEMENTATION FEASIBILITY ANALYSIS FOR SMALL PRODUCER

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ABSTRACT: Considering that beekeeping is an activity, which presents itself as an advantageous alternative with excellent prospects for rural properties, either for smaller or larger ones, this article shows the calculation of deploying an apiary with 50 hives of *Apis mellifera* and their economical viability. The gain comes from the honey product sale and improvement of productive flowering through pollination that bees naturally develop in seeking the nectar and pollen of flowers. The producer can even add value to the products, inserting the new context of sustainability; respect for people and the environment. The financial calculation was made through the sale of honey and propolis, which may be sold in bulk and transported in various packaging and quantities according to need or availability. The calculations performed show that the project is viable. The return percentage on the invested amount yields 28 %. The payback time is one year and seven months. For each R\$ 1,00 invested there is a return of R\$ 3,15. The profitability indicates that the culture gives 0.79 % of net income per year in relation to the incoming total amount. The return is 31 %, referring to the annual return of the invested capital. Taking into account the adequate management of establishment, to ensure satisfactory productivity and the prospects of increased consumption due to sporting events that Brazil will host, there will be a favorable market for bee products. The production can be marketed to supply local market, available in warehouses or industrial marketing to serve the foreign market for the consumption of the products, also their use in cosmetic, pharmaceutical and food industries.

Keywords: Beekeeping. Productivity. Profitability. Sustainability.

INTRODUCTION

Good investments do not happen perchance, a good deal is built from knowledge and information, which can be acquired with time and effort. In a globalized market full of risks and uncertainties, the entrepreneur must be meticulous in calculating costs and seeking means to reach the expected result. And, what is expected from an investment is that it

should cover all expenses, bring a profit and make feasible the quality of life of its investor and the environment where it is inserted. Beekeeping is an activity that presents itself as an advantageous alternative and with excellent perspectives for the rural properties, as it allows to obtain gains with the sales of beekeeping products and the improvement of the productive flowering through the pollination that bees naturally make possible by seeking the flowers nectar and pollen. It also gives the producer the possibility of adding value to his products, in general, as it is inserted in the new context of sustainability, respect to the environment and people. Beekeeping provides honey, which is the main product, wax, pollen, apitoxin, propolis, royal jelly and the pollination services (SEBRAE, 2009). This project had the purpose of calculating the implementation cost of an apiary with 50 beehives of *Apis mellifera* and its economic feasibility.

2 METHODOLOGY

A bibliographic research and primary and secondary data collection were made, by means of semi-structured questionnaire, applied during visits to rural properties in the Itapetininga Region, SP.

3 RESULTS AND DISCUSSION

As it is a theoretical revision, it is observed that the role performed by the bees is extremely important for agriculture and cattle breeding, since approximately 70% of the products consumed in the world depend on the pollination of these insects (IBAMA, 2012).

According to news divulged by the printed and electronic media, beekeeping has been suffering great losses due to the disappearance of bees. According to beekeepers in the region of Itapetininga/SP, the use of pesticides is considered the main cause of this loss, since these products affect the sensorial system of the insects hindering them from returning to the beehive and also causing intoxication leading to death.

The fall in production, due to the disappearance of the insects, has contributed for the abandonment of the activity by rural families, besides harming the flowering of important cultures due to the absence of pollination, decreasing productivity and demanding greater quantities of inputs to supply the deficiency of the productive cycle. According to beekeeper Gilberto Gobor, the lack of research and lack of organization in the productive chain of honey do not allow a control and monitoring work of the causes of bee disappearance to be performed.

In view of this problem, the technical, financial and economic feasibility assessment of honey and propolis production aims to find the balance required for the small properties to be

able to implement beekeeping in their systems, which brings an extra income, improves the quality of the flowering and works against the decrease of this insect in nature.

The area chosen for implementation of the apiary must observe the safety standards for people and animals. The facility must be built outside the urban area, 500 meters away from schools and residences, and 300 meters from confined animals, roads and highways. (SENAR, 2009)

The availability of bee pasturage and water must be carefully observed, the distance that bees cover is approximately 3,000m. Surveying the flowering is important for the planning of actions along the year, and taking note of the names of the plants and the months they blossom is a good start. The water source must not be farther than 200m and it must be free from contamination. Where there is no water, the installation of a water fountain is necessary; this water must always be fresh to keep the bees' health. (SENAR, 2009)

The apiary must have easy access to the vehicles that transport the equipment and flow out the production (SENAR, 2009). The area chosen must be cleared and maintained always clean to make the attack of predators difficult. The boxes are distributed using a spacing varying from 2 to 3 meters distance from one another and they must be installed at 50 cm from the ground (SENAR, 2009). Extreme high or low temperatures, and strong winds cause a drop in production and even abandonment of the beehive by the swarm. Winter is not propitious for the search of bee food and summer, with high temperatures, makes it difficult to travel long distances. This is the reason for the need for the bee pasturage to be near the beehives and, in periods of lack of flowering, to have artificial food available.

Brazilian beekeeping is made up of rustic bees that do not require strict control in the fight against sanitary risks. As for the diseases, these are related according to the phases of the bee: larva and adult bee. According to a report from beekeeper Gilberto Gobor, the diseases are not enough to cause significant damages; the most common and concerning risks are the pesticides, theft and attacks from the armadillo and tayra. He mentions some protection measures for the apiary:

- a) Replace or use less offensive products in the cultures near the beehives;
- b) Create a communication system between the properties, in order to warn the beekeepers previously before application of pesticides;
- c) Put the beehives on racks that have protection against ants climbing, using cotton wad or rags dipped in burnt oil on the base of the beehive's rack, or put grease which also makes it difficult for ants' access;
- d) Clear the apiary frequently from plants nearby that facilitate the ants' access.

To collect the honey supers it is necessary to follow all safety procedures and use the vital handling equipment. It should not be performed on rainy days or with high relative humidity of the air, to avoid loss in the quality of the honey. The beekeeper must prefer the

time between 9 am and 4 pm, on sunny days, and watch that they are not exposed to heat for long periods, which compromises the quality of the product (EMBRAPA, 2003).

The transport of the honey supers must be performed in accordance with the safety and hygiene measures to avoid contaminating the product. The use of covers on the collected honey supers serves as dust protection. The collected honey must be kept away from direct sunlight to avoid loss of quality. The movement of the vehicle must be made carefully to avoid damaging the honey frames. In case of need of stops during the transport, the vehicle must be parked in the shadow (SENAR, 2009).

The honey supers are taken to be processed in the Honey Exchange, or the property could make available an area of 64 m² for implementing the Honey House, where the product obtained from the beehives is bottled. The facilities must be adequate, hygienic and safe to ensure the quality of the final product, following the sanitary standards required for the construction described in ordinance No. 006/986 of the Ministry of Agriculture, Cattle Breeding and Supply - MAPA. All handling stages must be followed, according to the good manufacturing practices.

For wholesales, 200-liter drums, 18-liter cans and also plastic buckets are used. The acids in the honey attack the metal making its consumption impossible, because of this, the containers must be new and lined with polyethylene film. Glass bottles also provide greater durability of the product's characteristics, being less vulnerable to external actions; the disadvantages are the higher cost of the bottle and the need for greater care during transport due to the risk of breaking. For retail, it could be used from drums to plastic sachets with individual doses. Independently from the package used, any container must be inviolable and airtight. They must have the due labels from the sanitary and fiscal authorities. For valorization of the product, it is ideal for it to carry the producer's seal with all information on the vegetal origin of the honey and on the property (SENAR, 2009).

The analysis of the project shows that the economic feasibility is only positive, taking into consideration the implementation costs for production and manufacturing, as of implementation of 50 beehives of *Apis mellifera* for the marketing of honey and propolis.

In chart 1 it is shown the investment cost and description of the material to be used.

Chart 1 – Apiary Implementation Cost

Implementation Cost for the Apiary					
Fixed Production System					
Size of Apiary		50 Beehives			
Facilities, equipment and tools (investment)					
Components	Specification	Units	Quantity	Unit Value	Total Value
Full beehive w/ 2 honey supers		unit	50	120.00	6,000.00
Nucleus for swarm collection		unit	5	47.00	235.00
Beehive support	Eucalyptus platform + board	unit	50	4.00	200.00
Knife		unit	1	12.00	12.00
Tapes/elastic bands (collection)		meter	37	0.20	7.40
Wire No. 24 (Kg)		meter	1	20.00	20.00
Screen for nucleus transportation		unit	5	14.00	70.00
Bee smoker		unit	1	80.00	80.00
Overalls		unit	1	70.00	70.00
Boots		pair	1	30.00	30.00
Sweeper		unit	1	8.50	8.50
Gloves		pair	3	4.00	12.00
Doolittle Feeder		unit	50	7.00	350.00
Chisel		unit	1	10.00	10.00
Transport net for nest		unit	50	16.50	825.00
Queen excluding net		unit	50	18.00	900.00
Rustic shed		m ²	50	60.00	3,000.00
Uncapping fork		unit	2	9.75	19.50
Extracting centrifuge		unit	1	739.00	739.00
Stainless steel straining sieve		unit	1	104.00	104.00
Stainless steel settlement tank (800 kg)		unit	1	476.00	476.00
Plastic bucket	28 kg	unit	2	6.75	13.50
Uncapping fork		unit	2	10.00	20.00
Wax melter (30 L)		unit	1	250.00	250.00
Wax incrustation		unit	1	70.00	70.00
Honeycomb cylinder (manual wax)		unit	1	350.00	350.00
Plastic bin		unit	1	38.00	38.00
SUBTOTAL					13,909.90

Each beehive produces 35 kilos of honey and 200 grams of propolis per year. The honey could be sold in bulk for R\$ 6,00 per kilo; if packaged and labeled, it could reach R\$ 17,00 per kilo, depending on the quantity and type of packaging. The value per kilo of propolis is around R\$ 60,00 and may reach R\$ 200,00 for export (SENAR, 2009). The 50 beehives produce annually 1,750 kilos of honey and 10 kilos of propolis, with an income of R\$ 11.100,00. See chart 2.

Chart 2 - Income

Income					
Product	Beehive	Production (kg)	Total	Value R\$	Total Value
Honey	50	35	1750	6.00	10,500.00
Propolis	50	0.2	10	60.00	600.00
Total					11,100.00

The cash flow shows that the return on invested capital occurs on the second year. If

this value is diluted along the months, it can be seen that the return occurs in one year and seven months. See chart 3.

Chart 3 – Cash Flow

Cash Flow								
Year	Input	Output	Net	Accumulated	Net discounted	Accumulated Discounted	Input PV	Output PV
		-16,254.70	-16,254.70	-16,254.70	-16,254.70	-16,254.70	-	-16,254.70
1	11,100.00	2,344.80	8,755.20	-5,154.70	R\$ 8,106.67	-R\$ 4,772.87	R\$ 10,277.78	R\$ 2,171.11
2	11,100.00	2,344.80	8,755.20	5,945.30	R\$ 7,506.17	R\$ 5,097.14	R\$ 9,516.46	R\$ 2,010.29
3	11,100.00	2,344.80	8,755.20	17,045.30	R\$ 6,950.16	R\$ 13,531.11	R\$ 8,811.54	R\$ 1,861.38
4	11,100.00	2,344.80	8,755.20	28,145.30	R\$ 6,435.33	R\$ 20,687.64	R\$ 8,158.83	R\$ 1,723.50
5	11,100.00	2,344.80	8,755.20	39,245.30	R\$ 5,958.64	R\$ 26,709.69	R\$ 7,554.47	R\$ 1,595.83
Total	55,500.00	11,724.00	43,776.00				R\$ 44,319.08	R\$ 9,362.11
			8,755.20					

The Fixed Cost refers to expenses with materials that, independently from the production, is the same. In this project, the Fixed Cost refers to honeycomb wax used annually, shown in chart 4.

Chart 4 – Fixed Cost

B. FIXED COST				
SPECIFICATION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
Honeycomb wax	Kg	50	30.00	1,500.00
SUBTOTAL				1,500.00

The Variable Cost is made up by the sugar that is used as food for the bees in bee pasturage off season, and the drugs used for the maintenance of the apiary. See chart 5.

Chart 5 – Variable Cost

C. VARIABLE COST				
SPECIFICATION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
Sugar	Kg	20	0.86	16.80
Drugs	Unit	2	2.00	4.00
SUBTOTAL				20.80

Chart 6 shows the handling expenses required to maintain the good conditions of the apiary.

Chart 6 – Fixed Expenses

D. FIXED EXPENSES				
SPECIFICATION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
Maintenance & Handling	H/D	50	8.00	400.00
Revisions	H/D	50	8.00	400.00
Apiary cleaning	H/D	3	8.00	24.00
SUBTOTAL				824.00

The average production of this species is around 35 kilos of honey and 0.2 kilos of propolis per box/year. In areas with good bee pasturage, good flowering, and with selected bees, the productivity could reach 60 kilos of honey per box/year and 3 to 4 kilos of propolis per box/year.

The investment volume is considered low, allowing its implementation in small familiar properties that do not count on large structure and resources, according to Table 1. The important market appeal and which adds considerable value to the products is that of environment preservation. Beekeeping is considered a genuinely sustainable activity, as it does not pollute, contaminate or destroy; on the contrary it increases the quantity and quality of agricultural and wild productions, since when collecting the nectar they transport the pollen from one plant to another, optimizing fertilization and fructification.

The financial calculation was made through the sales of honey and propolis, which could be marketed in bulk and transported in several packages and quantities, according to the need or availability. Table 2.

According to Fogaça et al (2013), the Net Present Value (NPV) uses a rate of discount to bring the projected cash flow to the present value; the Internal Rate of Return (IRR), represents the profitability of the project, expressed in terms of an interest rate that shows the return the company is obtaining compared to an attractiveness rate; Benefit Cost Ratio (B/C) represents the ratio between the present value of the income and the cash outputs, and the discounted Payback Period represents the recovery period of the invested capital in present value. The attractiveness rate used is 8% per annum.

Chart 7 shows the result of the calculations: NPV of R\$ 6.308,30, which means the project is feasible. The IRR represents the percentage of return on the invested value, which in this project yields 28%. The Discounted Payback indicates the return period of the invested money, which in this plan was fixed in 1.7 years. The profitability index – PI, of R\$ 3,15 refers to the return for each R\$ 1,00 invested. The B/C, Benefit/Cost, is the difference between the Inputs and Outputs; when the result is equal to or greater than 1, this indicates that the investment could be accepted, in this plan we have a B/C of 4.73. The Break-even Point shows that to avoid losses, a minimum of 21% of the maximum production capacity must be marketed. The profitability indicated that the activity generates 79% of net profit per year referring to the Total Income. The Profitability is 31%, referring to the annual return of the invested capital, also called Attractiveness indicator.

Chart 7 – Financial Analysis

Financial analysis	
NPV	6.308.30
IRR	28%
Discounted Payback	1 year and 7 months
PI	3.15
B/C	4.73
Break-even Point	0.21
Net Profit	0.79
Profitability	3.15

Taking into account the adequate handling of the beekeeping, to ensure a satisfactory productivity and the perspective of increase in consumption due to the sports events that Brazil will host, there will be a propitious market for bee products. The production could be marketed to supply the local market, made available in the trading post or industrialized to meet the external market, both in the consumption of the products and in its use in cosmetics, pharmaceutical and food industries.

Beekeeping presents a medium risk factor, due to the market that oscillates according to the offer and demand of the products. A possibility for lowering this risk is industrialization of the production by the producer itself, which this way adds value and differentiates its products in relation to the competitors. According to beekeeper Gilberto Gobor, the losses for perishability are insignificant; they represent around 1 to 2 per cent, from collection to bottling.

4 FINAL CONSIDERATIONS

The project shows that beekeeping is a feasible activity, even if using just the basic production and marketing structure. With improvement of technical and structural resources, there will be an increase in diversity, productivity and profitability as a whole.

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