THE UNIVERSITY of ADELAIDE

The Centre for Global Food and Resources

The IndoDairy Smallholder Household Survey
From Farm-to-Fact

Factsheet 6: Milk Productivity, Price and Quality

Background

In the previous factsheet of the IndoDairy Smallholder Household Survey (ISHS) "*farm-to-fact*" series, we looked at dairy farm inputs used by dairy farmers in West Java. This factsheet sheds light on milk productivity, price and quality aspects including comparisons across the four districts: Bogor, Cianjur, Bandung and Garut.

Milk production

During the ISHS, farmers were asked about different measures of milk production for their farm, including average farm production, per individual cow, differences between wet and dry season. These figures were then used to estimate different measures of productivity and efficiency for farmers in the study. Detailed statistics are presented in Table 2.

Total farm milk production

Total farm milk production per day is illustrated in Figure 1 by districts, including comparisons to milk produced per cow.

- **On average, total farm milk production was 39 litres per day.** Total farm milk production per day significantly differs across districts.
- **Farmers in Bogor are producing the highest amount of milk per day 51 litres per day.**
- Farmers in Garut district produce the lowest amount of milk per day at around 26 litres, which is half of what farmers in Bogor are producing.

Milk production per cow per day

- **The average milk production per cow per day was 15 litres.** As with total farm production, milk production per cow per day was significantly different between districts.
- **Farmers in Bandung produce the highest amount of milk per cow per day with, on average, 15 litres.** Farmers in Cianjur produce significantly less milk per cow (14 litres).

When comparing milk production at the farm and cow level, as shown in Figure 2, there is no clear pattern across the districts. On the one hand, farmers in Garut are producing the least amount of milk per farm (26 litres) but are producing above average per cow (15 litres). Compare to this, farmers in Cianjur are producing above average at the farm-level (43 litres) but are the least productive per cow (14 litres) between the districts.

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Total farm milk production is determined by milk production per cow and the size the milking herd (presented in Factsheet 3) and would help explain these differences. A later factsheet will evaluate dairy profitability, including how milk productivity and herd size effect profit margins.

Milk produced per lactation

A key measure of a dairy cows' productivity is how much milk is produced in one lactation. Many aspects, including breed, age, parity (number of pregnancies) and nutrition, can affect this. Milk produced per lactation was estimated using a 300-day lactation period.

- With an average of 15 litre per cow per day, **it is estimated a cow will produce 4,426 litres per lactation.**
- When comparing districts, 15 litres per day in Bandung translates to around 4,535 per lactation, while, 14 litres in Cianjur translates to around 4,048. This means, **farmers in Bandung, on average, are producing approximately 500 litres more than Cianjur in one lactation.**

Milk produced per labour unit

Milk production per labour unit is an efficiency measure that based on the amount of milk one person can support in a year. This is based on how much milk produced by a farm in one year and how much hired and family labour is currently utilised.

- **On average, milk produced per labour unit is 10,329 litres per year.**
- Farmers in Garut district are producing the least amount of milk per labour unit with, on average, 7,953 litres per labour unit per year.
- Farmers in Bogor district are producing significantly more milk 13,975 litres per labour unit per year; approximately 50% more milk than farmers in Garut district do.
- Farmers in Bandung and Cianjur district show somewhat similar production levels with amount of milk per time spent on dairy farming, with farmers in Bandung producing 10,320 litres and farmers in Cianjur producing 10,872 litres in a year.

Milk produced per hectare per year

Milk produced per hectare evaluates the efficiency of production based on the land area used for dairy farming practices. Detailed land area statistics are presented in Factsheet 3.

On average, the area of land used per farm for dairy farming practices (i.e. for grazing cattle or growing fodder crops) is 0.22ha. When the total milk produced by a farm per year is considered by this land area, **it is estimated that a farm would produce 1,210,000 litres per hectare per year.**

- The average land area used for dairy farming practices is highest in Bogor district (0.33ha). However, the farmers in Bogor district are producing less milk as a proportion of their dairy land use compared to the other districts. This translates to approximately 759,000 litres per hectare per year.
- Farmers in Bandung (0.17ha), Garut (0.22ha), who manage less land; are able to produce more milk from land area utilised: 1,349,000 litre per hectare per year in Bandung, and 1,363,000 in Garut district. This is almost double that of farmers in Bogor district.

Despite variations in dairy land area used and large differences in milk produced per hectare between districts, **there is <u>no</u> significant differences between districts in milk produced per hectare per year**. There is likely due to high variations between farms within in a district, which is seen by the large standard deviation (see Table 2).

Seasonal difference in milk production

- **Overall, 76% of farmers reported a seasonal difference in daily milk production.**
- This varied between districts. A higher proportion of farmers reported a difference between seasons in Bandung (82%) and Garut (78%) compared to Bogor (54%)

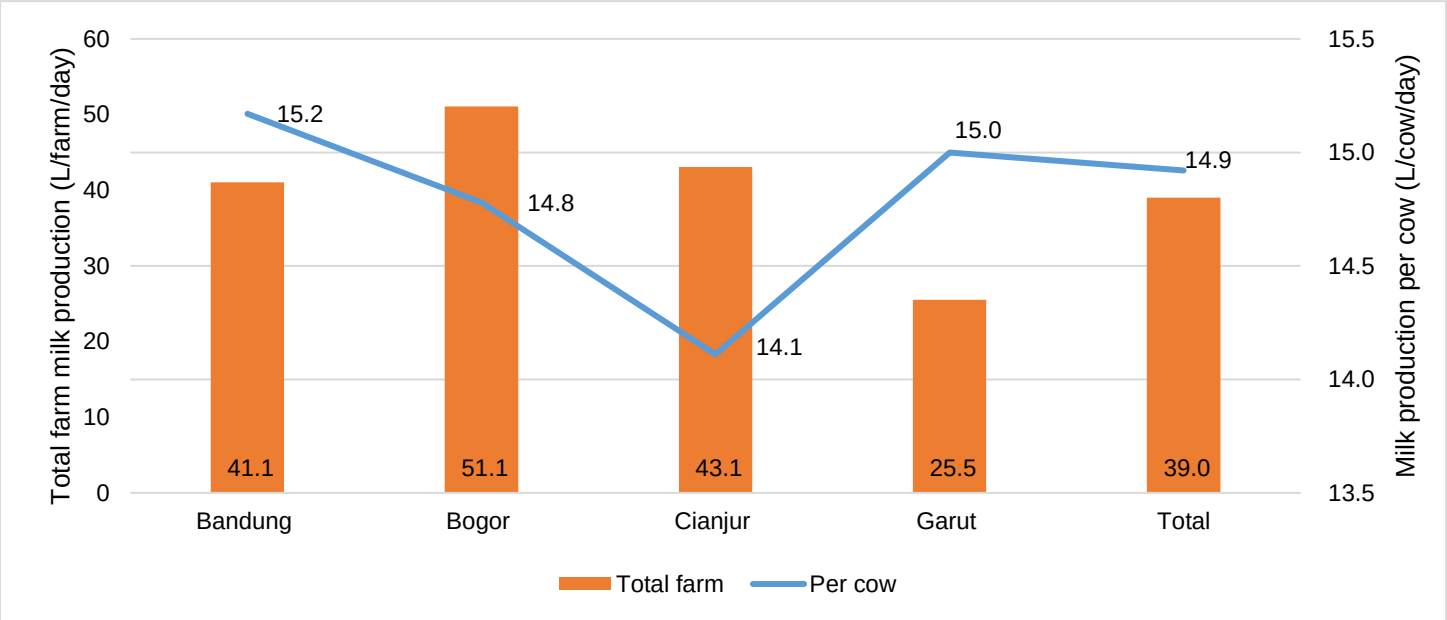

Figure 1. Comparison of total farm and per cow milk production by district.

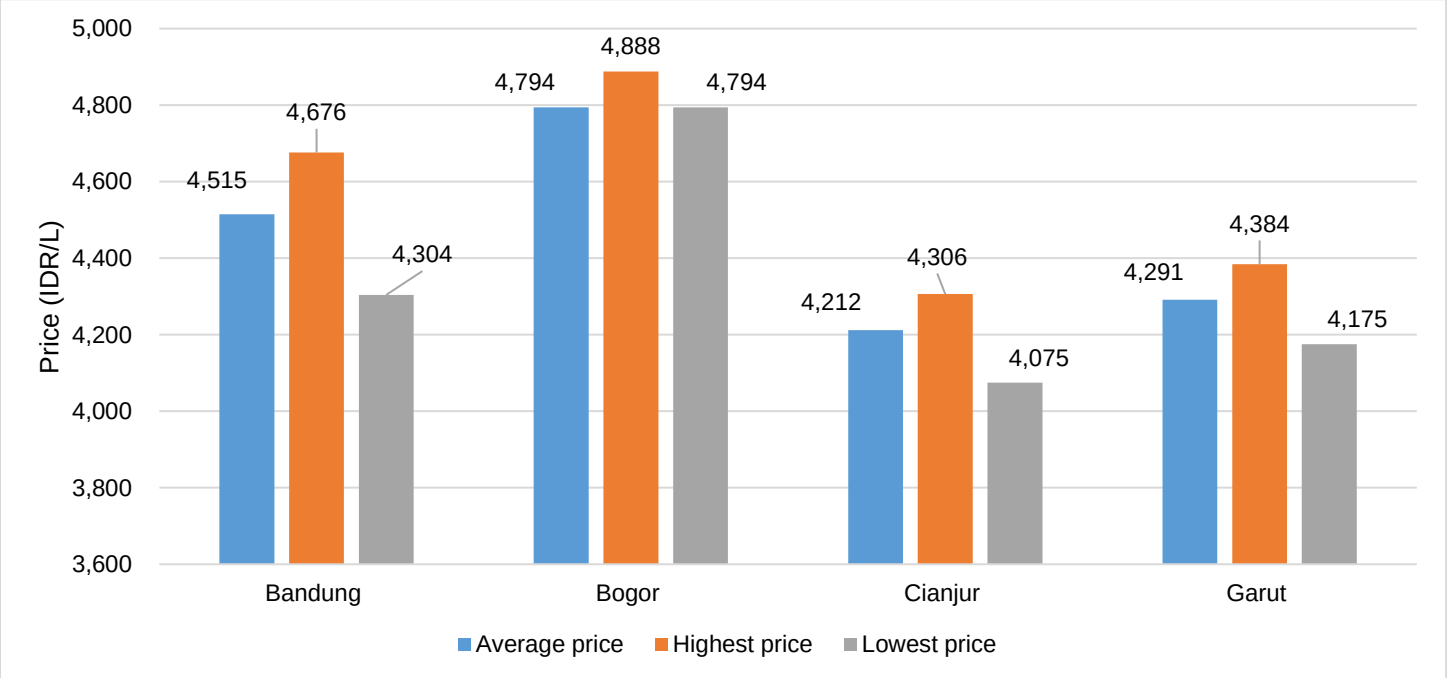

Figure 2. Farm-gate milk price across districts.

- This could be a result of differences in altitude and climatic characteristics of each district.

Farmers were then asked the average daily milk production between seasons.

- **On average farmers reported producing approximately four litres more per day in the wet season.**
- Farmers in Garut reported, on average, 26 litres in both seasons.

The differences in seasonal production could be explained by the availability of forages between seasons.

Milk price

Detailed milk price statistics and agreements with milk buyers are presented in Table 4.

Milk price

Farmers were asked what the average, highest and lowest milk price they received per litre of milk.

- Overall, farmers reported **the average price received for fresh milk was 4,458.7 IDR (USD 30.84 cents) per litre.**
- On average, the highest price received was 4,586.1 IDR (USD 31.72 cents) per litre, while the lowest price was 4,308.0 IDR (USD 29.79 cents).
- Milk price was significantly different across the districts, with farmers from Bogor district receiving the highest amount (4,793.7 IDR or USD 33.15 cents per litre).
- There is a consistent trend for the highest, lowest and average price received across the districts (illustrated in Figure 2).
- Farmers from Cianjur district receive the lowest milk price across the four districts at 4,212 IDR (USD 39.13 cents) per litre.

Arrangement with buyers

Form of contract with buyers

Farmers were asked about the agreements they have with their main buyer, such as written or verbal contracts.

- **Majority (80%) of the farmers across the four districts reported that they did not have any form of contract**, either verbal or written, with the buyers of milk.
- The highest proportion of verbal contracts was observed in Cianjur district (18%), while the highest proportion of written contracts was observed in Bandung district (9%).

Milk delivery

Farmers were asked how their milk reaches its next destination along the chain, such dairy co-operatives, and milk processors or direct to consumer.

- Overall, 91% of farmers reported they deliver milk directly to their dairy co-operative or milk collection point (MCP).
- However, this is lower in Bogor (76%) and Cianjur (70%). In these districts, a higher proportion of farmers reported their milk is picked up by their co-operatives (15% and 29%, respectively).

Processing of milk on farm

Farmers were asked what milk processing occurs prior to it is delivered/picked up from their farm.

- **Overall, 98% of farmers filter their milk on-farm** (to remove any physical contaminants) but <u>do not</u> cool the milk.
- Only 0.2% of farmers filter <u>and</u> cool the milk on farm.
- 2% of farmers reported they do not process the milk on farm.
- There was no significant difference between districts.

Farmers' awareness of milk quality determining price

Farmers were asked if the milk price they received was determined by milk quality parameters and, if so, which factors were the most important determinants.

- While **most farmers' reported milk price was determined by quality (85%),** the

proportion was highest in Bandung and Garut districts (99%).

- The lowest proportion was reported in Bogor district (13%) where in fact, farmers receive the highest average price for milk.
- Of the farmers who reported milk quality determined price, fat content (40%), total plate count (TPC, a measure of bacterial contamination) (39%) and absence of adulterants (32%) were reported as the most important quality factors.
- However, this was highly variable between districts and reflective of the pricing structures of the dairy co-operatives and milk processors. Table 1 summarises what farmers perceived as the three most important milk quality parameters by district.

It is interesting to note the overall percentage for any individual parameter is by no means high, with the exception to total solids (TS) in Cianjur (73%). This suggests that farmers are not fully aware of how milk quality parameters may affect the milk price they receive. We explore this in the next section, where we report on farmers' knowledge of milk quality parameters.

Farmers' knowledge of milk quality parameters

Farmers were asked their knowledge and awareness related to a number of factors related to milk quality, including their understanding of the concept; if they know the measurement for their milk; and either, what the average is for their farm or why they cannot find out the measurement. Table 5 summarises the responses.

- **Farmers' knowledge of their own milk quality measurements or the understanding of the concepts is generally low.**
- There are significant differences between farmers' knowledge of milk quality parameters across the four districts.
- Figure 3 summarises the proportion of farmers who know what the milk quality parameters are (conceptually) and their knowledge of the measurement for their milk.
- **Less than 50% of farmers understand what total solids, milk density and somatic cell counts were conceptually** (represented by the blue bars in Figure 3). More farmers understood what fat content

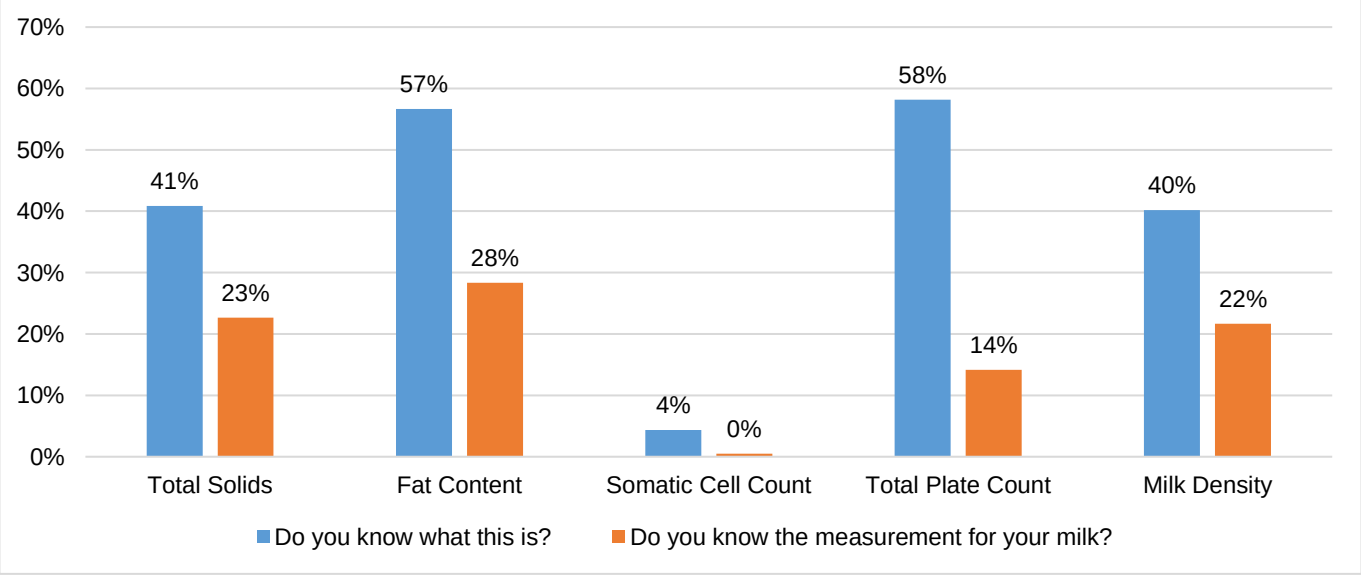

Figure 3. Farmers' knowledge of milk quality parameters

and total plate counts (TPC) were (57% and 58%, respectively).

- **When asked about their knowledge of the measurement for their milk, less than 30% of all farmers knew the measurement for any milk quality parameter** (represented by the orange bars in Figure 3).
- For instance, of all the farmers who understood the concept of fat content (57%), only half of these (about 28%) knew the measurement of fat content for the milk they produced.
- Additionally, of all the farmers who understood the concept of TPC (58%), less than a quarter of these (24%) were aware of the TPC measurement of their milk.

Many dairy co-operatives have milk-testing equipment, however, this is used primarily to test groups of farmers and many farmers are not told what their individual results are. This is reflected across the results from ISHS. Figures 4 to 8 illustrate the understanding of each milk quality parameters by district.

- Understanding of total solids (TS) is highest in Cianjur (81%) and lowest in Garut (12%) (Figure 4).
- Understanding of fat content is fairly consistent across the districts, between 47% in Garut and 73% in Bogor. However, there is a considerable range of farmers who know their own measurement; from 8% in Cianjur and 42% in Bandung (Figure 5).
- Understanding of somatic cell counts (SCC) (an indicator of mastitis) was very low across all districts, with less than 10% of farmers in any district aware of this quality factor (Figure 6).
- Total plate counts (TPC) was understood by a majority of farmers in Bogor (70%), Bandung (64%), and Cianjur (58%). However, very few farmers knew their own measurement, with highest in Bandung (22%). Despite the highest proportion of farmers understanding TPC being in Bogor, only 14% of farmers knew their measure; meaning 56% of farmers know about TPC but do not have access their measurements (Figure 7).
- Milk density was understood by fewer farmers in Bandung (20%) compared to the other districts which ranged between 49% in Garut and 75% in Bogor. This is likely reflective of the determinants of milk prices (mentioned above), where milk density was not reported as highly important factor of milk price (Figure 8).

Farmers were further asked about why, if they understand what the milk quality factor is, they do not know the measurement for their milk. These responses are summarised in Table 4.

- Farmers either responded: they do not have the equipment to measure it themselves; it is measured by the co-operative but they are not told their measurement; or that it is not measured by the co-operative.
- **More than two-thirds of farmers reported the reason they did not know their measurement for any milk quality factors, was because they have not been told about their measurement, despite it being measured.**

To address these issues the following steps need to be taken:

1. Extension and training of farmers needs to occur to build up their understanding of what this quality factors are and why they are important
2. Investments in milk testing equipment that is able to test milk of individual farmers.

Summary

This factsheet summarises the major findings regarding the milk productivity, price, and quality from the IndoDairy Smallholder Household Survey (ISHS). This factsheet has highlighted how milk productivity differs between districts, and that milk produced per cow does not translated directly to total farm milk production. Additionally, the total farm milk production and milk price determinants (i.e. milk

quality factors) differ between districts and overall farmer knowledge of milk quality is low.

In the next factsheet, we will look into the important aspect of costs, income and dairy profitability across the four districts.

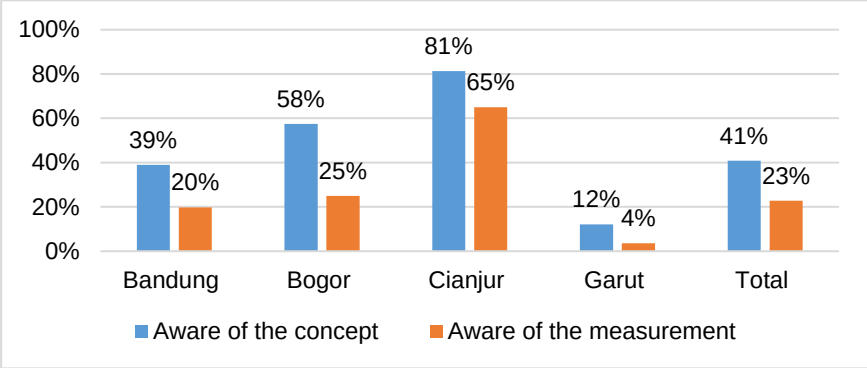

Figure 4. Farmer knowledge about *total solids (TS)* by district.

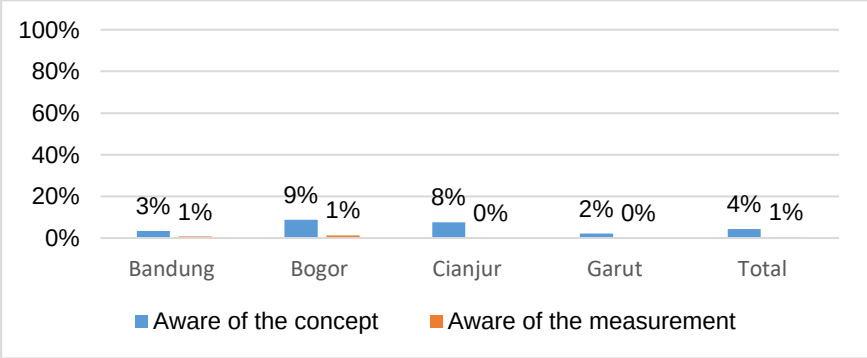

Figure 6. Farmer knowledge about *somatic cell count (SCC)* by district.

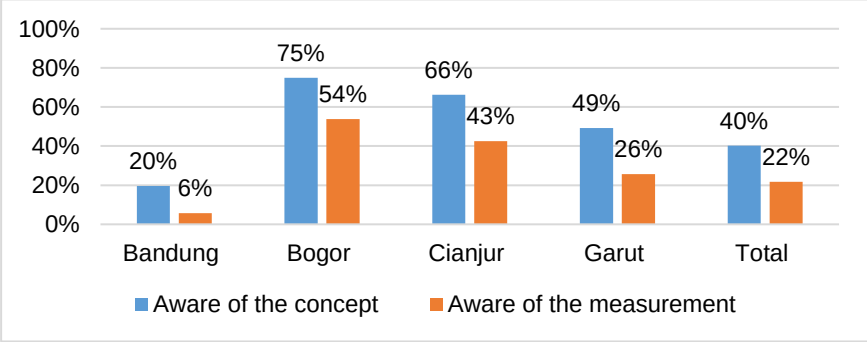

Figure 8. Farmer knowledge about *milk density* by district.

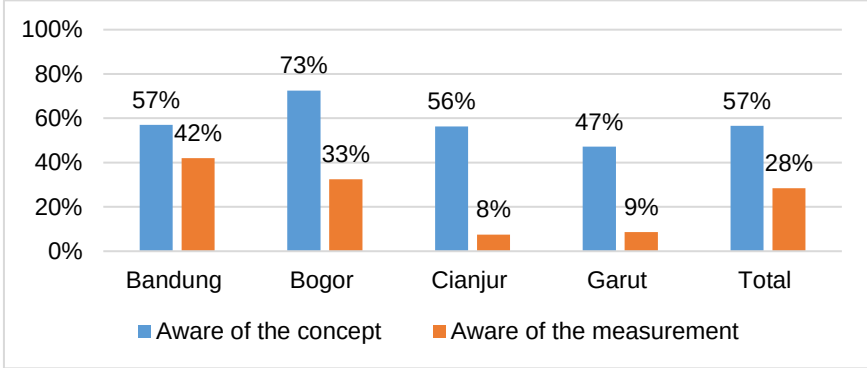

Figure 5. Farmer knowledge about *fat content* by district.

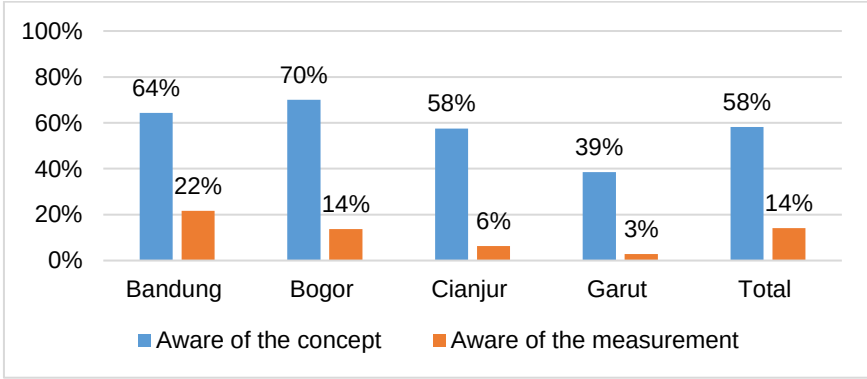

Figure 7. Farmer knowledge about *total plate count (TPC)* by district.

Appendix to Factsheet 6

This appendix provides summary statistics for milk production, price and knowledge of milk quality for the entire sample grouped by districts. Standard deviations (SD) are included where relevant.

Statistical significance between districts 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 ($p < 0.10$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table 1. Summary of the three most reported milk quality factors by district.

	Most important milk quality factors		
Districts	**Highest reported**	**2nd highest reported**	**3rd highest reported**
Bandung	TPC (51.5%)	Fat content (44.1%)	Adulterants (32.2%)
Bogor	TPC (50.0%)	Milk density (50.0%)	Adulterants (30.0%)
Cianjur	TS (73.3%)	Milk density (53.3%)	TPC (26.7%)
Garut	Milk density (47.4%)	Fat content (43.0%)	Adulterants (37.0%)
Total	Fat content (40.2%)	TPC (39.0%)	Adulterants (31.7%)

Percentage of farmers are displayed in brackets TPC = total plate count; TS = total solids; Adulterants refers to the absence of adulterants in milk (e.g. added water).

Table 2. Milk production statistics by districts (n = 600).

	Bandung			Bogor			Cianjur			Garut			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]**
Milk Production (n=600):															
Total farm (L/day)	41.05	31.03	a	51.05	56.48	a	43.09	40.00	a	25.50	16.50		39.02	35.24	***
Per cow (L/cow/day)	15.17	4.59	b	14.78	4.75	ab	14.11	4.95	a	15.00	3.89	ab	14.92	4.59	**
Per lactation (thousand L/cow/lactation)	4.53	1.13	b	4.28	1.19	ab	4.04	1.21	a	4.48	1.14	b	4.42	1.16	***
Per labour unit (thousand L/person/year)	10.32	5.54	a	13.97	12.59		10.87	8.20	a	7.95	4.82		10.32	7.32	***
Per land area (hundred thousand L/ha/year) (n=534)	13.49	25.37		7.58	15.30		9.61	12.42		13.62	25.69		12.12	22.87	
Is there any seasonal difference in milk production? (n=596)	81.9%		b	54.4%		a	69.6%		ab	77.7%		b	75.7%		***
Seasonal milk production (n=451)															
Dry season (L/day)	39.10	29.07	a	55.91	55.72	c	39.62	38.41	abc	26.19	16.57	a	37.67	32.48	***
Wet season (L/day)	43.70	31.22	a	59.40	54.55	b	43.81	42.98	abc	26.19	16.18		41.02	34.35	***

[1]Value is either percentage or mean; [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). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table 3. Milk prices by districts (n = 600).

Variable	Bandung			Bogor			Cianjur			Garut			Total		
	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]
Milk Prices (IDR/L)															
Average	4,514.7	230.8		4,793.7	584.0		4,212.1	577.1	a	4,290.9	163.2	a	4,458.7	390.4	***
Highest	4,675.8	252.1		4,888.0	997.3		4,305.6	564.0	a	4,383.7	183.8	a	4,586.1	497.6	***
Lowest	4,304.4	300.3		4,793.7	584.0		4,075.3	407.7	a	4,174.7	228.8	a	4,308.0	407.8	***
Milk Prices (USD cents/L)[4]															
Average	31.22	1.59		33.15	4.03		29.13	3.99	a	29.68	1.12	a	30.84	2.70	***
Highest	32.34	1.74		33.80	6.89		29.78	3.90	a	30.32	1.27	a	31.72	3.44	***
Lowest	29.77	2.07		33.15	4.03		28.18	2.80	a	28.87	1.58	a	29.79	2.82	***

[1]Value is mean; [2]SD = Standard Deviation; [3]Sig = Significance; [4]Exchange rate 1 USD = 14,459.50 Indonesian Rupiah on 27 July 2018* $p < 0.10$, ** $p < 0.05$ 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 ($p < 0.10$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table 4. Arrangements between farmers and milk buyers by district (n = 600).

	Bandung		Bogor		Cianjur		Garut		Total	
	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]
Form of contract with buyers (n = 599)										
None	75.0%		93.7%		75.0%		87.1%		80.3%	***
Written Contract	9.3%		0.0%		7.5%		0.7%		5.8%	***
Verbal Contract	15.7%		6.3%		17.5%		12.1%		13.9%	***
How is the milk delivered? (n = 600)										
Delivered to end-buyer location	2.0%		5.0%		0.0%		2.1%		2.2%	***
Delivered to co-operative/milk collection point	97.3%		76.3%		70.0%		96.4%		90.7%	***
Picked up by cooperative	0.7%		15.0%		28.8%		1.4%		6.5%	***
Picked up by the buyer	0.0%		3.8%		1.3%		0.0%		0.7%	***
Milk processing on-farm (n = 600)										
Filtering	97.7%		98.8%		100.0%		98.6%		98.3%	
Filtering and cool down	0.0%		1.3%		0.0%		0.0%		0.2%	
None	2.3%		0.0%		0.0%		1.4%		1.5%	
Milk priced determined milk quality (n=598)	99.0%	a	12.7%		96.2%	a	99.3%	a	87.1%	***
Most important quality factors for the buyer (n = 515)										
Total solids (TS)	30.8%	b	10.0%	ab	73.3%		9.6%	a	31.1%	***
Total plate count (TPC)	51.5%	b	50.0%	ab	26.7%	a	17.8%	a	39.0%	***
Fat content	44.1%	b	20.0%	ab	22.7%	a	43.0%	b	40.2%	***
Protein content	2.4%		0.0%		2.7%		2.2%		2.3%	
Milk density	3.1%		50.0%	a	53.3%	a	47.4%	a	22.9%	***
Absence of adulterants	32.2%	a	30.0%	a	20.0%	a	37.0%	a	31.7%	*
Body condition	11.9%	b	0.0%	ab	1.3%	a	11.9%	ab	10.1%	**
Genetic quality	0.3%		0.0%		0.0%		0.0%		0.2%	
Liquid content of milk / watery	15.6%	a	0.0%	a	9.3%	a	8.1%	a	12.4%	*
Other	13.2%	b	0.0%	ab	2.7%	a	8.9%	ab	10.3%	**

[1]Value is percentage. [2]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). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table 5. Farmer knowledge about factors that influence milk quality (n = 600).

Variable	Bandung			Bogor			Cianjur			Garut			Total		
	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]
Total solids (TS)															
Do you know what this is?	39.0%			57.5%			81.3%			12.1%			40.8%		***
Do you know the measurement for you milk? (n = 245)	50.4%		a	43.5%		a	80.0%			29.4%		a	56%		***
What is the measurement (%) (n = 136)	12.0	1.1	a	11.7	0.7	a	11.7	0.3	a	10.0	3.3		11.8	1.1	***
Why don't you know the measurement (n = 109)															
I cannot measure it	39.7%			19.2%			15.4%			25.0%			30.3%		
I have not been told what the measurement is	58.6%			76.9%			84.6%			75.0%			67.9%		
Not measured by cooperative	1.7%			3.9%			0.0%			0.0%			1.8%		
Fat content															
Do you know what this is?	57.0%		ab	72.5%		b	56.3%		ab	47.1%		a	56.7%		***
Do you know the measurement for you milk? (n = 340)	73.7%			44.8%			13.3%		a	18.2%		a	50.0%		***
What is the measurement (%) (n = 170)	4.3	2.0		4.4	2.5		5.0	3.0		4.8	3.8		4.4		
Why don't you know the measurement (n = 170)															
I cannot measure it	60.0%			28.1%			10.3%			14.8%			28.2%		***
I have not been told what the measurement is	40.0%			68.8%			87.2%			85.2%			70.6%		***
Not measured by cooperative	0.0%			3.1%			2.6%			0.0%			1.2%		***
Somatic Cell Count (SCC)															
Do you know what this is?	3.3%		a	8.8%		a	7.5%		a	2.1%		a	4.3%		**
Do you know the measurement for you milk? (n = 26)	20.0%			14.3%			0.0%			0%			11.5%		
What is the measurement (cells/mL) (n = 3)	261.5	365.6		12.0	.								178.3	295.9	
Why don't you know the measurement (n = 23)															
I cannot measure it	37.5%			0.0%			0.0%			0.0%			13.0%		*
I have not been told what the measurement is	62.5%			100.0%			100.0%			100.0%			87.0%		*

Table 5. Continued

Variable	Bandung			Bogor			Cianjur			Garut			Total		
	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]
Total plate count (TPC)															
Do you know what this is?	64.3%		a	70.0%		a	57.5%		a	38.6%			58.2%		***
Do you know the measurement for you milk? (n = 349)	33.7%		a	19.6%		ab	10.9%		a	7.4%		a	24.4%		***
What is the measurement (million cfu/mL) (n = 85)	0.48	0.49	a	3.18	2.47	b	1.14	0.48	a	4.5	3.1	b	1.06	1.63	***
Why don't you know the measurement (n = 264)															
I cannot measure it	39.8%			13.3%			12.2%			14.0%			26.1%		***
I have not been told what the measurement is	59.4%			77.8%			82.9%			86.0%			71.2%		***
Not measured by cooperative	0.8%			8.9%			4.9%			0.0%			2.7%		***
Milk density															
Do you know what this is?	19.7%			75.0%		a	66.3%		a	49.3%			40.2%		***
Do you know the measurement for you milk? (n = 241)	28.8%			71.7%		a	64.2%		a	52.2%		a	53.9%		***
What is the measurement (kg/L) (n = 130)	1.0	0.0	b	1.0	0.0	ab	1.0	0.0	a	1.0	0.0	ab	1.0	0.0	*
Why don't you know the measurement (n = 111)															
I cannot measure it	28.6%			11.8%			15.8%			15.2%			19.8%		
I have not been told what the measurement is	69.1%			82.4%			79.0%			84.9%			77.5%		
Not measured by cooperative	2.4%			5.9%			5.3%			0.0%			2.7%		

Note: Farmers were asked their knowledge and awareness related to a number of factors related to milk quality, including their understanding of the concept; if they know the measurement for their farm; and either, what the average is for their farm or why they cannot find out the measurement.
[1]Value is either percentage or mean. [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 ($p < 0.10$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).