ISSN : 1412-8837
e-ISSN : 2579-9959
JURNAL AGRISEP
Kajian Masalah Sosial Ekonomi Pertanian dan Agribisnis

DOI: 10.31186/jagrisep.21.2.457-472

BUSINESS INCOME IN RELATION TO PRODUCTION RISK CASE STUDY: DAIRY CATTLE FARMING BUSINESS IN CISARUA DISTRICT, BOGOR REGENCY, WEST JAVA PROVINCE

Pendapatan Usaha Dengan Adanya Risiko Produksi Studi Kasus : Usaha Peternakan Sapi Perah di Kecamatan Cisarua, Kabupaten Bogor, Provinsi Jawa Barat

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ABSTRACT

Cisarua District produces the least amount of cow's milk among numerous cows' milk production centers in Bogor Regency. Additionally, the fluctuations in milk production caused by disease in dairy cattle are also known to occur in Cisarua District. The study aimed to determine the expected business income when a production risk exists. The cross-sectional data used in this study were obtained from 57 dairy cattle farmers with an average number of 4 lactating cows consisting of second lactating cows, third lactating cows, and pregnant cows. Business income was calculated using R/C ratio analysis, and the expected value of income when production risk exists was measured using expected return. The expected return value was positive, which was IDR 1,907,582. The value represents dairy cattle farmers were risk takers because they continued to run the dairy cattle farming business when a production risk existed. The probability of disease as a production risk factor demonstrated that the dairy cattle farming business in Cisarua District remained profitable.

Keyword: business income, dairy cattle, farming, production, risk

ABSTRAK

Jumlah produksi susu sapi di Kecamatan Cisarua tersmasuk ke dalam jumlah produksi susu terendah di antara beberapa sentra produksi susu sapi di Kabupaten Bogor. Selain itu, fluktuasi produktivitas produksi susu yang disebabkan oleh terserangnya penyakit pada ternak sapi perah juga diketahui terjadi di Kecamatan Cisarua. Tujuan penilitian adalah untuk mengetahui nilai pendapatan yang diharapkan pada saat terjadi risiko produksi. Data cross section yang digunakan pada penilitian ini bersumber dari 57 orang peternak sapi perah dengan rata-rata jumlah sapi laktasi sebanyak 4 ekor yang terdiri dari sapi laktasi kedua, sapi laktasi ketiga, dan sapi bunting. Pendapatan usaha diukur menggunakan analisis R/C ratio dan nilai pendapatan yang diharapkan pada saat terjadi risiko produksi diukur menggunakan expected return. Nilai expected return berdasarkan hasil analisis diketahui bernilai positif, yaitu sebesar Rp 1 907 582. Probabilitas adanya penyakit sebagai faktor risiko produksi menunjukan usaha peternakan sapi perah di Kecamatan Cisarua tetap menguntungkan untuk dijalankan.

Kata Kunci: pendapatan, peternakan, produksi, risiko, sapi perah

INTRODUCTION

A dairy cattle farming is an agribusiness that contributes to Indonesia's milk production supply. In Indonesia, milk production centers are spread across several regions, one of which is in West Java Province. According to the Minister of Agriculture's Decree Number 830 of 2016 on the Locations for National Agricultural Areas Development, several regencies or cities in West Java have been designated as national livestock development areas, those are Bogor, Bandung and West Bandung Regency as the dairy cattle farming areas. Milk productivity in Bogor Regency was the lowest of all West Java's milk production centers. The low milk productivity in Bogor Regency, which is lower than that of West Bandung and Bandung Regencies, creates a gap between the milk production centers. This indicates that dairy farmers in Bogor regency confront production risks when conducting business.

Table 1. Milk productivity at milk production centers in West Java Province

Regencies	Population (head)	Milk Production (liter)	Milk Productivity (liter/head/day)
Bandung Barat	37.998	116.505.027	8,40
Bandung	33.764	79.653.746	6,46
Bogor	8.354	18.492.525	6,06

Source: Central Bureau of Statistics of West Java Province (2018)

Several regions in Bogor Regency, which are centers of dairy cattle farming and milk production, are located in the highlands. This is because the milk-producing cows are FH-type cows that are adapted to living in highland areas

with relatively cold air temperatures (Farizqie, et al. 2020; Brickell, et al. 2011; Ernawan, 2016; Amamou, et al., 2018; Hempel, et al., 2019). Bogor Regency has several dairy cattle farming centers, including Ciawi, Cibungbulang, Pamijahan, and Cisarua.

Table 2. Milk productivity of milk production centers in Bogor Regency

District	Milk Production (liter)	Dairy Cattle Population (head)	Milk Productivity (liter/head/day)
Ciawi	4.036.560	1.340	8,25
Cibungbulang	2.772.013	1.046	7,26
Pamijahan	2.769.743	1.120	6,78
Cisarua	2.120.443	934	6,22
Other	6.066.191	2.762	6,02
Bogor Regency	17.764.950	7.202	6,76

Source: Central Bureau of Statistics Bogor Regency (2018)

Milk production is influenced by the health condition of dairy cattle (Daud, 2017; Timonen et al., 2017; Adler, et al., 2019). Disease in dairy cattle is the risk factor that has the greatest influence on dairy farming (Meuwissen, et al. 2001; Raizman, 2009; Richert, et al., 2013; Alvasen, et al., 2014; Septiani, 2015; Clark, et al., 2016; Amam, 2019; Sugiyanto, 2021). Diseases that affect dairy cattle impair the cow's body health, resulting in decreased milk production. Dairy cattle frequently produced in Indonesia are FH cattle originating from temperate regions, making them more vulnerable to higher ambient temperatures in tropical climates (Salman, 2014). This condition increases the susceptibility of dairy cattle to disease. Another factor that may pose a production risk is the health maintenance of dairy cattle (Septiani, 2016).

Due to low milk productivity from each dairy cattle, the overall milk production is less than optimal. In addition, fluctuating milk productivity affects the amount of milk produced by farmers. This has an impact on business income as dairy farming is reliant on the sale of milk production (Nwaru, 2011; Pamela, 2016; Amam, 2018; Ervina, et al., 2019). Besides causing a decrease in milk production, disease in dairy cattle also increases production costs. Farmers incur additional production costs in the form of costs associated with purchasing medicines and vitamins for ill dairy cattle. The rise in production costs and decrease in milk production significantly impact the farmers' income (Singh, 2008). The income of a dairy farming business differs when there is a production risk. Operating cost at the time of production risk can be described through the expected value of income based on the possibility of production risk.

Based on the description above, the purpose of this study was to analyze the income of the dairy cattle farming business in the Cisarua District in relation to the production risk in the form of dairy cattle disease.

RESEARCH METHOD

Data Types and Sources

The research location in the Cisarua District, Bogor Regency, was determined purposively based on the lowest level of milk production in Bogor Regency. The cross-sectional data was used. The expected return analysis is used to analyze income when production risk exists. The sales and income were calculated using the milk production from four lactating cows as the average number of lactating cows owned by each farmer. The average number of cattle derived from productive cattle included second lactating cows, third lactating cows, and pregnant cows. The sample of farmers was purposively selected based on the duration of their business, specifically farmers who have been running their dairy farming business for at least 3 years. The number of farmers who became respondents in this study was 57 farmers who meet the requirements from all 91 farmers in this area.

The risk factor examined in this study was dairy cattle disease. The research hypothesis was that dairy cattle disease as a production risk could reduce the dairy cattle business income.

Expected return

Agribusiness income that has included an element of risk is referred to as an expected return. The expected return value will describe farm income that includes a risk component. The expected return value or the income value with risk is the multiplication of probability with income from each good and bad condition and then added up entirely (Dillon, 1993; Ellis, 1988). The probability of a good condition is when the dairy cattle are not infected with the disease; meanwhile, the probability of a bad condition is when the dairy cattle are infected with the disease. The probability of good conditions is calculated by dividing the number of good occurrences and the total observed events. In contrast, the probability of bad conditions is obtained by dividing the number of bad occurrences by the total number of observed events. All observed events are equal to the sum of the opportunities multiplied by the income in both good and bad conditions (Doll & Orazem, 1984; Ellis, 1988). Mathematically, the expected return calculation can be expressed as follows:

$$f(w) = E\left(R = \sum p_i \pi_i\right) \quad (1)$$

$$E(R) = p_1\pi_1 + p_2\pi_2 \quad (2)$$

notes: E(R) = expected return; p_1 = probability of good condition; p_2= probability of bad condition; π_1= income in good condition; π_2= income in bad condition

Income Analysis of Risk Conditions

The difference between farming revenue and all costs incurred in an agribusiness, including cash costs and calculated costs, is called farming income. Farming income analysis needs to be conducted to maximize farmer income. Mathematically, income (Y) from the output (Y) obtained through the use of input (X) can be represented as follows:

$$Y = P_y \times Y - \sum P_i \times X_i \qquad (P_y, P_i \rangle 0) \quad (3)$$

notes: $P_y.Y$ = farming revenue; $\sum P_i.X_i$= farming cost

The incidence of production risk in a farming activity will affect the amount of production output, directly affecting the farming revenue and income. The components of dairy farming income calculated are presented in Table 3.

Table 3. Components of dairy cattle farming income

No.	Components	Description
A	Cash revenue	Price(P) x dairy product sold (Q_1)
B	Calculated revenue	Price(P) x dairy products consumed/stored (Q_2)
C	Total revenue	A + B
D	Cash cost	Production input costs Labor costs outside the family (LCOF)
E	Calculated cost	Labor costs in the family (LCIF) Equipment depreciation Own land value
F	Total cost	D + E
G	Income on cash cost	A – D
H	Income on total cost	C – F
I	Income with production risk	$p_1H + p_2H$

Profit and Loss Analysis

The income statement can be used to perform a financial analysis of an ongoing business. The income statement is a report that describes the results of the company's operations in a certain period. The income statement consists of Total Revenue (TR), Total Fixed Cost (TFC), Total Variable Cost (TVC), Total

Cost (TC), net profit before interest, net profit before tax, tax, and net profit after tax (Nurmalina, et al., 2014).

The R/C ratio analysis is the comparison ratio between revenue and costs (Soekartawi, 2002). The R/C ratio analysis can be used to determine business efficiency. The statement can be expressed in the formula of the R/C ratio as follows:

$$R/C \text{ ratio} = \frac{TR}{TC} \quad (4)$$

Notes: R/C ratio= Ratio between revenue and cost; TR = Total revenue; TC = Total cost

Decision criteria:

R/C > 1: the business is profitable

R/C = 1: the business does not make a profit or loss (break-even)

R/C < 1: the business is losing

RESULT AND DISCUSSION

Dairy Cattle Farming Business Revenue

The revenue of dairy farmers in the Cisarua District consisted of cash and calculated revenue. Cash revenue was obtained from farmers' fresh milk sales to the village unit cooperative (*Koperasi Unit Desa*/KUD). Calves' milk consumption was the calculated revenue. The dairy consumption level of farmers in the Cisarua District was relatively low because farmers prefer packaged milk to fresh milk. The revenue of dairy farmers in the Cisarua District was determined from the sale of milk produced by four lactating cows during the second and third lactation periods, as well as milk produced from pregnant cows.

In Table 4, almost all of the revenue of dairy cattle farmers in the Cisarua District was generated from the fresh milk sale. Cash revenue for dairy farmers in Cisarua District was 93,9% of their total monthly revenue. The calculated revenue for dairy farmers was only 6,1% of the overall revenue each month. Revenue originating from the sale of cattle was not part of the revenue for dairy farmers in the Cisarua District because dairy farmers do not routinely sell cattle. The average revenue of dairy farmers in the Cisarua District is lower than that of dairy farmers in Lembang, West Java Province. Malau (2017) reported that the average monthly revenue from dairy farmers in Lembang, West Java Province, was IDR 7.935.092.

Table 4. The average monthly revenue of four lactating cows in a dairy cattle farming business in the Cisarua District

Revenue	Description	Production /day (liter)	Production /month (liter)	Unit price (IDR)	Total (IDR)
A	Cash revenue				
	Fresh milk sale	42,65	1.279,37	5.000	6.396.842
B	Calculated revenue				
	Calves' milk consumption	2,77	83,08	5.000	415.835
C	Total revenue				6.812.227

Dairy Cattle Farming Costs

The cost component used by dairy farmers in Cisarua District consisted of cash and calculated costs. The feed, animal health, electricity, and property tax were all included in the cash cost components. Meanwhile, forage cost, labor costs in the family, equipment depreciation, and land value were included in the calculated cost. The cost component used to assess production costs in a dairy cattle farming business in Cisarua District was solely the cost for the second lactation cow, third lactation cow, and pregnant cow because these are all producing milk cows. Heifers, dry period cattle, bulls, and calves were not included in calculating production costs.

The cost for concentrate feed was the largest cost component of the total cash costs incurred by farmers in the Cisarua District, accounting for 35.10 percent. The percentage value for concentrate feeds corresponded to the research conducted by Santosa (2013), Soeyatno (2013), Cahyawati (2015), Aini (2016), and Malau (2017), who concluded that the cost for concentrate feed was the highest cost of the cost component in dairy cattle farming business.

Polar was the feed composition that accounted for the second-highest proportion of production costs at 33,63%. This was influenced by the high price of polar, even though polar is used in small amounts compared to other feed components. The other significant cost component was bran, which accounted for 19,23% of the total cash cost. This demonstrated that the primary cost requirement for dairy farmers in the Cisarua District was to procure concentrate feed. The other feed cost components were also calculated as cash costs as part of the total production costs. Additionally, certain production costs were also categorized as cash costs, including tofu dregs, artificial insemination, vitamins and medication, electricity cost, and property tax.

Table 5. Average production costs per month for four lactating cows in a dairy farming business in Cisarua District

Cost	Description	Needs/day (kg)	Needs/months (kg)	Unit price (IDR)	Total (IDR)
D	Cash cost				
	- Bran (kg)	6,49	194,74	3.500	681.579
	- Polar (kg)	6,11	183,42	6.500	1.192.237
	- Tofu dregs (kg)	1586	475,80	633	301.181
	- Factory concentrate (kg)	12,76	382,80	3.250	1.244.100
	- Artificial insemination				25.000
	- Medication				24.000
	- Vitamin (bottle)				22.500
	- Electricity				50.000
	- Property tax				4.208
	Total cash cost				3.544.806
E	Calculated cost				
	- Forage (kg)	14,07	422,11	200	84.422
	- LCIF (working day)	0,69	20,70	13,333	276.000
	- Equipment depreciation				75.585
	Total calculated cost				436.007
F	Total production cost				3.980.813

The calculated cost for the dairy cattle farming business in Cisarua District was quite low, accounting for only 10,95% of the total production costs. The calculated costs consist of forage, labor costs in the family (LCIF), and depreciation costs. The LCIF was the largest cost component, amounting to 63,30% of the calculated costs. This finding was in accordance with the research by Cahyawati (2015) and Malau (2017), who reported that the greatest percentage of calculated costs in dairy cattle farming came from the labor in the family. The average total production cost required by dairy farmers in Cisarua District was IDR 3.980.813.

Dairy Cattle Farming Business Income

The income from the dairy cattle farming business is the difference between the total revenue and the total production costs. The dairy cattle farming business's income is divided into two categories: income on cash costs and income on total costs. In addition, the success of the dairy farming business is also measured using the R/C ratio. The R/C ratio is obtained by comparing the farmers' income to the costs incurred in the dairy cattle farming business in

Cisarua District. The income from dairy farming was calculated based on the milk production of four lactating cows.

Based on Table 6, it indicates that the dairy cattle farming business in Cisarua District was profitable. This was supported by positive income and a greater than one R/C ratio. The R/C ratio of cash costs was 1,81, which was greater than the R/C ratio of total costs of 1,71. A similar finding was also reported in the research by Soeyatno (2103), Cahyawati (2015) and Malau (2017). Based on the R/C ratio, it can be concluded that the dairy cattle farming business in Cisarua District was both feasible and profitable.

Table 6. The average income of four lactating cows in a dairy cattle farming business in the Cisarua District

No.	Description	Unit	Value
A	Cash revenue	IDR	6.396.842
B	Calculated revenue	IDR	415.835
C	Total revenue	IDR	6.812.227
D	Cash cost	IDR	3.544.806
E	Calculated cost	IDR	436.007
F	Total cost	IDR	3.980.813
G	Income on cash cost	IDR	2.852.037
H	Income on total cost	IDR	2.831.414
I	R/C ratio on cash cost		1,81
J	R/C ratio on total cost		1,71

Dairy Cattle Farming Business Income with Production Risk

The disease is a source of production risk that frequently occurs in dairy cattle farming in the Cisarua District. Mastitis was the most often discovered illness in dairy cattle. Mastitis is an inflammation of milk udder that it inhibits milk production in dairy cattle. The average loss of milk production in the morning milking process caused by mastitis in dairy cattle was 17 liters per head per day, while the average loss of milk production in the afternoon milking process was 10,50 liters per head per day. The average milk production of dairy cattle suffering from mastitis was 15,15 liters per head per day. Table 7 summarizes the average revenue of dairy farmers with production risk due to disease.

According to the data in Table 7, the revenue from the dairy cattle farming business was reduced by 60,55% when four lactating cows had the disease. The revenue loss was estimated at IDR 4.125.000, resulting in total

revenue from the dairy cattle farming business in the presence of disease only reached IDR 2.687.227. Even while the amount of revenue had dropped due to the presence of disease, the revenue remained positive.

Table 7. Average monthly revenue of four lactating cows with the disease in dairy cattle farming in Cisarua District

Revenue	Description	Production/ day (liter)	Production /month (liter)	Unit price (IDR)	Total (IDR)
A	Cash revenue				
	Fresh milk sale	15,15	454,37	5.000	2.271.842
B	Calculated revenue				
	Calves' milk consumption	2,77	83,08	5.000	415.835
C	Total revenue				2.687.227

The presence of diseases in dairy cattle had an effect on production costs. The components of production costs had increased due to the increased requirement to procure medications and vitamins for dairy cattle. The production cost for medications needs climbed from IDR 24.000 to IDR 96.000, while the production cost for vitamins increased from IDR 22.500 to IDR 67.500. Total production costs due to production risk increased by 2,83% to IDR 4.093.598. The average production cost of the dairy farmers with the presence of production risk is presented in Table 8.

The decrease in revenue and an increase in production costs from ill dairy cattle affected the income of the dairy cattle farming business in the Cisarua District. This change resulted in negative income for the dairy farmers, both for the income on cash costs and income on total costs. The value of the R/C ratio of cash costs and total costs at the time of the disease was less than one.

Table 8. Average production costs per month for four lactating cows with the disease in dairy cattle farming in Cisarua District

Cost	Description	Needs /day	Needs/ month	Unit price (IDR)	Total (IDR)
D	Cash cost				
	- Bran (kg)	6,49	194,74	3.500	681.579
	- Polar (kg)	6,11	183,42	6.500	1.192.237
	- Tofu dregs (kg)	15,86	475,80	633 3.250	301.181
	- Factory concentrate (kg)	12,76	382,80		1.244.100
	- Artificial insemination				25.000
	- Medications				96.000
	- Vitamin (bottle)				67.500
	- Electricity				50.000
	- Property tax				4.208
	Total cash cost				3.657.597
E	Calculated cost		`		
	- Forage (kg)	14,07	422,11	200	84.422
	- LCIF (working)	0,69	20,70	13.333	276.000
	- Depreciation				75.585
	Total calculated cost				436.007
F	Total production cost				4.093.598

Table 9. The average dairy cattle farming income of four lactating cows with the disease in the Cisarua District

No.	Description	Unit	Value
A	Cash revenue	IDR	2.271.842
B	Calculated revenue	IDR	415.835
C	Total revenue	IDR	2.687.227
D	Cash cost	IDR	3.657.597
E	Calculated cost	IDR	436.007
F	Total cost	IDR	4.093.598
G	Income on cash costs	IDR	- 970.370
H	Income on total cost	IDR	- 1.406.371
I	R/C ratio on cash cost		0,73
J	R/C ratio on total cost		0,66

The R/C ratio on cash costs was 0,73, while the R/C ratio on total costs was 0,66. The R/C ratio indicated that every IDR 1.00 of costs incurred by dairy farmers would earn a cash income of IDR 730 and a total income of IDR 660. This value demonstrated that the income of dairy cattle farming in the Cisarua District was smaller than production costs when the dairy cattle were infected with the disease. Such conditions illustrated that the presence of diseases in dairy cattle contributed to the inefficiency of the dairy cattle farming business in the Cisarua District.

Table 10. Expected return value

No.	Description	Unit	Value
A	Probability of not getting disease		0,782
B	Income on total cost at no risk	IDR	2.831.414
C	Expected income at no risk conditions	IDR	2.214.165
D	Probability of getting disease		0,218
E	Income on total cost in risky conditions	IDR	- 1.406.371
F	Expected income in risky conditions	IDR	- 306.588
G	Expected return value (C + F)	IDR	1.907.577

The expected return value is the expected income value by including the element of risk in the calculation of agribusiness. The possible risk used to calculate the expected return was the probability of disease in dairy cattle. The probability of disease in dairy cattle was 0,218, and the probability of not getting the disease was 0,782. Based on these probabilities, the expected return value for the dairy cattle farming business in Cisarua District was IDR 1.907.577. When there was production risk, the income value was negative, but the expected income value remained positive. These results were in accordance with the research conducted by Apriana (2017) and Hartoyo (2018). In addition, the expected return value also demonstrated that dairy farmers in Cisarua District tended to like risk (are not afraid of risk) as they continued to operate their dairy farming business, even when their income decreased due to sick cattle

CONCLUSION AND SUGGESTION

Conclusion

The income from dairy cattle farming in Cisarua District was positive. The R/C ratio to cash costs in dairy cattle farming was 1.81, while the R/C ratio to total costs was 1.71. Thus, it can be concluded that the dairy cattle farming business in Cisarua District was profitable. When the disease occurred, the expected return value from the dairy cattle farming business was positive, which

was IDR 1,907,582. The probability of the disease continued to make dairy cattle farming in Cisarua District profitable.

Recommendation

The production risk factors affecting the dairy farming income are not only disease. Several other production factors may have a probability of influencing the income of a dairy farming business. Thus, it is recommended that further research will be conducted on other production risk factors that may influence the dairy farming income in the other cow milk production centers, especially in Cisarua District.

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