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Research Article

BUSINESS DEVELOPMENT OF TRIGONA BEE HONEY (*Apis Melifera*) THROUGH COACHING FOR BEEKEEPER GROUPS

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Abstract

The purpose of this study was to determine the factors that influence the development of bee honey business, through coaching activities. The research was conducted on the Trigona beekeepers' (*Apis Melifera*) in West Java, with qualitative and quantitative research approaches. The data obtained were analyzed with the F test and T test, as well as multiple regression analysis to determine the relationship of variables of land area, total of colonies, equipment and labor used to honey production and farmer income .The results showed that the land area as a source of bee feed, the number of colonies maintained, equipment including the use of houses and artificial hives, as well as labor activities in beekeepers' simultaneously and partially have a positive effect on honey production and have a positive effect on the income of beekeepers', with the equation LnY = 5.920 + 0.011LnX1 + 0.349LnX2 + 0.238LnX3 + 0.417LnX4 + e , therefore this activity can be implemented elsewhere .

Keywords: Business development, Production, Bookeepers income.

INTRODUCTION

Honey in Indonesia is produced by forest bees and cultivated bees. Around 80%-90% of honey comes from forest bees in several regions of Indonesia, regions that are famous as the best honey producers in the country, including Sumbawa Regency, Kapuas Hulu Regency, and Pelawan Forest on Bangka Island Fluctuations in honey production are partly due to constraints in providing feed crops for bees, especially in Java, large-scale monocultures have a greater impact on bee communities than their existence from small bee farmers (St. Clair *et al.,* 2022). According to the Indonesian Bee Association (API), the kapokrandu (*Ceiba pentandra*) tree which is the mainstay of bee feed crops continues to decline in quantity and quality, the problems faced by *Apis mellifera* honey beekeepers' in Gembong District, Pati, Central Java based on the level of urgency of the problem from the highest to the lowest priority scale consisting of feed of 78.13%, funds or business / working capital 59.38%, technical guidance 37.50%, counseling 50.00%, pests or diseases 18.75%, and the availability of seeds, especially quality queen bee seedlings, is 25.00%). One of the contributing factors to the undevelopment of honey bee cultivation is because the farmer group does not have knowledge of the proper maintenance and care of livestock. Another function of bees is that in the process of pollination of plants, farmers consider bees to be pollinators that are more important than other flower visitors (Osterman *et al.,* 2021).

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The realization of Honey Production in West Java Province in 2021 is the production of stups /colonies and honey in Ciamis Regency as many as 9,111 units with honey production of 1,257 kg. This result is still very far when compared to other districts in West Java where the largest gain in Tasikmalaya Regency is 23,931 kg, then Sukabumi Regency is 7,084 kg, Sumedang Regency is 2,909 kg, Indramayu Regency is 1,685 kg and Pangandaran Regency is 1,315 kg. This can still be developed by conducting guidance for the beekeepers', namely the use of houses and artificial nest in order to increase honey production which has an impact on increasing their income, research is carried out in West Java, Indonesia, this coaching activity is a future intervention related to bee collection, domestication and commercialization in similar study and agroecology areas (Assefa and Lemma, 2022).

RESEARCH METHOD

This research was conducted with qualitative and quantitative approaches, with survey methods. Trainning the use of colony nest or artificial stups can increase honey production because it reduces the amount of energy that bees must expend in making the nest or colony .Data collection in proportion to random sampling obtained the size of respondents was 184 people, namely 30.6% of the population of honey bees farmers in West Java .The data taken are descriptions of respondents, land area, total of colonies, equipment, labor used, expenses and income of honey bee farmers, data obtained in Uji with Test F, so that a relationship will be obtained between these variables, for the influence of each variable in the analysis with Test T, so that it can be known which factors affect the development of honey bee business.

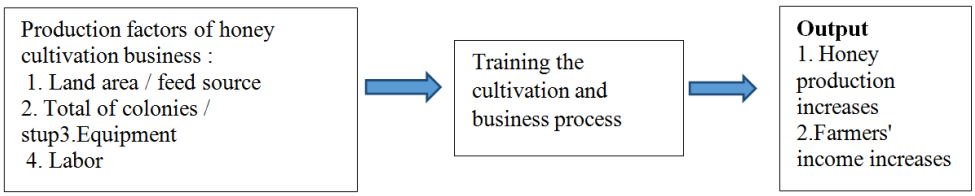

Figure 1. Frame work of thinking

RESULTS AND DISCUSION

Description of respondents

a. Age of respondents

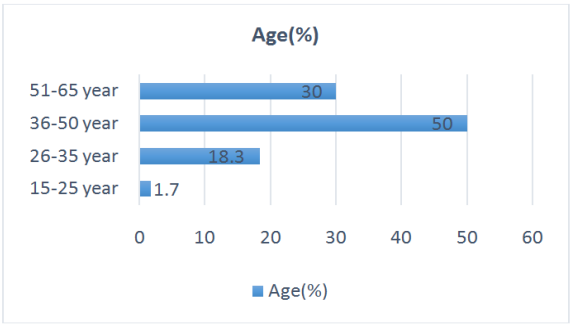

Figure 2. Age of respondents

The results showed that the largest number are farmers with an age of 36-50 years, with this productive age, coaching with material on various innovations can be delivered and change their attitudes and skills in developing their business, as well as the sustainability of the Trigona beefarmers' business.

b. Education of respondents

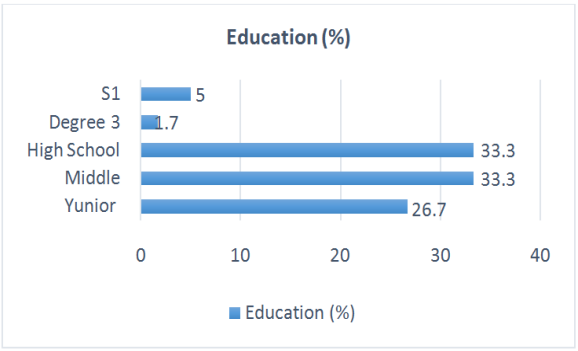

Figure 3. Education of respondents

The results showed that the highest number was middle and high school education, with this educational background, the guidance provided was very easy to accept and implement in bee farmers activities, therefore the development of bee famers businesses was very much needed, farmers' decision-making was in different contexts socially and agro ecologically, which was conditioned by long-term multi-sided changes in the region, age, education and experience are decisive in decision making (Kandel *et al.,* 2022). The results showed that the largest number were breeders with 6 years of bee farmers experience, they were experienced and receptive to innovations in their business development. The innovations presented are the use of artificial hives, the maintenance of environmentally friendly plants, the improvement of honey processing methods, these activities are easy to adopt and implement in the activities of breeders, beekeepers' scale management decisions related to the size and scope of their operations and the way beekeepers value their bees (Velardi *et al.,* 2020).

c. Length of business breeding bees

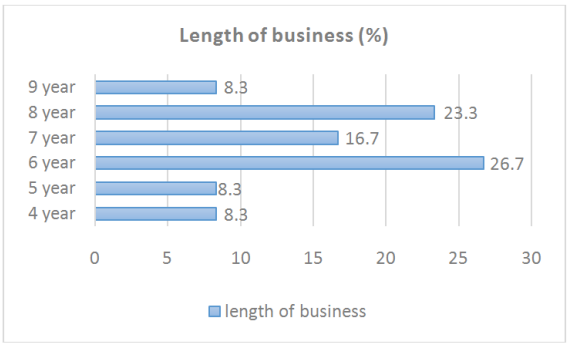

Figure 4. Length of business breeding bees

Description of research results

The land area as the smallest source of bee feed is 0.08 Ha or 800m^2, land limitations affect the limitations of bee maintenance which has an impact on low honey production therefore the formation of this group of bee farmers is very important because the collectivization and development of a diversified value chain together with activities outside agriculture can strengthen the market relationship of farmers with limited land. In addition to distance, market guarantees and market acceptance also affect market choices by land-constrained farmers (Bagchi *et al.,* 2021).

Factors affecting the development of the bee honey business

The results of the questionnaire are further analyzed so that the results can be accounted for, namely

Normality test: It aims to test whether the regression model, the bound variability and the free variable both have a normal distribution or not. For the normality test using the One Sample Kolmogorow Smirnow Test whose result is a Significance value of 0.765, this value is greater than the alpha value of 0.05, thus it can be said that the data are normally distributed, the normality test is met for multiple linear regression tests.

Multikolinearitas test: This test is performed to find out whether the free variable is cholinear or not. The method used is to calculate tolerance and VIP. The results of calculations with the SPSS program are as follows :

Tabel 1. Descriptive analysis

Variable	Minimum	Maximum	Mean	Std Deviation
Land (Ha)	0,08	1,01	0,31	0,20
Total Stup (unit)	12	100	39,40	21,43
Equipmment (Rp/Tahun)	200.000	1.535.000	555.500	324.262,79
Labor (Rp/Tahun)	440.000	3.084.000	1.486.033,33	637.265,93
Yield of honey harvest (Kg/Tahun)	31,2	260	104,25	55,18
Fix cost (Rp/Tahun)	581.013	5.801.713	1.911.800,50	1.195.676,78
Variable cost (Rp/Tahun)	1.185.000	7.510.000	3.157.116,67	1.552.768,95
Revenue (Rp/Tahun)	6.240.000	52.000.000	20.850.333,33	11.035.357,35

Table 2. Result of analysis Multikolinieritas test

Coefficients[a]			
		Colinearity Statistic	
Model		Tolerance	VIF
1	(Constant)		
	LnX1	.708	1.413
	LnX2	.247	4.046
	LnX3	.756	1.322
	LnX4	.310	3.225

Table 3. Result analisis multiple linier regression test

Coefficients[a]					
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-2.996	.814		-3.679	.001
	LnX1	.084	.032	.103	2.662	.010
	LnX2	.607	.064	.625	9.519	.000
	LnX3	.080	.036	.082	2.193	.033
	LnX4	.314	.064	.288	4.911	.000
a. Dependent Variable: LnY1						

Source : Output SPSS

Obtained multiple linear regression equation :

LnY =-2,996+0,084LnX1+0,607LnX2+0,080LnX3+0,314LnX4+e

X1 is a variable land area for bee feed

X2 is the colony/stup total variable

X3 is a variable equipment i.e. an artificial house for bees as a result of coaching

X4 is a variable labor

Y is a variable honey production

Based on the results above, it is known that the VIF is below 10 and the tolerance value is above 0.10, thus the regression line model used is appropriate.

Heterochedasity test: The results of the heterochedasity test analysis resulted in the following image distribution

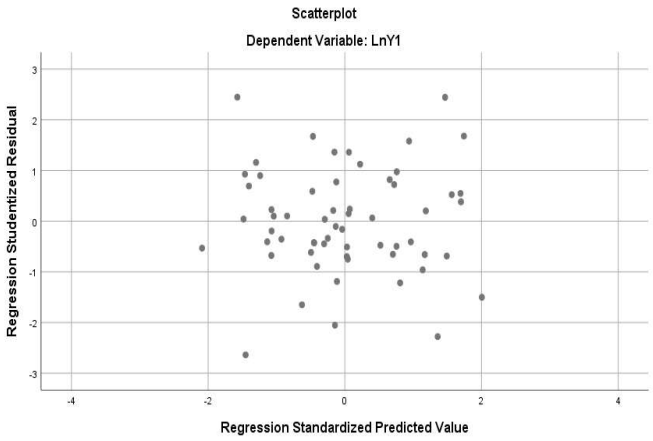

Figure 5. Heterochedasity test (SPSS)

Based on the Scatterplot image, the heterochedasity test shows that the data is scattered around the number 0 (0 on the Y axis), and does not form a specific pattern or trend line.

Thus, the data can be said to be homochedasity / non-occurrence of heterokedastity and meet the requirements for regression analysis.

Multiple Linear regression test

From the equation above, it shows that any increase in units of the variables of land area, total of colonies, use of equipment and the amount of labor used will have a positive effect on increasing honey production. Therefore, this business can still continue to be developed by anticipating the influence of other influences so as not to reduce honey production.

Simultaneous test of test F , joint influence of variable X on Y(honey production)

The results of the analysis show that F calculates > F table which means that H0 is rejected and H1 is accepted which means that the variable x together has a positive effect on honey production, so this multiple regression model is feasible to use. From the results of the F test, it can be said that the land area, total of colonies, equipment and labor together have a positive effect on honey production. The use of houses and artificial nest reduces the amount of energy that bees must expend, thereby increasing the amount of honey produced. Intensive maintenance using environmentally friendly pesticides on plants impacts healthy bees and produces maximum honey, implementing early deadlines for spraying

Table 4. Simultaneous Test Results (F Test)

ANOVA[a]							
Model		Sum of Squares	Df	Mean Square	F	Sig.	Conclusion
1	Regression	14.056	4	3.514	220.746	.000[b]	H0 not acceptance
	Residual	.876	55	.016			
	Total	14.931	59				

a. Dependent Variable: LnY1
b. Predictors: (Constant), LnX4, LnX1, LnX3, LnX2

Source : Output SPSS

Table 5. Partial test results of variable X against Y

No	Variable	T count	T table 5%	Sig.	Conclusion
1	X1= land area	2,662	2,004	0,010	H0 rejected
2	X2= total coloni/stup	9,519	2,004	0,000	H0 rejected
3	X3= equipment	2,193	2,004	0,033	H0 rejected
4	X4= labor	4,911	2,004	0,000	H0 rejected

Table 6. Coefficient of Determination Test Results

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.970[a]	.941	.937	.12617

a. Predictors: (Constant), LnX4, LnX1, LnX3, LnX2
b. Dependent Variable: LnY1

Source : Output SPSS

Talbe 7. Multiple Linear Regression Analysis Test Results

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.920	.809		7.316	.000
	LnX1	.011	.024	.013	.450	.655
	LnX2	.349	.064	.359	5.460	.000
	LnX3	.238	.063	.267	3.793	.000
	LnX4	.417	.071	.382	5.841	.000

a. Dependent Variable: LnY2

Source : Output SPSS

clopyralid can reduce the risk of contamination of bee food products (Hansted *et al.,* 2022). Semi-natural habitat structures must be maintained to preserve rare wild bees especially structurally simple agricultural landscapes (Schubert *et al.,* 2022), the abundance of bees is negatively affected by the type of land use at a temperature of 100 and a distance of 500 m, as well as vegetation cover, area and insulation (Lozada-Gobilard *et al.,* 2021).

Partial test T test, partial effect of variable X on Y

Result of Partial test, it can be seen in the following table:

From table 5 shows that the variability of land area, total of colonies, equipment and labor wages partially positively affects the production of honey produced. The total of colonies has a positive effect on honey production, this is supported by the amount of feed crop land that flowers for honey production, the type of flowers planted is very influential, the concentration of nectar and morphological flowers is an important factor for bees in choosing their food source[10], in coaching it is explained to plant the type of flowers that trigona bees need, so that honey production is optimal. Colony foraging activity is negatively associated with distance to flower strips while worker sizes are not affected. Annual flower strips in areas of ecological focus benefit bee colonies by improving forage (Klatt *et al.,* 2019), the use of artificial nest reduces the amount of feed and energy used by bees and increases the amount of honey production.

The results showed that the area of feed land, the number of colonies and equipment used had a real effect on honey production. The influence of workers on honey production can be seen from their activities to prepare houses and nest, carry out maintenance of plants as a source of bee feed, therefore workers must be able to choose and do their work so that the impact of risks can be minimized, such as replacing the most toxic pesticides with less toxic ones such as novaluron (insecticide), oxadiazon (herbicide), mancozeb (fungicide) and maneb (fungicide) can help reduce pressure pesticides against the environment (Nkontcheu Kenko and Ngameni, 2022). The role of farmers' environmental awareness in the implementation of sustainable agricultural practices, research activities and management programs directed at promoting environmentally friendly food production (Despotović *et al.,* 2021).

Determination test

Based on table 6, it can be seen that adjusted R Square of 0.937 which shows the strength of the relationship model between variables X and Y is very strong, which is 93.7%, while the remaining 6.3% is influenced by other factors. Another factor that may affect is weather or climate which affects the life of bees and plant growth so that it affects honey production and farmer income, although the strength of influence is small, which is 6.3%. Reducing resource barriers, among other things, every addition of nest bee, it is necessary to add flower strips, another obstacle is the distance of the nest

bee to the flower strip (Bommarco *et al.,* 2021), if commercial bees are available, optimal advantage can be achieved by providing no habitat at all for wild bees, and allowing these wild pollinators to become extinct (Kleczkowski *et al.,* 2017). The scheme of the agricultural environment is necessary to achieve a balanced understanding of ecological and economic effects and their effectiveness (Batáry and Tscharntke, 2022), the function of bees to help pollinate and produce honey is maintained by providing a source of feed for pollination activities to continue in the development of crop production.In forest environments, annual flower strips in ecological focus areas benefit bee colonies by increasing successful feeding, colony growth and ultimately increasing sexual reproduction (Klatt *et al.,* 2020).

Multiple liner regression test against bee farmer's income

The results of the analysis of multiple linear regression tests obtained equations

$$LnY = 5{,}920 + 0{,}011LnX_1 + 0{,}349LnX_2 + 0{,}238LnX_3 + 0{,}417LnX_4 + e$$

From the equation above, it shows that the variables of land area, total of colonies, equipment used, and labor that maintain crops and bee houses have a positive effect on farmers' income. In order to increase the livelihood capital of farmers, it is necessary to take measures to strengthen their human resources, promote product innovation, finance, and make good use of their social capital, it is also important to strengthen the support of industrial development to the people In order to increase the livelihood capital of farmers, it is necessary to take measures to strengthen their human resources, promote product innovation, finance, and make good use of their social capital, it is also important to strengthen the support of industrial development to the people (Yue LIU *et al.,* 2021). Furthermore, the interaction of farmers-bee farmers as determined by diverse agro-ecological, institutional and socioeconomic conditions, this must be maintained so that the conditions of the agro-ecological environment do not interfere with the growth and development of bees (Narjes and Lippert, 2018). Government support to form a honey processing industry that is ready for export is an added value for bee farmers.

Simultaneous test of the effect of variable x together on Y (bee farmer's income)

Table8. Simultaneous Test Results (F Test)

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.427	4	3.607	391.766	.000[b]
	Residual	.506	55	.009		
	Total	14.934	59			

a. Dependent Variable: LnY2

b. Predictors: (Constant), LnX4, LnX1, LnX2, LnX3

Source : Output SPSS

Based on the results of the analysis, the calculated F value of 391.766 was obtained while the Ftabel value with df1 = 4, df2 = 55 and α = 5% was 2.540. Thus, F count (391,766) >Ftable (2,540) or Sig. (0.000) <((0.05) means that H0 is rejected and H1 is accepted, this multiple regression model is worth using. Indonesia is one of the largest honey producers, this potential needs to be followed up with further development, the results of research show that coaching for beekeepers has a positive effect on farmers' incomes, honey prices are relatively stable and urgently needed both at home and abroad. Convergence of communication and expertise development for farmers to produce honey as needed can be integrated with the results of innovation for sustainable development actions (Prain *et al.,* 2020). The area of land, the number of colonies, equipment and labor used together have a positive effect on the income of trigona bee farmers, the Field school implemented in the diffusion process of innovation has succeeded in improving the skills and income of farmers. Therefore it is necessary to prioritize agricultural policy for the design of extension services and consulting services aimed at helping farmers to develop their business (Hansson and Sok, 2020). The use of artificial homes and bee nest prevents bees from migrating, the impact of migratory beekeeping on bee health, due to climate change and the demand for pollination of plants (Martínez-López *et al.,* 2022).

Conclusion

1. Development of land management, colonies, equipment and labor affects honey production
2. Development of land management, colonies, equipment and labor affects the income of beekeepers'

Recommendations

1. Coaching the use of artificial beehives is very effective and efficient helping beekkepers' more easily control the growth and development of bees
2. Fostering the manufacture of houses and beehives, is one way to reduce expenses.
3. Further guidance is the use of land in cultivating bee feed source crops
4. Government support forms an industry in processing honey to obtain quality honey that is ready for export.

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