THE UNIVERSITY of ADELAIDE

The Centre for Global Food and Resources

The IndoDairy Smallholder Household Survey
From Farm-to-Fact

Factsheet 13: Introduction to Profitability Comparison

Background

In the previous factsheet, the gender inclusiveness aspect of dairy farmers in the IndoDairy Smallholder Household Survey (ISHS) '*Farm-to-Farm'* series was analysed.

In this factsheet, the profitability aspects will be discussed again, similar to that in Factsheet 8: Costs, Revenue and Profit. However, quartiles instead of districts will be considered.

In this factsheet, the 600 households were categorised into quartiles based on their profitability, which allows us to identify characteristics of more versus less profitable dairy farmers.

Benchmarking

The benchmarking tool behind the categorisation and calculation of cost, revenue and profit was based on a model shown in Figure 1 used in the Australian dairy industry, developed by the project collaborator, Subtropical Dairy, where:

- **Total milk revenue:** fresh milk sales (net milk delivery costs), processed milk sales (e.g. yoghurt) and the value of milk consumed by household members and calves.
- **Total variable costs:** Forage costs, concentrate and supplement costs, feed delivery costs, health products and veterinary fees, artificial insemination costs and water costs.
- **Total overhead costs:** Employed labour costs, taxes, electricity costs, cooperative membership, recorder fees and other memberships.
- **Total other costs:** Land rent and interest on loans.

Comparison of profit quartiles

In order to identify characteristics that improve profitability, farmers were categorised based on the average profit received per lactating cow managed.

Farmers were grouped into four equal groups (n = 150) based on profit per cow per year. The average profit per cow per year for each quartile is shown in Table 1 below.

Table 1. IndoDairy Profit Quartiles.

Quartiles	Average profit per cow per year	
	IDR	USD[1]
Quartile 1	-687,253	-47.53
Quartile 2	8,652,920	598.44
Quartile 3	13,700,000	947.50
Quartile 4	23,800,000	1,646.03

[1]Exchange rate 1 USD = 14,459.50 Indonesian Rupiah on 27 July 2018

Australian Government Australian Centre for International Agricultural Research
Dairy Australia
Ministry of Agriculture Indonesia
IPB University Bogor Indonesia
Australian Aid

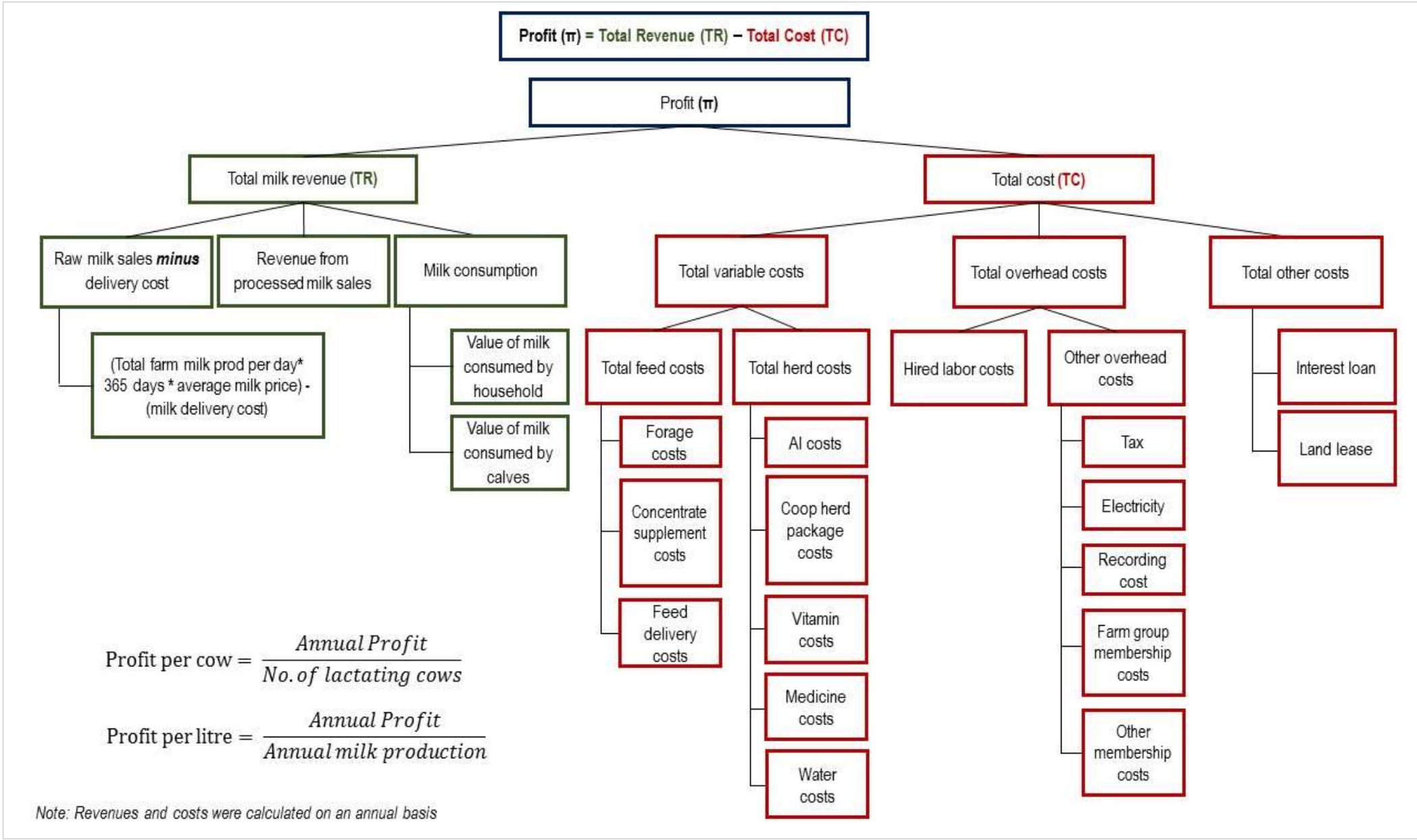

Figure 1. Details of benchmarking model to calculate dairy farm profitability. All revenue and costs were calculated per annum in IDR.

Production costs

A comparison of production costs based on profit quartiles is shown in Table A1 in the Appendix. Farmers with low profits (Quartile 1) operated with significantly higher costs of production compared to the farmers with high profits (Quartile 4).

A major difference between the quartiles was the costs associated with concentrates and supplements, with the Quartile 1 (Q1) farmers (42.90 million IDR or USD 2,967 per annum) spending, on average, twice as a much as farmers in Quartile 4 (Q4) (18.30 million IDR or USD 1,265 per annum).

A similar pattern was observed with other costs such as forages, employed labour, herd costs and other business costs (e.g. interest on loans and land rent) with farmers in Q1 spending more compared to farmers in Q4.

This was also reflected on the costs and expenses incurred by farmers on the production of milk per litre as shown in Table A2 in the Appendix.

Dairy farmers in Q1 had significantly higher costs per litre of milk: three times more than Q4 farmers. The costs of concentrates and supplements were major drivers for the difference between Q1 and Q4.

Revenue

The average annual revenue derived from dairy production for each of the profit quartile is shown in Table A1 in the Appendix.

The total revenue derived from milk production by Q1 was 65 million IDR (USD 4,495) per annum and 73.10 million IDR (USD 5,055) for Q4. This means, on average, **Q4 generated 8 million IDR (USD 553) more than Q1 per annum, which is approximately 12% more.**

When this data is observed on a per-litre-of-milk basis, as shown in Table A2 in the Appendix, **total revenue for Q1 was 4,755 IDR (USD 0.32) and Q4 was 4,989 IDR (USD 0.34) per litre.**

The area represented by the brown line in Figure 2 is total revenue per litre of milk produced. The total height of each column represents total cost per litre of milk produced, while the total profits (IDR) per quartile were highlighted on top of each column.

Profit

While farmers in Q4 had significantly higher revenue compared to the other quartiles, the magnitude of difference was considerably smaller compared to the difference in production costs between quartiles. To illustrate this point, production costs and revenue per litre of milk produced is presented by quartiles in Figure 2 below.

Total profit received per litre of milk for farmers in Q1 is -100 IDR (-0.06 USD) which increases to 3,376 IDR (USD 0.23) for farmers in Q4. As shown in Figure 2 below, there is a drastic drop in production costs by 3,243 IDR (USD 0.22) for farmers in Q4.

Profit distribution by district

A summary of districts by profit quartile is shown in Figure 3 and Table A3 in the Appendix. There were significant differences between proportions of farmers in each quartile across the four districts.

In Bogor, a greater proportion of farmers was noted in Q1 and Q4, while fewer in Q2 and Q3. This indicates that more farmers were towards the extreme ends of profitability, rather than middle range.

Garut had fewer farmers in Q1 (least profitable) and slightly more in Q2. Cianjur had slightly fewer farmers in Q4 (most profitable) and more in Q2.

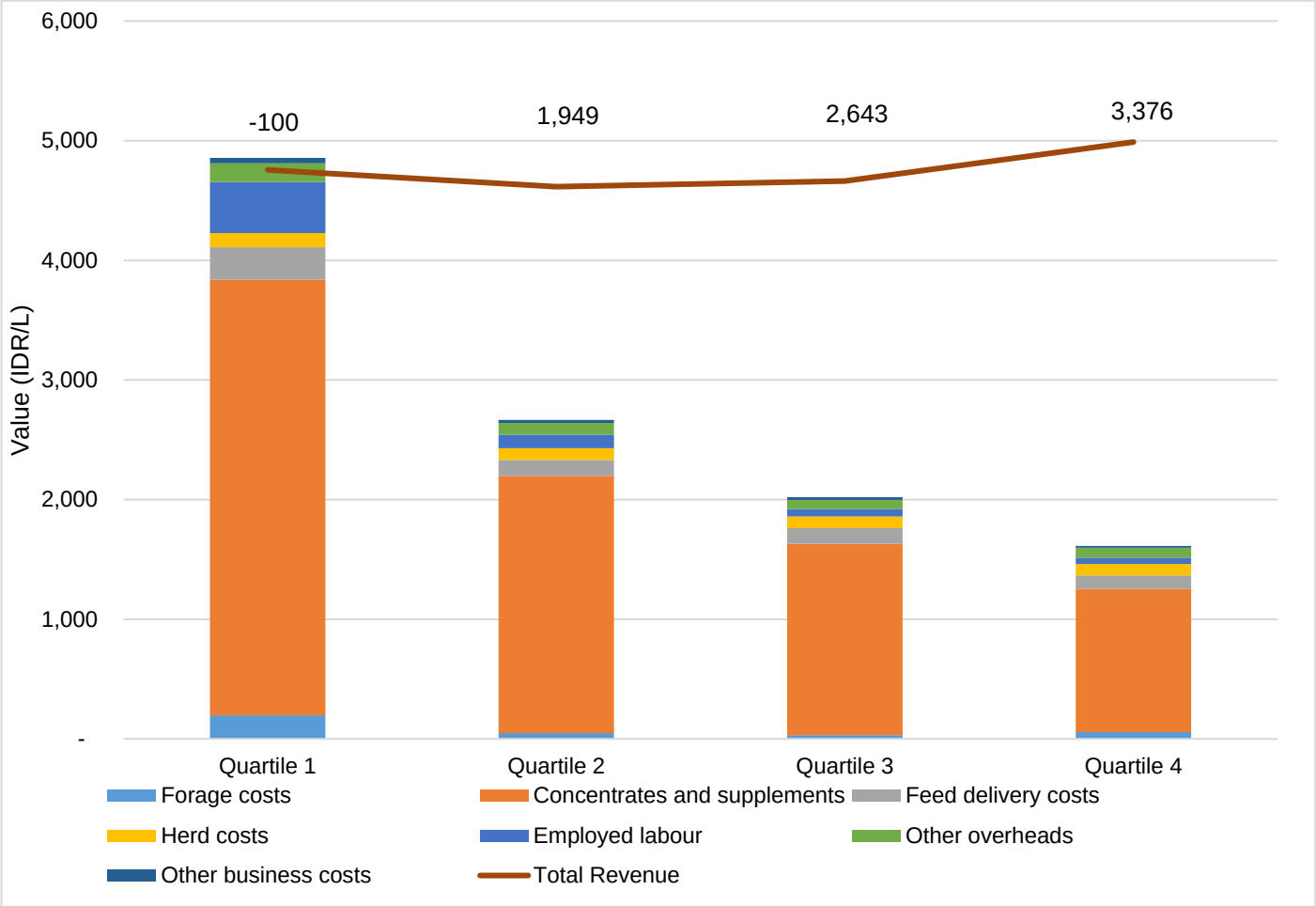

Figure 2. Comparison between profit quartiles of production costs and revenue per litre of milk produced. The total height of each column represents total costs while the brown line represents total revenue. The numbers at the top of each column represent profit per litre.

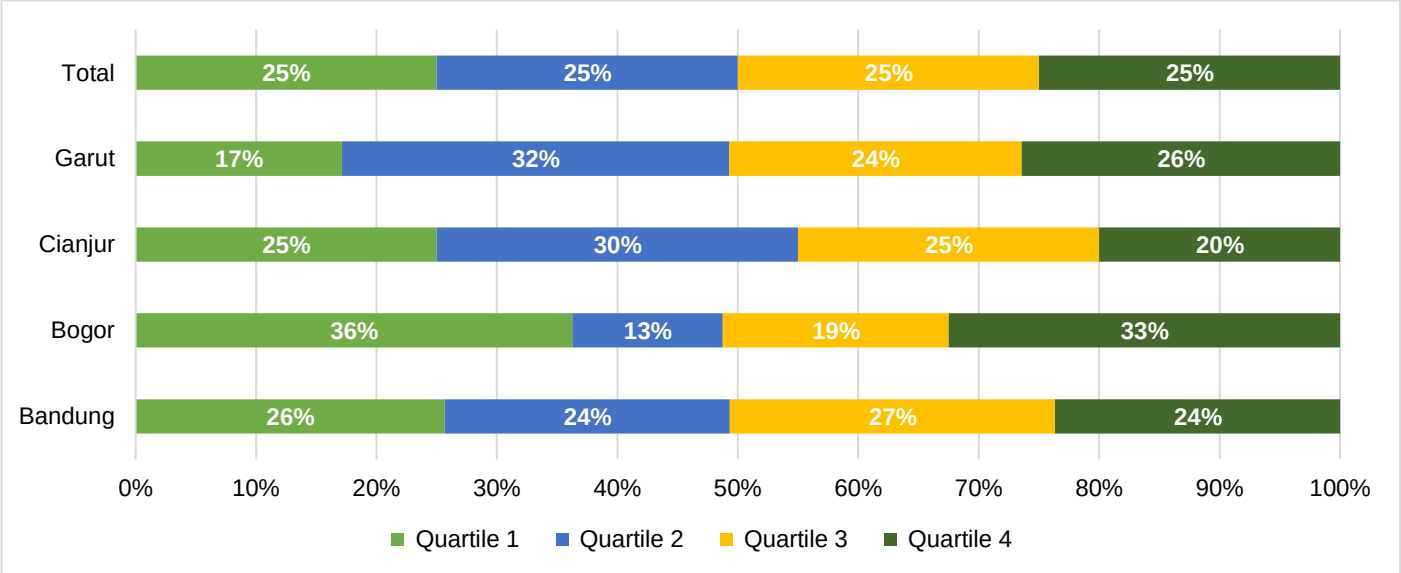

Figure 3. Distribution of profit quartiles by district.

Summary

This factsheet illustrates that profitability was largely determined by reducing overall costs, not higher revenues. Therefore, categorising the farmers in profit quartiles have allowed us to identify a set of farmers that were able to achieve higher profits with efficient management and control of costs.

- **Dairy farmers in Q1 (least profitable) had significantly higher costs per litre of milk; three times more than Q4 (most profitable) farmers. The costs of concentrates and supplements were major drivers for the difference between Q1 and Q4.**
- **On average, Q4 generated 8 million IDR (USD 553) in revenue, more than Q1 per annum, which is approximately 12% more. Total revenue for Q1 was 4,755 IDR (USD 0.32) and Q4 was 4,989 IDR (USD 0.34) per litre.**
- **Total profit received per litre of milk for farmers in Q1 is -100 IDR (-0.06 USD) which increases to 3,376 IDR (USD 0.23) for farmers in Q4. There is a drastic drop in production costs by 3,243 IDR (USD 0.22) for farmers in Q4.**

In order to determine other drivers of profitability within the IndoDairy Smallholder Household Survey (ISHS), the subsequent factsheets will assess differences between quartiles of farming characteristics, including: socio-demographic, farm and cattle characteristics, management practices and technology adoption.

Appendix to Factsheet 13

This appendix lists details milk production costs, revenue and profits as an annual and per litre value. These are disaggregated by profit quartiles.

Statistical significance between profit quartiles were determined using ANOVA (for binary and continuous variables) and Pearson's Chi-squared test (for categorical variables). For categorical variables with small observations ($n < 5$), Fisher's exact test was used to confirm the Chi-squared test. ANOVA and Chi-squared tests results are shown in the right-hand column, under the Total. Pairwise comparisons were performed for continuous and binary variables using Tukey tests when the ANOVA test was trending towards significant ($p < 0.10$). Profit quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A1. Total annual farm milk production costs and revenue by profit quartile, where farmers in the Quartile 1 were the least profitable per cow per year and farmers in Quartile 4 were the most profitable (n = 600).

	Quartile 1			Quartile 2			Quartile 3			Quartile 4			Total		
Variables	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**
Variable costs:															
Forage costs	2.13	8.24		0.63	2.88		0.55	2.96		1.14	9.14		1.11	6.50	
Concentrates and supplements	42.90	42.00		30.40	29.40	b	25.90	32.50	ab	18.30	17.10	a	29.40	32.70	***
Feed delivery costs	3.33	5.96		1.61	2.56	ab	1.57	2.47	ab	1.47	2.09	a	2.00	3.70	
Herd costs[4]	1.60	2.09		1.46	1.90		1.53	2.00		1.46	1.90		1.51	1.97	
(A) Total variable costs	**49.90**	**47.20**		**34.10**	**32.00**	b	**29.60**	**35.50**	ab	**22.40**	**21.30**	a	**34.00**	**36.60**	***
(B) Employed labour costs	10.40	25.50		2.39	6.95	a	1.65	7.47	a	1.42	6.19	a	3.96	14.50	***
(C) Other overheads[5]	1.53	1.71		1.00	0.94	a	0.85	0.86	a	1.05	1.66	a	1.11	1.37	***
(D) Other business costs[6]	0.59	1.68	b	0.30	0.69	ab	0.31	0.86	ab	0.24	0.59	a	0.36	1.05	**
(E) Total costs (A + B + C + D)	**62.42**	**76.09**		**37.79**	**40.58**	a	**32.41**	**44.69**	a	**25.11**	**29.74**	a	**39.43**	**53.52**	***
Milk revenue:															
Fresh milk sales[7]	60.20	64.80		60.70	55.50		67.40	70.10		67.30	51.90		63.90	60.90	
Value of consumed milk[8]	2.57	0.33	a	2.55	0.49	a	2.57	0.44	a	2.74	0.65		2.61	0.50	***
Processed milk sales	2.24	26.50		0.00	0.00		0.12	1.46		3.03	23.70		1.34	17.80	
(F) Total milk revenue	**65.00**	**80.30**		**63.30**	**55.60**		**70.10**	**70.90**		**73.10**	**57.10**		**67.90**	**66.70**	
(G1) Revenue over variable costs (F – A)	15.10	41.30		29.20	25.70		40.50	37.60	a	50.60	40.90	a	33.90	39.10	***
(G2) Revenue over total costs (F – E)	**2.54**	**23.80**		**25.50**	**21.40**		**37.70**	**32.40**		**47.90**	**37.00**		**28.40**	**33.80**	
(H) Number of lactating cows managed	3.28	3.56	a	2.92	2.29	a	2.75	2.29	ab	2.07	1.46	b	2.75	2.55	***
(I) Profitability per cow per year (G2 / H)	**-0.68**	**7.83**		**8.65**	**1.39**		**13.70**	**1.41**		**23.80**	**12.60**		**11.40**	**11.60**	
Opportunity costs:															
Owner's labour[9]	20.20	15.00	ab	21.10	12.20	ab	22.70	13.30	b	18.50	11.90	a	20.60	13.20	**

[1]Value = Indonesian Rupiah (IDR) in millions; [2]SD = Standard Deviation; [3]Sig = Significance; * p < 0.10, ** p < 0.05 and *** p < 0.01 indicate significance at the 10%, 5% and 1% levels, respectively. Pairwise comparisons were performed for continuous and binary variables using Tukey tests when the ANOVA test was trending towards significant (p < 0.10). Quartiles with the same letter were not significantly different at the 5% level (p > 0.05). [4]Herd costs include: Cattle health products, veterinary fees, artificial insemination costs and water costs; [5]Other overheads include: taxes, electricity costs, cooperative membership, recorder fees, other membership fees; [6]Other business costs: Land rent and interest on loans; [7]Fresh Milk Sales was revenue from milk sales at the KUD after deducting milk delivery costs; [8]Value of milk consumed by household members and calves. [9]Owner's labour was the estimated value of household members' time towards dairy-related activities, calculated by the amount of time spent multiplied by the hired labour rate.

Table A2. Production costs and revenue per litre of milk produced based on profit quartiles, where farmers in the first quartile were the least profitable per cow per year and farmers in the fourth quartile were the most profitable (n = 600).

	Quartile 1			Quartile 2			Quartile 3			Quartile 4			Total		
Variable	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**	**Value[1]**	**SD[2]**	**Sig[3]**

Variable costs:														
Forage costs	0.19	0.72		0.05	0.19	a	0.03	0.12	a	0.05	0.30	a	0.08	0.41	***
Concentrates and supplements	3.64	2.00		2.15	0.61		1.59	0.58		1.19	0.59		2.15	1.46	
Feed delivery costs	0.27	0.42		0.13	0.23	a	0.13	0.19	a	0.11	0.18	a	0.16	0.28	***
Herd costs[4]	0.12	0.08	b	0.09	0.06	ab	0.10	0.07	ab	0.09	0.08	a	0.10	0.07	***
Total variable costs	**4.22**	**2.03**		**2.43**	**0.62**		**1.85**	**0.57**		**1.46**	**0.65**		**2.50**	**1.56**	
Employed labour costs	0.42	0.74		0.11	0.31	a	0.06	0.19	a	0.05	0.17	a	0.16	0.45	***
Other overheads[5]	0.15	0.16		0.09	0.10	a	0.08	0.08	a	0.08	0.09	a	0.10	0.12	***
Other business costs[6]	0.04	0.10		0.02	0.07	a	0.02	0.04	a	0.02	0.04	a	0.02	0.06	***
Total costs	**4.85**	**1.98**		**2.66**	**0.58**		**2.01**	**0.55**		**1.61**	**0.71**		**2.78**	**1.68**	
Milk revenue:														
Fresh milk sales[7]	4.35	0.34	a	4.32	0.32	a	4.39	0.29	ab	4.51	0.62	b	4.39	0.42	***
Value of consumed milk[8]	0.37	0.35	b	0.29	0.19	ab	0.26	0.17	a	0.25	0.14	a	0.29	0.23	***
Processed milk sales	0.04	0.39		0.00	0.00		0.00	0.02		0.21	1.82		0.06	0.93	
Total milk revenue	**4.75**	**0.64**		**4.61**	**0.33**		**4.66**	**0.31**		**4.98**	**1.92**		**4.76**	**1.05**	
Revenue over variable costs	0.52	2.00		2.18	0.53		2.80	0.55		3.52	1.76		2.26	1.77	
Revenue over total costs (profit)	**-0.10**	**1.92**		**1.94**	**0.51**		**2.64**	**0.54**		**3.37**	**1.76**		**1.96**	**1.87**	
Opportunity costs:														
Owner's labour[9]	2.59	2.31	a	2.24	1.76	a	2.15	1.57	ab	1.64	1.26	b	2.15	1.80	***

[1]Value = Indonesian Rupiah (IDR) in thousands; [2]SD = Standard Deviation; [3]Sig = Significance; * $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$ indicate significance at the 10%, 5% and 1% levels, respectively. Pairwise comparisons were performed for continuous and binary variables using Tukey tests when the ANOVA test was trending towards significant ($p < 0.10$). Quartiles with the same letter were not significantly different at the 5% level ($p > 0.05$). [4]Herd costs include: Cattle health products, veterinary fees, artificial insemination costs and water costs; [5]Other overheads include: taxes, electricity costs, cooperative membership, recorder fees, other membership fees; [6]Other business costs: Land rent and interest on loans; [7]Fresh Milk Sales was revenue from milk sales at the KUD after deducting milk delivery costs; [8]Value of milk consumed by household members and calves. [9]Owner's labour was the estimated value of household members' time towards dairy-related activities, calculated by the amount of time spent multiplied by the hired labour rate.

Table A3. Distribution of profit quartiles by district (n = 600).

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
District:						
Bandung	25.7%	23.7%	27.0%	23.7%	**25.0%**	***
Bogor	36.3%	12.5%	18.8%	32.5%	**25.0%**	***
Cianjur	25.0%	30.0%	25.0%	20.0%	**25.0%**	***
Garut	17.1%	32.1%	24.3%	26.4%	**25.0%**	***

[1]Sig = Significance; * $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$ indicate significance at the 10%, 5% and 1% levels, respectively.