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The Centre for Global Food and Resources

The IndoDairy Smallholder Household Survey (ISHS)
From '*Farm-to-Fact*' Series

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Dairy Australia
Your Levy at Work

Ministry of Agriculture
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Bogor Indonesia

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From '*Farm-to-Fact*' Factsheet Titles

Factsheet 1: Introduction to the "IndoDairy" Project & The IndoDairy Smallholder Household Survey

Background

With a population of approximately 264 million people (FAOSTAT, 2016); Indonesia is the fourth most populous country in the world after China, India and the USA. The Island of Java is home to 58% of Indonesia's population and it is the most populated island in the world. The Indonesian economy is in transition and growing rapidly resulting in massive urbanisation, increase in disposable income and changes in food consumption patterns.

The Indonesian Dairy Sector

Traditionally, dairy has not been a significant component of Indonesian diets, however, with a growing middle class, the demand for animal-based protein products has driven an increase in consumption of dairy products. Milk consumption has doubled in the past three decades and continues to increase annually. While there has been a rapid growth in demand in dairy products, domestic production has struggled to keep up with growing demand.

In 2012, Indonesia was producing less than one-third of its domestic demand for dairy products. This has contracted further in recent years. In 2014, approximately 40% of the nation's dairy herd was slaughtered to deal with high beef prices, which has further added to the fragility of domestic milk supply chain.

The dairy supply chain in Java faces a multitude of growth-limiting constraints, including institutional, government, socio-economic, technical and post-farm gate challenges. Pre-farm gate impediments include a smallholder dominated production base with very low economies of scale, limited forage availability and quality, low animal reproductive performance, poor animal health management and poor milk quality with limited technical skills in these areas. Various socio-economic and agro-economic barriers prevent the adoption of available knowledge and technology. These are currently limiting on-farm efficiency, farm growth and profitability.

Post-farm gate, the production of long-life, reconstituted products by many Indonesian dairy processors has allowed imported ingredients to be substituted for fresh whole milk. This has resulted in the price for whole milk aligning relatively closely with international dairy commodity market prices. Many of the local processors are also multi-nationals with

highly developed global supply chains. There are, however, some innovative small local processors using fresh milk to manufacture short-life dairy products. Anecdotal evidence suggests that the number of small local processors is increasing.

The IndoDairy Project

In June 2016, the project "*AGB/2012/099: Improving Milk Supply, Competitiveness and Livelihoods of Smallholder Dairy Chains in Indonesia*" (**IndoDairy**) commenced and aims to improve milk supply (quantity and quality) by 25% by 2020 for at least 3,000 dairy producers in West Java and North Sumatra.

The project has the following three objectives:

Objective 1: Identify and recommend strategies and policies to support development of sustainable, profitable and smallholder-inclusive dairy supply chains in North Sumatra and West Java.

Objective 2: Identify barriers to adoption of profitable management practices and farm business models and develop strategies to inform development of extension programs in West Java and North Sumatra.

Objective 3: Develop, pilot and evaluate best-bet dissemination to improve adoption of innovative dairy management practices by smallholder farmers in West Java.

The IndoDairy project is funded by the Australian Centre for International Agricultural Research and is a research partnership between key Australian and Indonesian research agencies. The Centre for Global Food and Resources (CGFAR) at the University of Adelaide is the lead organisation with support from key in-country partners including Indonesian Centre for Animal Research and Development (ICARD), Bogor Agricultural University (IPB), The Indonesian Centre of Agricultural Socio Economic Policy Studies (ICASEPS) and in consultation with Subtropical Dairy Ltd.

The IndoDairy project uses interdisciplinary research methods, including whole of chain analyses of dairy value chains in North Sumatra and West Java. This research includes deep consultations with key stakeholders in the sector including government agencies, dairy cooperatives, NGOs and private sector enterprises, to identify existing and future whole-of-chain opportunities for industry and government. The project has established collaborative arrangements with five dairy cooperatives in four districts of West Java to enhance engagement with key stakeholders and smallholder dairy farmers in the region.

Why an IndoDairy Smallholder Household Survey?

During August and September 2017, a baseline household survey of 600 dairy farming households located in West Java, Indonesia was implemented using digital data collection applications. The survey is called the **IndoDairy Smallholder Household Survey (ISHS)**. The ISHS is a primary focus of Objective 2 of the IndoDairy project.

After extensive interviews with key stakeholders in the dairy sector, including national and local government, universities, milk processing companies, and dairy co-operatives, the ISHS was designed to collect a wide range of useful information from dairy farming households. The information allows the research team (and interested stakeholders) to understand the current socio-demographic and farm characteristics of dairy farming households in West Java as well as issues affecting and limiting smallholder profitability and opportunities to improve smallholder livelihoods.

The survey included 20 sections, collecting information on the following:

- Household characteristics of dairy farmers
- Information on livestock and land assets
- Individual animal information

- Management of dairy farm animals
- Access to credit
- Information on inputs and labour
- Costs and expenses of managing dairy farm operations
- Information on household income
- Information on milk production
- Sales and marketing information
- Information on adoption of dairy farming technologies
- Group membership of dairy farmers
- Farmers' attitudes and perceptions
- Information on role of women by using the 'Women's Empowerment in Agriculture Index' (WEAI)
- Information on household food security by using the 'Household Food Insecurity Access Scale' (HFIAS)

Information collected and presented in this factsheet series provides a broad overview of many aspects of dairy smallholders in West Java, Indonesia. This insight is helping the research team to better understand issues faced by the households, including barriers to adoption of technology and profitable management practices. The information is helping to identify opportunities to improve adoption rates and address issues with dairy production and management.

Further, data and insight from the survey is aiding in the development (e.g. design and testing) and deployment of innovative technical practice change / extension programs with the aim of improving the dairy sector productivity and livelihoods in the region. The extension programs will be delivered from late 2018 to 2020 in collaboration with dairy cooperatives that are key partners in the program. The baseline information from the survey will also be used in the evaluation of the effectiveness of the extension programs at the end of the project.

About our factsheets

This set of factsheets provides a complete overview of the information gained from the analysis of the data collected from the Indonesian Smallholder Household Survey (ISHS).

The factsheets are available on the project website: https://www.indodairy.net/ and the Centre for Global Food and Resources website: https://www.adelaide.edu.au/global-food/research/improving-milk-supply-competitiveness-and-livelihoods-in-smallholder-dairy

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Factsheet 2: IndoDairy Smallholder Household Survey Sampling Design and Survey Roll-out

Critical aspects of the survey

The aim of the IndoDairy Smallholder Household Survey (ISHS) was to improve understanding of farm-level profit drivers, management and technology options in relation to cost of production, contribution of dairy (milk and cattle sales) to household income, enterprise profitability and viability. Comparative analysis of technical options, labour use, risk and sensitivity analysis to price, input costs and other factors were also included. Additionally, the survey obtained information on sources of feed and input use, marketing activities and channels, sources of capital, access to and participation in government support, credit and subsidy programs, sources of information, collective action, adoption of management practices and technology, barriers to adoption and growth (including social and cultural) incentives which would improve adoption and attitudes.

The IndoDairy project collaborated with five dairy co-operatives in West Java and used a purposive proportional random sampling method to select 600 dairy households. A team of experienced enumerators carried out the survey using digital data collection applications between August and September 2017.

Collaboration with Dairy Co-operatives

Dairy farmers in Indonesia are typically members of village level co-operatives (*koperasi desa unit* – KUDs). In order to identify and address issues faced by smallholder dairy farmers, it was important to take into account the role of dairy cooperatives and processors. Considering the perishable nature of fresh milk, cooperatives' role in managing milk collection from farmers and milk delivery to processors is critical. Given their position as intermediary institutions, the dairy cooperatives form an integral component of the whole of chain activities in the dairy sector and play an important role in aiding the Government of Indonesia to distribute support, such as government purchased dairy cows and credit subsidies to dairy farmers. In addition, it was also important to understand what successful strategies cooperatives had deployed in West Java to improve smallholders' milk production and quality. These factors highlighted the need to initiate collaborative partnerships with leading dairy cooperatives in West Java and engage in consultations with them to develop the survey and engage in further project activities. Scoping studies were conducted in November–

December 2016 to discuss and initiate collaborative partnerships with five KUDs. Five KUDs from four different districts of Bandung, Cianjur, Bogor and Garut were chosen as key partners. The collaboration with the KUDs ensured the data collection exercise for the project would target smallholder dairy producers consolidated in the West Java province.

These dairy cooperatives include:

1. KPBS Pangalengan
2. KPS Cianjur Utara
3. KUD Giri Tani
4. KPS Bogor
5. KPGS Cikajang Garut

Sampling Design

The Indonesian dairy industry is highly concentrated in Java, which accounts for 99% of the dairy cattle population and 95% of dairy production. Most of Indonesia's dairy farmers reside in West Java with close proximity to key urban centres like Jakarta, Bandung and Bogor.

The IndoDairy Smallholder Household Survey (ISHS) collected information from 600 smallholder dairy farm households. A purposive proportional random sampling method was utilised to identify the sample.

The identification of the sample consisted of the following stages:

1. The five dairy cooperatives who were key collaborators on the project were contacted and a list of active farmers with each cooperative (KUD) was shared.
2. The active member farmers became the study's population for sampling.
3. A proportional sampling method was used to determine the number of farmers that were interviewed from each KUD.
4. The farmers were randomly selected using simple random sampling tools.

This sampling design method ensured that our survey sample would be representative of the smallholder dairy farmers in West Java. Table 1 presents the sampling distribution of the ISHS.

IndoDairy Smallholder Household Survey

The Centre for Global Food and Resources (CGFAR) at the University and Adelaide and The Indonesian Centre for Agricultural Socio Economic Policy Studies (ICASEPS) led development and implementation of the household survey.

The survey instrument was comprised of a detailed questionnaire that collected information at the household level and included questions that captured:

- Household socio-demographics
- Household asset ownership
- Individual animal information
- Calf and herd management
- Expenses and costs associated with dairy operations
- Milk production
- Sales and marketing of products from the dairy farm
- Adoption of technology and management practices
- Farmers' attitudes to technologies and perception of change
- Household Food Insecurity Access Scale (HFIAS) and consumption behaviour
- Abbreviated – Women's Empowerment on Agricultural Index (A-WEAI)

Table 1. Sampling distribution of the IndoDairy Smallholder Household Survey (ISHS).

District	Dairy Co-operative	Number of respondents	Percentage (%) of respondents
Bogor	KPS Bogor	15	2.5
Bogor	KUD Giri Tani	65	10.9
Cianjur	KPS Cianjur Utara	80	13.3
Garut	KPGS Cikajang Garut	140	23.3
Bandung	KPBS Pangalengan	300	50
	Total	**600**	**100**

Survey roll out

To improve the efficiency and quality of data collection the project digitised the survey using CommCare, a mobile-based application, allowing data to be input and monitored in near real time. The IndoDairy project brought in the technical expertise of Oikoi, a Research for Development Support Company, to build and refine the digital survey application to ensure a smooth implementation of the study.

The data was collected during the months of August-September 2017 by an experienced team of enumerators. Enumerators visited selected households and administered the survey under the supervision of researchers from ICASEPS. The enumerators had prior experience in conducting agricultural household surveys and were fluent in Bahasa. The locations of the IndoDairy Smallholder Farmer Household Survey have been highlighted below in Figure 1.

Capacity Building

Capacity building has been a critical part of the sampling design and survey component of the IndoDairy project. The IndoDairy project activities have focused on improving the capacity and efficiency of researchers from Indonesian and Australian partner institutions in the field of data collection and analyses. Researchers from Indonesian Centre for Agricultural Socio Economic and Policy Studies (ICASEPS) and Centre for Global Food and Resources (GFAR) had the opportunity to undergo a weeklong training in designing and developing the survey in CommCare to develop their capacity and skills in tablet-based data collection applications. The training workshops also provided the opportunity to improve skills in interdisciplinary research.

Figure 1. Location details of the IndoDairy Smallholder Household Survey (ISHS).

The IndoDairy Smallholder Household Survey
From Farm-to-Fact

Factsheet 3: Overview of Household and Farm Characteristics

Background

The IndoDairy Smallholder Household Survey (ISHS) collected information from 600 dairy farming households across four districts in West Java. Data collection took place between August and September 2017. The sample included 300 households from the Bandung district, 140 from the Garut district, 80 from the Cianjur district and 80 from Bogor district. The map in Figure 1 shows the location of each of the districts across West Java.

Figure 1. Sample size and district location of farm in the IndoDairy Smallholder Household Survey (ISHS).

Sampling

A purposive proportional random sampling method was utilised to select households in order to have a data set that represented the population of dairy farmers in these districts. A list of active farmer members was collected from the dairy cooperatives (KUDs) of each district, and a proportional sampling method was used to determine the number of farmers that were interviewed from each KUD. This ensured that the sample would be representative of smallholder dairy farmers in West Java.

So, who was in the survey sample?

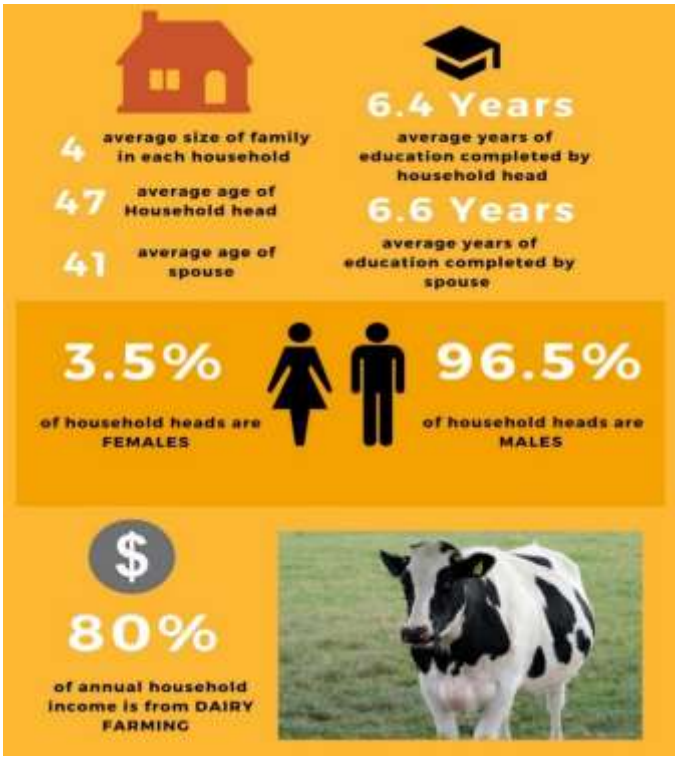

Figure 2. Characteristics of households in the survey.

Household characteristics

In total, 600 dairy farming households were interviewed for the IndoDairy Smallholder Household Survey (ISHS). See Table A1 in the Appendix for a summary of household characteristics by district.

Household makeup

On average, there were four people per household. Households in Bandung were significantly smaller households (3.7 people per household) compared to Bogor (4.4 people per household) and Garut (4.1 people per household).

On average, there were one to two children per household. The difference in average household size between the districts was due to variation in the number of adults, with average across the districts ranging from 2.4 and 3.0 for adults compared to 1.3 and 1.5 for children.

House ownership

With regards to ownership of houses, 84% of the dairy farmers owned the dwelling that they lived in, while 2% rented the house and 15% had alternative housing arrangements, such as borrowing from relatives or non-relatives.

The average house value was IDR 145,000,000 (approximately USD 10,030). However, this varied significantly between districts, with houses in Bogor and Cianjur three times the value of houses in Bandung and Garut.

Asset ownership

The average number of household assets is summarised by district in Figure 3 and in Table A1 in the Appendix. Overall, asset ownership was highest in Bogor households, and lowest in Garut (Figure 3).

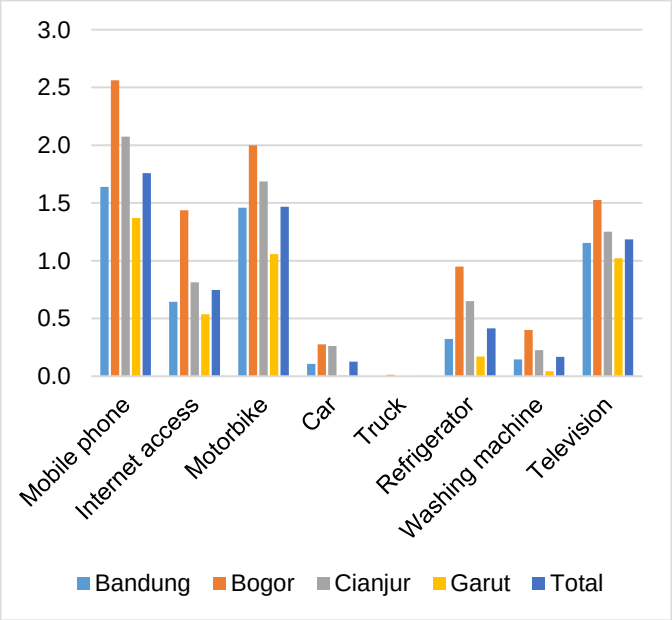

Figure 3. Number of assets owned per household across the districts.

- Telecommunication – The average number of mobile phones was 1.8, while the number of types was forms of internet, such as smart phones or laptops, was 0.8 per household.
- Transport – On average, households owned 1.5 motorbikes and 0.1 cars. The average number of trucks owned was 0.0.
- Household appliances – there were 1.2 televisions, 0.4 refrigerators and 0.2 washing machines owned.

Household decision makers

Overall, approximately 97% of the households' primary decision makers (PDM) were male. 94% of households had a secondary decision maker (SDM) and nearly all were female (99%). The detailed results on household decision makers are shown in Table A2 in the Appendix.

Age

The average age of the PDM was 47.0 years, while the average age of the SDM was 41.2 years.

Education

Both PDMs and SDMs had completed formal education of up to an average of six years, which was equivalent to elementary school education.

Main occupation

The main income activity, determined by the amount of time spent, for the majority (85%) of the PDMs was dairy farming. Off-farm income activity through wage/salaried employment was the main source of income for only 8% of PDMs. The rate of off-farm employment was highest in the district of Garut at 16% as compared to the other three districts. The main activity for the SDMs was unpaid work or unemployed (> 50%), followed by dairy farming (23%).

In addition to dairy farming, households received, on average 10% of their income from off-farm activities, 8% from horticultural production, 2% from other livestock (e.g. beef cattle, small ruminants or poultry) and 1% from crop production.

Off-farm income included wage employment, self-employment, pensions, remittances and trading businesses.

Dairy business information

Approximately 91% of households considered dairy farming to be the main business activity. Dairy business information summary statistics are presented in Table A3 in the Appendix.

Income sources

Of the households surveyed, dairy-related income, which includes the sale of raw milk, processed milk and dairy cattle, contributed an average of 77% of total household income. The share was highest in the district of Bandung (83%) and lowest in the district of Cianjur (74%) although the shares were not significantly different.

Experience in dairy farming

Dairy farmers on average had 19 years of experience in the dairy business, with farmers in Cianjur having the least amount of experience at 14 years and farmers in Bogor with the highest amount of experience at 21 years.

Sources of capital

During the interviews, respondents were asked about the main source of capital for their dairy business in the past 12 months. 82% of the farmers used personal funds for capital for their dairy business. These personal funds included savings from previous business activities or earnings from other sources of income. The remaining households had either loan (16%), partnerships (2%) or inheritance (0.2%) as their main source of capital.

Farm characteristics

Table A4 in the Appendix summarises farm characteristics by district.

Altitude

GPS coordinates and altitudes were recorded for each household. The average altitude of dairy farms across the four districts was 1,280 metres above sea level. Between the districts altitude varied. Farmers in Bogor and Cianjur had the lowest altitude (900 metres) while

farmers in Bandung had the highest (1,520 metres).

Milk production

Average total farm milk production was 39.0 litres per day. Milk production per cow was 14.9 litres per cow per day. The highest production was observed in Bandung district (15.2 litres) and the lowest in Cianjur district (14.1 litres).

Dairy herd size

Dairy herd size is illustrated in Figure 4. On average, there were 5.6 cattle per farm. Between districts, dairy herd size was highest in Bogor (7.7) and lowest in Garut (3.1); less than half the size of Bogor farms.

The average number of lactating cows per farm was 2.8. Variation between districts followed a similar trend to total herd size, with the highest number in Bogor (3.6) and lowest in Garut (1.8). Despite this, dairy farms across the four districts were, on average, operating small herd sizes.

Total land area

On average, total land area managed by households was 0.49 hectares (ha) with an average of 2-3 plots per household. However, this was significantly higher in Cianjur (1.41ha).

The total managed land dedicated to dairy farming (for grazing or growing forages) was 0.22ha. This was highest in Bogor (0.33ha) and lowest in Bandung (0.17ha).

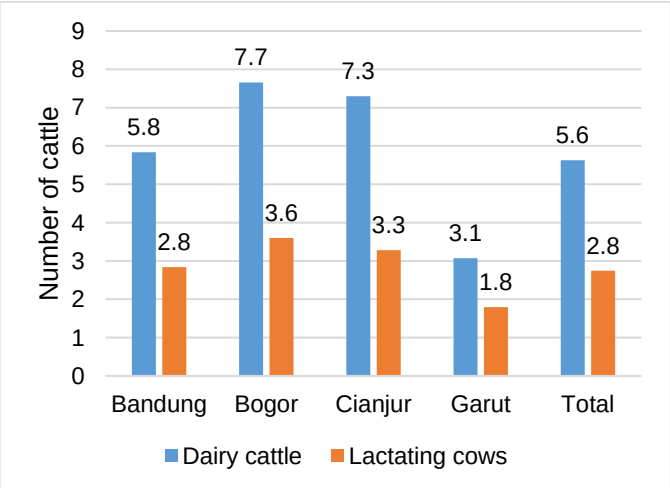

Figure 4. Average dairy herd size, including number of lactating cows.

Land ownership

The average land owned by households was 0.19ha, which was approximately 39% of total land managed.

Households in Cianjur on average owned significantly more land (0.52ha) than Bandung (0.09ha).

Distances

Respondents were asked to indicate the amount of time it took to reach certain destinations that are critical to the dairy farm businesses.

- Dairy co-operatives – On an average, dairy farms were located 8 minutes from their nearest milk collection point and 33 minutes from their dairy co-operative head office.
- Free grass – Time to land with freely accessible grass was 22 minutes across the four districts. This was significantly different with households in Cianjur travelling significantly less time (12 minutes), compared to other districts (between 20 and 24 minutes).
- Agricultural plots – The average time taken to reach the land plots managed/owned by households was 10 minutes. This would suggest that majority of the land plots were not located immediately next to or behind the house of the farmers.
- Veterinary and technical services – It took on average 26 minutes to travel to the livestock clinic/veterinary doctor and 19 minutes to reach the house of the inseminator. Farmers in Bogor had less than half the travel time to reach these services compared to Garut, which had the longest travel time.

Summary

In this factsheet the household and farm characteristics of the dairy farmers in the ISHS were analysed.

- **On average, there were four people per household. Households in Bandung were significantly smaller households (3.7**

people per household) compared to Bogor (4.4 people per household) and Garut (4.1 people per household).

- **In regard to ownership of houses, 84% of the dairy farmers owned the dwelling that they lived in, while 2% rented the house and 15% had alternative housing arrangements, such as borrowing from relatives or non-relatives.**
- **Overall, approximately 97% of the households' primary decision makers (PDM) were male. 94% of households had a secondary decision maker (SDM) and nearly all were female (99%).**
- **The average age of the PDM was 47.0 years, while the average age of the SDM was 41.2 years.**
- **The main income activity, determined by the amount of time spent, for the majority (85%) of the PDMs was dairy farming.**
- **The average altitude of dairy farms across the four districts was 1,280 metres above sea level.**
- **Average total farm milk production was 39.0 litres per day. Milk production per cow was 14.9 litres per cow per day.**
- **On average, total land area managed by households was 0.49 hectares (ha) with an average of 2-3 plots per household.**

Other key characteristics such as profitability, use of inputs, technology adoption, marketing of dairy products, attitudes, perception of change and aspirations of the dairy farmers will be discussed in other factsheets.

Appendix to Factsheet 3

The tables included in this Appendix provide summary statistics related to household and farm characteristics 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 A1. Household summary statistics and socio-demographic characteristics by district (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]
Number of households	300			80			80			140			600		
Number of people per household:	3.72	1.24	a	4.36	1.77	b	4.08	1.59	ab	4.11	1.44	b	3.95	1.44	***
Adults[4]	2.40	0.73	a	3.00	1.26	c	2.79	1.04	bc	2.61	0.89	ab	2.58	0.92	***
Children	1.34	0.95		1.38	1.08		1.31	1.09		1.50	1.12		1.38	1.03	
House ownership:															
Owned	78.0%			92.5%			83.8%			91.4%			83.8%		
Rented	2.0%			0.0%			3.8%			0.0%			1.5%		
Other	20.0%			7.5%			12.5%			8.6%			14.7%		***
House value (n=498):															
Indonesian Rupiah (in millions)	97.70	96.10	a	293.0	334.0	b	292.0	1230	b	69.70	65.70	a	145.0	478.0	***
US Dollars (in thousands)[5]	6.76	6.65	a	20.26	23.1	b	20.19	85.1	b	4.82	4.54	a	10.03	33.1	***
Number of assets owned:															
Mobile phone	1.64	1.12	a	2.56	1.80	b	2.08	1.38	b	1.37	0.98	a	1.76	1.29	***
Internet access	0.64	0.86	a	1.44	1.40		0.81	1.04	a	0.54	0.75	a	0.75	0.99	***
Motorbike	1.46	0.94	a	2.00	1.30	b	1.69	1.24	ab	1.06	0.90		1.47	1.07	***
Car	0.11	0.38	a	0.28	0.71	b	0.26	0.63	b	0.01	0.08	a	0.13	0.45	***
Truck	0.00	0.00	a	0.01	0.11	a	0.00	0.00	a	0.00	0.00	a	0.00	0.04	*
Television	1.15	0.42	ab	1.53	0.86		1.25	0.72	b	1.02	0.33	a	1.19	0.55	***
Refrigerator	0.32	0.48		0.95	0.65		0.65	0.80		0.17	0.40		0.42	0.59	***
Washing machine	0.15	0.35	a	0.40	0.52		0.23	0.42	a	0.04	0.20		0.17	0.38	***

[1]Value is either percentage or mean; [2]SD = Standard Deviation; [3]Sig = Significance; [4]Adults are ≥ 18 years of age; [5]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 in the significance column are not significantly different at the 5% level ($p > 0.05$).

Table A2. Primary and secondary decision maker summary statistics by district.

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]
Primary Decision Maker Information (n = 600)															
Gender:															
Male	96.3%			97.5%			97.5%			95.7%			96.5%		
Female	3.7%			2.5%			2.5%			2.5%			3.5%		
Age	45.93	12.00	a	49.06	11.64	a	47.44	11.00	a	48.04	10.81	a	47.04	11.59	*
Education (years)	6.49	2.70	a	6.93	3.81	a	7.10	3.78	a	5.44	2.91		6.38	3.12	***
Main Occupation:															
Dairy farming	89.7%			86.3%			80.0%			77.9%			85.2%		***
Farmer or fishermen	2.3%			1.3%			8.8%			5.0%			3.7%		***
Self-employed/employer	1.3%			0.0%			1.3%			0.0%			0.8%		***
Wage/salaried employee	5.0%			8.8%			6.3%			16.4%			8.3%		***
Unpaid family/community worker	0.7%			1.3%			1.3%			0.0%			0.7%		***
Unemployed	0.7%			1.3%			1.3%			0.7%			0.8%		***
Secondary Decision Maker Information (n = 563)															
Number of households with a 'Secondary decision maker'	280			76			74			133			563		
Gender:															
Male	0.0%			1.0%			0.0%			0.0%			0.0%		
Female	100%		a	98.7%		a	100%		a	100%		a	99.8%		*
Age	40.08	10.37	a	42.34	10.25	ab	41.42	9.87	ab	42.89	9.60	b	41.23	10.16	**
Education (years)	6.96	2.39	b	6.03	3.30	a	6.82	3.74	ab	6.16	2.64	a	6.63	2.81	***
Main Occupation:															
Dairy farming	25.4%			13.2%			21.9%			25.6%			23.3%		**
Farmer or fishermen	1.8%			2.6%			4.1%			5.3%			3.0%		**
Self-employed/employer	9.3%			9.2%			19.2%			7.5%			10.1%		**
Wage/salaried employee	12.5%			5.3%			9.6%			12.8%			11.2%		**
Unpaid family/community worker	36.1%			50.0%			39.7%			37.6%			38.8%		**
Unemployed	13.2%			19.7%			5.5%			9.0%			12.1%		**
Retired	1.1%			0.0%			0.0%			0.0%			0.5%		**
Other	0.7%			0.0%			0.0%			2.3%			0.9%		**

[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 in the significance column are not significantly different at the 5% level ($p > 0.05$).

Table A3. Dairy business information summary statistics by district (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]
Would you say the dairy business is for your household:															
The main business activity	92.3%			95.0%			88.8%			85.7%			90.7%		**
A secondary business	7.7%			5.0%			10.0%			14.3%			9.2%		**
Third or fourth	0.0%			0.0%			1.3%			0.0%			0.2%		**
Proportion of household income (%):															
Dairy farming	82.69	31.34		81.03	34.38		74.13	31.36		75.36	46.95		79.61	36.07	
Off-farm[4]	7.66	18.60	a	16.98	32.06	b	16.97	30.46	b	8.26	19.59	a	10.28	23.16	***
Crops	0.24	3.26	a	0.48	4.00	ab	1.17	3.25	ab	1.77	8.11	b	0.75	4.95	**
Horticulture	8.01	26.61	ab	1.03	5.20	a	5.45	11.65	ab	12.43	30.88	b	7.77	24.66	***
Aquaculture	0.00	0.00	a	0.13	0.84	b	0.00	0.00	ab	0.02	0.27	ab	0.02	0.33	**
Other Livestock	1.40	6.50		0.35	9.21		2.28	10.30		2.17	21.46		1.56	12.39	
Dairy business experience (years)	21.11	10.62	b	21.36	9.27	b	13.69	8.50	a	16.53	9.91	a	19.08	10.40	***
Main source of capital in last 12 months:															
Personal	76.7%			83.8%			86.3%			87.9%			81.5%		**
Loan	19.7%			16.3%			8.8%			12.1%			16.0%		**
Partnership	3.3%			0.0%			5.0%			0.0%			2.3%		**
Inheritance	0.3%			0.0%			0.0%			0.0%			0.2%		**

[1]Value is either percentage or mean. [2]SD = Standard Deviation. [3]Sig = Significance; [4]Off-farm income includes wage employment, self-employment, pensions, remittances, trading businesses. * 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 in the significance column are not significantly different at the 5% level (p > 0.05).

Table A4. Farm summary statistics by district (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]**
Altitude (km)	1.52	0.12		0.90	0.23	a	0.89	0.12	a	1.20	0.15		1.28	0.31	***
Daily milk production:															
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 lactating 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	**
No. of livestock (ruminants):															
Dairy cattle	5.84	4.48	a	7.66	6.89	b	7.30	6.46	ab	3.07	2.03		5.63	5.02	***
Beef cattle	0.06	0.36	a	0.04	0.34	ab	0.80	5.61	b	0.02	0.25	a	0.15	2.08	**
Buffalo	0.10	0.62	a	0.30	1.34	ab	1.51	11.22	b	0.27	1.22	ab	0.35	4.19	*
Goats/sheep	0.06	0.43		0.14	1.03		0.26	1.95		0.11	0.61		0.11	0.91	
No. of dairy cattle managed:															
Lactating cows	2.84	2.21	a	3.60	4.02	a	3.28	2.97	a	1.79	1.33		2.75	2.55	***
Dry cows	0.29	0.66	a	0.59	1.15	b	0.58	1.06	b	0.13	0.41	a	0.33	0.78	***
Replacement cows	1.10	1.27	a	1.51	1.52	a	1.48	1.83	a	0.44	0.55		1.05	1.33	***
Other dairy cattle (calves and bulls)	1.59	1.80	a	1.99	2.26	a	1.99	2.30	a	0.72	0.91		1.50	1.84	***
Proportion of milking cows of total herd (%)	51.79	19.47	a	48.66	20.13	a	47.59	17.66	a	62.20	23.11		53.24	20.85	***
Number of land plots per farm	1.94	1.22	a	2.04	1.05	ab	2.41	1.60	bc	2.64	1.38	c	2.18	1.32	***
Land tenure ownership and usage (ha):															
Total managed	0.27	0.52	a	0.42	0.84	a	1.41	4.98		0.49	0.72	a	0.49	1.94	***
Total owned	0.09	0.37	a	0.17	0.70	ab	0.52	3.20	b	0.25	0.48	ab	0.19	1.25	**
Total used for dairy production[4]	0.17	0.46	a	0.33	0.55	b	0.30	0.65	ab	0.22	0.43	ab	0.22	0.50	**
Distances in minutes to:															
Traditional market (n=598)	22.96	14.88	a	23.19	18.71	ab	24.75	12.32	ab	27.46	20.59	b	24.29	16.70	*
Milk collection point (n=592)	9.01	6.57	b	5.49	4.96	a	7.00	6.16	ab	8.26	6.66	b	8.12	6.45	***
Dairy co-operatives (n=593)	37.19	27.90	b	23.84	25.94	a	32.41	17.67	ab	30.98	22.06	ab	33.35	25.51	***
Free grass (n=588)	23.21	19.21	a	20.32	21.21	a	12.44	9.60		23.94	19.36	a	21.53	18.87	***
Your agricultural plots (n=582)	9.24	12.13		11.85	15.80		7.47	9.52		10.07	10.53		9.53	12.03	
House of inseminator (n=439)	16.63	14.48		10.39	7.63		23.85	15.54	a	26.73	24.93	a	18.61	17.22	***
Livestock clinic/veterinary doctor (n=381)	28.36	23.46	a	13.00	11.61		28.24	16.15	a	29.90	23.52	a	26.59	22.15	***

[1]Value is either percentage or mean; [2]SD = Standard Deviation; [3]Sig = Significance; [4]Land for dairy production includes grazing dairy cattle and growing forages. * $p < 0.10$, ** $p < 0.05$ 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 in the significance column are not significantly different at the 5% level ($p > 0.05$).

Factsheet 4: Overview of Individual Cow Characteristics and Farm Management Practices

Background

In the previous factsheet, an overview of the household and farm characteristics of the farmers from IndoDairy Smallholder Household Survey (ISHS) was analysed across the four districts of Bandung, Bogor, Cianjur and Garut. This factsheet discusses dairy cow characteristics and farm management practices.

Individual cow characteristics

Individual production characteristics were recorded for every milking cow at the time of the ISHS. In total, 1,626 milking cows were registered.

Table A1 in the Appendix shows details of individual animal information.

- **The primary method of breeding cows was artificial insemination according to 100% dairy farmers across the four districts.**
- The average age of cows was 60 months i.e. 5 years across the four districts.
- The average weight of a dairy cow was 437 Kg across the four districts, with the highest average weight recorded in Bogor district (465 Kg) and lowest in Bandung district (429 Kg).
- **Average age of dairy cow at the time of first calving was 27 months i.e. 2 years 3 months across the four districts.**
- Average calving interval across the four districts was 14 months i.e. 1 year 2 months.

Herd management

Herd management practices for cows and calves are summarised in Table A2 and A3 in the Appendix respectively. The section below summaries the key characteristics of herd management across the four districts.

- **Majority of the dairy farmers continuously housed (96%) and tied (99%) the cattle on the farm.**
- Majority of the farmers used visual method (100%) of heat detection at the time of induction of oestrus.
- For the induction of oestrus in dairy cattle, 46% farmers used one shot of prostaglandin, 32% farmers did not use any method of induction of oestrus while 14% farmers used other methods.

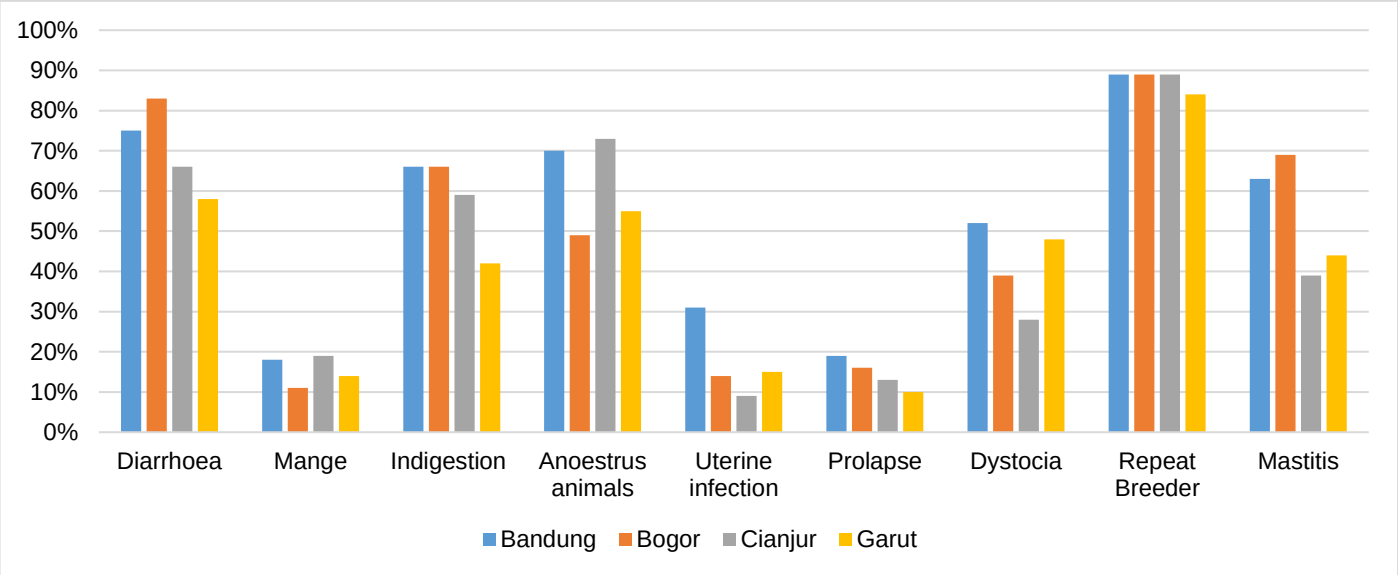

Figure 1. Occurrence of disease in cattle.

The respondents were asked about their colostrum feed practices for new born claves. Colostrum is a fluid produced by the pregnant cow prior to giving birth in preparation for the calf at first suckling. As calves are born with little to no immunity to protect them from infectious diseases, colostrum feed after birth provides them with essential antibodies to develop immunity.

- **59% farmers fed colostrum to their calves less than an hour after parturition, while 35% farmers fed colostrum within the first 3 hours after parturition.**
- The share of farmers who fed colostrum within one hour after parturition was higher in Bogor (78%) and Cianjur (79%) districts as compared to Bandung (46%) and Garut (64%) districts.
- Overall, 5% farmers fed colostrum within 4 to 6 hours after parturition and 2% farmers fed colostrum within 7 to 12 hours.
- **Majority of the farmers (84%) fed colostrum twice a day, while 16% fed three times a day.**
- Overall, 47% farmers provided 1 to 2 litres of colostrum per feed. This quantity of colostrum feed was lowest in Cianjur district (9%), and highest in Bandung district (61%).
- Overall, 46% farmers provided 3 to 4 litres colostrum per feed, with a high number of farmers (81%) in Cianjur district following this practice.
- A small number of farmers (6%) provided more than 5 litres of colostrum per feed. This was observed highest in Bogor district (11%).
- Majority of the farmers (69%) dewormed their calves at the age of 3 to 4 months, while some farmers (20%) dewormed their calves at 5 to 6 months.
- With regards to sale of male calves, high number of farmers (47%) sold their male calves between the ages of 4 to 7 months.
- A significant percentage of farmers (22%) did not sell their male calves.

Disease occurrence in cattle

The occurrence of cattle health issues, including calves and cows, is summarised in Figure 1 and Table A4 in the Appendix.

- There was a **high occurrence of occasional (53%) diarrhoea among the dairy cattle, with the highest percentage in Bogor district 58% and**

lowest in Garut district with 46% occurrence.

- There was a significant occurrence (51%) of occasional indigestion among the dairy cattle across the four districts.
- Similarly, there was a significant occurrence (52%) of occasional anoestrus animals among the dairy cattle across the four districts, with about 16% cattle being anoestrus in Garut district.
- Dystocia occasionally occurred among 41% of the cattle across the four districts, with a high occurrence of 46% in Bogor district.
- There was a small percentage of occasional occurrence of diseases like uterine infection (21%), prolapse (15%) and mange (15%) among the dairy cattle across the four districts.
- There was a high occurrence (51%) of often repeat breeder cows among the dairy cattle across the four districts. This was observed highest (59%) in Cianjur district and lowest (48%) in Bogor district.
- **Mastitis occasionally occurred (50%) in dairy cattle across the four districts, with the highest occasional occurrence in Bogor district (61%).**

Summary

In this factsheet the key individual cow characteristics and herd management practices across the ISHS were analysed.

- **Artificial insemination was the primary breeding method across the four districts.**
- **Majority of the dairy farmers kept the dairy cattle continuously housed and tied on the farm.**
- **Majority of the farmers fed colostrum within one hour after parturition and did so twice a day.**
- **Diseases like diarrhoea, indigestion, anoestrus animals and Mastitis occasionally occurred among the dairy cattle across the four districts.**

The following factsheet, Factsheet 5, provides information on dairy farm inputs across the four districts.

Appendix to Factsheet 4

The tables included in this Appendix provide summary statistics related to household and farm characteristics 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 A1. Dairy cow information.

	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]**
Method of Breeding (n=1626)															
Artificial Insemination (AI)	100%			100%			100%			100%			100%		
Cow age (months) (n=1578)	61.4	25.2	a	60.2	23.7	a	57.2	22.3	a	59.0	22.1	a	60.2	24.1	*
Cow weight (Kg) (n=1571)[4]	428.9	68.2	a	465.0	82.4		437.4	72.3	a	434.7	61.7	a	436.8	71.4	***
Parity (n=1616)	3.2	2.1	b	3.0	1.7	ab	2.7	1.6	a	2.8	1.8	a	3.0	1.9	***
Age at first calving (months) (n=1545)	27.1	7.8		27.4	4.4		27.1	3.3		27.1	4.0		27.1	6.3	
Calving interval (months) (n=1224)	13.4	2.9	a	13.4	2.1	a	13.7	2.8	ab	14.3	3.0	b	13.6	2.8	***
Average milk production (L/cow/day) (n=1626)	15.2	4.6	b	14.8	4.7	ab	14.1	5.0	a	15.0	3.9	ab	14.9	4.6	**

[1]Value is either percentage or mean; [2]SD = Standard Deviation; [3]Sig = Significance; [4]Cow weight is based on farmers' estimation; * $p < 0.10$, ** $p < 0.05$ 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 in the significance column are not significantly different at the 5% level ($p > 0.05$).

Table A2. Dairy management practices.

	Bandung		Bogor		Cianjur		Garut		Total	
Variable	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**
Cattle housing										
Offered shade for part of the day	0.7%		1.3%		0.0%		0.0%		0.5%	*
Offered shade all day	5.3%		0.0%		0.0%		5.7%		4.0%	*
Continuously housed	94.0%		98.8%		100.0%		94.3%		95.5%	*
Cattle restraints										
Continuously tied	99.3%		97.5%		98.8%		99.3%		99.0%	
Tied for part of the day	0.7%		0.0%		0.0%		0.0%		0.3%	
Not tied	0.0%		2.5%		1.3%		0.7%		0.7%	
Heat detection										
Visual	99.7%		100.0%		100.0%		100.0%		99.8%	
None	0.3%		0.0%		0.0%		0.0%		0.2%	
Induction of Oestrus										
One shot of prostaglandin	54.7%		27.5%		42.5%		41.4%		46.3%	***
Two shots of prostaglandin	12.3%		0.0%		0.0%		6.4%		7.7%	***
None	27.7%		42.5%		33.8%		33.6%		31.8%	***
Other	5.3%		30.0%		23.8%		18.6%		14.2%	***

[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 in the significance column are not significantly different at the 5% level ($p > 0.05$).

Table A3. Calves management.

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Timing of first colostrum feed (n=599)						
0 - 1 hour	45.5%	77.5%	78.8%	64.3%	58.6%	***
1 - 3 hours	44.5%	21.3%	18.8%	32.9%	35.2%	***
4 - 6 hours	7.7%	1.3%	1.3%	1.4%	4.5%	***
7 - 12 hours	2.3%	0.0%	1.3%	1.4%	1.7%	***
Times colostrum is fed per day (n=599)						
Twice a day		97.5%	97.5%	73.6%	83.6%	***
Three times a day	19.1%	2.5%	2.5%	26.4%	16.4%	***
Amount of colostrum provided per feed (n=599)						
1-2 litres	61.2%	41.3%	8.8%	42.9%	47.3%	***
3-4 litres	34.1%	47.5%	81.3%	52.1%	46.4%	***
More than 5 litres	4.7%	11.3%	10.0%	5.0%	6.3%	***
Calf deworming (n=600)	68.0%	95.0%	93.8%	84.3%	78.8%	***
Age of deworming (N=473)						
1 - 2 months	14.2%	1.3%	10.7%	7.6%	9.9%	**
3 - 4 months	63.7%	73.7%	76.0%	71.2%	69.1%	**
5 - 6 months	20.1%	25.0%	13.3%	18.6%	19.5%	**
Other	2.0%	0.0%	0.0%	2.5%	1.5%	**
Calf dehorning (n=600)	1.3%	0.0%	0.0%	5.7%	2.0%	***
Age male calves sold (n=600)						
0 - 3 months	12.7%	2.5%	8.8%	15.7%	11.5%	***
4 - 7 months	37.7%	57.5%	66.3%	50.7%	47.2%	***
8 - 11 months	6.0%	6.3%	2.5%	5.0%	5.3%	***
12 - 17 months	9.3%	11.3%	7.5%	3.6%	8.0%	***
More than 18 months	7.3%	10.0%	2.5%	4.3%	6.3%	***
Not sold	27.0%	12.5%	12.5%	20.7%	21.7%	***

[1]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 in the significance column are not significantly different at the 5% level ($p > 0.05$).

Table A4. Disease occurrence in cattle (n = 600).

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Diarrhoea						
Never	24.7%	17.5%	33.8%	42.1%	29.0%	***
Occasionally	55.0%	57.5%	51.3%	45.7%	52.7%	***
Often	20.3%	25.0%	15.0%	12.1%	18.3%	***
Mange						
Never	82.3%	88.8%	81.3%	85.7%	83.8%	
Occasionally	17.0%	11.3%	17.5%	11.4%	15.0%	
Often	0.7%	0.0%	1.3%	2.9%	1.2%	
Indigestion						
Never	34.0%	33.8%	41.3%	57.9%	40.5%	***
Occasionally	55.3%	58.8%	48.8%	37.1%	50.7%	***
Often	10.7%	7.5%	10.0%	5.0%	8.8%	***
Anoestrus animals						
Never	30.3%	51.3%	27.5%	45.0%	36.2%	***
Occasionally	57.0%	40.0%	65.0%	39.3%	51.7%	***
Often	12.7%	8.8%	7.5%	15.7%	12.2%	***
Uterine infection						
Never	69.3%	86.3%	91.3%	85.0%	78.2%	***
Occasionally	29.7%	12.5%	8.8%	12.9%	20.7%	***
Often	1.0%	1.3%	0.0%	2.1%	1.2%	***
Prolapse						
Never	81.3%	83.8%	87.5%	90.0%	84.5%	
Occasionally	18.0%	16.3%	12.5%	10.0%	15.2%	
Often	0.7%	0.0%	0.0%	0.0%	0.3%	
Dystocia						
Never	48.0%	61.3%	72.5%	52.1%	54.0%	***
Occasionally	45.7%	36.3%	25.0%	44.3%	41.3%	***
Often	6.3%	2.5%	2.5%	3.6%	4.7%	***
Repeat breeder						
Never	11.0%	11.3%	11.3%	16.4%	12.3%	
Occasionally	38.3%	41.3%	30.0%	33.6%	36.5%	
Often	50.7%	47.5%	58.8%	50.0%	51.2%	
Mastitis						
Never	36.7%	31.3%	61.3%	55.7%	43.7%	***
Occasionally	56.7%	61.3%	30.0%	39.3%	49.7%	***
Often	6.7%	7.5%	8.8%	5.0%	6.7%	***

[1]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 in the significance column are not significantly different at the 5% level ($p > 0.05$).

Factsheet 5: Dairy Farm Inputs

Background

In the previous factsheet, individual cow and farm management characteristics were analysed. In this factsheet, the characteristics of the IndoDairy Smallholder Household Survey (ISHS) will be further examined, focusing on the inputs used by dairy farmers.

Dairy co-operative Animal Health Packages

Dairy co-operatives in West Java play a critical role as input suppliers for farmers, in many cases sourcing raw materials and mixing concentrates. Some dairy co-operatives provide this in the form of "package", where a portion of the milk sales from farmers goes towards covering the costs of supplying feeds, supplements and subsidising animal health services (including vets and artificial insemination). Summary statistics of Animal Health Packages across the districts are shown in Table A1 in the Appendix.

- **Farmers in Bandung (99%) and Garut (99%) received Animal Health Packages from their dairy co-operatives.**
- In regard to contents of the package, majority included artificial insemination services (100%), medicines (99%), vitamins (96%) and veterinary services (99%). Some cooperatives (KUDs) provided family health insurance as part of the package.

Input use

Inputs used by farmers in the ISHS are summarised in Table A2 in the Appendix. These inputs are a separate purchase to those supplied through the dairy co-operative Animal Health Package.

Medicines, vitamins and minerals

Figure 1 shows the distribution of medicines, vitamins and minerals purchased by dairy farmers across the four districts.

- Medicines, vitamins and mineral mixes were covered in the Animal Health Packages received by farmers in Bandung and Garut districts and thus the share of purchases of these inputs externally was low for farmers from these districts.
- However, only 70% farmers from Bogor and 63% farmers from Cianjur purchased medicines.
- Only about half of the farmers from Bogor (55%) and Cianjur (45%) purchased vitamins.

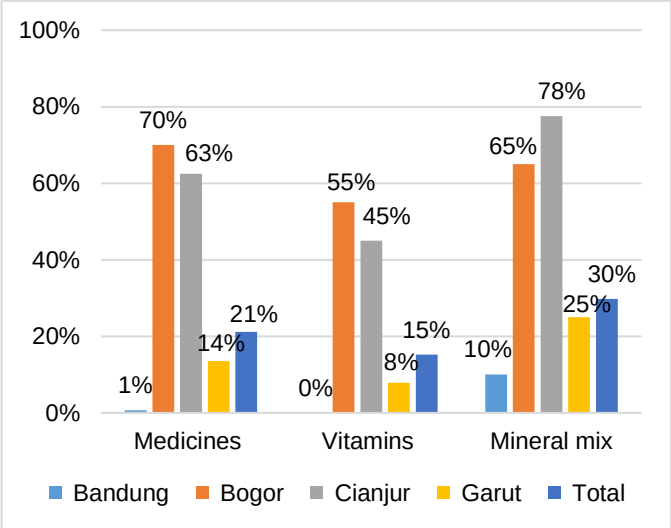

Figure 1. Medicine, vitamin and mineral inputs used by farmers. Note: These are inputs that were purchased independently to the co-operative Animal Health Package.

- Despite receiving mineral mix as part of the Animal Health Packages, 25% of the farmers in Garut and 10% of the farmers from Bandung still purchased these minerals externally.

Concentrates and waste feeds

Figure 2 shows the distribution of concentrates and waste feeds purchased by dairy farmers across the four districts.

- **94% dairy farmers purchased at least one type of concentrate** as a separate input to the Animal Health Packages.
- In particular, all Garut farmers and 93% of Bandung farmers reported purchasing at least one type of concentrate externally.
- 30% of farmers sourced two types of concentrates and 2% sourced three types (Table A2).

Dairy farmers utilised by-products from different food types as supplements for their herd, as they are generally cheap sources of energy and other nutrients.

- Common examples of by-products from different food types included tofu waste (20%), cassava waste (21%), and wastes from vegetables (28%).
- The share of farmers using cassava waste was highest in Bandung (40%).
- 70% farmers in Bogor district used tofu waste.
- Dairy farmers also utilised other feeds and waste mixes. Overall responses are shown in Table A3 in the Appendix.

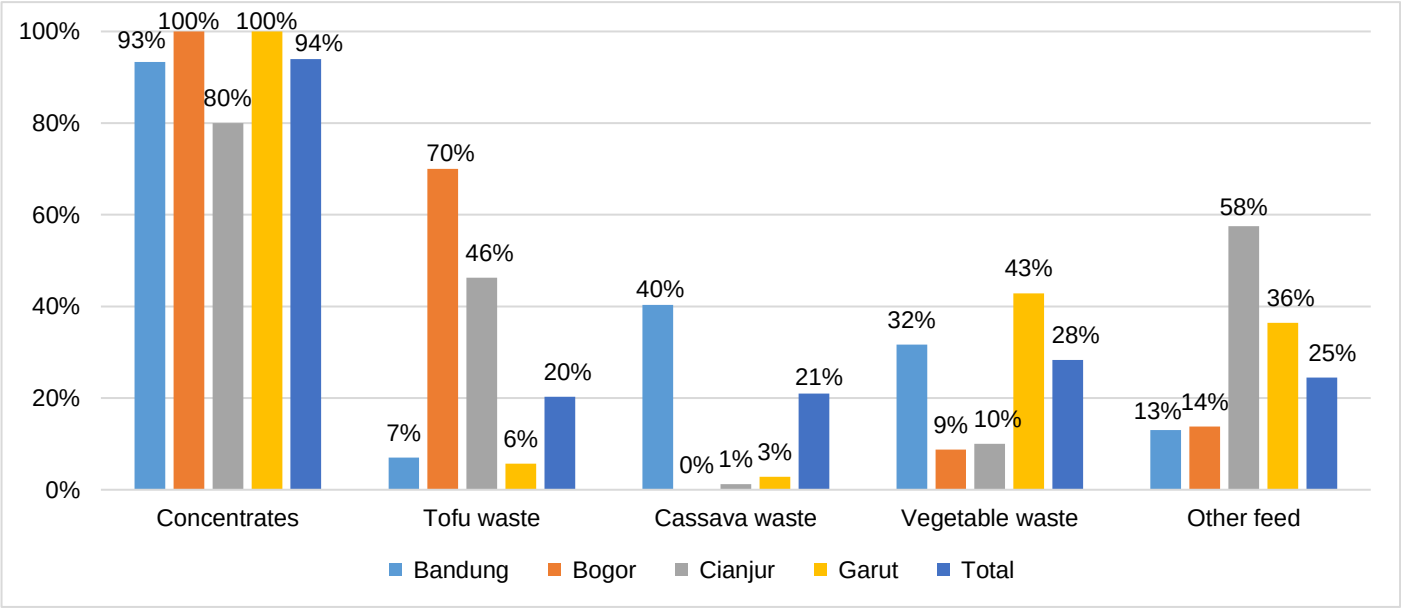

Figure 2. Concentrates and waste feeds used by dairy farmers.

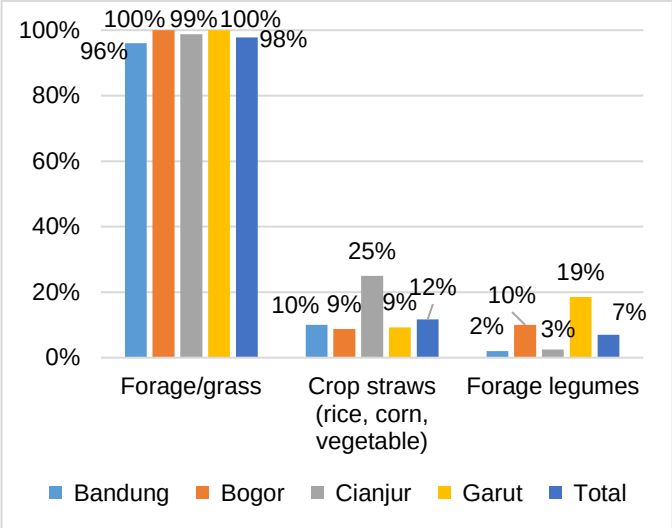

Figure 3. Forages and crop straws inputs used by dairy farms.

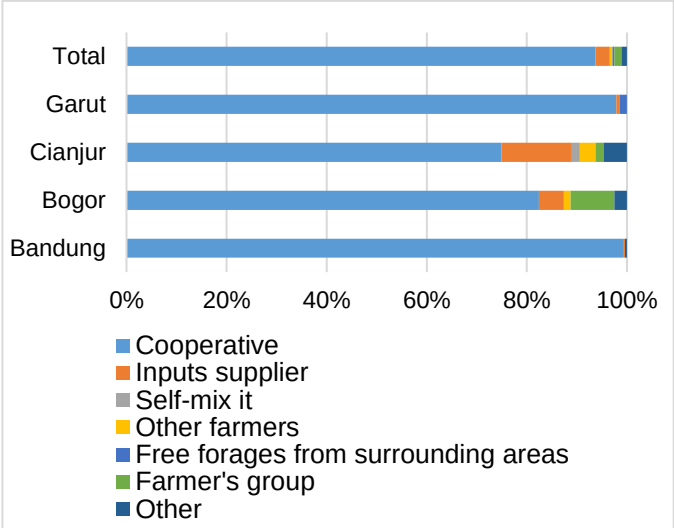

Figure 4. Sources of concentrates, by district.

Forages and grasses

Figure 3 shows the distribution of forages and crop straws purchased by dairy farmers across the four districts.

- Majority of farmers (98%) purchased forages or grass. This was consistent throughout all districts.
- Overall, crop straws (rice, corn, vegetable) were not widely used by the farmers, with only 12% of the respondents utilising them. However, this number was substantially higher in Cianjur district (25%).
- Likewise, forage legumes were not broadly used either. Overall, only 7% reported purchasing them. However, this number was higher in Garut district (19%).

Table 1. Concentrate crude protein (CP) content knowledge, by district.

Districts	Knowledge of CP content (n = 575)	CP content of concentrates (%) (n = 65)
Bandung	14.5%	14.8
Bogor	17.5%	11.9
Cianjur	11.3%	15.2
Garut	1.4%	15.0
Total	11.3%	14.3

Quality of concentrates

Concentrates are a nutrient-dense source of energy and proteins. For dairy production, sourcing high quality concentrates is essential.

A key measure of concentrate quality is the crude protein (CP) content. In the ISHS, farmers were asked if they were aware of the CP for the concentrates they used.

Figure 4 shows the sources of concentrates, by district. Table 1 shows the summary of the respondents aware of the CP in their concentrates and the content itself. District wise results are shown in Table A4 in the Appendix.

Overall, the share of farmers aware of the CP of the concentrates was generally low (11%) (Table 1).

- **Highest share of farmers aware of the CP content was recorded in Bogor district (18%) and lowest was recorded in Garut (1%).**

Of the farmers who were aware of the CP levels, the **average CP level was 14.3%,** which was below the **recommended 16%** to optimise dairy cow performance. This was likely to be due to the higher costs to source or produce higher quality concentrates. Lowest average CP was recorded in Bogor district (12%).

- **94% of farmers who purchased concentrates sourced them from a co-operative (Figure 4).**

Summary

- **Animal Health Packages were critical inputs provided by co-operatives to farmers in Bandung and Garut districts.**
- **Forages or grasses and concentrates were the most commonly procured inputs by dairy farmers.**
- **Other key inputs included forage legumes, crop straws and waste feeds.**

The following factsheet, Factsheet 6, discusses aspects of dairy farm labour across the four districts.

Appendix to Factsheet 5

The tables included in this appendix provide summary statistics related to use of inputs at the dairy household level for the entire sample.

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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A1. Animal Health Packages from dairy co-operatives by profit quartiles.

	Bandung		Bogor		Cianjur		Garut		Total	
Variable	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**
Farmers who receive an Animal Health Package (n = 600)	99.3%	b	0%	a	0%	a	99.3%	b	72.8%	***
What is covered in the package? (n=437)										
Artificial Insemination (AI)	100.0%		0%		0%		100.0%		100.0%	
Medicine	100.0%		0%		0%		97.1%		99.1%	***
Vitamin	97.3%		0%		0%		94.2%		96.3%	
Veterinary Fees	99.0%		0%		0%		100.0%		99.3%	
Reproduction Incentive	17.8%		0%		0%		82.7%		38.4%	***

[1]Value is percentage; [2]Sig = Significance; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A2. Usage of inputs on dairy farms accounting for inputs provided in the co-operative packages shown in Table 1 (n = 600).

	Bandung		Bogor		Cianjur		Garut		Total	
Variable	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**
Artificial Insemination	0.7%		98.8%		92.5%		1.4%		26.2%	
Medicines:										
Type 1	0.7%		70.0%	a	62.5%	a	13.6%		21.2%	***
Type 2	0.0%	a	12.5%	b	11.3%	b	1.4%	a	3.5%	***
Type 3	0.0%	a	5.0%	b	2.5%	ab	0.0%	a	1.0%	***
Vitamins:										
Type 1	0.0%		55.0%	a	45.0%	a	7.9%		15.2%	***
Type 2	0.0%	a	5.0%	c	3.8%	bc	0.0%	ab	1.2%	***
Type 3	0.0%	a	1.3%	ab	2.5%	b	0.0%	ab	0.5%	**
Concentrates:										
Type 1	93.3%	a	100.0%	ab	80.0%		100.0%	b	94.0%	***
Type 2	35.3%	bc	43.8%	c	25.0%	ab	11.4%	a	29.5%	***
Type 3	3.0%		1.3%		2.5%		0.0%		2.0%	
Mineral mix	10.0%		65.0%	a	77.5%	a	25.0%		29.8%	***
Forage or grass	96.0%	a	100.0%	ab	98.8%	ab	100.0%	b	97.8%	**
Crop straws (rice, corn, vegetable)	10.0%	a	8.8%	a	25.0%		9.3%	a	11.7%	***
Forage legumes	2.0%	a	10.0%	bc	2.5%	ab	18.6%	c	7.0%	***
Feed wastes:										
Tofu waste	7.0%	a	70.0%		46.3%		5.7%	a	20.3%	***
Cassava waste	40.3%		0.0%	a	1.3%	a	2.9%	a	21.0%	***
Fermented soybean waste	0.0%	a	0.0%	a	1.3%	a	0.0%	a	0.2%	*
Soybean meal	0.0%	a	0.0%	a	1.3%	a	0.0%	a	0.2%	*
Palm kernel cake	0.0%		0.0%		0.0%		0.7%		0.2%	
Vegetable waste	31.7%	b	8.8%	a	10.0%	a	42.9%	b	28.3%	***
Other feeds	13.0%	a	13.8%	a	57.5%		36.4%		24.5%	***

[1]Value is percentage; [2]Sig = Significance; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A3. Other feeds reported by dairy farmers (n = 147).

Other feeds	Number of farmers	Percentage of the total responses (n = 600)
Cassava	37	6.2%
Rice bran	28	4.7%
Peanut meal	13	2.2%
Pollard	12	2.0%
Bread waste	9	1.5%
Pellet	8	1.3%
Bread	7	1.2%
Banana leaves	6	1.0%
Cake	3	0.5%
Corn leaves	3	0.5%
Barley	2	0.3%
Silage	2	0.3%
Tempe/soybean waste	2	0.3%
Ransum concentrate	1	0.2%
African leaves	1	0.2%
Banana stem	1	0.2%
Banana stem and leaves	1	0.2%
Bread and rice bran	1	0.2%
Brown sugar and green coconut	1	0.2%
Cake and rice bran	1	0.2%
Cake powder	1	0.2%
Bread waste and peanut meal tempe	1	0.2%
Carrot	1	0.2%
Formula milk for calves	1	0.2%
Leaves	1	0.2%
Pollard and rice bran	1	0.2%
Rice waste	1	0.2%
Salt	1	0.2%

Table A4. Concentrate knowledge and sources.

	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]**
Know concentrate crude protein content (n = 575)	14.5%		b	17.5%		b	11.3%		ab	1.4%		a	11.3%		***
Crude protein content of the concentrate (%) (n = 65)	14.81	3.53	b	11.94	2.73	a	15.22	2.28	ab	15.00	1.41	ab	14.26	3.36	**
Source of concentrates (n = 564):															
Cut and carry from surrounding areas for free	0.0%			0.0%			0.0%			1.4%			0.4%		***
Cooperative	99.3%			82.5%			75.0%			97.9%			93.8%		***
Inputs supplier	0.4%			5.0%			14.1%			0.7%			2.7%		***
Self-mix it	0.0%			0.0%			1.6%			0.0%			0.2%		***
Other farmers	0.0%			1.3%			3.1%			0.0%			0.5%		***
Farmer's group	0.0%			8.8%			1.6%			0.0%			1.4%		***
Other	0.4%			2.5%			4.7%			0.0%			1.1%		***

[1]Value is either percentage or mean; [2]SD = Standard Deviation; [3]Sig = Significance. *p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Factsheet 6: Dairy Farm Labour

Background

In the previous factsheet, dairy farm inputs used by dairy farmers in West Java were examined. In this factsheet, the characteristics of the IndoDairy Smallholder Household Survey (ISHS) will be further examined, focusing on the critical aspect of dairy farm labour.

Main sources of labour

The respondents were asked about the main sources of labour they use on the dairy farm. District wise results are shown in Table A1 in the Appendix.

Figure 1 highlights the main sources of labour.

- **Overall, the majority of the respondents (59%) reported that household members were the main source of labour in dairy business.**
- The share of dairy farms where the respondent was the only source of labour was also significant with 26% of the total responses.
- Overall, the share of hired labour was generally low, with only 3% of the total responses.
- 10% of dairy farms source their labour from hired labour and family members.
- However, this was substantially higher in Bogor district where 24% of the respondents indicated that both themselves and hired labour are the main source of labour in dairy business. On the other hand, only 6% of the respondents reported this in Bandung district.
- Other sources of labour accounted for 2% in total, which included a combination of the household head, immediate and extended family members, and neighbours.
- Overall, the main sources of labour in Bandung, Cianjur and Garut consisted primarily of either just the respondent or the respondent and their family. However, the respondents in Bogor formed a majority in either just the respondent or hired labour and the respondent together.

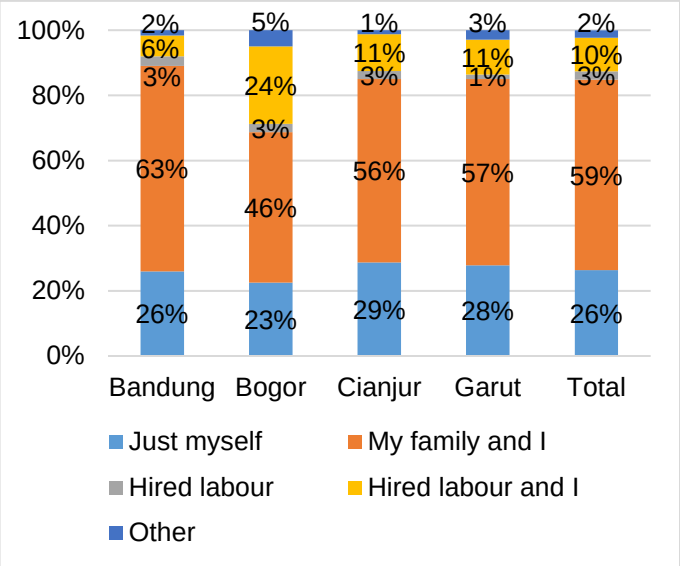

Figure 1. Main sources of labour on dairy farm.

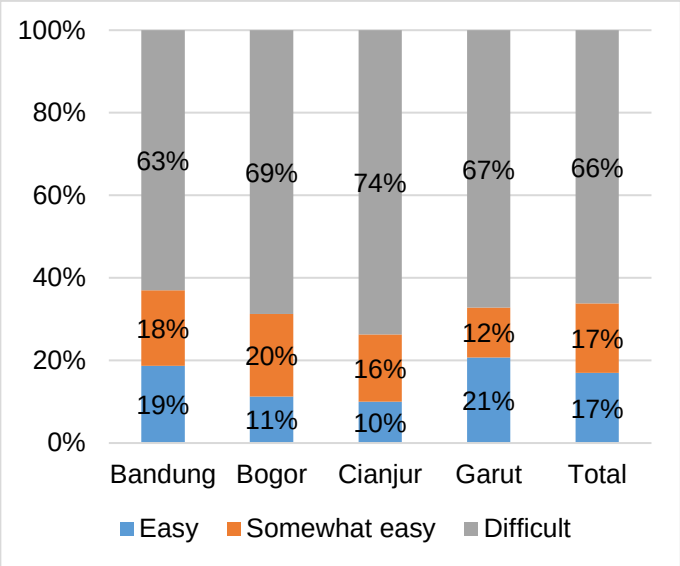

Figure 2. Ease of access to labour.

Labour Hire

The respondents were asked if they had hired any labour to work on dairy farm in the past 12 months. District wise results are shown in Table A1 in the Appendix.

- Overall, 22% of the respondents reported hiring labour to work on the farm in the past 12 months.
- The highest share of hiring dairy farm labour in the past 12 months was reported in Bogor district (33%) and lowest in Bandung (19%) and Garut (19%) districts.

Daily wage rates

The respondents were asked if they were to hire someone to work on the farm on the day of the survey, what would be the daily wage rate including meals. The results are summarised in Table A1 in the Appendix.

- The average daily wage rate across the four districts was 46,193 IDR, which is equivalent to USD 3.19.
- The highest daily wage rate was reported by farmers in Bogor district at 53,742 IDR, which was equivalent to USD 3.72. On the other hand, the lowest wage rate was reported by farmers in Garut district at 39,651 IDR, which was equivalent to USD 2.74.

Bogor is a key urban centre located in close proximity to the national capital, Jakarta, which could be the reason that average daily wage rates are highest in this region.

Methods of payment

The dairy farmers were asked what the most common method of payment was when they hired someone to work on the dairy farm. The results are summarised in Table A1 in the Appendix.

- **Overall, the most common method of payment was cash (65%), with an exception of Cianjur district where only 43% of the respondents reported using cash payments.**
- This was followed by cash and meals with 33% of the respondents using this method. The highest share of this method of payment was recorded in Cianjur district (56%).
- Only a small number of farmers (0.5%) reported using cash, meals and milk as payment for dairy farm labour.

Access to labour

Access to labour is an important aspect of operating a dairy farm. The respondents were asked if it was easy to find labour in their local area. Figure 2 highlights labour accessibility on dairy farms across the four districts.

District wise results are summarised in Table A1 in the Appendix.

- **Overall, majority of the farmers (66%) reported that it was difficult to find labour in their local area.** The highest share of farmers who faced difficulty in access to labour was in Cianjur district (74%) and lowest in Bandung district (63%).
- Only 17% of the farmers found it easy to access labour for their dairy farms. Further, the same number of farmers (17%) found it somewhat easy to find labour.

It is noteworthy that despite being located in close proximity to urban centres, a high number of respondents from Bogor (69%) and Bandung (63%) still reported difficulties in accessing labour.

Labour hours on farm

The number of hours dairy farmers or hired labour spend on dairy farm is an important determinant of productivity, which also relates to the cost of dairy farm operations. The respondents were asked to consider the different activities undertaken on the dairy farm on a daily basis, including the contribution of different household members and employed labour. District wise results are summarised in Table A2 in the Appendix. Figure 3 and 4 show the total number of hours each type of labour spent on the dairy farm operations.

- **On average, the family contributed the most in labour (9.7 hours) to the dairy farm operations**.
- The share of hired labour hours was substantially lower compared to family labour, with an average of 1.8 hours overall.
- The share of hired labour hours on farm was highest in Bogor district (3.5 hours) and lowest in Bandung (1.4 hours) and Garut (1.2 hours).

There was a substantial difference between labour hours in males and females across the four districts.

- On average, males spent about 7.2 hours on farm labour while females spent 2.3 hours.

Family labour vs hired labour

Dairy farm families and hired labour collectively spent significant amount of time on the farm in various activities. The share of time spent on these activities was further analysed. District wise results are summarised in Table A2 in the Appendix.

- On average, **most time was spent on collecting forages**, both for family (4.4 hours) and for hired labour (1.0 hour).
- Other activities that took up a large amount of the family's time included milking (1.1 hours) and washing the barn (1.1 hours).

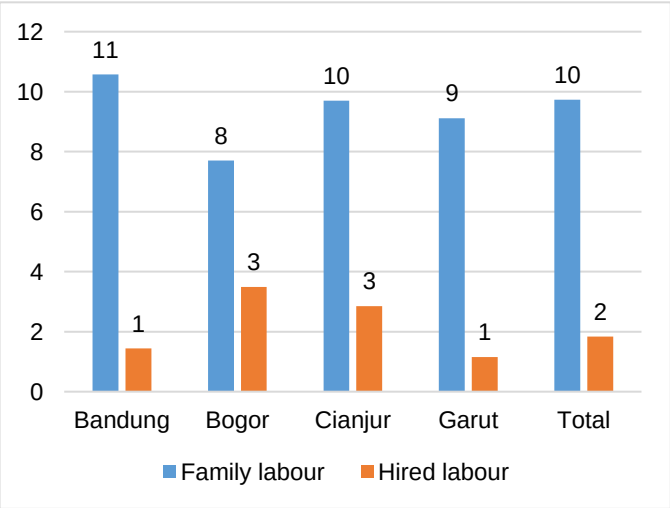

Figure 3. Comparison of family and hired labour hours spent on dairy farms.

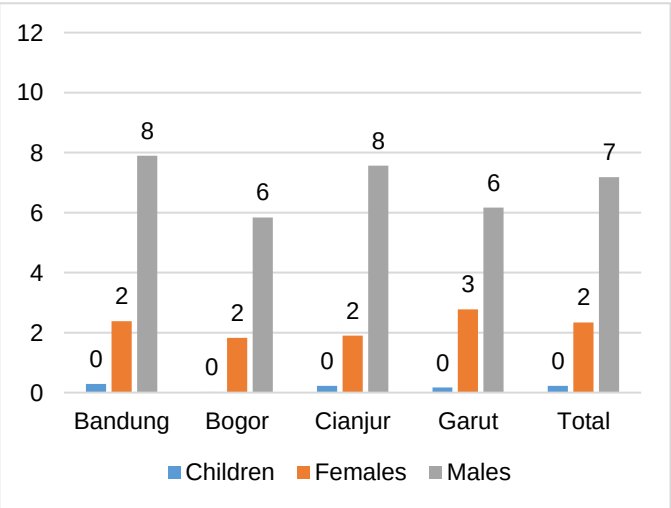

Figure 4. Comparison of family labour hours on dairy farm.

- Feeding took up almost an hour (0.9 hour) of the family's time.
- Washing cows also took up almost an hour (0.8 hour) of the dairy farm family's time.
- Apart from collecting forages, hired labour spent little time on other activities. For instance, milking (0.2 hour), washing barn/cage (0.2 hours), feeding (0.1 hour) and washing cows (0.1 hour).

Therefore, labour was mainly hired for the purposes of collecting forages.

Summary

- **Collectively, family members were the main source of labour on dairy farm.**
- **The number of hired labour on dairy farm was generally low. However, in Bogor district there was a higher number of households employing labour compared to the other districts.**
- **Finding labour was generally difficult, even in districts that are in close proximity to urban centres like Bogor and Bandung.**
- **Dairy farm owners mostly used cash to pay for hired labour.**
- **Collecting forages took up the most time of both family and hired labour.**

In the next factsheet, Factsheet 7, milk productivity, price and quality will be analysed across the four districts.

Appendix to Factsheet 6

The tables included in this appendix provide summary statistics related to use of labour inputs at the dairy household level for the entire sample.

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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A1. Dairy farm labour statistics.

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]
Main source of labour in dairy business (n=600)															
Just myself	26.0%			22.5%			28.8%			27.9%			26.3%		***
My family and I	63.0%			46.3%			56.3%			57.1%			58.5%		***
Hired labour	3.0%			2.5%			2.5%			1.4%			2.5%		***
Hired labour and I	6.3%			23.8%			11.3%			10.7%			10.3%		***
Other	1.7%			5.0%			1.3%			2.9%			2.3%		***
Total litres per labour unit	10,044	5,218	a	12,201	8,320		9,658	5,918	a	7,612	3,877		9,713	5,722	***
Hired labour in the past 12 months? (n=600)	18.7%		a	32.5%		b	27.5%		ab	18.6%		ab	21.7%		**
Number of people currently hired (n=130)	1.48	1.32		1.73	0.96		1.82	1.44		1.54	1.03		1.60	1.22	
Employed labour daily rate (n=600)															
IDR	46,256	19,601	a	53,742	20,768	b	49,574	18,458	ab	39,651	15,748		46,193	19,256	***
USD[4]	3.20	1.36	a	3.72	1.44	b	3.43	1.28	ab	2.74	1.09		3.19	1.33	***
Common payment methods (n=600)															
Only cash	72.7%			56.3%			42.5%			67.9%			65.3%		***
Cash and meals	25.7%			40.0%			56.3%			31.4%			33.0%		***
Cash, meals and milk	0.3%			1.3%			1.3%			0.0%			0.5%		***
Other	1.3%			2.5%			0.0%			0.7%			1.2%		***
Ease of finding local labour (n=600)															
Easy	18.7%			11.3%			10.0%			20.7%			17.0%		
Somewhat easy	18.3%			20.0%			16.3%			12.1%			16.8%		
Difficult	63.0%			68.8%			73.8%			67.1%			66.2%		

[1]Value is either percentage or mean; [2]SD = Standard Deviation; [3]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$). [4]Exchange rate: 1 USD = 14,459.50 Indonesian Rupiah on 27 July 2018.

Table A2. Number of hours spent daily by labour on dairy farm (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 number of labour hours on farm															
Family labour	10.57	4.28	c	7.70	3.26	a	9.70	4.48	bc	9.11	3.40	ab	9.73	4.11	***
Children	0.29	1.11		0.02	0.13		0.23	1.06		0.17	0.76		0.22	0.95	
Females	2.38	2.54	ab	1.83	2.50	a	1.90	2.94	ab	2.78	2.54	b	2.34	2.60	**
Males	7.90	3.51	b	5.84	2.90	a	7.56	4.20	b	6.17	2.81	a	7.18	3.49	***
Hired labour	1.44	4.52	a	3.49	8.04	b	2.85	8.15	ab	1.15	4.36	a	1.84	5.71	***
Total number of owner's hours spend on															
Cut-and-carry grass	4.38	2.35	a	3.21	1.99		4.52	2.65	a	5.01	2.56	a	4.39	2.45	***
Feeding	1.05	0.78		0.70	0.56	a	0.77	0.47	a	0.69	0.43	a	0.88	0.67	***
Providing water	0.69	0.96		0.24	0.25	a	0.39	0.51	a	0.33	0.22	a	0.51	0.74	***
Milking	1.21	0.96	b	0.87	0.65	a	1.05	0.90	ab	0.81	0.55	a	1.05	0.85	***
Washing barn / cage	1.28	0.79	b	1.03	0.69	a	1.13	0.75	ab	0.91	0.55	a	1.14	0.74	***
Washing cows	1.00	0.97	a	0.92	0.64	a	0.97	0.74	a	0.39	0.44		0.84	0.84	***
Cleaning equipment	0.32	0.20	b	0.24	0.21	a	0.29	0.23	ab	0.26	0.16	a	0.29	0.20	***
Milk handling (filtering / packing)	0.09	0.16		0.08	0.18		0.08	0.11		0.06	0.10		0.08	0.15	
Milk delivery	0.54	0.42	ab	0.42	0.55	a	0.51	0.44	ab	0.65	0.60	b	0.55	0.49	***
Total number of hours hired labour spend on															
Cut-and-carry grass	0.82	2.37	a	1.51	2.99	a	1.70	4.11	a	0.80	2.68	a	1.02	2.83	**
Feeding	0.10	0.52	a	0.37	1.00	b	0.17	0.78	ab	0.07	0.48	a	0.14	0.64	***
Providing water	0.04	0.25	a	0.12	0.35	a	0.10	0.41	a	0.02	0.15	a	0.06	0.28	**
Milking	0.19	1.13	a	0.44	1.13	a	0.37	1.80	a	0.08	0.41	a	0.22	1.14	*
Washing barn / cage	0.08	0.46	a	0.49	1.92	b	0.21	0.76	ab	0.08	0.51	a	0.15	0.86	***
Washing cows	0.12	0.59	a	0.35	1.00	b	0.18	0.69	ab	0.05	0.29	a	0.14	0.63	***
Cleaning equipment	0.03	0.17	a	0.10	0.27	b	0.06	0.23	ab	0.02	0.10	a	0.04	0.19	***
Milk handling (filtering / packing)	0.01	0.07		0.03	0.13		0.01	0.09		0.01	0.09		0.01	0.09	
Milk delivery	0.05	0.17	a	0.09	0.23	a	0.06	0.27	a	0.02	0.09	a	0.05	0.18	*

[1]Value is mean; [2]SD = Standard Deviation; [3]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Factsheet 7: Milk Productivity, Price and Quality

Background

In the previous factsheet of the IndoDairy Smallholder Household Survey (ISHS) "*Farm-to-Fact*" series, dairy farm labour used by dairy farmers in West Java was evaluated. 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 A2 in the Appendix.

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 differed across districts.
- **Farmers in Bogor were producing the highest amount of milk with 51 litres per day.**
- Farmers in Garut district produced the lowest amount of milk per day at around 26 litres, which was half of what farmers in Bogor were 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 produced the highest amount of milk per cow per day with, on average, 15 litres.** Farmers in Cianjur produced significantly less milk per cow (14 litres).

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

Total farm milk production is determined by milk production per cow and the size of 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 affect 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 was estimated a cow will produce 4,426 litres per lactation.**
- When comparing districts, 15 litres per day in Bandung translated to around 4,535 per lactation, while, 14 litres in Cianjur translated to around 4,048. This means, **farmers in Bandung, on average, were 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 is 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 was 10,329 litres per year.**
- Farmers in Garut district were producing the least amount of milk per labour unit with, on average, 7,953 litres per labour unit per year.
- Farmers in Bogor district were producing significantly more milk 13,975 litres per labour unit per year; approximately 50% more milk than farmers in Garut district did.
- Farmers in Bandung and Cianjur district showed 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) was 0.22ha. When the total milk produced by a farm per year was considered by this land area, **it was estimated that a farm would produce 1,210,000 litres per hectare per year.**

- The average land area used for dairy farming practices was highest in Bogor district (0.33ha). However, the farmers in Bogor district were producing less milk as a proportion of their dairy land use compared to the other districts. This translated to approximately 759,000 litres per hectare per year.
- Farmers in Bandung (0.17ha), Garut (0.22ha), who managed less land, were 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 was 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 was <u>no</u> significant differences between districts in milk produced per hectare per year**. This is likely due to high variations between farms within in a district, which is seen by the large standard deviation (see Table A2 in the Appendix).

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%).

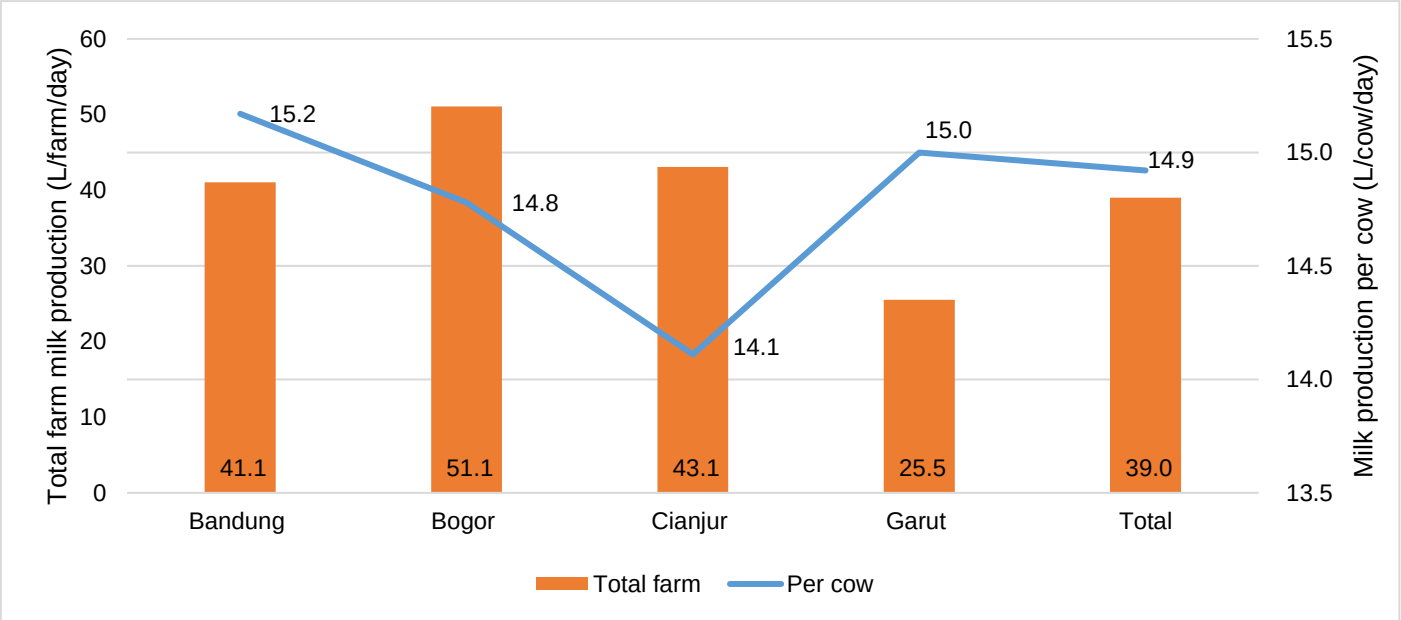

Figure 1. Comparison of total farm and per cow milk production by district.

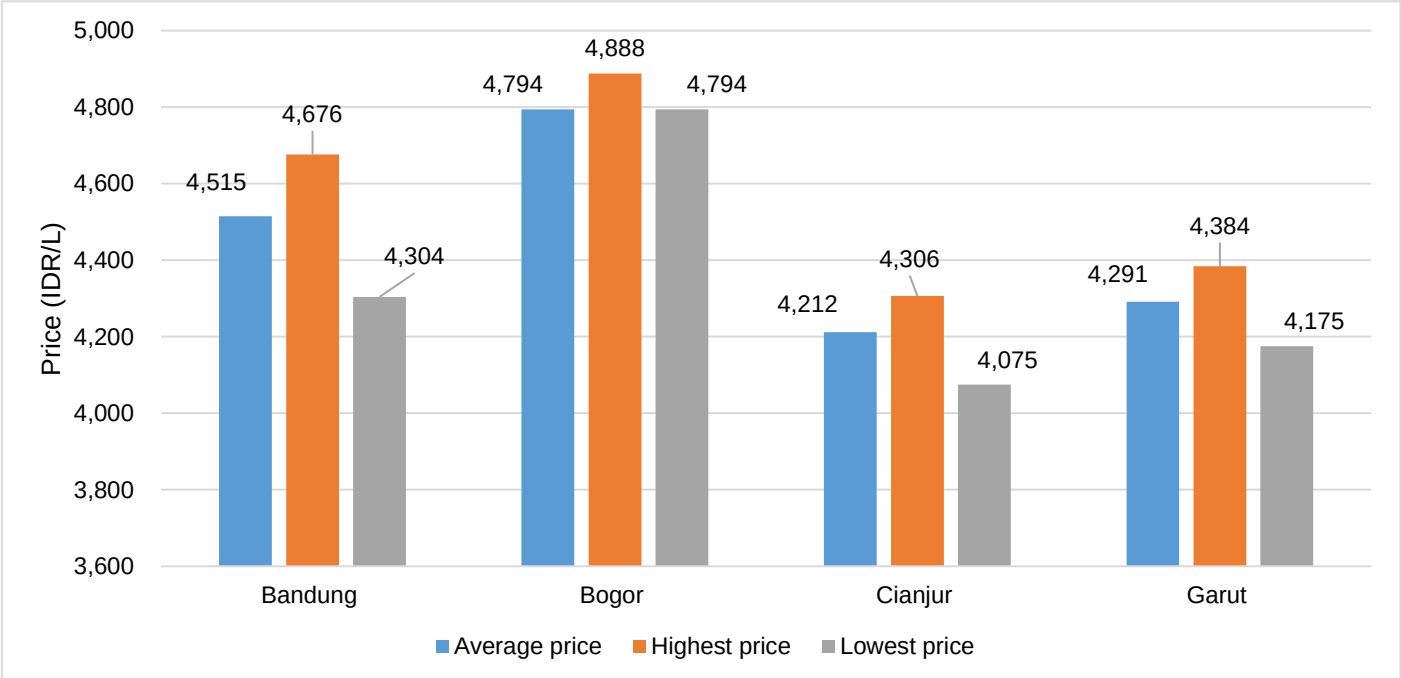

Figure 2. Farm-gate milk price across districts.

- 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 A4 in the Appendix.

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 IDR 4,458.7 (US 30.8 cents) per litre.**
- On average, the highest price received was IDR 4,586.1 (USD 31.7 cents) per litre, while the lowest price was IDR 4,308.0 (US 29.8 cents).
- Milk price was significantly different across the districts, with farmers from Bogor district receiving the highest amount (IDR 4,793.7 or US 33.2 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 received the lowest milk price across the four districts at IDR 4,212 (US 39.1 cents) per litre.

Arrangement with buyers

Form of contract with buyers

Farmers were asked about the agreements they had 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 reached its next destination along the chain, such as dairy co-operatives, and milk processors or direct to consumers.

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

Processing of milk on farm

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

- **Overall, 98% of farmers filtered their milk on-farm** (to remove any physical contaminants) but did not cool the milk.
- Only 0.2% of farmers filtered and cooled the milk on farm.
- 2% of farmers reported they did 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 received 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 A1 in the Appendix 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 was by no means high, with the exception to total solids (TS) in Cianjur (73%). This suggests that farmers were not fully aware of how milk quality parameters may affect the milk price they received. This is explored in the next section, where farmers' knowledge of milk quality parameters is reported.

Farmers' knowledge of milk quality parameters

Farmers were asked about their knowledge and awareness related to a number of factors related to milk quality, including their understanding of the concept; if they knew the measurement for their milk; and either, what the average was for their farm or why they could not find out the measurement. Table A5 in the Appendix summarises the responses.

- **Farmers' knowledge of their own milk quality measurements or the understanding of the concepts was generally low.**
- There were significant differences between farmers' knowledge of milk quality parameters across the four districts.
- Figure 3 summarises the proportion of farmers who knew what the milk quality parameters were (conceptually) and their knowledge of the measurement for their milk.
- **Less than 50% of farmers understood 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

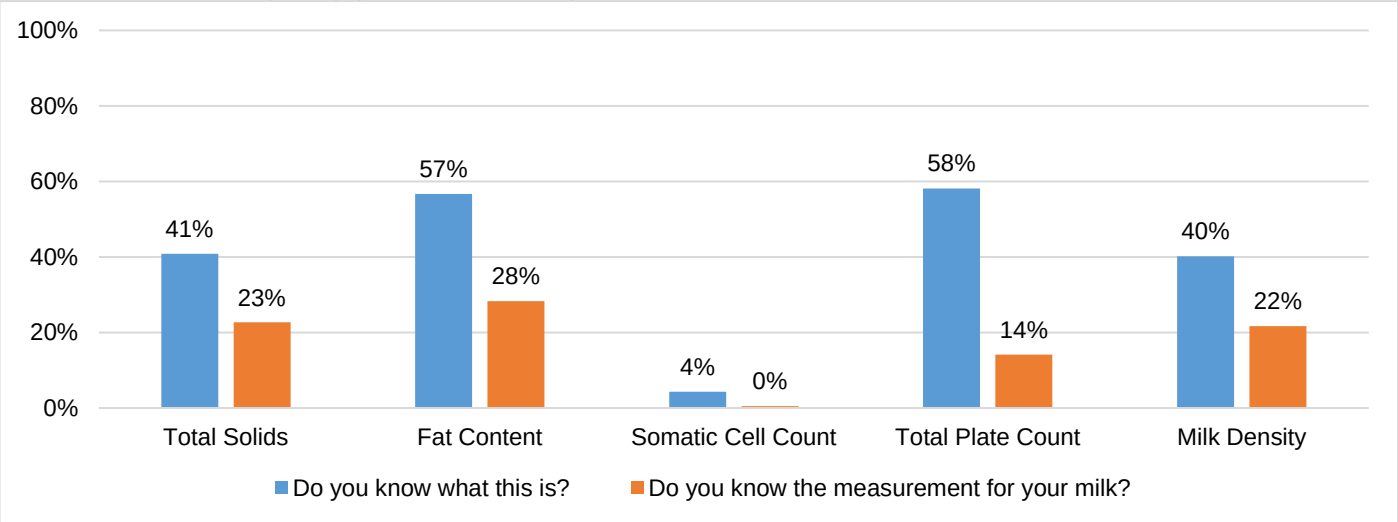

Figure 3. Farmers' knowledge of milk quality parameters.

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) was highest in Cianjur (81%) and lowest in Garut (12%) (Figure 4).
- Understanding of fat content was fairly consistent across the districts, between 47% in Garut and 73% in Bogor. However, there was a considerable range of farmers who knew 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 knew about TPC but did not have access to 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 was likely reflective of the determinants of milk prices (mentioned above), where milk density was not reported as a highly important factor of milk price (Figure 8).

Farmers were further asked about why, if they understood what the milk quality factor was, they did not know the measurement for their milk. These responses are summarised in Table A4 in the Appendix.

- Farmers either responded: they did not have the equipment to measure it themselves; it was measured by the co-operative but they were not told their measurement; or that it was 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 had 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).

- **On average, total farm milk production was 39 litres per day.**

- **Farmers in Bogor were producing the highest amount of milk with 51 litres per day.**
- **The average milk production per cow per day was 15 litres.**
- **Farmers in Bandung produced the highest amount of milk per cow per day with, on average, 15 litres.**
- **On average, milk produced per labour unit was 10,329 litres per year.**
- **Overall, 76% of farmers reported a seasonal difference in daily milk production.**
- **Overall, farmers reported the average price received for fresh milk was IDR 4,458.7 (US 30.8 cents) per litre.**
- **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.**
- **Farmers' knowledge of their own milk quality measurements or the understanding of the concepts was generally low.**
- **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.**
- **More than two-thirds of farmers reported the reason they did not know their measurement for any milk quality factors, was because they had not been told about their measurement, despite it being measured.**

In the next factsheet, Factsheet 8, costs, revenue and profit will be analysed across the four districts.

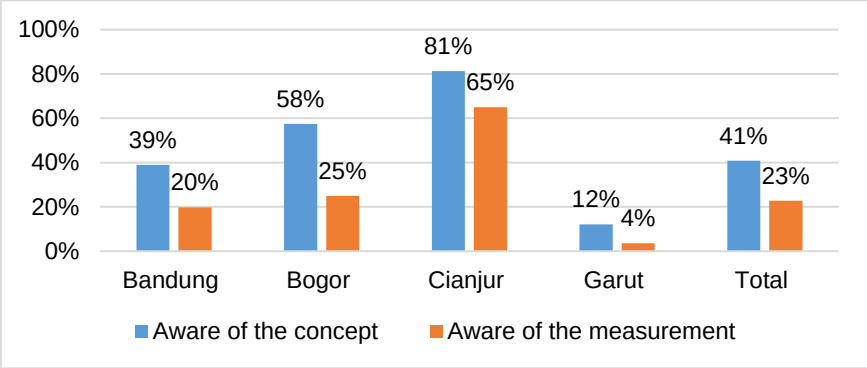

Figure 4. Farmer knowledge about *total solids (TS)* by district.

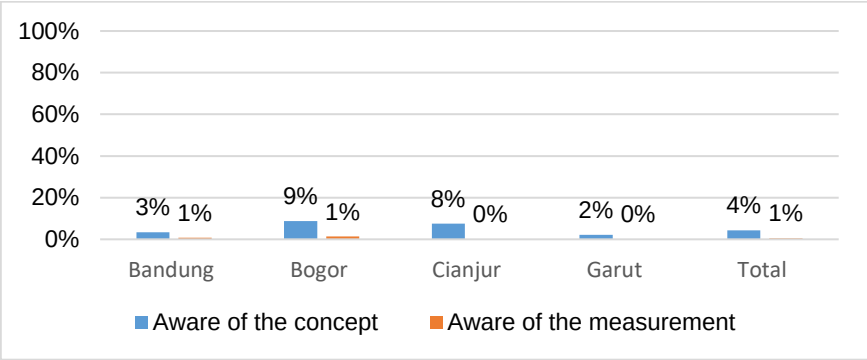

Figure 6. Farmer knowledge about *somatic cell count (SCC)* by district.

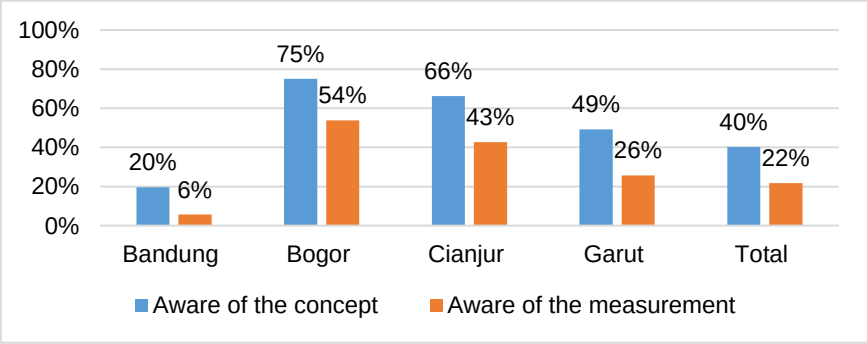

Figure 8. Farmer knowledge about *milk density* by district.

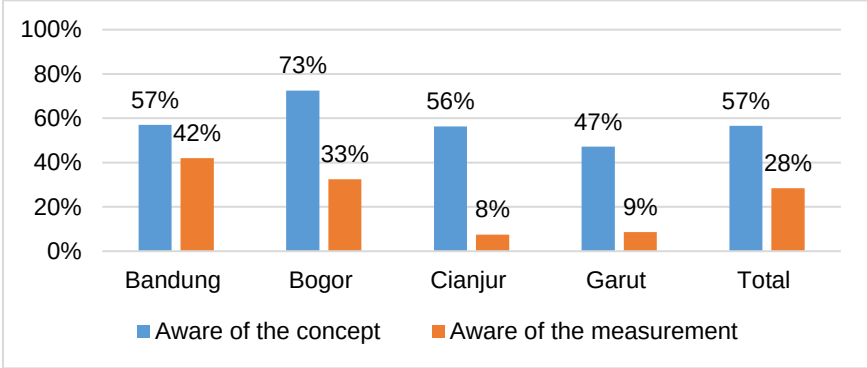

Figure 5. Farmer knowledge about *fat content* by district.

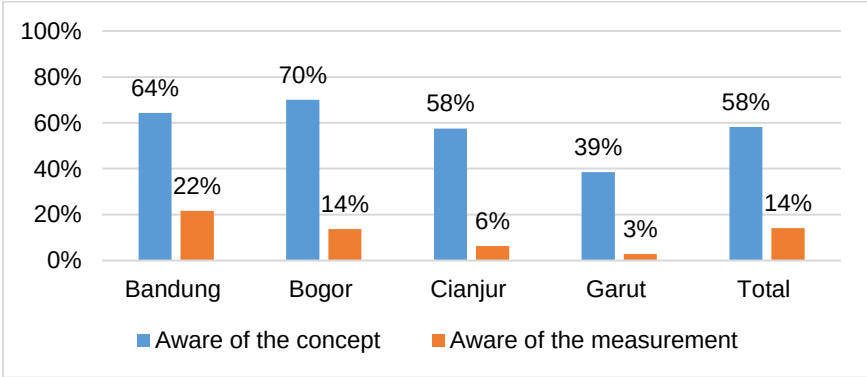

Figure 7. Farmer knowledge about *total plate count (TPC)* by district.

Appendix to Factsheet 7

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 A1. Summary of the three most reported milk quality factors by district.

	Bandung	Bogor	Cianjur	Garut	Total
Most important milk quality factors:					
Highest reported	TPC (51.5%)	TPC (50.0%)	TS (73.3%)	Milk density (47.4%)	Fat content (40.2%)
2nd highest reported	Fat content (44.1%)	Milk density (50.0%)	Milk density (53.3%)	Fat content (43.0%)	TPC (39.0%)
3rd highest reported	Adulterants (32.2%)	Adulterants (30.0%)	TPC (26.7%)	Adulterants (37.0%)	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 A2. 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 A3. 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 A4. 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 A5. 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%		*

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 ($p > 0.05$).

Factsheet 8: Costs, Revenue and Profit

Background

In the previous factsheet, the aspects of milk productivity, price and milk quality were analysed.

In this factsheet, the aspect of cost, revenue and profitability will be considered. This factsheet builds on the information summarised in Factsheets 3, 4 and 7 of the IndoDairy Smallholder Household Survey (ISHS) '*Farm-to-Fact*' series by assessing dairy-related costs, revenue and profitability across the four districts: Bogor, Cianjur, Bandung and Garut.

Financial comparison by district

Production costs

One of the key objectives of the ISHS was to improve the understanding of input costs and overheads related to dairy production.

Farmers in the ISHS were asked to report on the variable costs (e.g. feed and herd health) and overheads (e.g. employed labour, taxes, interest of loans etc) for their dairy business. The results are shown in Table A1 in the Appendix.

Annual production costs

The major variable costs for the dairy farmers related to the purchase of forage, concentrates and supplements, feed delivery costs and herd costs related with maintaining the herd on the farm (e.g. veterinary and herd health, water costs).

On average, across the four districts, total variable costs were 34.0 million IDR (USD 2,351) per annum and total farm cost was 39.5 million IDR (USD 2,732).

Concentrates and supplements accounted for the largest share of costs, making up approximately 74% of total costs. On average, these costs summed to 29.4 million IDR, (approx. USD 2,000) annually.

There was significant variation between the districts, with households in Bogor spending more than twice the amount in concentrates compared to households in Garut.

Multiple factors could affect this, such as farm size, which was higher in Bogor; and arrangements in place with the corresponding dairy cooperatives, which were a major source of inputs for farmers.

Other major costs related to dairy farming were hired labour (3.9 million IDR or USD 274 per annum), feed delivery costs (2 million IDR or USD 138 per annum), and herd costs (1.5 million IDR or USD 104 per annum).

Production costs per litre of milk

Costs and revenue per litre of milk produced were also analysed to help account for differences in factors affecting total costs, such as farm size. See Figure 1 below and Table A2 in the Appendix for the breakdown of costs per litre of milk produced.

The overall high costs of concentrates and supplements (2,147 IDR/L, or USD 0.14/L) was also reflected in these figures. While farmers in Bogor paid the highest rate for concentrates, as seen in the sections below, that these farmers were also received higher revenue from milk sales.

The total cost incurred by dairy farmers for producing a litre of milk was 2,789 IDR (USD 0.19/L).

Family labour

The time contributed to dairy-related activities by family members was a significant opportunity cost for the household and estimated to be an additional in-kind 20.6 million IDR (USD 1,425) per annum (see Table A1 in the Appendix).

Farmers in Bandung and Cianjur had the highest in-kind contribution in labour with 22.5 and 22 million IDR (USD 1,556 and 1,521) per annum, respectively.

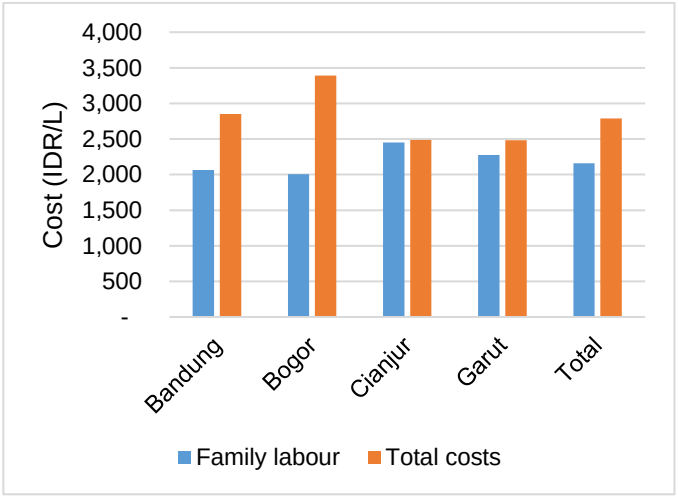

Figure 2. Cost of family labour, compared to total cash costs, per litre of milk produced.

The value of time contributed by family members to producing a litre of milk is shown in Table A2 in the Appendix. On average, **family labour equated to approximately to 2,160 IDR per litre (USD 0.15/L).**

When compared to total cash costs, dairy household members contributed almost the same value as in-kind time in Cianjur and Garut district (Figure 2).

A later factsheet will look at specific details regarding both family and hired labour; however, a major activity was harvesting and collecting grasses. This also explains the low cash costs of forages in Figure 1.

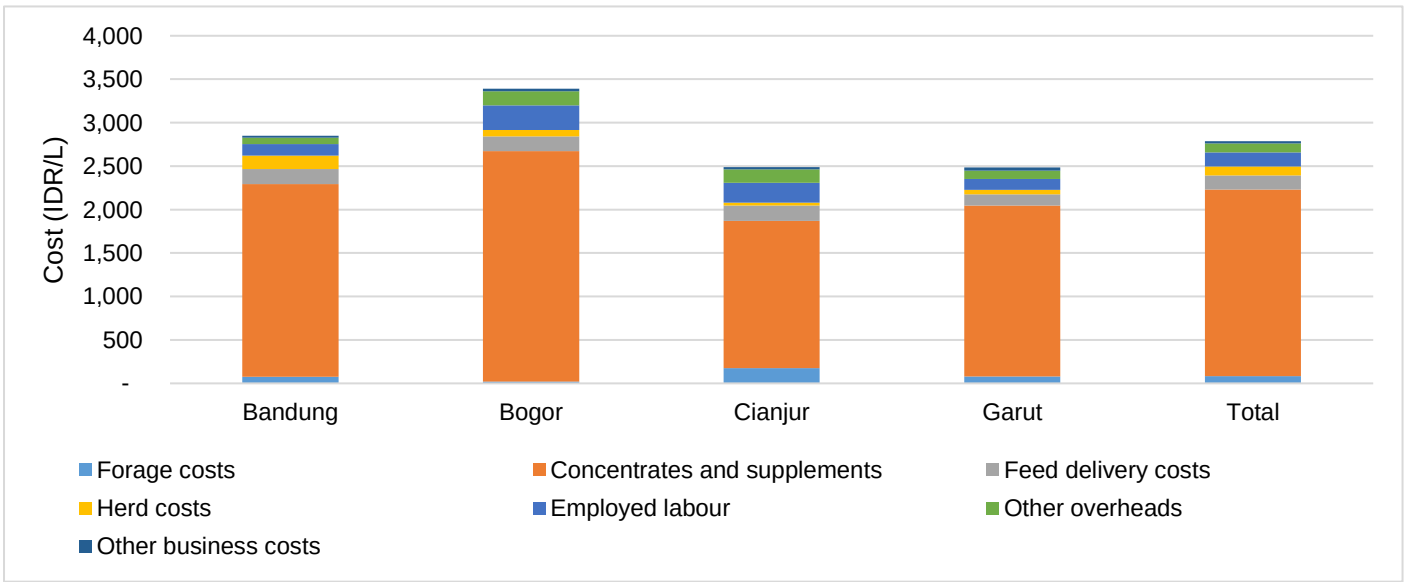

Figure 1. Milk production costs per litre of milk produced grouped by district.

Revenue from milk production

Annual revenue

The average revenue derived from the fresh milk sales (minus cost of delivering the milk) was 63.9 million IDR (USD 4,419) per annum (see Table A1 in the Appendix).

The revenue derived from fresh milk sales was highest in Bogor district (90.50 million IDR or USD 6,258) as compared to the other districts. Farmers in the Garut district had the lowest revenue on average, with less than half that of Bogor farmers (39.6 million IDR or USD 2,738 per annum).

Other aspects of the dairy operations considered while calculating the total farm revenue were the value of milk consumed and fed to calves (2.61 million IDR or USD 181) and sales from processed milk (1.34 million IDR or USD 93).

Bogor district farmers also had the highest revenue from processed milk sales (9.52 million IDR), which was negligible for the other three districts.

The average total revenue from milk production across the four districts was 67.90 million IDR (USD 4,695) per annum.

Revenue per litre of milk produced

Figure 3 shows value per litre based on the three categories of revenue across the districts. On average, the revenue derived from the sale

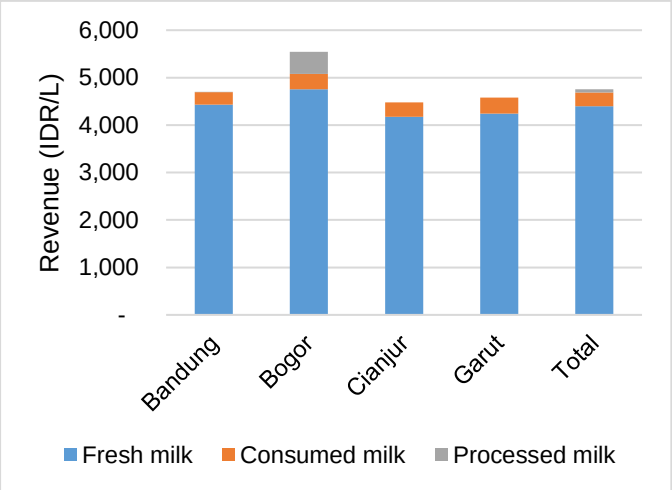

Figure 3. Revenue per litre of milk produced.

of one litre of fresh milk (minus delivery costs) was 4,390 IDR (USD 0.30), as shown in Table A2 in the Appendix.

When including the value of processed milk sales and consumed milk, **the total revenue from a litre of milk produced was 4,756 IDR (USD 0.32).**

Profitability

Figure 4 illustrates the cost, revenue and profit from production of a litre of milk across the four districts.

Farmers in Bogor district had significantly higher revenue (5,547 IDR or USD 0.38 per litre) and costs (3,390 IDR or USD 0.23 per litre) compared to the other districts.

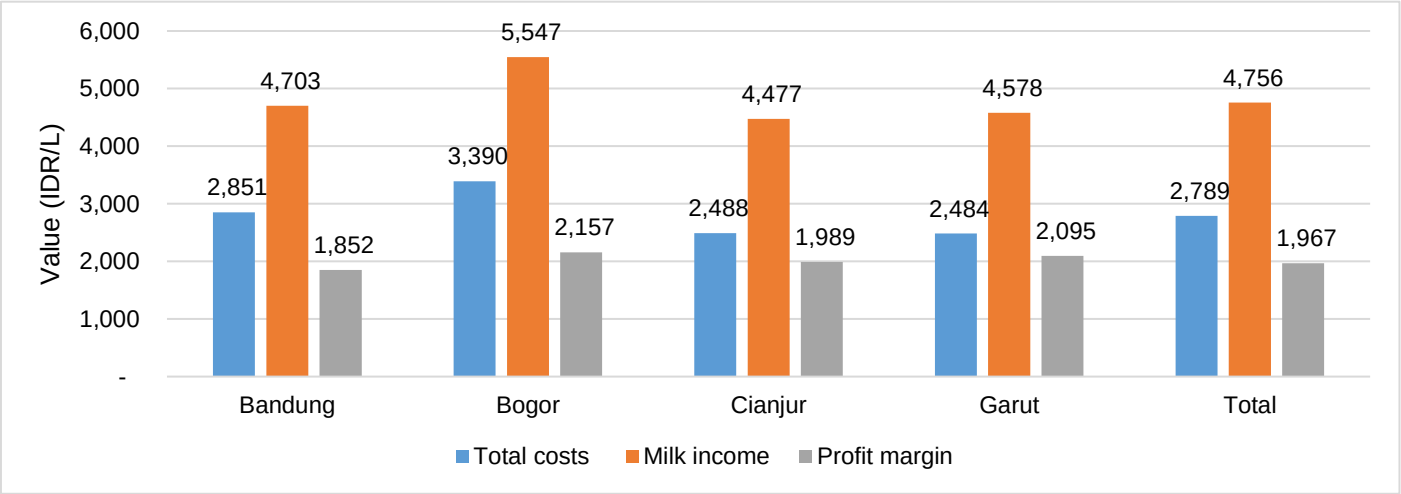

Figure 4. Total production costs, revenue and profit per litre of milk by district.

Farmers in Cianjur received the lowest revenue across the four districts with 4,477 IDR (USD 0.31) per litre at a cost of 2,488 IDR (USD 0.17) per litre.

Despite the significant variation in revenue and costs, **there was no significant differences between profits per litre of milk across the districts.**

The total average profit per litre was 1,967 IDR (USD 0.14 per litre).

Summary

This factsheet has provided an overview of production costs, revenue and profitability of dairy farmers. Key insights highlighted in this factsheet are:

- **On average, across the four districts, total variable costs were 34.0 million IDR (USD 2,351) per annum and total farm cost was 39.5 million IDR (USD 2,732).**
- **Concentrates and supplements accounted for the largest share of costs, making up approximately 74% of total costs.**
- **The total cost incurred by dairy farmers for producing a litre of milk was 2,789 IDR (USD 0.19/L).**
- **Family labour equated to approximately to 2,160 IDR per litre (USD 0.15/L). When compared to total cash costs, dairy household members contributed almost the same value as in-kind time in Cianjur and Garut district.**
- **The average total revenue from milk production across the four districts was 67.90 million IDR (USD 4,695) per annum. The total revenue from a litre of milk produced was 4,756 IDR (USD 0.32).**
- **There were no significant differences between profits per litre of milk across the districts. The total average profit per litre was 1,967 IDR (USD 0.14 per litre).**

The next factsheet, Factsheet 9, will consider the important aspects of technology adoption across the four districts.

Appendix to Factsheet 8

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

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 A1. Total annual milk production costs and revenue by district (n=600).

	Bandung			Bogor			Cianjur			Garut			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	1.21	6.02	a	0.27	1.72	a	2.56	13.10	a	0.57	1.74	a	1.11	6.50	*
Concentrates and supplements	31.5	28.4	b	45.4	55.1		26.70	33.80	ab	17.10	13.80	a	29.40	32.70	***
Feed delivery costs	2.05	3.97	ab	2.81	4.45	b	2.45	3.83	ab	1.15	2.05	a	2.00	3.70	***
Herd costs[4]	2.33	2.04		1.19	2.47	b	0.63	1.46	ab	0.45	0.27	a	1.51	1.97	***
(A) Total variable costs	**37.10**	**32.30**	**a**	**49.70**	**59.60**		**32.30**	**39.90**	**a**	**19.30**	**14.50**		**34.00**	**36.60**	*******
(B) Employed labour costs	2.86	9.96	ab	9.01	25.80	c	7.12	20.80	bc	1.65	6.61	a	3.96	14.50	***
(C) Other overheads[5]	0.84	0.71	a	1.99	2.47	b	1.79	1.83	b	0.79	0.82	a	1.11	1.37	***
(D) Other business costs[6]	0.37	1.06		0.48	1.14		0.39	1.42		0.25	0.68		0.36	1.05	
(E) Total costs (A + B + C + D)	**41.20**	**39.60**	**a**	**61.20**	**82.40**		**41.60**	**56.30**	**a**	**22.00**	**18.60**		**39.50**	**48.10**	*******
Milk revenue:															
Fresh milk sales[7]	67.30	52.70	a	90.50	102.00	b	67.40	65.90	ab	39.60	26.10		63.90	60.90	***
Value of consumed milk[8]	2.66	0.49		2.93	0.66		2.46	0.51	a	2.40	0.16	a	2.61	0.50	***
Processed milk sales	0.16	2.77	a	9.52	47.90		0.00	0.00	a	0.00	0.00	a	1.34	17.80	***
(F) Total milk revenue	**70.10**	**52.90**	**a**	**103.00**	**123.00**		**69.80**	**66.00**	**a**	**42.00**	**26.10**		**67.90**	**66.70**	*******
(G1) Revenue over variable costs (F – A)	33.00	31.80	a	53.20	72.60		37.50	36.60	a	22.70	17.60		33.90	39.10	***
(G2) Revenue over total costs (F – E)	**28.90**	**29.60**	**b**	**41.70**	**58.80**	**c**	**28.20**	**34.30**	**abc**	**20.00**	**15.50**	**a**	**28.40**	**33.80**	*******
(H) Number of lactating cows managed	2.84	2.21	a	3.60	4.02	a	3.28	2.97	a	1.79	1.33		2.75	2.55	***
(I) Profitability per cow per year (G2 / H)	**10.60**	**10.10**		**13.40**	**19.10**		**10.90**	**11.70**		**12.00**	**8.10**		**11.40**	**11.60**	
Opportunity costs:															
Owner's labour[9]	22.50	14.20	b	19.20	12.60	ab	22.00	14.50	b	16.60	9.08	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). Districts 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 by district (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]**
Variable costs:															
Forage costs	0.08	0.39		0.02	0.11		0.18	0.76		0.08	0.27		0.08	0.42	
Concentrates and supplements	2.21	1.56	bc	2.65	1.38	c	1.69	1.42	a	1.97	1.18	ab	2.15	1.46	***
Feed delivery costs	0.17	0.32		0.17	0.20		0.18	0.24		0.13	0.23		0.16	0.28	
Herd costs[4]	0.15	0.06		0.07	0.09		0.03	0.03	a	0.05	0.02	a	0.10	0.08	***
Total variable costs	**2.62**	**1.64**	**bc**	**2.91**	**1.50**	**c**	**2.07**	**1.63**	**a**	**2.23**	**1.28**	**ab**	**2.49**	**1.56**	*******
Employed labour costs	0.13	0.41	a	0.28	0.57	a	0.22	0.54	a	0.12	0.36	ab	0.16	0.45	**
Other overheads[5]	0.07	0.07	a	0.16	0.18	b	0.15	0.15	b	0.10	0.10	a	0.10	0.12	***
Other business costs[6]	0.02	0.06		0.03	0.06		0.02	0.04		0.03	0.10		0.03	0.07	
Total costs	**2.85**	**1.74**	**ab**	**3.38**	**1.68**	**b**	**2.48**	**1.77**	**a**	**2.48**	**1.37**	**a**	**2.78**	**1.68**	*******
Milk revenue:															
Fresh milk sales[7]	4.43	0.29		4.75	0.58		4.18	0.59	a	4.24	0.25	a	4.39	0.42	***
Value of consumed milk[8]	0.27	0.19	a	0.32	0.29	ab	0.30	0.39	ab	0.34	0.16	b	0.30	0.24	**
Processed milk sales	0.01	0.12	a	0.47	2.53		0.00	0.00	a	0.00	0.00	a	0.07	0.94	***
Total milk revenue	**4.70**	**0.32**	**a**	**5.55**	**2.55**		**4.48**	**0.69**	**a**	**4.58**	**0.30**	**a**	**4.76**	**1.05**	*******
Revenue over variable costs	2.08	1.62	a	2.63	2.83	a	2.40	1.69	a	2.35	1.25	a	2.26	1.77	*
Revenue over total costs	**1.85**	**1.72**		**2.15**	**2.93**		**1.98**	**1.85**		**2.09**	**1.33**		**1.96**	**1.87**	
Opportunity costs:															
Owner's labour[9]	2.06	1.62		2.01	1.75		2.45	2.57		2.28	1.66		2.16	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). Districts 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.

Factsheet 9: Technology Adoption

Background

In the previous factsheet, costs, revenue and profit were considered across the four districts. In this factsheet, the characteristics of the IndoDairy Smallholder Household Survey (ISHS) will be further studied, focusing on what technologies were used by dairy farmers in West Java and how these contributed to on farm productivity and milk quality.

The dairy farmers were asked a series of questions to understand the level of adoption of dairy farming technologies on farm. Farmers were asked a series of questions for 27 technologies and based on responses, were categorised under one of the adoption statuses for each technology:

1. Unaware
2. Aware, but not adopted
3. Stopped adoption (disadoption)
4. Still using (continued adoption)

The process for categorising farmers' responses is illustrated in Figure 1.

This information gives us a sound understanding of the extent of outreach and adoption of many improved management practices for dairy farming. The different categories help identify the necessary intervention to improve the adoption of the technology. For instance, technologies which have low awareness initially require communication and training activities, while technologies which have high rates of discontinuation require additional consideration as to why farmers are not using it – such as accessibility issues, cost of adoption is high.

An overview of this data is presented in Table A1 in the Appendix and in Figure 2.

Overview of ISHS results

Technologies with low awareness

The overall results indicate that a high percentage of farmers were unaware of certain dairy farm technologies. These technologies included:

- Synchronisation estrus (91%), nutrient feed blocks (87%), milk pasteurisation (74%), UHT (Ultra High Temperature) (72%).

It is interesting to note that there was a fairly high percentage of farmers who were unaware of certain basic dairy farm technologies that are critical to ensure dairy productivity and quality.

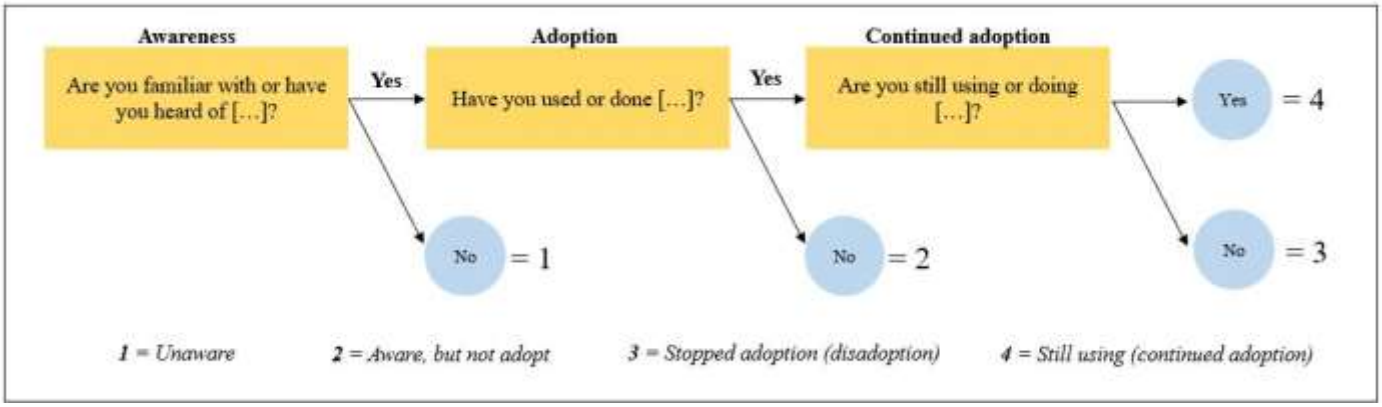

Figure 1. Categories based on adoption decisions.

These technologies included:

- Mastitis test (63%), high protein concentrates (62%), record keeping (56%), application of breeding plan (55%) and feeding legume forages (51%).

There were significant differences across districts with respect to awareness about certain technologies. District wise results of technology awareness are shown in Table A2 in the Appendix and in Figure 3.

- The share of farmers who were aware about high protein concentrates (16% or higher) was highest in Cianjur district (60%) and lowest in Garut district (22%).
- Overall, only 58% of the farmers were aware about teat dipping after milk. Of these, the share of farmers who were aware was lowest in Garut district (35%) and highest in Bandung district (72%).
- Similarly, the share of farmers who were aware about stainless steel milking equipment was the lowest in Garut district (64%) compared to other districts.

It was interesting to note that the **level of awareness about majority of the technologies was generally lowest in Garut district** as compared to the other districts.

Technologies with low adoption

The dairy farmer respondents were asked, of the technologies that they were aware of, had they ever used any of them on the farm, to get insights on technologies with low adoption. The district wise results are shown in Table A3 in the Appendix and in Figure 4.

- Overall results indicate that the technology, which had the highest percentage of farmers being aware but not adopted, was automatic milking machines (74%).
- Other technologies like biogas tanks (65%), manure processing/manure re-use (58%), cooling milk in water tanks (56%), milk quality testing (53%) also had a high percentage where farmers were aware of but had not adopted these technologies on farm.

There were significant differences across districts with respect to adoption about certain technologies.

- It is noteworthy that, overall of the farmers that were aware about mastitis tests, only about half (50%) of the farmers had ever used mastitis tests. Of these, the share of farmers from Cianjur district was the lowest (32%).
- Similar observations were noted with the use of high protein concentrates, with overall of the farmers that were aware of high protein concentrates only 48% had ever used it on farm. Of these, the highest use was observed in Bogor district (61%) and lowest in Garut district (32%).

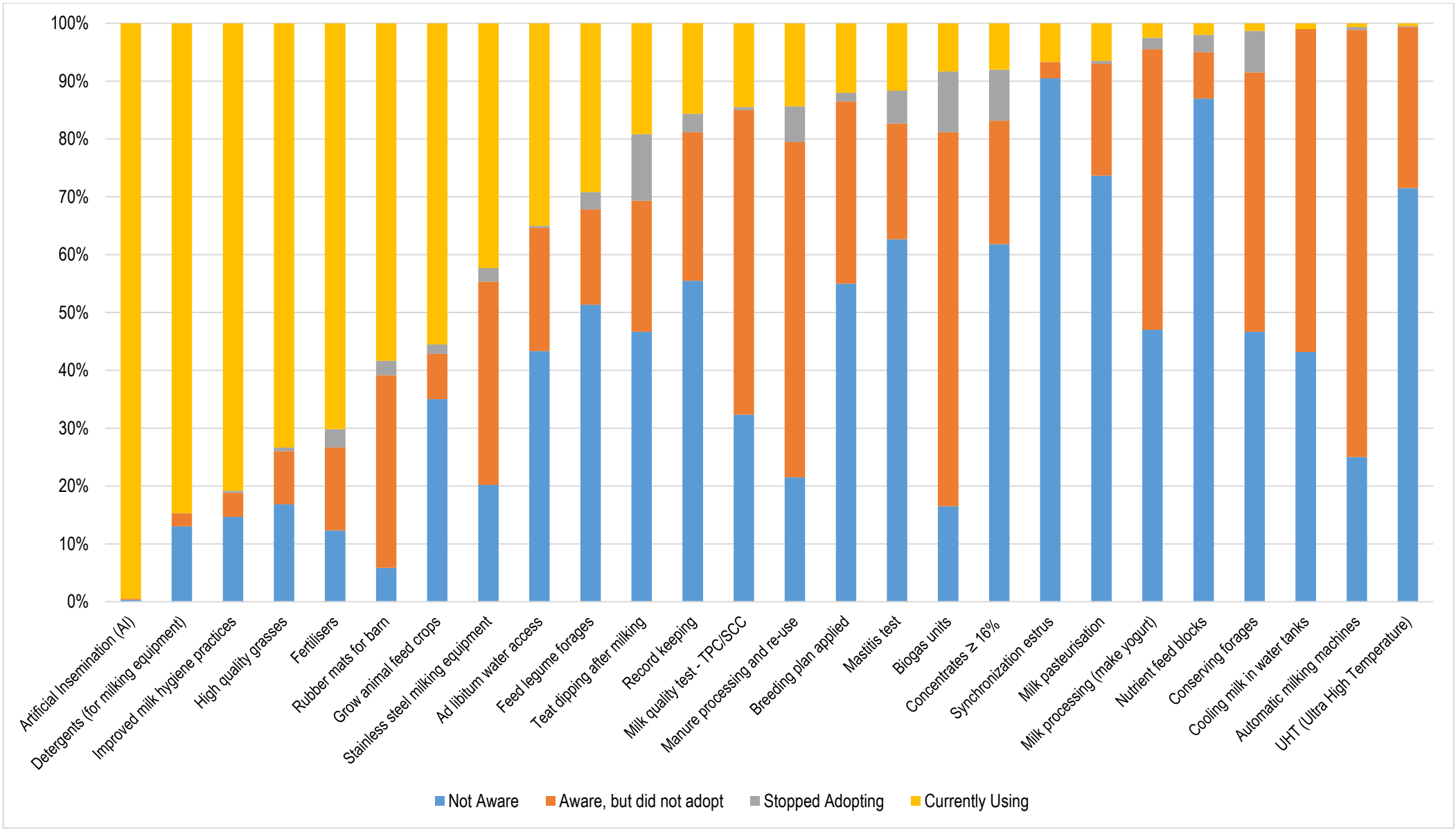

Figure 2. Adoption decisions of dairy technologies in Indonesian smallholder dairy farmers.

- With respect to usage of feed legume forages, of the farmers that were aware of this, 67% had used this on farm. The differences between usages of feed legume forages were significant across the four districts, with higher share of farmers from districts of Bogor (81%) and Garut (86%), on the other hand, lower share of usage in farmers from Cianjur (64%) and Bandung (46%) district.

A high percentage of use of some technologies was noted in farmers across the four districts that reported to be aware of these technologies. These included:

- Use of high-quality grasses (89%), growing animal feed crops (88%), fertiliser uses for growing grass (84%), use of detergents for milking equipment (97%) and improving milking hygiene to reduce Total Plate Count (TPC) (95%).

On the other hand, for some technologies a lower percentage of use was noted across the four districts. These technologies included:

- Application of breeding plan (31%), manure processing/re-use (29%), biogas units (28%), milk pasteurisation (28%), conserving forages for the dry season (22%), milk quality tests to determine Total Plate Count/Somatic Cell Count (23%), milk processing (10%), cooling milk in water tanks (2%) and automatic milking machines (2%).

Technologies that farmers stopped using

For the farmers who answered that they were aware of certain technologies and had ever used them on their farm, they were then asked if they had used these technologies since 2014 to get insights on technologies which farmers stopped using or disadopted on their dairy farms. The results are shown in Table A4 in the Appendix and in Figure 5.

- **It is interesting to note that overall, about 12% of the farmers had stopped teat dipping after milking, a critical practice from preventing occurrence of mastitis.**
- About 11% of farmers had stopped using high protein concentrates to feed their dairy cattle.

For technologies that farmers had used since 2014, there were no significant differences across the four districts for the following technologies:

- Mastitis tests (86%), usage of high protein concentrates (86%), usage of feed legume forages (97%), use of high quality grasses (99%), teat dipping after milking (86%), improving drinking water availability 24/7 (99%), using detergents for milking equipment (99%), improving milk hygiene to reduce TPC (99%), nutrient feed blocks (83%), cooling milk in water tanks (100%), stainless steel milking equipment (99%), milk pasteurisation (91%), milk processing (87%), milk quality testing (98%), synchronisation of oestrus (93%) and manure processing (85%).

On the other hand, significant differences across the four districts were noted in regard to some technologies that farmers reported to have stopped using since 2014.

- Almost all farmers from Bandung (98%), Bogor (100%) and Cianjur (100%) districts used rubber/plastic floor for the barn cage but only 67% of farmers from Garut district reported to have used this since 2014.
- Similarly, with regards to record keeping, the share of farmers keeping records since 2014 was higher in Bandung (93%), Bogor (93%) and Cianjur (96%) districts as compared to Garut district (67%).
- On the other hand, the share of farmers using biogas units since 2014 was higher in Bogor (88%), Cianjur (100%) and Garut districts (91%) as compared to Bandung where only 58% of farmers had used biogas units since 2014.

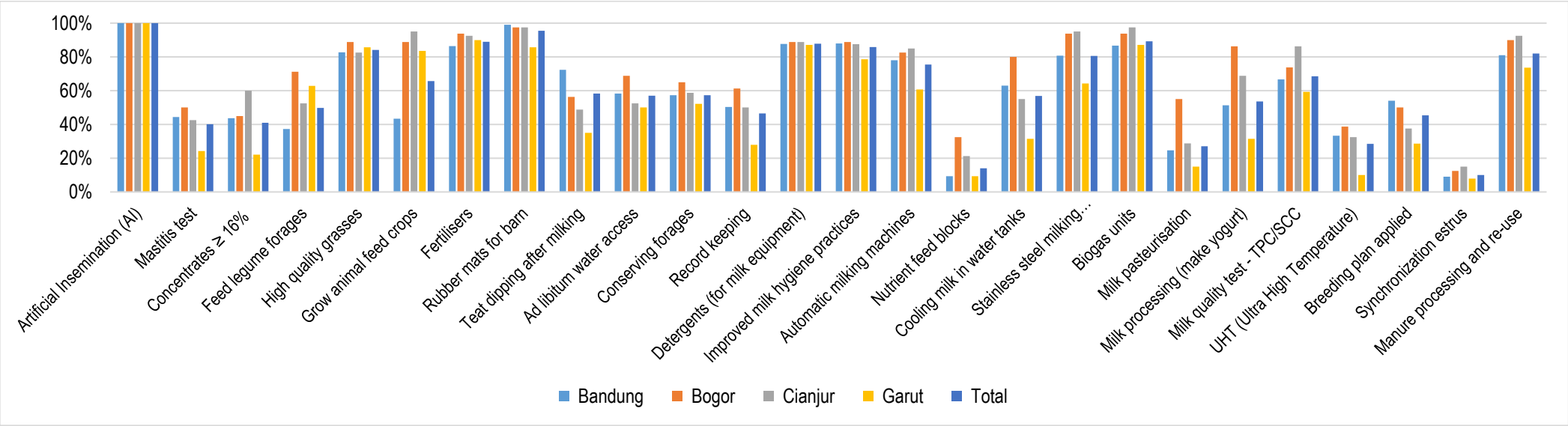

Figure 3. Awareness of technologies among dairy farmers.

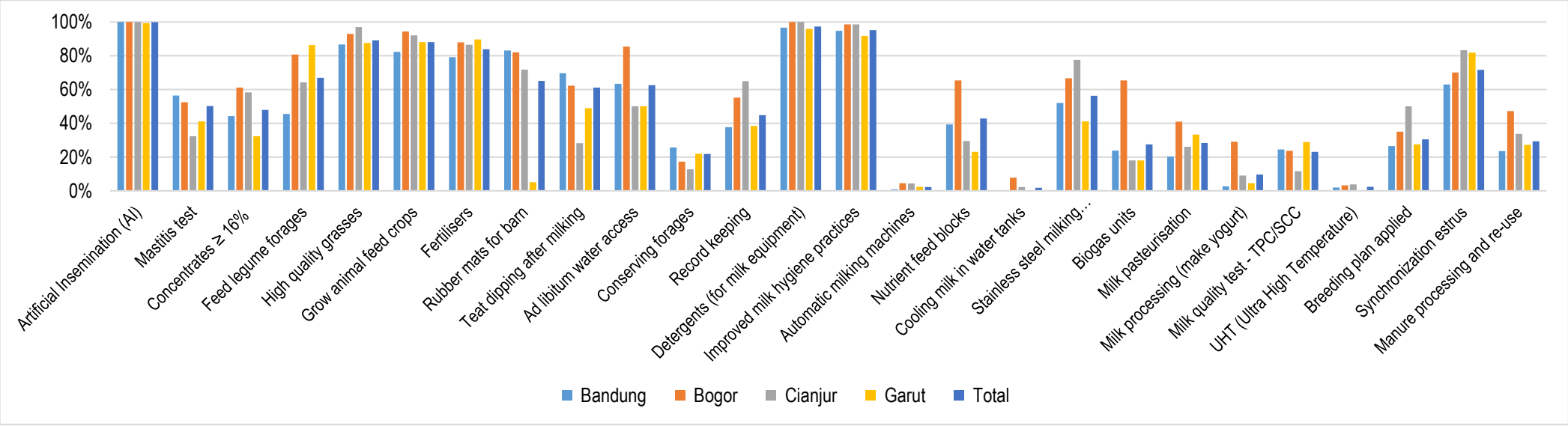

Figure 4. Technologies that have ever been used by dairy farmers.

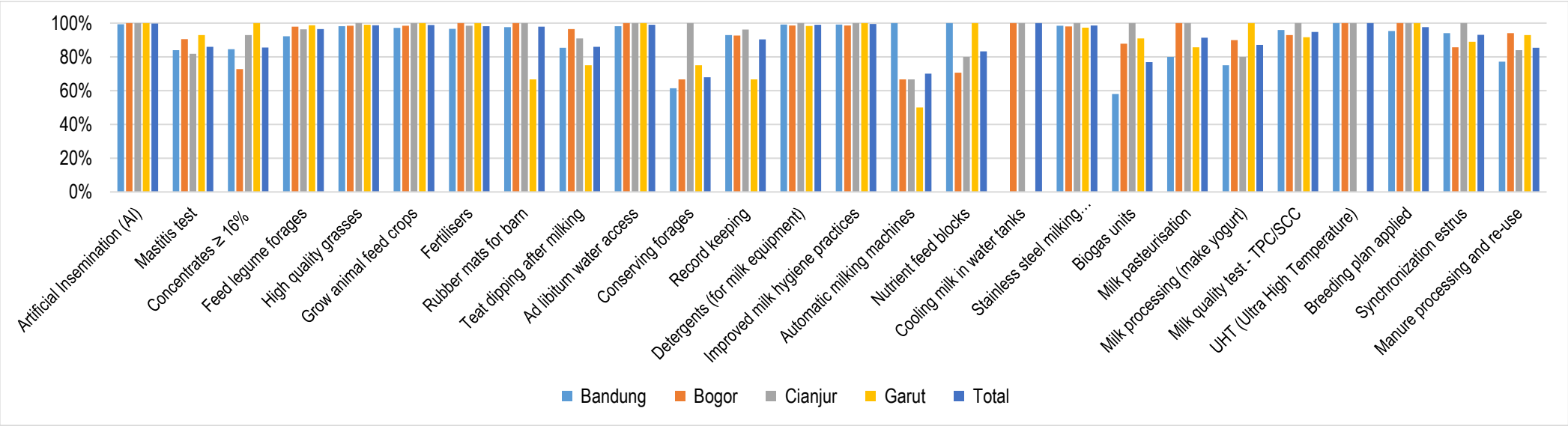

Figure 5. Technologies used since 2014 by dairy farmers.

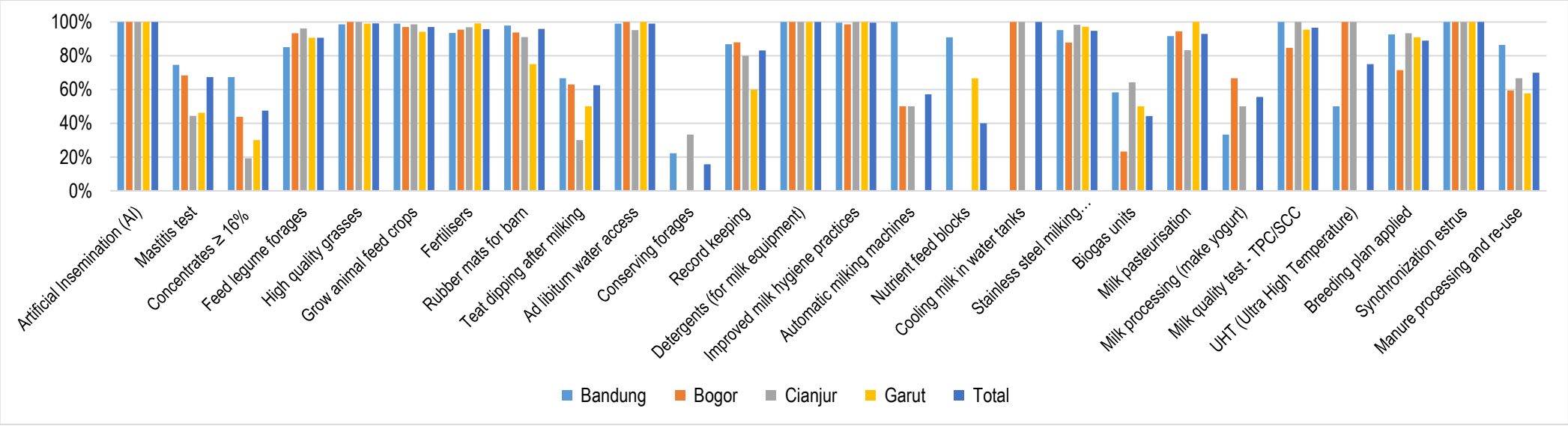

Figure 6. Technologies currently used on farm by dairy farmers.

Currently used technologies

The final question in the series of questions on technology uses, as shown in Figure 1, was if the farmers were using certain technologies at the time of the survey. This question was asked to the farmers only if they reported to be aware of these technologies, had ever used them and had used them since 2014. The district wise results are shown in Table A5 in the Appendix and in Figure 6.

A high percentage of farmers continued to use some of the basic but critical technologies on their dairy farms including:

- Artificial insemination (100%), using detergents for milking equipment (85%), improving milk hygiene to reduce TPC (81%), use of high-quality grasses (73%), use of fertilisers to grow grass (70%), rubber/plastic floor for barn/cage (58%) and growing animal feed crops (56%).

It is interesting to note that only a fewer number of farmers continued to use some critical technologies that are essential for production efficiency and ensuring product quality.

- This included teat dipping after milking (19%), record keeping (16%), milk quality testing (15%), application of breeding plan (12%), mastitis test (12%).
- Only few farmers used complex technologies like milk pasteurisation (7%), milk processing (3%), cooling milk in water tanks (1%), automatic milking machines (0.67%) and UHT (Ultra High Temperature) (0.50%).
- Of the technologies that farmers reported to have used since 2014, the technologies that continue to being used at the time of the survey were, artificial insemination (100%), using detergent for milking equipment (100%), use of high quality grasses (99%), growing animal feed crops (97%), use of fertilisers for grass (96%), rubber/plastic floor for barn cage (96%),improving milk hygiene to reduce TPC (100%), stainless steel milking equipment (95%).

There were significant differences across districts with regards to some technologies continuously being used by dairy farmers.

- Overall, 48% of farmers indicated that they used high protein concentrates at the time of the survey with the highest share of farmers using this technology observed in Bandung district (67%) and lowest in Cianjur (19%).
- Significant difference was noted with the use of rubber/plastic floor for the barn/cage with farmers from Bandung (98%), Bogor (94%) and Cianjur (91%) reporting high levels of adoption while only 75% of farmers from Garut were using this technology at the time of the survey.
- Overall, 44% of farmers were using biogas units at the time of the survey, with the lowest usage reported in Bogor district (23%) and the highest in Cianjur district (64%).

Summary

Technologies with low awareness

- **Only a fewer number of farmers had heard about or were aware of technologies like synchronization of estrus, nutrient feed blocks, milk pasteurisation and UHT (Ultra High Temperature).**
- **A fairly high percentage of farmers were unaware of certain basic dairy farm technologies that are critical to ensure dairy productivity and quality like Mastitis test (63%), high protein concentrates (62%), record keeping (56%), application of breeding plan (55%) and feeding legume forages (51%).**

Technologies with low adoption

- **Technologies with a high percentage of awareness but low levels of adoption included automatic milking machines (74%), biogas tanks (65%), manure processing/manure re-use (58%), cooling milk in water tanks (56%), milk quality testing (53%).**

Technologies with discontinued adoption

- **Overall, about 12% of the farmers had stopped teat dipping after milking, a critical practice from preventing occurrence of mastitis.**
- **About 11% of farmers had stopped using high protein concentrates to feed their dairy cattle.**

Technologies with high continued adoption

- **A high percentage of farmers continued to use some of the basic but critical technologies on their dairy farms including artificial insemination (100%), using detergents for milking equipment (85%), improving milk hygiene to reduce TPC (81%), use of high-quality grasses (73%), use of fertilisers to grow grass (70%), rubber/plastic floor for barn/cage (58%) and growing animal feed crops (56%).**

Further understanding of the level of awareness and current usage patterns of dairy farm technologies will pave the way for design and implementation of extension programs targeted at knowledge dissemination and capacity building of smallholder dairy farmers.

The following factsheet, Factsheet 10, provides information on attitudes, future aspirations and perceptions of dairy farmers in the ISHS across the four districts.

Appendix to Factsheet 9

The tables included in this Appendix provide summary statistics related to technology adoption 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 A1. Overview of dairy farm technology adoption of the ISHS (n=600).

Dairy Technologies	Not Aware[1]	Aware, but not adopted[2]	Stopped adopting[3]	Still Using[4]
Artificial Insemination (AI)	0.3%	0.2%	0.0%	99.5%
Using detergents for milking equipment	13.0%	2.3%	0.0%	84.7%
Improved milking hygiene to reduce TPC	14.7%	4.2%	0.3%	80.8%
Use of high-quality grasses	16.8%	9.2%	0.7%	73.3%
Use of fertiliser to grow grass	12.3%	14.3%	3.2%	70.2%
Rubber/Plastic floor for the barn/cage	5.8%	33.3%	2.5%	58.3%
Grow animal feed crops	35.0%	7.8%	1.7%	55.5%
Stainless steel milking equipment	20.2%	35.2%	2.3%	42.3%
Improving drinking water availability 24/7	43.3%	21.3%	0.3%	35.0%
Feed legume forages (e.g. Leucaena)	51.3%	16.5%	3.0%	29.2%
Teat dipping after milking	46.7%	22.7%	11.5%	19.2%
Record keeping	55.5%	25.7%	3.2%	15.7%
Milk quality test	32.3%	52.7%	0.5%	14.5%
Manure processing / manure re-use	21.5%	58.0%	6.2%	14.3%
Breeding plan applied	55.0%	31.5%	1.5%	12.0%
Mastitis test	62.7%	20.0%	5.7%	11.7%
Biogas units	16.5%	64.7%	10.5%	8.3%
High protein concentrates (16% or higher)	61.8%	21.3%	8.8%	8.0%
Synchronization estrus	90.5%	2.8%	0.0%	6.7%
Milk pasteurisation	73.7%	19.3%	0.5%	6.5%
Milk processing (make yogurt)	47.0%	48.5%	2.0%	2.5%
Nutrient feed blocks	87.0%	8.0%	3.0%	2.0%
Conserving forages for the dry seasons (hay, silage)	46.7%	44.8%	7.2%	1.3%
Cooling milk in water tanks	43.2%	55.8%	0.0%	1.0%
Automatic milking machines	25.0%	73.8%	0.5%	0.7%
UHT (Ultra High Temperature)	71.5%	27.8%	0.2%	0.5%

[1]Not aware – the value shows the percentage of farmers not aware or have never heard about the technology; [2]Aware, but not adopted – the value shows the percentage of farmers aware of the technology but have not adopted on the farm; [3]Stopped adopting – the value shows the percentage of farmers that have stopped adopting or stopped using certain technologies on farm; [4]Still Using – the value shows the percentage of farmers still using certain technologies at the time of the survey

Table A2. Technologies by level of awareness in dairy farmers (n=600).

Variables	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]
Have you heard about the technology? (n=600)										
Artificial Insemination (AI)	100.0%		100.0%		100.0%		100.0%		100.0%	
Mastitis test	44.3%	a	50.0%	a	42.5%	a	24.3%		40.2%	***
High protein concentrates (16% or higher)	43.7%	a	45.0%	ab	60.0%	b	22.1%		41.0%	***
Feed legume forages (e.g. Leucaena)	37.3%	a	71.3%	b	52.5%	ab	62.9%	b	49.8%	***
Use of high-quality grasses	82.7%		88.8%		82.5%		85.7%		84.2%	
Grow animal feed crops	43.3%		88.8%	a	95.0%	a	83.6%	a	65.7%	***
Use of any fertilisers for the grass	86.3%		93.8%		92.5%		90.0%		89.0%	
Rubber/Plastic floor for the barn/cage	99.0%	a	97.5%	a	97.5%	a	85.7%		95.5%	***
Teat dipping after milking	72.3%		56.3%	b	48.8%	ab	35.0%	a	58.3%	***
Improving drinking water availability 24/7	58.3%	ab	68.8%	b	52.5%	ab	50.0%	a	57.0%	**
Conserving forages for the dry seasons (hay, silage)	57.3%		65.0%		58.8%		52.1%		57.3%	
Record keeping	50.3%	a	61.3%	a	50.0%	a	27.9%		46.5%	***
Using detergents for milking equipment	87.7%		88.8%		88.8%		87.1%		87.8%	
Improved milking hygiene to reduce TPC	88.0%	b	88.8%	ab	87.5%	ab	78.6%	a	85.8%	**
Automatic milking machines	78.0%	a	82.5%	a	85.0%	a	60.7%		75.5%	***
Nutrient feed blocks	9.3%	a	32.5%	c	21.3%	bc	9.3%	ab	14.0%	***
Cooling milk in water tanks	63.0%	a	80.0%		55.0%	a	31.4%		56.8%	***
Stainless steel milking equipment	80.7%		93.8%	a	95.0%	a	64.3%		80.5%	***
Biogas units	86.7%	a	93.8%	ab	97.5%	b	87.1%	ab	89.2%	**
Milk pasteurisation	24.7%	a	55.0%		28.8%	a	15.0%	a	27.0%	***
Milk processing (make yogurt)	51.3%		86.3%	a	68.8%	a	31.4%		53.7%	***
Milk quality test - TPC/SCC	66.7%	a	73.8%	ab	86.3%	b	59.3%	a	68.5%	***
UHT (Ultra High Temperature)	33.3%	a	38.8%	a	32.5%	a	10.0%		28.5%	***
Breeding plan applied	54.0%	c	50.0%	bc	37.5%	ab	28.6%	a	45.3%	***
Synchronization estrus	9.0%		12.5%		15.0%		7.9%		10.0%	
Manure processing / manure re-use	81.0%	ab	90.0%	b	92.5%	b	73.6%	a	82.0%	***

[1]Value is a 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 A3. Technologies adopted by dairy farmers.

Variables	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]
Have you ever used the technology?										
Artificial Insemination (AI) (n=600)	100.0%		100.0%		100.0%		99.3%		99.8%	
Mastitis test (n=241)	56.4%	a	52.5%	a	32.4%	a	41.2%	a	50.2%	*
High protein concentrates (16% or higher) (n=246)	44.3%	a	61.1%	a	58.3%	a	32.3%	a	48.0%	**
Feed legume forages (e.g. Leucaena) (n=299)	45.5%	a	80.7%	bc	64.3%	ab	86.4%	c	66.9%	***
Use of high-quality grasses (n=505)	86.7%	a	93.0%	a	97.0%	a	87.5%	a	89.1%	*
Grow animal feed crops (n=394)	82.3%	a	94.4%	a	92.1%	a	88.0%	a	88.1%	**
Use of any fertilisers for the grass (n=534)	79.2%	a	88.0%	ab	86.5%	ab	89.7%	b	83.9%	**
Rubber/Plastic floor for the barn/cage (n=573)	83.2%	a	82.1%	a	71.8%	a	5.0%		65.1%	***
Teat dipping after milking (n=350)	69.6%	c	62.2%	bc	28.2%	a	49.0%	ab	61.1%	***
Improving drinking water availability 24/7 (n=342)	63.4%	a	85.5%		50.0%	a	50.0%	a	62.6%	***
Conserving forages for the dry seasons (hay, silage) (n=344)	25.6%		17.3%		12.8%		21.9%		21.8%	
Record keeping (n=279)	37.7%	a	55.1%	ab	65.0%	b	38.5%	ab	44.8%	***
Using detergents for milking equipment (n=527)	96.6%		100.0%		100.0%		95.9%		97.3%	
Improved milking hygiene to reduce TPC (n=515)	94.7%	a	98.6%	a	98.6%	a	91.8%	a	95.1%	*
Automatic milking machines (n=453)	0.9%		4.5%		4.4%		2.4%		2.2%	
Nutrient feed blocks (n=84)	39.3%	a	65.4%	a	29.4%	a	23.1%	a	42.9%	**
Cooling milk in water tanks (n=341)	0.0%	a	7.8%	b	2.3%	ab	0.0%	a	1.8%	***
Stainless steel milking equipment (n=483)	52.1%	ab	66.7%	bc	77.6%	c	41.1%	a	56.3%	***
Biogas units (n=535)	23.8%	a	65.3%		17.9%	a	18.0%	a	27.5%	***
Milk pasteurisation (n=162)	20.3%		40.9%		26.1%		33.3%		28.4%	
Milk processing (make yogurt) (n=322)	2.6%	a	29.0%		9.1%	a	4.5%	a	9.6%	***
Milk quality test - TPC/SCC (n=411)	24.5%	a	23.7%	a	11.6%	a	28.9%	a	23.1%	*
UHT (Ultra High Temperature) (n=171)	2.0%		3.2%		3.8%		0.0%		2.3%	
Breeding plan applied (n=272)	26.5%	a	35.0%	a	50.0%	a	27.5%	a	30.5%	*
Synchronization estrus (n=60)	63.0%		70.0%		83.3%		81.8%		71.7%	
Manure processing / manure re-use (n=492)	23.5%	a	47.2%	b	33.8%	ab	27.2%	a	29.3%	***

[1]Value is a 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 A4. Technology disadoption since 2014 by dairy farmers.

Variables	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]
Have you used this technology since 2014?										
Artificial Insemination (AI) (n=599)	99.3%		100.0%		100.0%		100.0%		99.7%	
Mastitis test (n=121)	84.0%		90.5%		81.8%		92.9%		86.0%	
High protein concentrates (16% or higher) (n=118)	84.5%		72.7%		92.9%		100.0%		85.6%	
Feed legume forages (e.g. Leucaena) (n=200)	92.2%		97.8%		96.3%		98.7%		96.5%	
Use of high-quality grasses (n=450)	98.1%		98.5%		100.0%		99.0%		98.7%	
Grow animal feed crops (n=347)	97.2%		98.5%		100.0%		100.0%		98.8%	
Use of any fertilisers for the grass (n=448)	96.6%	a	100.0%	a	98.4%	a	100.0%	a	98.2%	*
Rubber/Plastic floor for the barn/cage (n=373)	97.6%	a	100.0%	a	100.0%	a	66.7%		97.9%	***
Teat dipping after milking (n=214)	85.4%		96.4%		90.9%		75.0%		86.0%	
Improving drinking water availability 24/7 (n=214)	98.2%		100.0%		100.0%		100.0%		99.1%	
Conserving forages for the dry seasons (hay, silage) (n=75)	61.4%		66.7%		100.0%		75.0%		68.0%	
Record keeping (n=125)	93.0%	a	92.6%	a	96.2%	a	66.7%		90.4%	***
Using detergents for milking equipment (n=513)	99.2%		98.6%		100.0%		98.3%		99.0%	
Improved milking hygiene to reduce TPC (n=490)	99.2%		98.6%		100.0%		100.0%		99.4%	
Automatic milking machines (n=10)	100.0%		66.7%		66.7%		50.0%		70.0%	
Nutrient feed blocks (n=36)	100.0%		70.6%		80.0%		100.0%		83.3%	
Cooling milk in water tanks (n=6)	.		100.0%		100.0%		.		100.0%	
Stainless steel milking equipment (n=272)	98.4%		98.0%		100.0%		97.3%		98.5%	
Biogas units (n=147)	58.1%		87.8%	a	100.0%	a	90.9%	a	76.9%	***
Milk pasteurisation (n=46)	80.0%		100.0%		100.0%		85.7%		91.3%	
Milk processing (make yogurt) (n=31)	75.0%		90.0%		80.0%		100.0%		87.1%	
Milk quality test - TPC/SCC (n=95)	95.9%		92.9%		100.0%		91.7%		94.7%	
UHT (Ultra High Temperature) (n=4)	100.0%		100.0%		100.0%		.		100.0%	
Breeding plan applied (n=83)	95.3%		100.0%		100.0%		100.0%		97.6%	
Synchronization estrus (n=43)	94.1%		85.7%		100.0%		88.9%		93.0%	
Manure processing / manure re-use (n=144)	77.2%	a	94.1%	a	84.0%	a	92.9%	a	85.4%	*

[1]Value is a 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 A5. Technologies currently being used by dairy farmers.

Variables	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]
Are you currently using the technology?										
Artificial Insemination (AI) (n=597)	100.0%		100.0%		100.0%		100.0%		100.0%	
Mastitis test (n=104)	74.6%	a	68.4%	a	44.4%	a	46.2%	a	67.3%	*
High protein concentrates (16% or higher) (n=101)	67.3%	b	43.8%	ab	19.2%	a	30.0%	ab	47.5%	***
Feed legume forages (e.g. Leucaena) (n=193)	85.1%		93.3%		96.2%		90.7%		90.7%	
Use of high-quality grasses (n=444)	98.6%		100.0%		100.0%		99.0%		99.1%	
Grow animal feed crops (n=343)	99.0%		97.0%		98.6%		94.2%		97.1%	
Use of any fertilisers for the grass (n=440)	93.4%		95.5%		96.8%		99.1%		95.7%	
Rubber/Plastic floor for the barn/cage (n=365)	97.9%	a	93.8%	a	91.1%	a	75.0%	a	95.9%	**
Teat dipping after milking (n=184)	66.7%	a	63.0%	a	30.0%	a	50.0%	a	62.5%	*
Improving drinking water availability 24/7 (n=212)	99.1%		100.0%		95.2%		100.0%		99.1%	
Conserving forages for the dry seasons (hay, silage) (n=51)	22.2%		0.0%		33.3%		0.0%		15.7%	
Record keeping (n=113)	86.8%		88.0%		80.0%		60.0%		83.2%	
Using detergents for milking equipment (n=508)	100.0%		100.0%		100.0%		100.0%		100.0%	
Improved milking hygiene to reduce TPC (n=487)	99.6%		98.6%		100.0%		100.0%		99.6%	
Automatic milking machines (n=7)	100.0%		50.0%		50.0%		0.0%		57.1%	
Nutrient feed blocks (n=30)	90.9%	b	0.0%	a	0.0%	a	66.7%	b	40.0%	***
Cooling milk in water tanks (n=6)	0.0%		100.0%		100.0%		0.0%		100.0%	
Stainless steel milking equipment (n=268)	95.2%	a	87.8%	a	98.3%	a	97.2%	a	94.8%	*
Biogas units (n=113)	58.3%	b	23.3%	a	64.3%	b	50.0%	ab	44.2%	***
Milk pasteurisation (n=42)	91.7%		94.4%		83.3%		100.0%		92.9%	
Milk processing (make yogurt) (n=27)	33.3%		66.7%		50.0%		0.0%		55.6%	
Milk quality test - TPC/SCC (n=90)	100.0%	b	84.6%	a	100.0%	ab	95.5%	ab	96.7%	**
UHT (Ultra High Temperature) (n=4)	50.0%		100.0%		100.0%		0.0%		75.0%	
Breeding plan applied (n=81)	92.7%		71.4%		93.3%		90.9%		88.9%	
Synchronization estrus (n=40)	100.0%		100.0%		100.0%		100.0%		100.0%	
Manure processing / manure re-use (n=123)	86.4%	a	59.4%	a	66.7%	a	57.7%	a	69.9%	**

[1]Value is a 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 ($p > 0.05$).

Factsheet 10: Farmers' Attitudes, Perceptions of Change and Future Aspirations

Background

This factsheet provides an overview of the perceptions of change, risk and expectations for the future by dairy farmers in West Java. This information builds upon Factsheet 3 and 4, which summarises household, farm and individual animal characteristics of the IndoDairy Smallholder Household Survey (ISHS).

This information provides a base to understand farmers' attitudes towards dairy farming, how they perceived risks towards changing their practices and their intentions with respect to expanding their dairy business or exiting dairy altogether.

Dairy farmers' perceptions of changes provide insight into what factors were leading to changes in availability, quality, and prices of inputs and services. This provides us with a better understanding of potential areas where interventions such as extension programs could have a significant positive impact.

Attitudes towards adopting new technology and practices

In the ISHS, the dairy farmers were asked what their attitudes were towards trying new technologies, management practices and production methods. A summary of their responses is displayed in Figure 1 and Table A1 in the Appendix.

- **The majority of the farmers (59%) indicated that they normally waited to see others' success before trying new technologies, management practices and production methods.**
- Roughly 28% of farmers indicated that they were 'early adopters' (always or one of the first to adopt) of new technologies and practices. In Bogor district, a much higher share of farmers, nearly 50% considered themselves to be early adopters.
- Farmers in Garut and Bandung had the lowest proportion of farmers identifying as 'early adopters' (21% and 23%, respectively). Additionally, Garut had the highest number of late (14%) and non-adopters (10%) compared to the total sample population (8% and 5%, respectively).

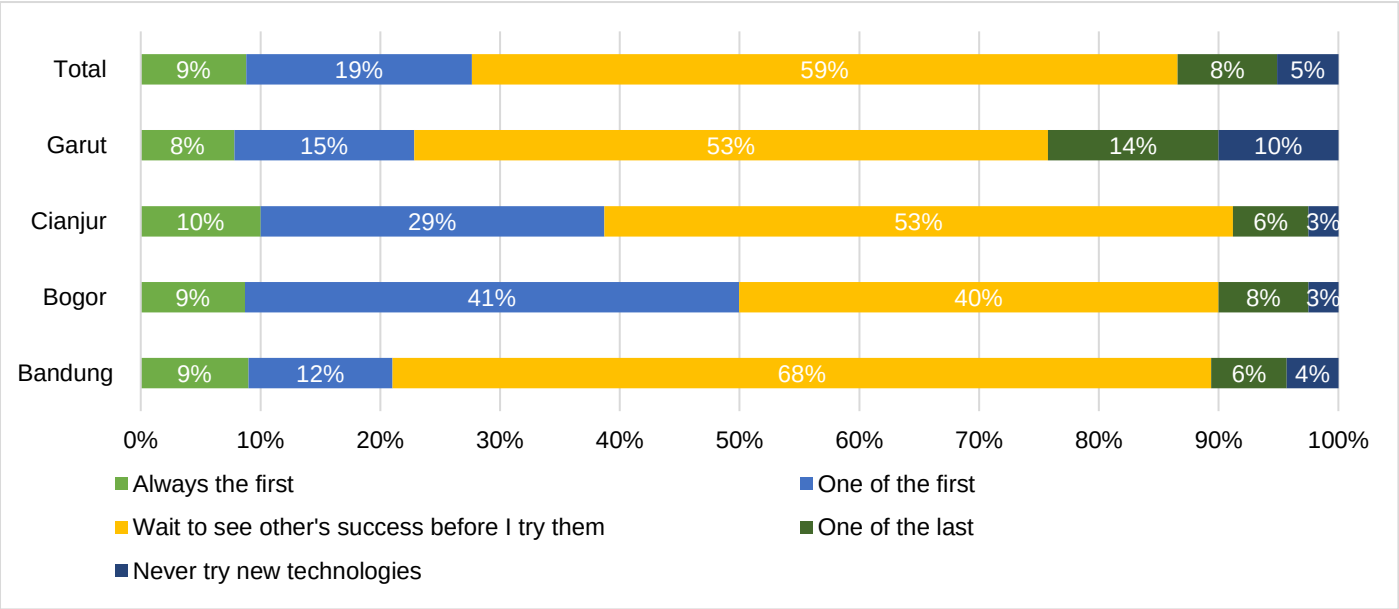

Figure 1. Farmers' attitudes towards adoption of new technologies, management practices and production methods grouped by district.

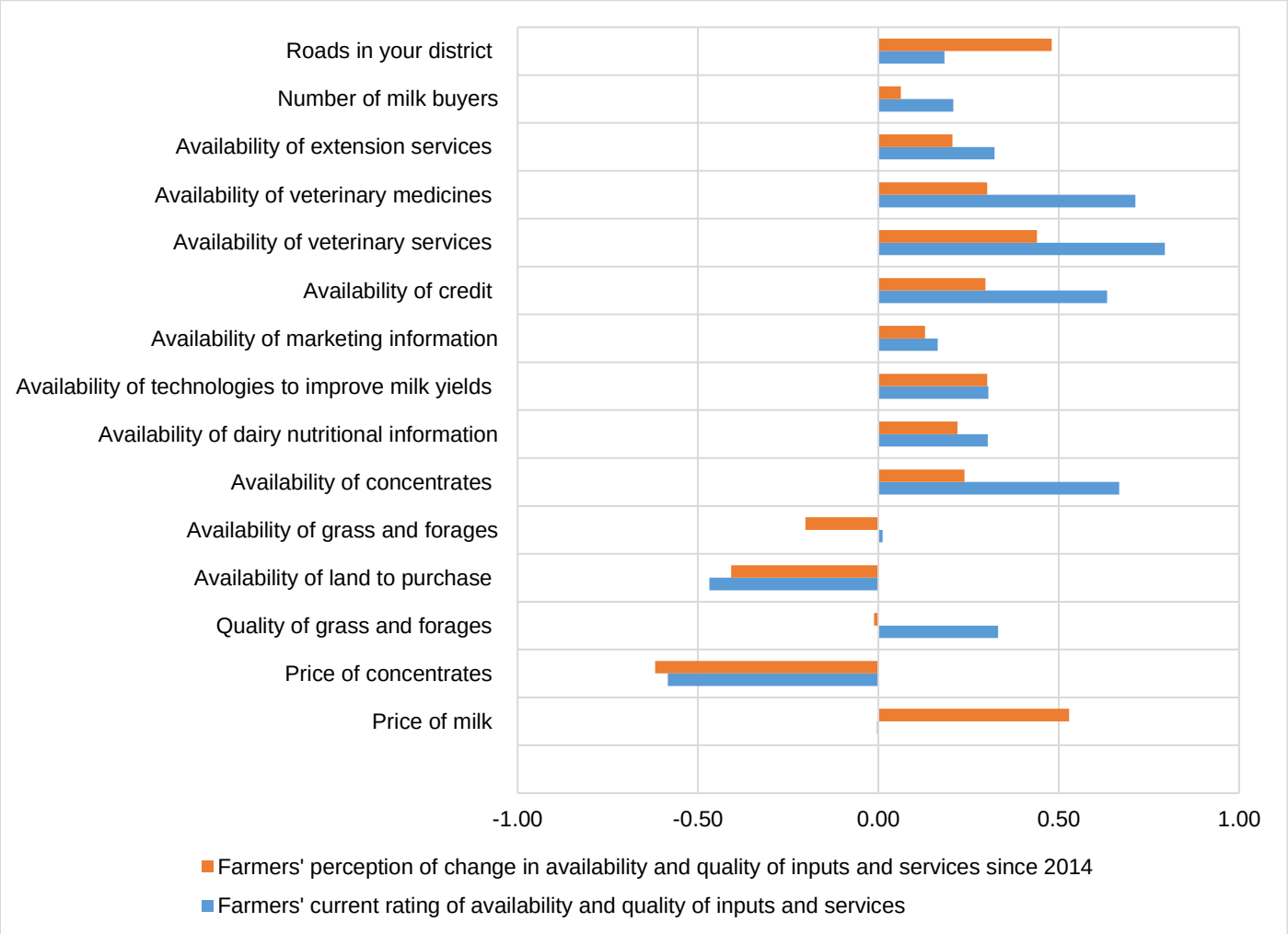

Figure 2. Farmers' current rating and perception of change (since 2014) in prices and the availability and quality of inputs and services.

Dairy farmer households in Bogor are in close proximity to the developed urban centres of Bogor City and Jakarta. Thus for these farmers, better access to inputs and services, and access to different types of markets could be one reason for the higher propensity for 'early adoption'. It may also be that farmers in these districts were exposed to new technologies, management practices and production methods earlier then farmers in other districts.

Rating of prices, availability and quality of inputs and services

An aim of the ISHS was to identify how farmers perceived and rated the availability, quality and prices of essential inputs and services required for dairy farming. They also indicated how things had changed since 2014, that is, three years prior to when the survey was conducted.

Farmers were asked how they would currently rate various aspects related to dairy farming, where: 1 = good, 0 = fair and -1 = poor.

Next farmers indicated how these aspects had changed since 2014, where: 1 = improved, 0 = no change and -1 = became worse (detailed summary statistics are provided in Table A2 and A3 in the Appendix).

Figure 2 illustrates how farmers rated various aspects related to their dairy business at the time of the survey, and their perception how each aspect had changed since 2014.

What was perceived to be 'good'?

On average, dairy farmers rated the following aspects to be 'good' (i.e. the mean value in Table A2 is ≥ 0.50):

- Availability of concentrates (note: farmers in Cianjur, Bogor and Garut rated concentrates significantly lower than in Bandung);
- Availability of credit (note: farmers in Garut rated credit availability significantly higher than Bogor and Cianjur);
- Availability of veterinary services; and
- Availability of veterinary medicines.

What was perceived to be 'poor'?

Considering the average rating, farmers reported only two of the 15 aspects to be 'poor' (i.e. mean value in Table A2 is < 0.00):

- Price of concentrates (note: on average, farmers in the Bandung district rated the price of concentrates more positively than in other districts); and
- Availability of land to purchase (note: farmers in the Bogor district rated land availability relatively more negative than other farmers).

What was perceived to be 'fair'?

On average, farmers gave a 'fair' rating (i.e. the mean value in Table A2 is ≥ 0.00 and < 0.50) to the following:

- Price of milk (with the exception of farmers in Bogor and Cianjur who rated the price of milk as 'poor' on average; Bogor farmers' average rating was significantly lower than farmers in Bandung and Garut, and Cianjur farmers' rating was significantly lower than Bandung);
- Number of milk buyers;
- Quality and availability of grass and forages;
- Availability of dairy nutritional information (note: farmers in the Bogor district rated availability of nutritional information relatively lower);
- Availability of technologies to improve milk yield (note: on average, farmers in the Bandung district rated this more positively than farmers in Bogor and Garut);
- Availability of marketing information;
- Availability of extension services (note: on average, farmers in the Bandung district rated this more positively than farmers in other districts, and farmers in Bogor rated extension services more negatively);
- Quality of roads (note: on average farmers in Bogor rated road quality significantly higher than farmers in Bandung).

Perceptions of changes (from 2014) in prices, availability and quality of inputs and services

Dairy farmers were also asked to indicate whether each of the fifteen factors discussed in the previous paragraphs had changed compared to 2014 (three years prior).

The summary statistics of their responses are shown in Table A3 in the Appendix.

What had 'improved'?

- A large share of farmers in Bogor, Cianjur and Garut indicated they perceived that **milk prices had improved** since 2014 (i.e. the mean value in Table A3 is ≥ 0.50).
- Other factors like concentrate availability, dairy nutritional information, access to credit, and availability of veterinary medicines and services showed general signs of improvements in all districts.
- Availability of extension services was also perceived to have improved in Bandung, Cianjur and Garut; however, Bogor dairy farming households viewed availability of extension services as declining.
- Farmers in Bogor had a significantly more positive perception of change in the number of milk buyers as compared to Bandung, Cianjur and Garut.
- Farmers in Bogor, Cianjur and Garut perceived that roads in their district had improved as compared to 2014.

What had 'worsened'?

- On average, farmers indicated that price of concentrates had gotten worse (more expensive) (i.e. the mean value in Table A3 is < 0.00).
- Farmers also indicated that the availability of land to purchase, and the availability and quality of grass and forages had declined.
- Bogor farmers indicated that the availability of extension services had declined since 2014. This is noteworthy because all other districts perceived that availability had improved.

Farmers' perception of availability of technologies had not registered much change since 2014.

Perceptions of changes of farming characteristics in the past 12 months

Farmers were asked to indicate their perceptions of change in farming characteristics in the past 12 months. The results of the overall sample are shown in Figure 3 and Table A4 in the Appendix. District wise results are shown in Figures 4 to 7 and in Table A5 in the Appendix.

- **Overall, 45% of households indicated that total income received for milk sales decreased in the past 12 months,** while 22% indicated that milk sales increased.
- One-third of households said they had increased the number of dairy cattle, however, a large share **(37%) indicated**

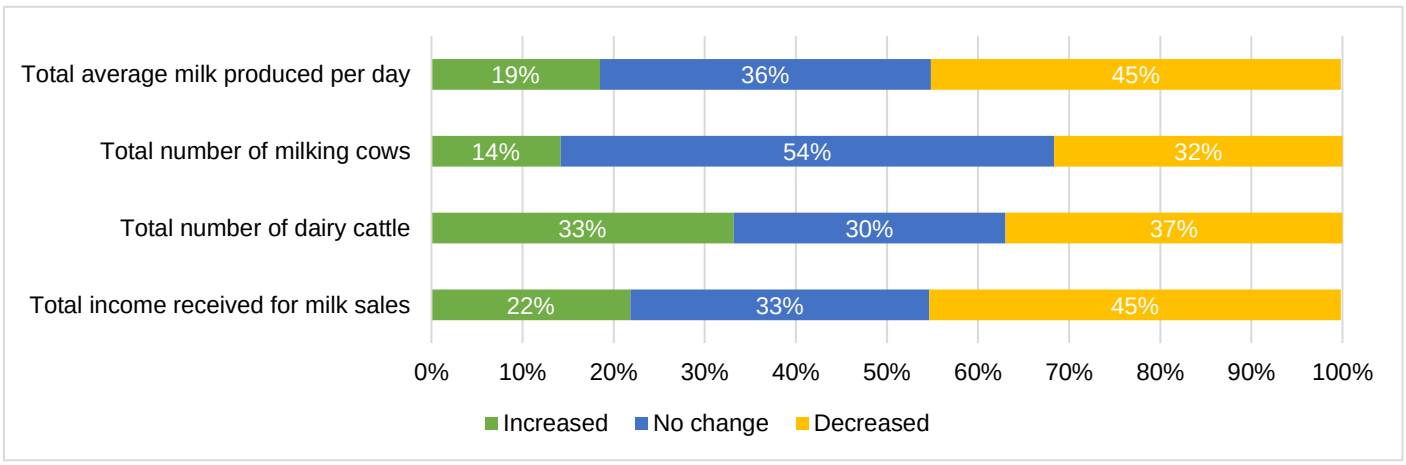

Figure 3. Changes in farming characteristics in the past 12 months.

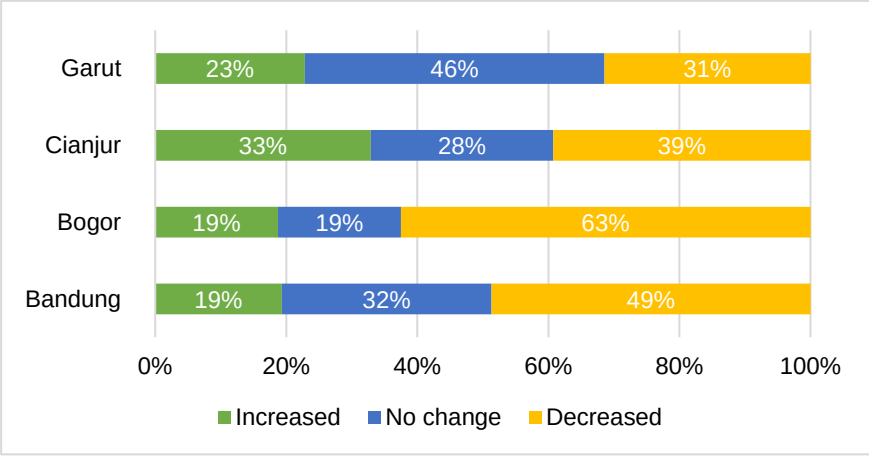

Figure 4. Change in total *income received from milk sales* in past 12 months.

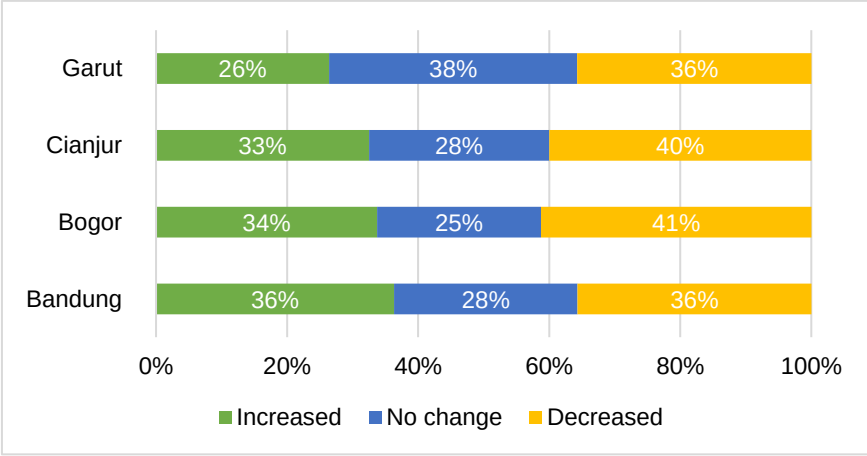

Figure 5. Change in total *number of dairy cattle* in the past 12 months.

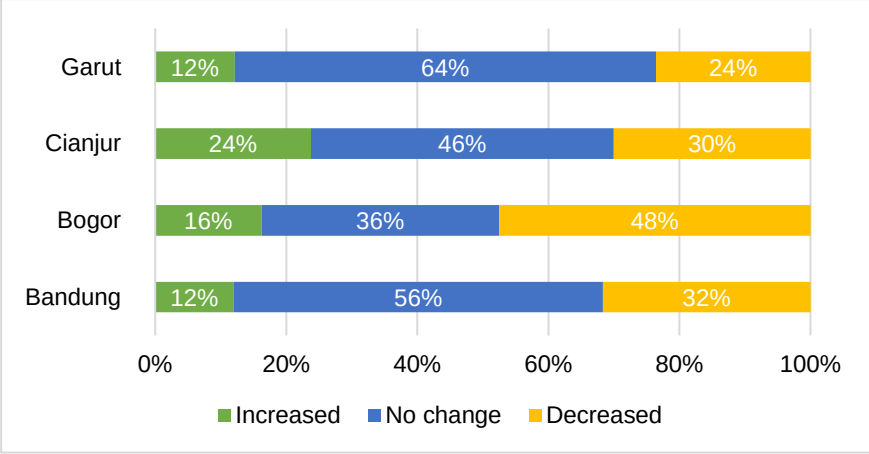

Figure 6. Change in total *number of milking cows* in the past 12 months.

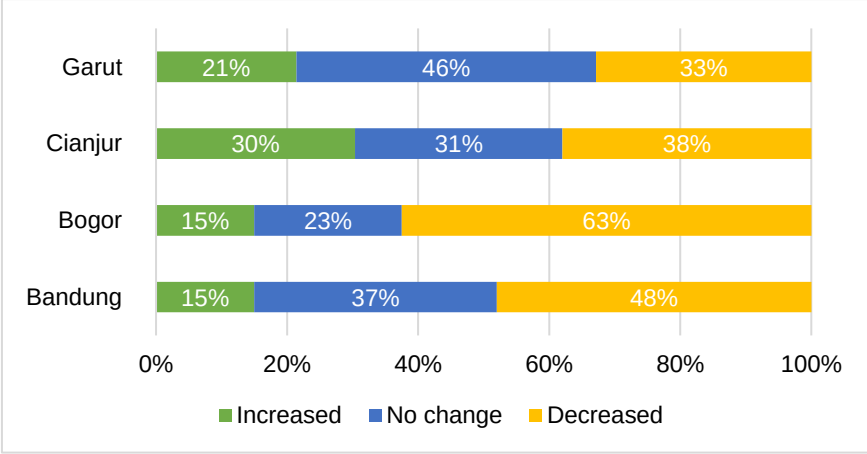

Figure 7. Change in total average *milk produced per day* in the past 12 months.

that they decreased the number of dairy cattle.

- More than half (54%) farmers reported no change in the number of milking cows.
- Overall, **total average milk produced per day decreased for 45% households** and increased for only 19% of households.

Comparisons between districts

Total income received from milk sales

- The share of farmers whose total income from milk sales decreased was higher in the districts of Bandung and Bogor (Figure 4).
- Farmers in Cianjur district reported the highest (33%) share of increase in total income received from milk sales (Figure 4).

Total number of dairy cattle

- The share of farmers who had increased the size of their dairy cattle was slightly higher in Bandung district (Figure 5).
- The highest reduction in total number of dairy cattle was in Bogor district (41%) (Figure 5).

Total number of milking cows

- Farmers in Bogor district reported the highest share (48%) of reduction in milking cows, followed by farmers in Bandung district (32%) (Figure 6).
- Farmers in Cianjur had the highest share (24%) of increased number of lactating cows in the past 12 months (Figure 6).

Total average milk produced per day

- There was noteworthy reduction in total average milk production per day in Bogor district (63%) and Bandung district (48%). (Figure 7). This is likely because there had been a reduction of lactating cows in both Bogor and Bandung districts in the past 12 months.
- In regard to labour in the dairy business, the majority of farmers indicated no change to labour (male: 97%; female: 93%, and total family labour: 76%) in the past 12 months (Figure 7).

Perception of change in household financial situation (compared to 2014)

The change in household financial situation is shown in Figure 8. This provides a broad overview of changes experienced by households that have had an impact on their financial situation and perceived reasons for these changes.

- **Overall, about 50% of farmers felt their financial situation had become somewhat or much better, while 16% indicated that it had become somewhat or much worse.**

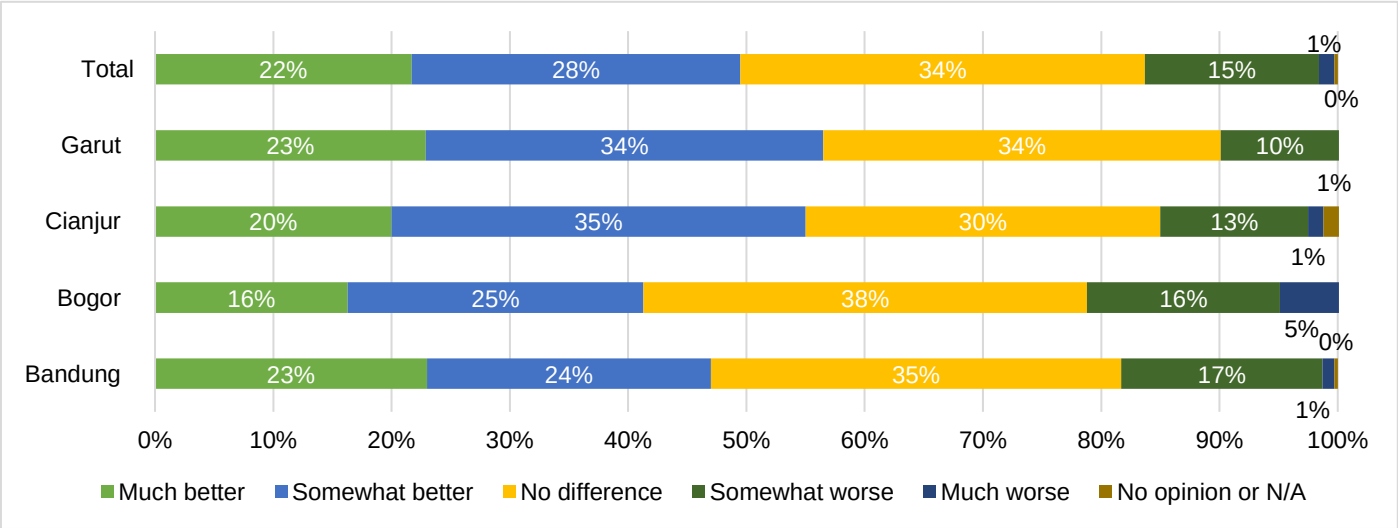

Figure 8. Perception of change in household financial situation (compared to 2014).

- The primary reasons indicated for changes in the household financial situation were changes in non-dairy livestock income (25%), non-farm income (21%) and changes in milk yields (20%).
- Compared to other districts, a large share of farmers (42%) in Cianjur and Bogor district indicated they experienced a change in non-dairy livestock income. In Garut, a relatively larger share of farmers (roughly 37%) indicated a change in non-farm income.

Farmers' aspirations

The respondents were asked about their future aspirations for their dairy farming operations. The results are presented in Table A7 in the Appendix.

- **90% of farmers intend to expand their dairy farm operations.**
- In the future, farmers in Bogor district expected to have the largest herd size with about 18 head of cattle while farmers in Garut district expected their herd size to grow to about 6 head of cattle.

Despite current farm size being significantly smaller in Garut (3.1 cows) compared to Bogor (7.7) as shown in Factsheet 3, the proportional increase that farmers expect was approximately twice as a much in Bogor compared to Garut.

Training needs

In order to support the farmers with training that would help them achieve their ambitions for dairy farming, the farmers were asked to identify the areas they would like to receive training to improve dairy production practices. These results are shown in Table A8 in the Appendix.

- **Dairy farmers indicated a strong desire for training to increase their capacity in animal husbandry (33%), cattle nutrition and feed management (21%) and farm business management (18%).**
- Field practice and field training was identified as the most preferred method of training.

Significant constraints faced by farmers

The training areas identified by farmers were further reflected in their answers when asked about significant constraints to the dairy industry from the dairy farmer's perspectives (results shown in Table A9 in the Appendix).

- **The top constraint identified by dairy farmers were adequate feed resources (27%).**
- Access to high quality animals (14%), personal knowledge limitations regarding dairy farming (9%).
- Farmers also identified a range of other constraints that include access to capital, animal health, low milk prices and issues with quality of feed (a detailed list is provided in Table A10 in the Appendix).

Summary

- **Overall, price of concentrates and availability of land to purchase were perceived to be poor by dairy farmers.**
- **Farmers indicated that since 2014, the price of concentrates, availability of land to purchase, and the availability and quality of grass and forages had all worsened.**
- **Farmers in the Bogor district indicated a decline in availability of extension services. Farmers in Bogor district also had the highest share in reduction of lactating cows in the past 12 months, which had also led to reduction in total average milk produced.**

In addition to understanding farmers' attitudes and perceptions, it is important to understand how decisions are made among household members in order to identify strategies that would positively impact production (quality and quantity). The following factsheet, Factsheet 11, provides information on gender inclusiveness in decision making.

Appendix to Factsheet 10

The tables included in this Appendix provide summary statistics related to farmers' expectations, perceptions of risk and perception of changes at the dairy household level for the entire sample.

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 A1. Farmers' attitudes towards trying new technologies, management practices and/or production methods grouped by districts (n=600).

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Attitudes towards trying new technologies new management practices and new production methods:						
Always the first	9.0%	8.7%	10.0%	7.8%	8.8%	***
One of the first	12.0%	41.2%	28.7%	15.0%	18.8%	***
Wait to see other's success before I try them	68.3%	40.0%	52.5%	52.8%	58.8%	***
One of the last	6.3%	7.5%	6.3%	14.2%	8.3%	***
Never try new technologies	4.3%	2.5%	2.5%	10.0%	5.1%	***

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

Table A2. Farmers' perceptions of current situation with respect to prices and quality or availability of inputs and services (1= good, 0 = fair, -1 = poor).

	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]
Prices paid by buyer for milk (n=600)	0.15	0.69	c	-0.40	0.72	a	-0.21	0.67	ab	0.01	0.72	bc	0.00	0.73	***
Number of milk buyers(n=519)	0.19	0.57		0.36	0.61		0.23	0.66		0.16	0.65		0.21	0.61	NS
Price of concentrates (n=598)	-0.49	0.60		-0.68	0.50	a	-0.72	0.50	a	-0.66	0.56	a	-0.58	0.57	***
Quality of grass and forages (n=599)	0.29	0.63		0.44	0.67		0.29	0.64		0.38	0.62		0.33	0.64	NS
Availability of land to purchase (n=587)	-0.44	0.69	a	-0.71	0.58		-0.38	0.80	a	-0.44	0.76	a	-0.47	0.72	***
Availability of grass and forages(n=599)	-0.01	0.80		-0.01	0.77		0.04	0.77		0.05	0.79		0.01	0.79	NS
Availability of concentrates (n=599)	0.70	0.48		0.65	0.55		0.71	0.48		0.58	0.59		0.67	0.52	NS
Availability of dairy nutritional information (n=557)	0.40	0.57	a	0.01	0.72	b	0.22	0.65	ab	0.31	0.62	a	0.30	0.63	***
Availability of technologies to improve milk yields (n=573)	0.41	0.63	a	0.11	0.71	b	0.26	0.69	ab	0.23	0.61	b	0.31	0.66	***
Availability of marketing information (n=546)	0.21	0.63	a	0.28	0.66	a	0.09	0.74	a	0.05	0.71	a	0.16	0.67	**
Availability of credit (n=588)	0.67	0.53	bc	0.49	0.70	ab	0.43	0.71	a	0.77	0.46	c	0.63	0.58	***
Availability of veterinary services (n=599)	0.81	0.41		0.85	0.45		0.74	0.50		0.76	0.50		0.79	0.45	NS
Availability of veterinary medicines (n=584)	0.68	0.50	a	0.73	0.55	a	0.84	0.43	a	0.70	0.48	a	0.71	0.49	*
Availability of extension services (n=596)	0.53	0.65		-0.18	0.79		0.19	0.76	a	0.24	0.79	a	0.32	0.76	***
Roads in your district (n=600)	0.08	0.82	a	0.48	0.71	b	0.23	0.83	AB	0.22	0.87	ab	0.18	0.83	***

[1]Value is a 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 A3. Dairy farmers' perceptions of changes (compared to 2014) in prices and quality or availability of inputs and services (1 = good, 0 = fair, -1 = poor). Perceptions of change in inputs and services (1= increased, 0= no change and -1= decrease).

	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]**
Price paid by buyer for milk (n=594)	0.58	0.65	a	0.20	0.77		0.62	0.61	a	0.56	0.64	a	0.53	0.67	***
Number of milk buyers(n=591)	0.02	0.15	ab	0.28	0.45		0.09	0.29	b	0.01	0.08	a	0.06	0.24	***
Price of concentrates (n=593)	-0.54	0.59	b	-0.63	0.56	ab	-0.73	0.45	a	-0.73	0.48	a	-0.62	0.55	***
Quality of grass and forages (n=594)	0.04	0.47	b	-0.01	0.52	ab	-0.17	0.50	a	-0.04	0.44	ab	-0.01	0.48	***
Availability of land to purchase (n=586)	-0.37	0.52	a	-0.60	0.52		-0.38	0.59	a	-0.39	0.52	a	-0.41	0.54	***
Availability of grass and forages (n=598)	-0.14	0.64	a	-0.26	0.59	a	-0.32	0.67	a	-0.24	0.60	a	-0.20	0.63	*
Availability of concentrates (n=595)	0.32	0.50	b	0.20	0.51	ab	0.19	0.49	ab	0.12	0.42	a	0.24	0.49	***
Availability of dairy nutritional information(n=552)	0.29	0.48	b	0.07	0.38	a	0.13	0.38	a	0.20	0.40	ab	0.22	0.44	***
Availability of technologies to improve milk yields (n=566)	0.39	0.52	b	0.19	0.53	a	0.27	0.47	ab	0.21	0.43	a	0.30	0.50	***
Availability of marketing information (n=557)	0.15	0.36		0.14	0.45		0.06	0.37		0.11	0.31		0.13	0.37	NS
Availability of credit (n=583)	0.32	0.50	bc	0.11	0.58	a	0.21	0.66	ab	0.41	0.49	c	0.30	0.54	***
Availability of veterinary services (n=596)	0.47	0.52		0.36	0.51		0.42	0.57		0.42	0.52		0.44	0.53	NS
Availability of veterinary medicines (n=583)	0.31	0.48		0.25	0.46		0.33	0.53		0.30	0.46		0.30	0.48	NS
Availability of extension services (n=593)	0.41	0.60		-0.26	0.63		0.18	0.60	a	0.06	0.62	a	0.21	0.65	***
Roads in your district (n=599)	0.39	0.73	a	0.63	0.60	b	0.58	0.67	ab	0.53	0.70	ab	0.48	0.70	**

[1]Value is a 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 A4. Changes at the dairy household level in the past 12 months (n=600).

Variable	**Increased**	**No change**	**Decreased**	**N/A[1]**
Total income received for milk sales	21.8%	32.8%	45.2%	0.2%
Total number of dairy cattle	33.2%	29.8%	37.0%	0.0%
Total number of milking cows	14.2%	54.2%	31.7%	0.0%
Total averaged milk produced per day	18.5%	36.3%	45.0%	0.2%
Total household family labour in dairy business (male)	0.5%	96.5%	1.5%	1.5%
Total household family labour in dairy business (female)	0.0%	92.8%	0.7%	6.5%
Total household family labour in dairy business	0.3%	76.3%	0.5%	22.8%

[1]N/A = Not Applicable.

Table A5. Changes at the dairy household level in the past 12 months, grouped by districts (n=600).

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Total income received for milk sales						
Increased	19.3%	18.8%	32.5%	22.9%	21.8%	***
No change	32.0%	18.8%	27.5%	45.7%	32.8%	***
Decreased	48.7%	62.5%	38.8%	31.4%	45.2%	***
N/A	0.0%	0.0%	1.3%	0.0%	0.2%	***
Total number of dairy cattle						
Increased	36.3%	33.8%	32.5%	26.4%	33.2%	
No change	28.0%	25.0%	27.5%	37.9%	29.8%	
Decreased	35.7%	41.3%	40.0%	35.7%	37.0%	
N/A	0.0%	0.0%	0.0%	0.0%	0.0%	
Total number of milking cows						
Increased	12.0%	16.3%	23.8%	12.1%	14.2%	***
No change	56.3%	36.3%	46.3%	64.3%	54.2%	***
Decreased	31.7%	47.5%	30.0%	23.6%	31.7%	***
N/A	0.0%	0.0%	0.0%	0.0%	0.0%	
Total averaged milk produced per day						
Increased	15.0%	15.0%	30.0%	21.4%	18.5%	***
No change	37.0%	22.5%	31.3%	45.7%	36.3%	***
Decreased	48.0%	62.5%	37.5%	32.9%	45.0%	***
N/A	0.0%	0.0%	1.3%	0.0%	0.2%	***
Total household family labour in dairy business (male)						
Increased	0.7%	1.3%	0.0%	0.0%	0.5%	
No change	96.0%	96.3%	97.5%	97.1%	96.5%	
Decreased	1.3%	2.5%	1.3%	1.4%	1.5%	
N/A	2.0%	0.0%	1.3%	1.4%	1.5%	
Total household family labour in dairy business (female)						
Increased	0.0%	0.0%	0.0%	0.0%	0.0%	
No change	93.3%	88.8%	90.0%	95.7%	92.8%	
Decreased	1.0%	0.0%	0.0%	0.7%	0.7%	
N/A	5.7%	11.3%	10.0%	3.6%	6.5%	
Total household family labour in dairy business						
Increased	0.7%	0.0%	0.0%	0.0%	0.3%	
No change	76.3%	72.5%	71.3%	81.4%	76.3%	
Decreased	0.3%	1.3%	0.0%	0.7%	0.5%	
N/A	22.7%	26.3%	28.8%	17.9%	22.8%	

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

Table A6. Change in household financial situation since 2014, grouped by districts.

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Change in household financial situation since 2014 (n=600)						
Much better	23.0%	16.3%	20.0%	22.9%	21.7%	*
Somewhat better	24.0%	25.0%	35.0%	33.6%	27.8%	*
No difference	34.7%	37.5%	30.0%	33.6%	34.2%	*
Somewhat worse	17.0%	16.3%	12.5%	10.0%	14.7%	*
Much worse	1.0%	5.0%	1.3%	0.0%	1.3%	*
No opinion or N/A	0.3%	0.0%	1.3%	0.0%	0.3%	*
Reasons for change in household financial situation (n=393)						
Change in milk prices	14.9%	2.0%	5.5%	6.5%	9.9%	***
Change in milk yield	25.6%	10.0%	20.0%	12.9%	19.9%	***
Change in dairy cattle price	1.0%	2.0%	1.8%	0.0%	1.0%	***
Change in livestock (non-dairy) income[2]	17.4%	36.0%	41.8%	23.7%	24.7%	***
Change in non-farm income[3]	20.0%	14.0%	7.3%	36.6%	21.4%	***
Change in family size	4.1%	2.0%	1.8%	2.2%	3.1%	***
Household member found a new job	1.0%	4.0%	1.8%	3.2%	2.0%	***
Household member lost a job	0.5%	0.0%	0.0%	0.0%	0.3%	***
Expenses associated with illness	0.5%	0.0%	0.0%	1.1%	0.5%	***
Expenses associated with education	1.5%	12.0%	1.8%	0.0%	2.5%	***
Member of household passed away	1.0%	0.0%	0.0%	0.0%	0.5%	***
Other	12.3%	18.0%	18.2%	14.0%	14.3%	***

[1]Sig = Significance; * p < 0.10, ** p < 0.05 and *** p < 0.01 indicate significance at the 10%, 5% and 1% levels, respectively. [2]Non-dairy livestock income includes income derived from sale of cattle. [3]Non-farm income includes income derived from off-farm activities like wage employment, self-employment, pensions, remittances, and trading businesses.

Table A7. Future aspiration of farmers with respect to dairy farm operations, grouped by district.

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Future aspiration of farmers with respect to dairy farm operations (n=600)						
Remain the same	7.7%	3.8%	8.8%	10.7%	8.0%	
Expand	90.3%	95.0%	90.0%	84.3%	89.5%	
Undecided	0.0%	1.3%	0.0%	2.1%	0.7%	
Quit	0.7%	0.0%	0.0%	1.4%	0.7%	
Other	1.3%	0.0%	1.3%	1.4%	1.2%	
Expected future herd size (no. of cows) (n=540)	11.39	17.46	13.22	6.38	11.39	***

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

Table A8. Training requirements and expectations of dairy farmers, grouped by district. For areas of training, farmers were asked to identify up to 3 options.

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Willingness to participate in a farmer training day/workshop in village (n=600)	94.0%	92.5%	90.0%	89.3%	92.2%	
Willingness of female members of household to attend farmer training day/workshop (n=600)	72.3%	73.8%	63.8%	81.4%	73.5%	**
Preferred method of training (n=575)						
Seminar	18.1%	18.4%	13.0%	20.2%	17.9%	
Theory / written material	6.9%	1.3%	3.9%	6.7%	5.7%	
Field practice	56.3%	57.9%	64.9%	62.7%	59.1%	
Farm visit	18.8%	22.4%	18.2%	10.5%	17.2%	
Preferred areas of training (n=1437)						
Nutrition / feeding management	19.8%	26.3%	19.0%	23.4%	21.4%	**
Animal husbandry	31.2%	29.9%	34.4%	35.8%	32.6%	**
Reproduction	12.1%	10.8%	9.2%	9.3%	10.9%	**
Milking practice / management	15.1%	6.7%	16.4%	14.7%	14.1%	**
Farm business management	19.0%	21.1%	18.5%	13.9%	18.0%	**
Other	2.9%	5.2%	2.6%	2.9%	3.1%	**

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

Table A9. Dairy farmers' perceptions of significant constraints facing the dairy industry. (Note: Farmers were asked to identify up to three constraints). The figures in this table represent a proportion of all constraints identified by farmers (n=1067).

Variable	Bandung	Bogor	Cianjur	Garut	Total	Sig[1]
Significant constraints to dairy industry from the dairy farmer's perspective (n=1067)						
Knowledge	11.3%	4.8%	6.1%	8.9%	9.1%	*
Training	6.2%	2.1%	4.7%	6.2%	5.4%	*
Quality animals	12.5%	15.1%	11.5%	18.5%	14.2%	*
Feed resources	25.3%	28.1%	27.0%	27.7%	26.5%	*
Availability of vet services	0.4%	0.7%	1.4%	2.3%	1.0%	*
Marketing	3.9%	6.2%	2.7%	1.5%	3.5%	*
Nutrition	3.9%	3.4%	5.4%	1.9%	3.6%	*
Labour	4.9%	4.8%	4.7%	3.1%	4.4%	*
Reproduction	4.7%	4.1%	4.1%	6.2%	4.9%	*
Calf rearing	0.8%	0.0%	0.0%	0.4%	0.5%	*
Other	26.1%	30.8%	32.4%	23.5%	27.0%	*

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

Table A10. Summary of ‘other’ significant constraints facing the dairy industry.

‘Other' significant constraints to dairy industry
Access to capital
Access to credit
Low milk prices
High prices of inputs like concentrates and feeds
Availability of land
Animal health issues
Quality of inputs like concentrates and feeds
Limited availability of water
Lack of communication between dairy cooperatives and farmers
Lack of good infrastructure

Factsheet 11: Gender Inclusiveness in Decision Making

Background

In the previous factsheets, various aspects of dairy farm operations in West Java such as attitudes and perceptions of farmers, dairy farm inputs, sales, labour, technology adoption, costs, revenue, and profitability aspects were examined.

In the next two factsheets of the IndoDairy Smallholder Household Survey (ISHS) '*Farm-to-Fact*' series, the aspect of gender inclusiveness will be considered. This factsheet evaluates differences in decision making within the household.

Approach

In order to understand women's role in day-to-day operations on dairy farms and how much involvement they have in decision-making processes, a modified version of the Abbreviated Women Empowerment in Agriculture Index (A-WEAI) was used.

The WEAI was developed by International Food Policy Research Institute (IFPRI). This index measures the empowerment, agency, and inclusion of women in the agricultural sector in an effort to identify ways to overcome obstacles and constraints of active participation.

The A-WEAI uses measurements from five domains of the agricultural sector:

- Production – input in production decisions and autonomy in production.
- Resources – ownership, purchase, sale or transfer of assets, access to, and decisions on credit.
- Income – control over use of income.
- Leadership – group membership and speaking in public.
- Time – workload and leisure.

A modified version of the A-WEAI was used in the ISHS and included questions in the survey on the following aspects, with an emphasis on dairy farming activities:

- Input in production decisions
- Ownership of assets
- Decisions on credit
- Control over use of income
- Group membership

In order to avoid biases in responses, the primary decision makers (PDMs) and the secondary decision makers (SDMs) in the

household were asked the questions in this module separately.

In Factsheet 3, which provided an overview of household characteristics of the ISHS, it was noted that overall, **97% of the households' PDMs were male. 94% of households had a SDM and nearly all were female (99%).**

Activity participation

The respondents were asked questions about participation in certain types of work activities within the household. Detailed district wise results are shown in Table A1 in the Appendix.

These activities included food crop farming (grown primarily for household consumption), cash crop farming (grown for sale on the market), livestock raising (cattle, buffalo, horse, etc.), and activities related to the dairy business including selling and buying cows, forages, concentrates, maintaining herd health, and milk marketing.

- Both **PDMs (10%) and SDMs (9%) reported a similar level of participation in food crop farming grown primarily for household consumption.**
- In regards to **cash crop farming**, PDMs participated in it slightly more (27%) than SDMs (21%).
- 94% of PDMs (most of whom are men) and 76% of SDMs (mostly women), participated in **dairy business** activities (Table A1).

PDMs participated more in different activities of the dairy business compared to SDMs.

Figure 1 shows levels of participation of PDMs and SDMs in various activities of the dairy business.

- Of the various activities, **the largest share (61%) of participation from SDMs (women) was in selecting forages for the dairy farm operations** (Figure 1).
- The **lowest share (50%) in activity participation of SDMs was in selling and buying of cattle** (Figure 1).
- Across the four districts, the share of SDM participation in the dairy business was the highest in Garut district (84%) (Table A1).
- On the contrary, the lowest share of SDM participation in the dairy business was recorded in Cianjur district (69%) (Table A1).

Intra-household decision making

Overall decision making

The primary and secondary decision makers were asked who normally makes the decisions regarding key work activities.

Both respondents were asked who was involved in the decision-making process: themselves, their spouse, another household member, or a non-household member.

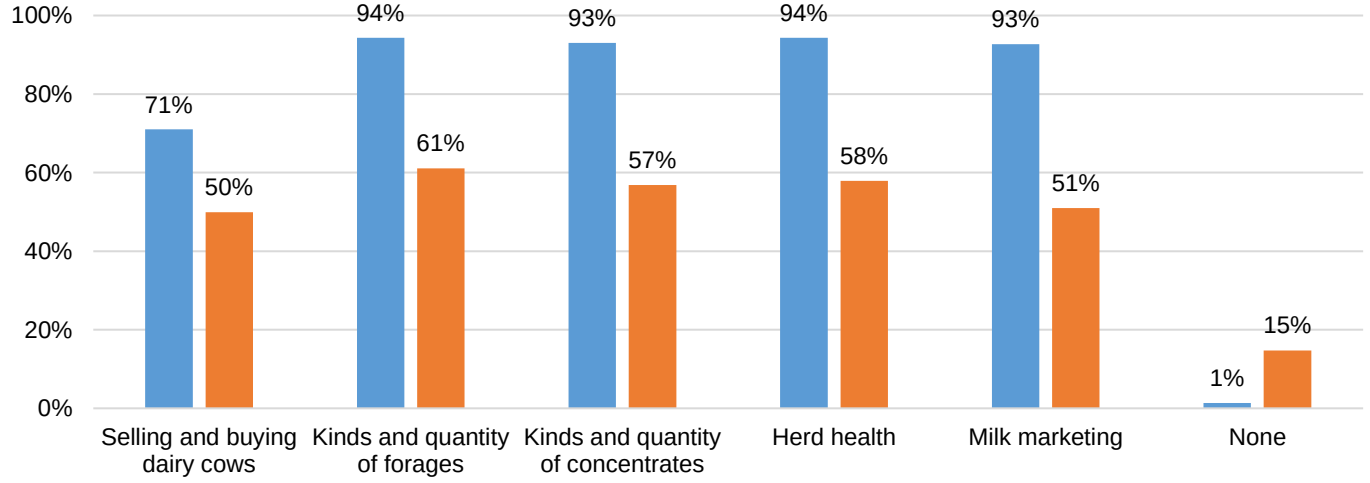

Figure 1. Comparison of primary and secondary decision makers' participation in various dairy business activities.

An overall summary of decision making between household and non-household members, broken down by district, is shown in Table A2 in the Appendix.

For all activities, involvement of other household members and non-household members was very low: 5% as reported by PDMs and 3% for SDMs. Therefore, in the following paragraphs we focus on the differences and similarities between the views of PDMs and SDMs role of themselves and their spouses.

- Overall, 96% of PDMs (men) reported they made these decisions, compared to 74% of SDMs (women).
- The proportion of SDMs (74%) who perceived they made these decisions was significantly higher than the number of PDMs (41%) who thought that their spouses made these decisions (Table A2).

This highlights that **more women perceived they made major decisions than men perceived women did.** This also indicates that **women perceived they had higher levels of decision-making capability than the levels perceived by men.**

- This high difference was noted across the four districts, especially in Bandung district where 64% of SDMs (women) perceived they made major decisions, while only little more than half of that, 35% of PDMs (men) perceived that they actually did (Table A2).

A breakdown of responses regarding specific dairy farm activities, broken down by district, is shown in Table A3 in the Appendix.

- Overall, the number of PDMs (9%) who reported they made decisions on **food crop farming** was similar to SDMs who considered themselves responsible (8%).
- In regard to **cash crop farming**, 26% of PDMs reported making these decisions, compared to only 15% of SDMs who reported making those decisions.
- Similarly, 9% of PDMs as opposed to 5% of SDMs, considered themselves responsible for making decisions regarding **livestock raising.**
- The largest spread was noted in decisions regarding the **dairy business**. 91% of PDMs reported making these decisions, compared to only 58% of SDMs who reported making these decisions.

  This highlights that, on average, **fewer women perceived they were responsible for making decisions** regarding various farm activities compared to men, **in particular on the dairy business.**

A comparison of PDMs' and SDMs' perception of decision making by household (HH) members on the dairy business is shown in Figure 2 below.

- 52% of PDMs (men) reported that their spouses are involved in these decisions and 58% of SDMs (women) said they were involved in these decisions, which is relatively similar (Figure 2).
- However, 91% of PDMs reported that they make these decisions themselves, while only 72% of SDMs said that their spouses make these decisions (Figure 2).

Hence, there are **disparities between how husbands and wives perceive each other's involvement** in decision making in the dairy business. However, **this is most pronounced in the couples' view of men's decision making** on the farm: a difference of 19% compared to 6%.

Intra-household decision making in dairy farming activities

In order to understand the gender roles in decision making in smallholder dairy farms, it is critical to assess specific activities related to the dairy business. Therefore, the ISHS had a modified list of activities to the A-WEAI questionnaire. This included asking questions about selling and buying dairy cows, sourcing forages and concentrates, managing herd health, and milk marketing.

District wise results are shown in Table A3 in the Appendix.

Primary decision makers' views of their spouses

The following points highlight the PDMs' view of the spouse's involvement in decision making – i.e. **men's views of their wives.**

- 45% of PDMs reported their spouses make decisions regarding **selling and buying cows.**
- 24% of PDMs said that their spouses make decisions related to **forage management.**
- 26% of PDMs stated their spouses make decisions regarding **concentrate management.**
- 36% of PDMs responded that their spouses make decisions about **herd health.**
- 34% of PDMs reported that their spouses make decisions regarding **milk marketing.**

Secondary decision makers' views of their spouses

The following points highlight the SDMs' view of the spouse's involvement in decision making – i.e. **women's views of their husbands**.

- 48% of SDMs reported that their spouses make decisions regarding **selling and buying cows.**
- 56% of SDMs stated their spouses make decisions regarding **forage management.**
- 48% of SDMs responded that their spouses make decisions regarding **concentrate management.**
- 53% of SDMs said that their spouses make decisions about **herd health.**
- 45% of SDMs reported their spouses make decisions regarding **milk marketing.**

Comparison of decision making between husbands and wives

The previous two sections outlined some of the consistencies and inconsistencies between PDMs and SDMs views of their own and their spouse's role in decision making. The following points highlight the similarities and differences in their responses.

Similarities:

In some aspects of the dairy business, PDMs' view of their spouses' involvement in decision making is relatively consistent with their spouse's view of their own involvement.

This holds true for **selling and buying cows** (45% compared to 43%) and **milk marketing** (34% compared to 38%).

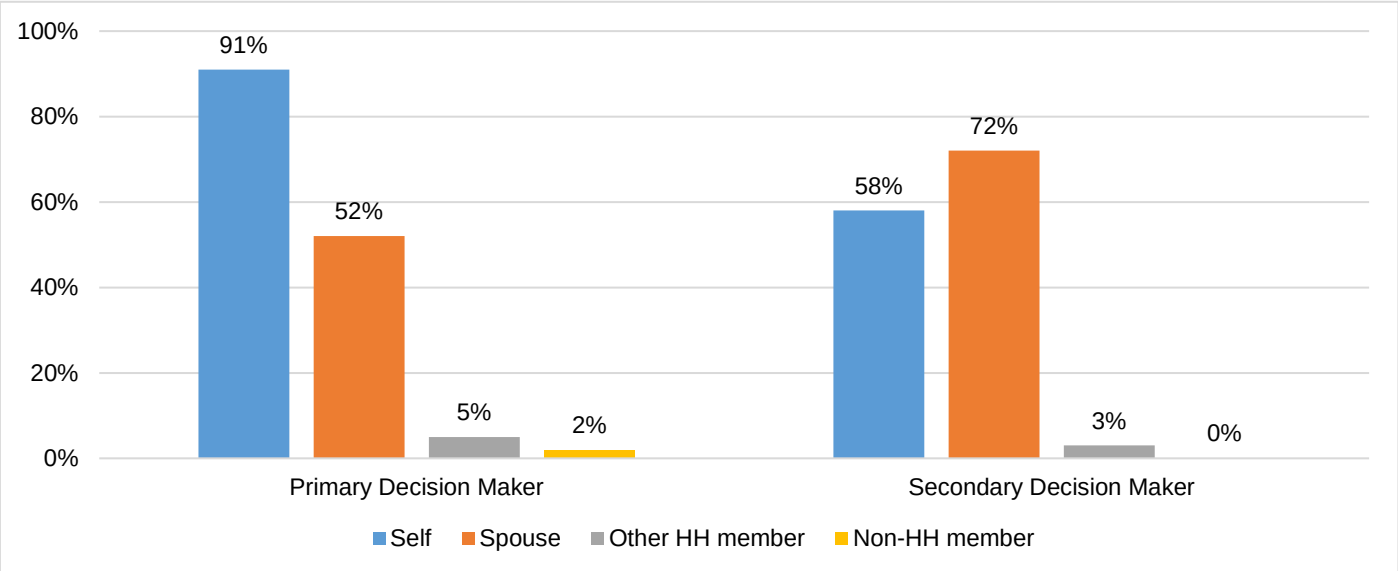

Figure 2. Comparison of primary and secondary decision makers' perception of decision making by household (HH) members on the dairy business.

Differences:

In other aspects of the dairy business, **slightly fewer PDMs reported their spouses make decisions, compared to the number of SDMs who consider themselves responsible.**

- This holds true for **forage management** (24% compared to 37%), **concentrates management** (26% compared to 38%), **and herd health** (35% compared to 45%).

In every aspect of the dairy business, **there were large discrepancies between SDMs view of their spouses'** involvement in decision making (women's views of their husbands) **and PDMs view of their own involvement** (men's view of themselves).

- For example, only 48% of SDMs considered their spouses responsible for **concentrate management**, compared to 91% of PDMs who reported making these decisions.
- In **milk marketing**, almost half as many SDMs (45%) reported that their spouses make decisions, compared to 89% of PDMs who reported making these decisions.

Overall, **both men and women perceived their spouse's involvement in decision making differently compared to their partners' perception of self-involvement** in decisions regarding dairy business activities**.**

Level of input in decisions

The respondents in the ISHS were asked how much input they had in making decisions about the various aspects of farm operations, that is input into: most/all, some, a few, or no decisions.

District wise results are shown in Table A4 in the Appendix.

- It is interesting to note that when it comes to **food crops** grown primarily for household consumption, only 15% of SDMs had input in most or all decisions, while 50% of PDMs had more input in most or all decisions.
- Similar differences were noted with **cash crops produced for sale on the market**. 35% of PDMs had input in most or all decisions while only 7% of SDMs had input in most or all decisions.

Figure 3 and Table A4 shows levels of input in decisions of the dairy business by PDMs and SDMs.

- Overall, **the majority of PDMs had input in some (46%) or most/all of decisions (42%) regarding the dairy business, combining for 88% in total.**
- **The SDMs, however, formed a majority in only a few (40%) and some input (46%) on decisions regarding the dairy business, combining for 86% in total** (Figure 3).
- **42% of PDMs reported having input in most or all decisions related to the dairy business, compared to only 9% of SDMs** (Figure 3).
- On the other hand, equal number of PDMs and SDMs (46%) reported that they had input in some decisions regarding the **dairy business**, therefore indicating joint decision making (Figure 3).
- With **kinds and quantities of forages**, 40% of SDMs reported they had input in only a few decisions, and 38% reported having input in some decisions. 56% of PDMs reported they had input in some decisions regarding kinds and quantities of forages (Table A4).
- Similar levels were noted with decisions regarding **buying and selling cows**, where 54% of PDMs and 55% of SDMs had some input in decisions (Table A4).
- 57% of PDMs had input in some decisions regarding **kinds and quantities of concentrates**, while 43% of SDMs had input in some decisions (Table A4).

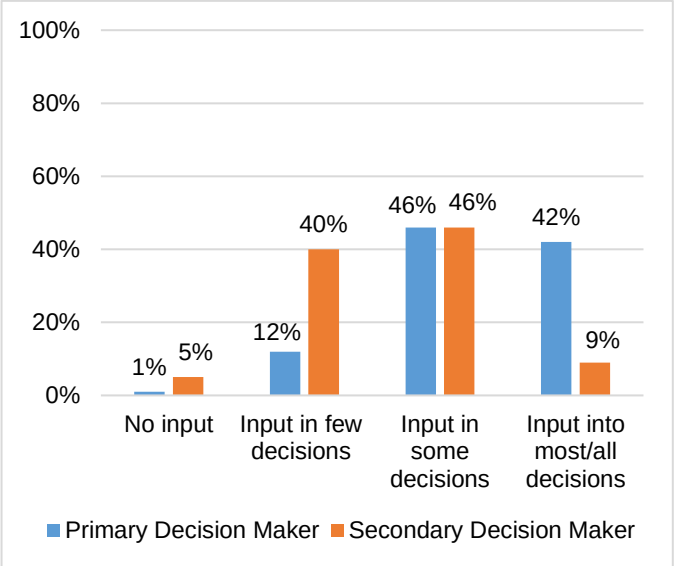

Figure 3. Comparison of primary and secondary decision makers' input in making decisions about the dairy business.

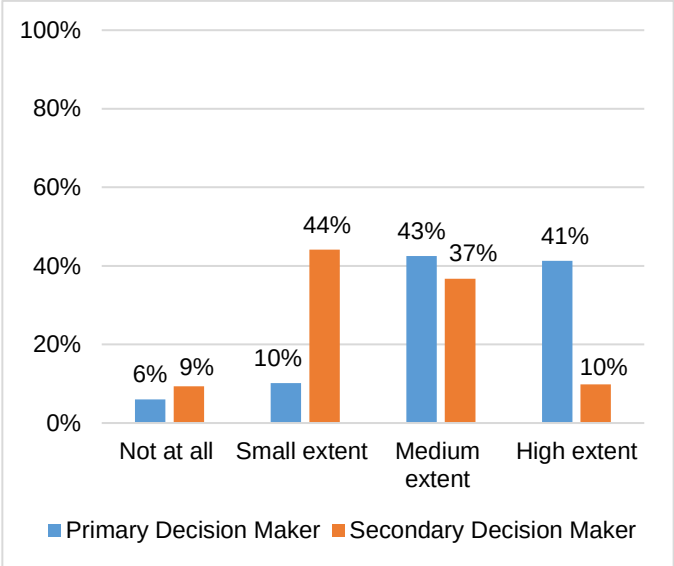

Figure 4. Comparison of primary and secondary decision makers' perception on the extent they feel they contribute to decisions on the dairy business.

- When it comes to **herd health**, majority of the SDMs either had input in only a few decisions (35%) or input in some decisions (50%); while 56% of PDMs had input in some decisions and 33% had input in most or all decisions (Table A4).
- 59% of PDMs had input in some decisions regarding **milk marketing**, compared to 46% of SDMs that had input in some decisions (Table A4).

In specific dairy business activities, it was found that in a number of aspects, both PDMs and SDMs had input in some decisions, thereby indicating that **majority of decisions were generally made together.** However, there was **a greater emphasis on the role of PDMs (men) level of input compared to SDMs (women).**

Extent of personal decision making

The respondents in the ISHS were asked to what extent they felt they could make their own personal decisions regarding the household activities: a high, medium, or small extent, or not at all.

District wise results are shown in Table A5 in the Appendix. Figure 4 shows different levels of extent of personal decision making in the dairy business across the four districts.

- Overall, **the majority of PDMs perceived that they either have a medium (43%) or a high extent (41%)** of contribution towards the decisions regarding the **dairy business**.
- **The majority of SDMs, on the other hand, mainly perceived that they either have a low (44%) or a medium extent (37%) of contribution** (Figure 4).
- 10% of SDMs felt they had high extent of personal decision-making abilities regarding the **dairy business**, as opposed to 41% of PDMs (Figure 4).
- With **selling and buying cattle**, both PDMs (48%) and SDMs (48%) reported that they had medium extent of personal decision making (Table A5).
- Majority of SDMs reported either small (37%) or medium extent (43%) of personal decision making about **herd health**, while majority of PDMs either had medium (50%) or high extent (38%) in this category.
- Similarly, majority of SDMs either had small (34%) or medium extent (41%) of personal decision making in **milk marketing**, while majority of PDMs reported either medium

(53%) or high extent (28%) in the same category (Table A5).

Level of input in decisions on generated income

The ISHS captured information about the level of input on decisions regarding the use of income generated from various farm activities: most/all, some, a few, or no decisions.

District wise results are shown in Table A6 in the Appendix.

Figure 5 shows a comparison between PDMs and SDMs on contributing to decisions regarding the use of income generated from the **dairy business**.

- Majority of PDMs (75%) either had input in some or most/all of the decisions regarding the use of income generated from the **dairy business**. Similarly, majority of SDMs had input in some or most/all of those decisions (80%) (Figure 5). However, these numbers are not statistically significant.

Compared to the input in **decisions regarding the dairy business activities,** outlined in an earlier section of the factsheet (Figure 3), the results are more evenly split for decisions on income use.

- The majority of PDMs (88%) reported having input in either some or most/all decisions regarding the income generated from **dairy business**; however, the majority of SDMs (86%) reported having input in only a few or some of those decisions.

Hence, a very interesting difference can be seen. While **PDMs (men) had a higher input in making decisions regarding the dairy business activities**, **SDMs (women) had a higher input in decisions regarding the use of income generated from it.**

For income that was generated from **buying and selling cattle**, the share of SDMs (women) with input in some or most/all decisions (84%) was slightly higher than that of PDMs (men) (80%).

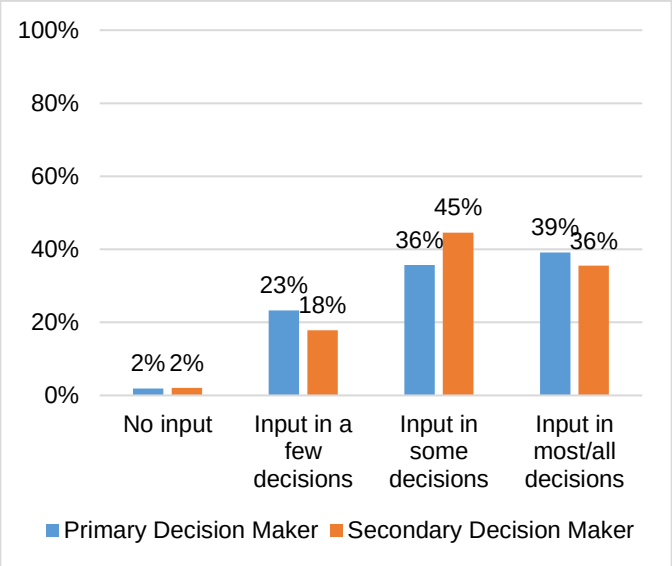

Figure 5. Comparison of PDMs and SDMs input in decisions on the use of income generated from the dairy business.

Summary

In this factsheet, the role and involvement of PDMs and SDMs in making decisions regarding various activities on-farm and related to farm income was examined.

- **94% of PDMs participated in dairy farming activities while only 76% of SDMs participated in the same activities.**
- Of the various dairy business activities, **the largest share (61%) of participation from SDMs was in procuring and feeding forages.**

There is a considerable difference in perception of PDMs and SDMs when it comes to decisions made by spouses.

- **The number of SDMs (women) (74%) who reported they made these decisions was higher than the number of PDMs (men) (41%) who thought that their spouses made these decisions.**

This highlights that more women perceived they made major decisions than men perceived women did. This also indicates that women perceived they had higher levels of decision-making capability than the levels perceived by men.

- **Overall, 91% of PDMs (men) perceived that they were responsible for making all major dairy business decisions, while 58% of SDMs (women) perceived they were responsible for making the same decisions.**
- **Fewer PDMs perceived their spouses responsible for making decisions, compared to the number of SDMs who considered themselves responsible.**
- **In specific dairy related activities, it was found that in a number of the aspects, both PDMs and SDMs had inputs in some decisions, thereby indicating that majority of the decisions were jointly taken.**
- **While PDMs (men) had a higher input in making decisions regarding the dairy business, SDMs (women) had a higher input in the decisions regarding the use of income generated from it.**
- **Regarding inputs in decisions on the use of generated income from various dairy related activities, majority of PDMs had input into some (36%) and most or all (39%) of the decisions in use of generated income. Similarly, majority of the SDMs also had input into some (45%) and most or all (36%) decisions.**

In the next factsheet, Factsheet 12, the aspect of gender inclusiveness will be further examined, focusing on asset ownership, credit access, and group memberships.

Appendix to Factsheet 11

The tables included in this appendix provide summary statistics related to gender inclusiveness in decision making for the entire sample.

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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A1. Percent of PDMs and SDMs participating in various farm activities during the last 12 months by district.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Food crop farming	4.7%	a	6.3%	a	13.8%	ab	19.3%	b	9.5%	***	5.7%	a	3.9%	a	12.2%	ab	17.3%	b	9.1%	***
Cash crop farming	23.3%		8.8%		45.0%	a	35.7%	a	27.2%	***	17.5%		3.9%		35.1%	a	29.3%	a	20.8%	***
Livestock raising (cattle, buffalo, horses etc.)	5.3%	a	12.5%	ab	20.0%	b	11.4%	ab	9.7%	***	3.9%		6.6%		8.1%		9.8%		6.2%	
Dairy farming (general)	92.0%	a	98.8%	ab	90.0%	a	99.3%	b	94.3%	***	75.0%	a	72.4%	a	68.9%	a	84.2%	a	76.0%	*
Selling and buying dairy cows	65.0%	a	85.0%	b	73.8%	ab	74.3%	ab	71.0%	***	45.7%	ab	61.8%	b	40.5%	a	57.1%	ab	49.9%	***
Kinds and quantity of forages	92.7%		98.8%		92.5%		96.4%		94.3%		60.0%	a	50.0%	a	51.4%	a	75.2%		61.1%	***
Kinds and quantity of concentrates	91.7%	ab	98.8%	b	87.5%	a	95.7%	ab	93.0%	**	54.6%	a	53.9%	a	51.4%	a	66.2%	a	56.8%	*
Herd health	92.3%	a	98.8%	a	91.3%	a	97.9%	a	94.3%	**	53.9%	a	57.9%	ab	51.4%	a	69.9%	b	57.9%	**
Milk marketing	91.3%		98.8%		91.3%		92.9%		92.7%		38.2%		60.5%	a	55.4%	a	69.9%	a	51.0%	***
None	1.0%	a	1.3%	ab	5.0%	b	0.0%	a	1.3%	**	12.9%		21.1%		20.3%		12.0%		14.7%	

[1]Sig = Significance; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A2. Percent of PDMs and SDMs reporting on who normally make decisions (for all activities), by district.

	Primary Decision Maker (n=3516)										Secondary Decision Maker (n=2189)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Self	95.3%	a	96.9%	a	96.3%	a	97.1%	a	96.1%	*	64.0%		82.6%	a	86.3%	a	79.4%	a	73.7%	***
Spouse	35.2%	a	44.1%		35.3%	a	53.7%		41.0%	***	90.7%	ab	87.2%	a	89.5%	ab	93.4%	b	90.9%	**
Other HH member[2]	4.8%	a	4.3%	a	9.1%		3.3%	a	5.0%	***	2.7%		4.3%		4.3%		2.0%		2.9%	
Non-HH member[2]	1.6%		1.2%		1.0%		0.8%		1.3%		0.5%		0.7%		0.7%		0.0%		0.4%	

[1]Sig = Significance; [2]HH = Household; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A3. Percent of PDMs and SDMs reporting on who normally makes the decisions regarding various farm activities, by district.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Food crop farming																				
Self	4.0%	a	6.3%	ab	13.8%	bc	19.3%	c	9.2%	***	3.9%	a	3.9%	a	9.5%	ab	15.8%	b	7.5%	***
Spouse	2.0%	a	5.0%	a	7.5%	ab	14.3%	b	6.0%	***	4.6%	a	3.9%	a	12.2%	ab	15.0%	b	8.0%	***
Other HH member[2]	0.3%		0.0%		0.0%		0.0%		0.2%		0.4%		0.0%		0.0%		0.0%		0.2%	
Non-HH member[2]	0.0%		0.0%		0.0%		0.7%		0.2%		0.0%		0.0%		0.0%		0.0%		0.0%	
Cash crop farming																				
Self	22.0%	a	8.8%	a	45.0%	b	33.6%	b	26.0%	***	11.1%	a	2.6%	a	27.0%	b	23.3%	b	14.9%	***
Spouse	8.3%	a	6.3%	a	18.8%	ab	20.0%	b	12.2%	***	14.6%	a	3.9%	a	33.8%	b	28.6%	b	19.0%	***
Other HH member[2]	1.3%		0.0%		2.5%		2.1%		1.5%		1.1%		0.0%		0.0%		0.0%		0.5%	
Non-HH member[2]	0.7%		0.0%		0.0%		0.7%		0.5%		0.7%		0.0%		0.0%		0.0%		0.4%	
Livestock raising (cattle, buffalo, horses etc.)																				
Self	5.0%	a	11.3%	ab	20.0%	b	10.7%	ab	9.2%	***	1.8%	a	6.6%	ab	8.1%	ab	9.0%	b	5.0%	***
Spouse	3.0%	a	8.8%	a	10.0%	a	8.6%	a	6.0%	**	3.6%	a	6.6%	a	8.1%	a	9.8%	a	6.0%	*
Other HH member[2]	0.0%	a	0.0%	a	1.3%	a	0.0%	a	0.2%	*	0.0%	a	0.0%	a	1.4%	a	0.0%	a	0.2%	*
Non-HH member[2]	0.0%	a	1.3%	a	0.0%	a	0.0%	a	0.2%	*	0.0%		0.0%		0.0%		0.0%		0.0%	
Dairy business (general)																				
Self	87.3%	a	95.0%	ab	87.5%	ab	96.4%	b	90.5%	***	52.1%	a	64.5%	ab	55.4%	ab	66.2%	b	57.5%	**
Spouse	47.0%	a	58.8%	ab	38.8%	a	64.3%	b	51.5%	***	70.7%	ab	67.1%	ab	60.8%	a	82.7%	b	71.8%	***
Other HH member[2]	3.7%		6.3%		8.8%		2.9%		4.5%		1.8%	a	2.6%	a	6.8%	a	1.5%	a	2.5%	*
Non-HH member[2]	2.3%		0.0%		1.3%		0.7%		1.5%		0.4%		1.3%		0.0%		0.0%		0.4%	

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**
Selling and buying dairy cows																				
Self	61.3%	a	83.8%	b	68.8%	ab	73.3%	b	68.2%	***	39.6%	a	53.9%	a	37.8%	a	47.4%	a	43.2%	*
Spouse	39.3%	a	57.5%	c	36.3%	ab	52.9%	bc	44.5%	***	43.9%	ab	57.9%	b	36.5%	a	56.4%	b	47.8%	***
Other HH member[2]	3.3%	a	3.8%	a	8.8%	a	2.1%	a	3.8%	*	1.1%		2.6%		1.4%		0.8%		1.2%	
Non-HH member[2]	1.0%		1.3%		2.5%		0.0%		1.0%		0.7%		0.0%		1.4%		0.0%		0.5%	
Kinds/quantity of forages																				
Self	88.3%	a	97.5%	a	90.0%	a	93.6%	a	91.0%	**	29.3%	a	32.9%	a	41.9%	ab	54.1%	b	37.3%	***
Spouse	19.7%	a	21.3%	a	18.8%	a	37.9%		24.0%	***	55.4%	a	42.1%	a	43.2%	a	70.7%		55.6%	***
Other HH member[2]	5.3%		5.0%		10.0%		4.3%		5.7%		1.8%		2.6%		1.4%		3.0%		2.1%	
Non-HH member[2]	2.0%		0.0%		0.0%		0.7%		1.2%		0.0%	a	1.3%	a	0.0%	a	0.0%	a	0.2%	*
Kinds/quantity of concentrates																				
Self	87.3%	a	96.3%	a	85.0%	a	92.1%	a	89.3%	**	30.7%	a	40.8%	ab	43.2%	ab	48.9%	b	38.0%	***
Spouse	22.7%	a	26.3%	ab	17.5%	a	37.9%	b	26.0%	***	45.4%	a	42.1%	a	43.2%	a	57.9%	a	47.6%	*
Other HH member[2]	3.7%		3.8%		8.8%		2.9%		4.2%		1.1%		2.6%		1.4%		1.5%		1.4%	
Non-HH member[2]	1.7%		1.3%		1.3%		0.7%		1.3%		0.0%	a	0.0%	a	1.4%	a	0.0%	a	0.2%	*
Herd health																				
Self	88.0%	a	96.3%	ab	87.5%	ab	96.4%	b	91.0%	***	36.8%	a	50.0%	ab	48.6%	ab	57.9%	b	45.1%	***
Spouse	31.3%	a	35.0%	ab	30.0%	a	50.0%	b	36.0%	***	50.0%	a	48.7%	a	47.3%	a	65.4%	a	53.1%	**
Other HH member[2]	4.7%		3.8%		7.5%		2.9%		4.5%		1.1%		2.6%		1.4%		1.5%		1.4%	
Non-HH member[2]	0.3%		1.3%		1.3%		0.7%		0.7%		0.0%		0.0%		0.0%		0.0%		0.0%	
Milk marketing																				
Self	88.7%		92.5%		85.0%		89.3%		88.8%		21.8%		51.3%	a	51.4%	a	57.9%	a	38.2%	***
Spouse	23.0%	a	48.8%	b	36.3%	ab	48.6%	b	34.2%	***	33.6%		51.3%	a	50.0%	a	60.9%	a	44.6%	***
Other HH member[2]	4.3%		3.8%		7.5%		3.6%		4.5%		1.4%		2.6%		2.7%		1.5%		1.8%	
Non-HH member[2]	1.0%		2.5%		0.0%		0.7%		1.0%		0.0%		0.0%		0.0%		0.0%		0.0%	

[1]Sig = Significance; [2]HH = Household; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A4. Percent of PDMs and SDMs reporting on how much input they have in making decisions on various farm activities, by district.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Food crop farming (PDM=38) (SDM = 46)												
No input	0.0%	0.0%	0.0%	0.0%	0.0%		7.1%	0.0%	11.1%	0.0%	4.4%	
Input in few decisions	0.0%	0.0%	0.0%	9.5%	5.3%		35.7%	66.7%	22.2%	35.0%	34.8%	
Input in some decisions	57.1%	25.0%	83.3%	33.3%	44.7%		35.7%	33.3%	55.6%	50.0%	45.7%	
Input into most or all decisions	42.9%	75.0%	16.7%	57.1%	50.0%		21.4%	0.0%	11.1%	15.0%	15.2%	
Cash crop farming (PDM=81) (SDM=110)												
No input	6.9%	0.0%	0.0%	3.2%	3.7%		9.1%	0.0%	8.0%	2.6%	6.4%	**
Input in few decisions	6.9%	20.0%	18.8%	12.9%	12.4%		29.6%	66.7%	40.0%	57.9%	42.7%	**
Input in some decisions	51.7%	0.0%	68.8%	45.2%	49.4%		54.6%	0.0%	52.0%	29.0%	43.6%	**
Input into most or all decisions	34.5%	80.0%	12.5%	38.7%	34.6%		6.8%	33.3%	0.0%	10.5%	7.3%	**
Livestock raising (cattle, buffalo, horses etc.) (PDM=37) (SDM=34)												
No input	0.0%	0.0%	0.0%	0.0%	0.0%		20.0%	0.0%	0.0%	0.0%	5.9%	
Input in few decisions	22.2%	0.0%	12.5%	8.3%	10.8%		40.0%	20.0%	50.0%	76.9%	52.9%	
Input in some decisions	22.2%	87.5%	50.0%	33.3%	46.0%		40.0%	80.0%	50.0%	23.1%	41.2%	
Input into most or all decisions	55.6%	12.5%	37.5%	58.3%	43.2%		0.0%	0.0%	0.0%	0.0%	0.0%	
Dairy farming (general) (PDM = 334) (SDM=408)												
No input	0.0%	2.0%	2.7%	0.0%	0.6%	*	7.5%	0.0%	0.0%	3.6%	4.7%	
Input in few decisions	12.3%	14.3%	5.4%	12.9%	12.0%	*	35.0%	43.1%	48.9%	44.6%	40.2%	
Input in some decisions	42.6%	44.9%	67.6%	43.0%	45.8%	*	47.0%	51.0%	46.8%	41.8%	46.1%	
Input into most or all decisions	45.2%	38.8%	24.3%	44.1%	41.6%	*	10.5%	5.9%	4.3%	10.0%	9.1%	
Selling and buying dairy cows (PDM = 283) (SDM=271)												
No input	0.0%	2.1%	2.9%	0.0%	0.7%		2.4%	2.3%	7.4%	1.3%	2.6%	
Input in few decisions	7.9%	8.5%	14.7%	6.7%	8.5%		29.6%	25.0%	25.9%	34.7%	29.9%	
Input in some decisions	50.4%	53.2%	58.8%	58.7%	54.1%		52.0%	56.8%	59.3%	57.3%	55.0%	
Input into most or all decisions	41.7%	36.2%	23.5%	34.7%	36.8%		16.0%	15.9%	7.4%	6.7%	12.6%	
Kinds and quantity of forages (PDM = 177) (SDM=319)												
No input	1.3%	5.3%	9.1%	5.2%	4.0%	*	18.4%	18.2%	9.4%	9.4%	14.7%	
Input in few decisions	9.0%	15.8%	13.6%	1.7%	7.9%	*	38.6%	27.3%	50.0%	42.7%	39.8%	
Input in some decisions	51.3%	63.2%	50.0%	62.1%	55.9%	*	37.3%	48.5%	34.4%	39.6%	38.9%	
Input into most or all decisions	38.5%	15.8%	27.3%	31.0%	32.2%	*	5.7%	6.1%	6.3%	8.3%	6.6%	
Kinds and quantity of concentrates (PDM = 183) (SDM=272)												
No input	3.7%	8.7%	9.5%	5.3%	5.5%		18.6%	15.6%	9.4%	10.1%	14.7%	
Input in few decisions	15.9%	30.4%	14.3%	8.8%	15.3%		33.3%	40.6%	40.6%	34.2%	35.3%	
Input in some decisions	52.4%	56.5%	61.9%	61.4%	56.8%		38.8%	43.8%	43.8%	48.1%	42.7%	

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Input into most or all decisions	28.1%	4.4%	14.3%	24.6%	22.4%		9.3%	0.0%	6.3%	7.6%	7.4%	
Herd health (PDM = 240) (SDM=301)												
No input	0.0%	6.7%	10.3%	0.0%	2.1%	***	5.7%	2.7%	0.0%	4.6%	4.3%	
Input in few decisions	7.4%	10.0%	0.0%	12.3%	8.3%	***	39.7%	27.0%	37.1%	28.4%	34.6%	
Input in some decisions	50.9%	66.7%	62.1%	57.5%	56.3%	***	41.1%	67.6%	51.4%	55.7%	49.8%	
Input into most or all decisions	41.7%	16.7%	27.6%	30.1%	33.3%	***	13.5%	2.7%	11.4%	11.4%	11.3%	
Milk marketing (PDM = 226) (SDM=256)												
No input	0.0%	4.8%	9.1%	2.9%	3.1%		20.6%	5.1%	5.3%	6.1%	11.3%	***
Input in few decisions	13.6%	11.9%	12.1%	15.7%	13.7%		39.2%	25.6%	36.8%	30.5%	34.0%	***
Input in some decisions	54.3%	69.1%	66.7%	55.7%	59.3%		34.0%	66.7%	50.0%	48.8%	46.1%	***
Input into most or all decisions	32.1%	14.3%	12.1%	25.7%	23.9%		6.2%	2.6%	7.9%	14.6%	8.6%	***

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A5. Percent of PDMs and SDMs reporting on the extent of making personal decisions on various farm activities, by district.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Food crop farming (PDM=38) (SDM = 46)												
Not at all	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	11.1%	0.0%	2.2%	
Small extent	0.0%	0.0%	0.0%	9.5%	5.3%		28.6%	66.7%	22.2%	25.0%	28.3%	
Medium extent	42.9%	25.0%	66.7%	33.3%	39.5%		64.3%	33.3%	44.4%	55.0%	54.4%	
High extent	57.1%	75.0%	33.3%	57.1%	55.3%		7.1%	0.0%	22.2%	20.0%	15.2%	
Cash crop farming (PDM=81) (SDM=110)												
Not at all	3.5%	0.0%	0.0%	9.7%	4.9%		6.8%	0.0%	8.0%	13.2%	9.1%	
Small extent	13.8%	20.0%	25.0%	12.9%	16.1%		36.4%	66.7%	40.0%	50.0%	42.7%	
Medium extent	51.7%	0.0%	43.8%	41.9%	43.2%		52.3%	0.0%	36.0%	31.6%	40.0%	
High extent	31.0%	80.0%	31.3%	35.5%	35.8%		4.6%	33.3%	16.0%	5.3%	8.2%	
Livestock raising (cattle, buffalo, horses etc.) (PDM=37) (SDM=34)												
Not at all	0.0%	0.0%	0.0%	16.7%	5.4%		0.0%	0.0%	0.0%	15.4%	5.9%	
Small extent	33.3%	0.0%	12.5%	8.3%	13.5%		70.0%	20.0%	33.3%	69.2%	55.9%	
Medium extent	33.3%	62.5%	37.5%	16.7%	35.1%		30.0%	60.0%	50.0%	15.4%	32.4%	
High extent	33.3%	37.5%	50.0%	58.3%	46.0%		0.0%	20.0%	16.7%	0.0%	5.9%	
Dairy farming (general) (PDM = 334) (SDM=408)												
Not at all	5.8%	2.0%	2.7%	9.7%	6.0%	**	12.5%	0.0%	0.0%	11.8%	9.3%	**
Small extent	9.7%	16.3%	5.4%	9.7%	10.2%	**	40.0%	58.8%	53.2%	40.9%	44.1%	**
Medium extent	43.2%	38.8%	67.6%	33.3%	42.5%	**	39.0%	31.4%	36.2%	35.5%	36.8%	**
High extent	41.3%	42.9%	24.3%	47.3%	41.3%	**	8.5%	9.8%	10.6%	11.8%	9.8%	**
Selling and buying dairy cows (PDM = 283) (SDM=271)												
Not at all	6.3%	2.1%	2.9%	5.3%	5.0%		16.0%	2.3%	7.4%	2.7%	9.2%	
Small extent	5.5%	12.8%	14.7%	5.3%	7.8%		29.6%	34.1%	29.6%	34.7%	31.7%	
Medium extent	45.7%	42.6%	52.9%	53.3%	48.1%		45.6%	47.7%	51.9%	50.7%	48.0%	
High extent	42.5%	42.6%	29.4%	36.0%	39.2%		8.8%	15.9%	11.1%	12.0%	11.1%	
Kinds and quantity of forages (PDM = 177) (SDM=319)												
Not at all	1.3%	5.3%	9.1%	6.9%	4.5%		18.4%	18.2%	9.4%	14.6%	16.3%	
Small extent	9.0%	15.8%	13.6%	6.9%	9.6%		37.3%	42.4%	50.0%	36.5%	38.9%	
Medium extent	44.9%	52.6%	40.9%	46.6%	45.8%		35.4%	33.3%	25.0%	37.5%	34.8%	
High extent	44.9%	26.3%	36.4%	39.7%	40.1%		8.9%	6.1%	15.6%	11.5%	10.0%	
Kinds and quantity of concentrates (PDM = 183) (SDM=272)												
Not at all	3.7%	8.7%	9.5%	10.5%	7.1%		20.9%	15.6%	9.4%	12.7%	16.5%	
Small extent	13.4%	26.1%	19.1%	12.3%	15.3%		36.4%	43.8%	40.6%	39.2%	38.6%	
Medium extent	43.9%	52.2%	42.9%	45.6%	45.4%		33.3%	37.5%	31.3%	32.9%	33.5%	
High extent	39.0%	13.0%	28.6%	31.6%	32.2%		9.3%	3.1%	18.8%	15.2%	11.4%	

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Herd health (PDM = 240) (SDM=301)												
Not at all	0.9%	6.7%	10.3%	5.5%	4.2%	**	9.2%	2.7%	0.0%	10.2%	7.6%	
Small extent	7.4%	13.3%	0.0%	12.3%	8.8%	**	39.7%	37.8%	37.1%	31.8%	36.9%	
Medium extent	45.4%	53.3%	58.6%	50.7%	49.6%	**	38.3%	51.4%	45.7%	44.3%	42.5%	
High extent	46.3%	26.7%	31.0%	31.5%	37.5%	**	12.8%	8.1%	17.1%	13.6%	13.0%	
Milk marketing (PDM = 226) (SDM=256)												
Not at all	3.7%	4.8%	6.1%	11.4%	6.6%		20.6%	5.1%	5.3%	15.9%	14.5%	**
Small extent	14.8%	14.3%	15.2%	7.1%	12.4%		40.2%	33.3%	34.2%	25.6%	33.6%	**
Medium extent	46.9%	57.1%	60.6%	52.9%	52.7%		33.0%	53.9%	44.7%	43.9%	41.4%	**
High extent	34.6%	23.8%	18.2%	28.6%	28.3%		6.2%	7.7%	15.8%	14.6%	10.6%	**

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A6. Percent of PDMs and SDMs reporting on how much input they have in decisions regarding the use of income generated from various farm activities, by district.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Cash crop farming (PDM=163) (SDM=117)												
No input	1.4%	0.0%	0.0%	2.0%	1.2%		2.0%	0.0%	3.9%	0.0%	1.7%	
Input in few decisions	15.7%	42.9%	30.6%	20.0%	21.5%		14.3%	0.0%	26.9%	23.1%	19.7%	
Input in some decisions	35.7%	14.3%	27.8%	36.0%	33.1%		51.0%	66.7%	42.3%	51.3%	49.6%	
Input into most or all decisions	47.1%	42.9%	41.7%	42.0%	44.2%		32.7%	33.3%	26.9%	25.6%	29.1%	
Livestock raising (cattle, buffalo, horses etc.) (PDM=58) (SDM=35)												
No input	12.5%	0.0%	0.0%	0.0%	3.5%		0.0%	0.0%	0.0%	0.0%	0.0%	
Input in few decisions	25.0%	20.0%	18.8%	31.3%	24.1%		36.4%	0.0%	16.7%	30.8%	25.7%	
Input in some decisions	6.3%	40.0%	18.8%	18.8%	19.0%		54.6%	60.0%	33.3%	38.5%	45.7%	
Input into most or all decisions	56.3%	40.0%	62.5%	50.0%	53.5%		9.1%	40.0%	50.0%	30.8%	28.6%	
Dairy farming (general) (PDM = 566) (SDM=428)												
No input	3.6%	1.3%	0.0%	0.0%	1.9%		3.3%	1.8%	0.0%	0.9%	2.1%	
Input in few decisions	22.1%	20.3%	26.4%	25.9%	23.3%		18.1%	18.2%	21.6%	15.2%	17.8%	
Input in some decisions	35.5%	38.0%	29.2%	38.1%	35.7%		44.8%	43.6%	41.2%	46.4%	44.6%	
Input into most or all decisions	38.8%	40.5%	44.4%	36.0%	39.1%		33.8%	36.4%	37.3%	37.5%	35.5%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Factsheet 12: Gender Inclusiveness in Asset Ownership, Access to Credit and Group Membership

Background

In the previous factsheet, the role of men and women in activity participation, decision making in dairy related activities, level of input in decision making, extent of personal decision making, and use of income generated from various on-farm activities was analysed.

The approach to collecting the data using the Abbreviated Women Empowerment in Agriculture Index (A-WEAI) module was explained in Factsheet 11.

In this factsheet, the aspect of gender inclusiveness will be further explored, focusing on individual and collective ownership of assets; decision making regarding sources, forms, and borrowing of funds; and participation in various groups.

In order to avoid biases in responses, the primary decision makers (PDMs) and the secondary decision makers (SDMs) in the household were asked the questions in this module separately.

In Factsheet 3, on household characteristics of the ISHS, it was noted that overall, **97% of the household's PDMs were male. 94% of households had a SDM and nearly all were females (99%).**

Ownership of assets

The respondents were asked about household assets and ownership of a number of items that could be used to generate income. District wise results are shown in Table A1 in the Appendix.

Assets that were considered include: agricultural land; large (e.g. cattle, horses and buffalo) and small (e.g. goats, sheep and pigs) livestock; poultry (e.g. chickens, ducks, turkeys and pigeons); fishing pond and fishing equipment; mechanised and non-mechanised farming equipment; non-farm business equipment; houses and other structures; large (e.g. refrigerators) and small (e.g. cookware and radios) consumer durables; mobile phones; other land (for non-agricultural purposes); and means of transportation.

Household asset ownership

Overall, the reported ownership was consistent between PDMs and SDMs for all categories:

- Agricultural land (for 47% and 46%, respectively)
- Large livestock (94% and 93%, respectively)

- Small livestock (5% for both)
- Poultry (24% for both)
- Fishing pond or fishing equipment (5% and 4%, respectively)
- Non-mechanised farm equipment (79% and 75%, respectively)
- Non-farm business equipment (12% and 13%, respectively)
- House or other large structures (90% and 89%, respectively)
- Small consumer durables (97% and 98%, respectively)
- Means of transportation (83% for both)

Intra-household asset ownership

The respondents were also asked, within the household, if assets were owned solely or jointly. Figure 1 shows intra-household asset ownerships as reported by PDMs and SDMs. District wise results are shown in Table A2 in the Appendix.

- 66% of the PDMs (most of whom are men) perceived that the assets were owned jointly, while 75% of the SDMs (most of whom are women) felt the same. **This indicates that more women perceived there was joint ownership of assets compared to the men in the household.**
- The number of PDMs (21%) who reported they were the sole owners of assets was almost double than that of the SDMs (11%).

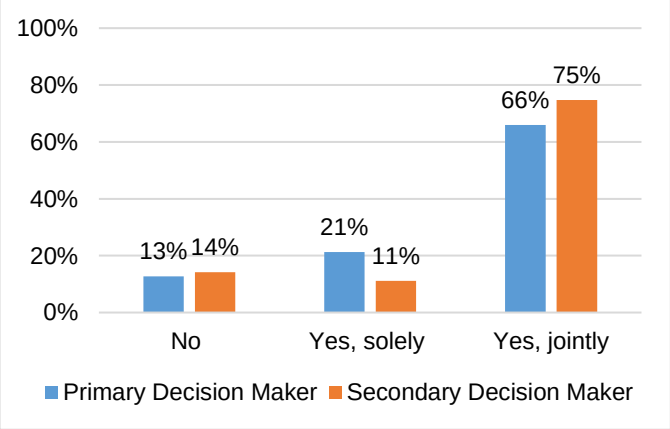

Figure 1. Perception of sole and joint ownership of assets by PDMs and SDMs.

When assets were considered separately (e.g. land, livestock, household consumer durables), overall, **the results indicate a greater number of SDMs perceived joint ownership compared to PDMs**. However, there are some differences between the types of assets.

District wise results are shown in Table A3 in the Appendix.

- Only 6% of SDMs (women) perceived that they had sole ownership of **agricultural land**, while 83% of SDMs perceived joint ownership. On the other hand, 26% of PDMs (men) perceived sole ownership, while 66% perceived joint ownership of **agricultural land**.
- In regard to **large livestock**, majority of SDMs (91%) perceived that there was joint ownership, compared to only 78% of PDMs; 19% of PDMs perceived sole ownership, compared to only 1% of SDMs.
- A small number of SDMs (3%) had a perception of sole ownership when it comes to **non-mechanised farm equipment**, while large number of PDMs (42%) perceived sole ownership of **non-mechanised farm equipment**.
- In regard to **houses or other structures**, the difference between PDMs' (81%) and SDMs' (89%) perception of joint ownership was smaller compared to difference in perception for other assets. **This indicates that for both men and women in household there was an increased sense of joint ownership of houses.**
- However, 28% of SDMs perceived sole ownership of **small consumer durables**, while only 6% of PDMs reported sole ownership and 26% stated no ownership.
- Majority of SDMs either reported joint (68%) or no ownership (30%) of **means of transportation.** PDMs, on the other hand, mainly reported joint ownership (60%) or sole ownership (29%).

Access to credit

Sources of loans

The respondents were asked about their experience with borrowing money or other items in the past 12 months.

District wise results of sources of loans are shown in Table A4 in the Appendix.

- **A large proportion of PDMs (men) (38%) and SDMs (women) (36%) reported no sources for borrowing credit,** which indicates that the household had not borrowed money in the past 12 months.
- According to both PDMs and SDMs, a majority of the households (36%) that had borrowed money did so from the **dairy cooperative**.
- This was followed by borrowing **from formal sources like banks and financial institutions** according to 21% of PDMs and 22% of SDMs.
- According to 6% of PDMs and SDMs, money was also borrowed from **friends and/or relatives with no interest.**

Forms of loan

From the respondents who had reported borrowing funds, they were asked about the forms of loans, whether they were cash, in kind, or both that households borrowed in the past 12 months.

District wise results are shown in Table A5 in the Appendix.

- According to **majority (98%) of PDMs and SDMs, the loan from the dairy cooperative was in the form of cash.**
- Similarly, **100% of PDMs and SDMs reported that lending from banks and financial institutions was in the form of cash.**
- 87% of PDMs and 86% of SDMs that borrowed from **friends/relatives** received the credit in cash, while 14% received it in-kind.

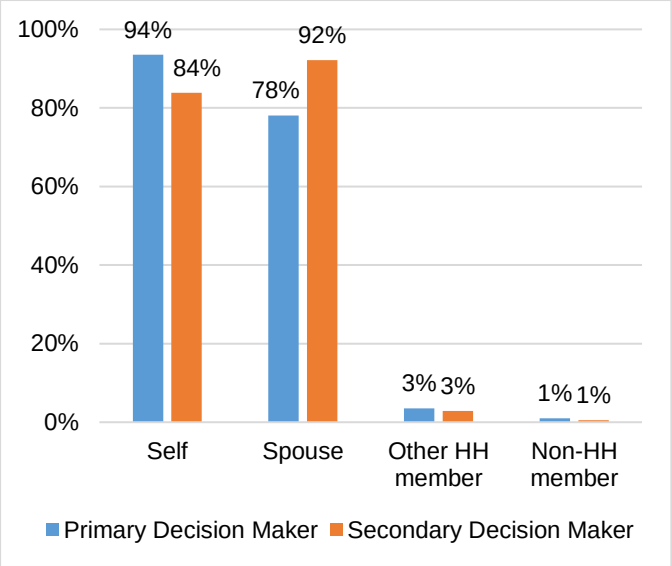

Figure 2. Perception of decision making regarding borrowing funds by PDMs (n=402) and SDMs (n=384).

Decisions on borrowing funds

The respondents were asked who made the decision to borrow most of the time in the past 12 months.

Figure 2 shows the level of decision making on borrowing funds according to PDMs and SDMs. District wise results are shown in Table A6 in the Appendix.

- 94% of PDMs reported making decisions to borrow themselves, compared to 92% of SDMs who considered their spouse responsible.
- There was a larger spread between PDMs who considered their spouse responsible for borrowing decisions (78%) and SDMs who considered themselves responsible (84%).
- According to 4% of PDMs, other household members made decisions to borrow funds, while 3% of SDMs thought the same (Figure 2).

Overall, **this indicates that decisions to borrow funds were in most cases undertaken jointly.**

Decisions on usage of borrowed funds

The previous question was followed by a question on who made decisions on what to do with the borrowed funds.

District wise results are shown in Table A6 in the Appendix. Figure 3 shows the differences in the level of decision making between PDMs and SDMs when it comes to decisions on what to do with the borrowed funds.

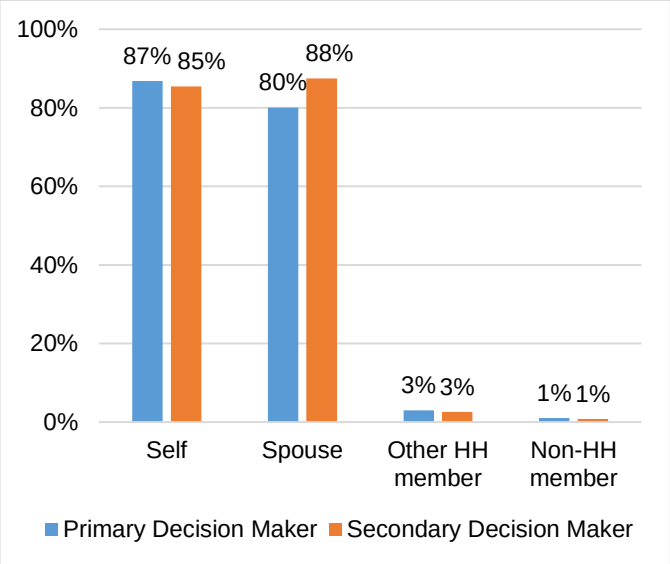

Figure 3. Perception of decision making on what to do with borrowed funds by PDMs and SDMs.

- 87% of PDMs reported making decisions on what to do with the borrowed funds themselves, while 88% of SDMs considered their spouse responsible.
- Similarly to the previous section, less PDMs considered their spouse responsible for making these decisions (80%), compared to SDMs who considered themselves responsible (85%).

However, the difference in perception was relatively small. **This indicates that decisions on what to do with borrowed funds were in most cases also undertaken jointly.**

Group membership

The respondents were asked about formal, informal, and customary groups in the community and whether they were active members of any of these groups.

Groups that are considered in the A-WEIA include: farmer (including agricultural, livestock, fisheries, and marketing), youth, forest, credit or microfinance, insurance, trade and business associations, civic, religious, and women's groups.

This has shed some light onto the level of exposure women might receive when participating in training in farming, business, capacity building, and social activities through membership in such groups.

Figure 4 shows the level of membership of both PDMs and SDMs in various formal, informal, and customary groups in the community. District wise results are shown in Table A7 in the Appendix.

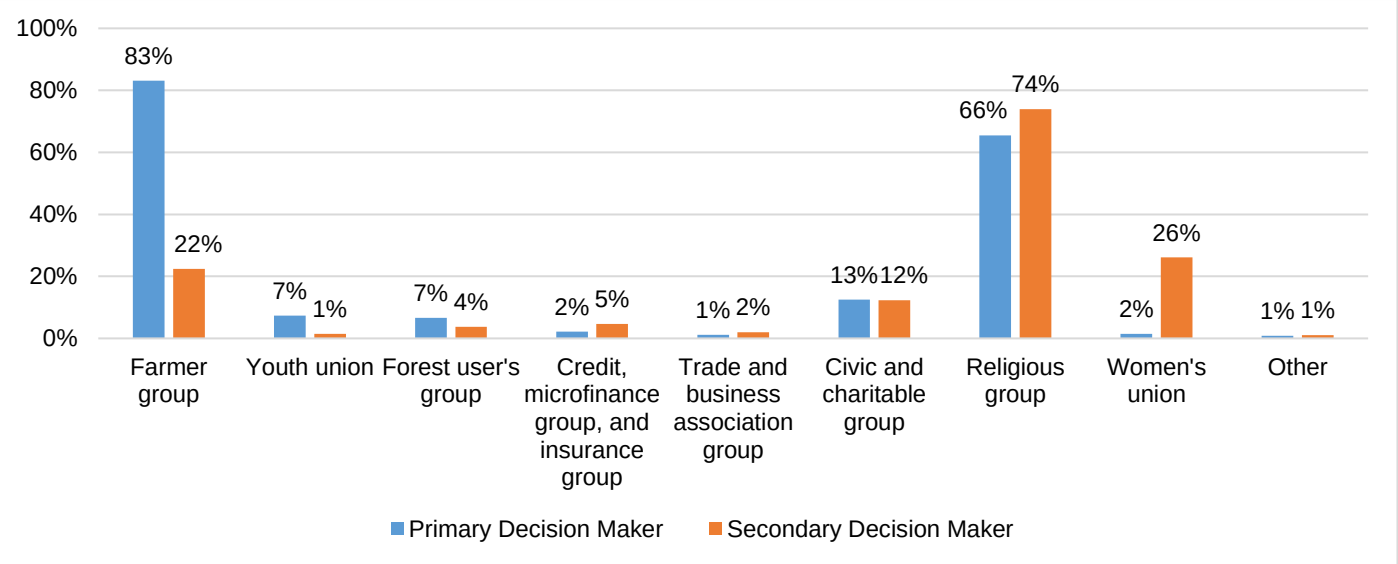

Figure 4. Comparison of membership in various groups between PDMs and SDMs.

In regard to membership in farmer groups, there was a substantial difference in the level of participation between PDMs and SDMs.

- Overall, **83% of PDMs were members of farmer groups, while only 22% of SDMs were members of similar groups** (Figure 4).
- The level of SDM membership in these groups was highest in Garut district (34%), and lowest in Bandung district (16%) (Table A7).

On the other hand, more SDMs reported being active members of religious groups compared to PDMs.

- Overall, **74% of SDMs were members of religious groups, while 66% of PDMs were members of similar groups** (Figure 4).
- Highest share of membership of religious groups for both PDMs (86%) and SDMs (92%) was in Garut district (Table A7).

Another interesting fact can be noted in a relatively low participation of SDMs in Women's union groups.

- **Only 26% of SDMs (women) were active members of Women's union** (Figure 4).
- Highest share of membership of Women's union was reported in Bogor district (30%) and lowest was in Cianjur district (19%) (Table A7).

Summary

In this factsheet, various insights from the ISHS were examined, including individual and collective ownership of assets, forms of credit, decision making on borrowing, decision making on the use of borrowed funds, and aspects of group membership of PDMs and SDMs.

- In regard to **ownership of major assets (e.g. houses, agricultural land plots and means of transportation), the share of reported PDM ownership was relatively similar to SDM ownership.**
- 66% of the PDMs perceived that there was joint ownership of assets, while 75% of the SDMs felt the same. This indicates that **more women thought there was joint ownership of assets compared to the men in the household.**
- In regard to sole or joint ownership, the overall results indicate that **for majority of the assets, a greater number of SDMs perceived a joint ownership compared to PDMs.**
- **According to both PDMs (38%) and SDMs (36%), majority of the households had not borrowed money in the past 12 months.**
- **Majority of PDMs and SDMs (36%) who had borrowed money in the past 12 months reported borrowing from the dairy cooperatives, which was predominantly (98%) in the form of cash.**
- In regard borrowing funds, 94% of PDMs perceived that they made the decision on borrowing, while 92% of SDMs considered their spouse responsible. Likewise, 84% of SDMs reported making these decisions themselves, while 78% of PDMs considered their spouse responsible. **This indicates that the decisions to borrow funds were in most cases undertaken jointly.**
- Similarly, with decisions on what to do with the borrowed funds, 87% of PDMs perceived that they made these decisions themselves, while 88% of SDMs considered their spouse responsible. 85% of SDMs considered themselves responsible, while 80% of PDMs considered their spouse responsible. **This indicates that the decisions on what to do with the borrowed funds were in most cases undertaken jointly.**
- In regard to **farmer groups, there was a significant difference in the level of participation between PDMs (83%) and SDMs (22%).**
- On the other hand, **more SDMs (74%) reported active participation in religious groups, compared to only 66% of PDMs.**

Appendix to Factsheet 12

The tables included in this appendix provide summary statistics related to gender inclusiveness in asset ownership, access to credit, and group membership for the entire sample.

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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A1. Percent of PDMs and SDMs who own various assets that could be used to generate income, by district.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Agricultural land	46.0%	ab	45.0%	ab	32.5%	a	57.1%	b	46.7%	***	43.6%	ab	44.7%	ab	35.1%	a	56.4%	b	45.6%	**
Large livestock	90.0%		100.0%	a	98.8%	a	96.4%	a	94.0%	***	89.3%	a	100.0%	b	98.6%	b	95.5%	ab	93.4%	***
Small livestock	2.7%	a	7.5%	a	8.8%	a	6.4%	a	5.0%	*	2.9%	a	7.9%	a	6.8%	a	8.3%	a	5.3%	*
Poultry	20.3%	a	22.5%	ab	37.5%	b	23.6%	ab	23.7%	**	19.6%	a	23.7%	ab	40.5%	b	23.3%	a	23.8%	***
Fish pond or fishing equipment	2.0%	a	5.0%	ab	2.5%	a	11.4%	b	4.7%	***	1.4%	a	5.3%	ab	1.4%	a	12.0%	b	4.4%	***
Farm equipment (non-mechanised)	70.3%		92.5%	a	88.8%	a	83.6%	a	78.8%	***	65.4%		90.8%	a	87.8%	a	80.5%	a	75.3%	***
Farm equipment (mechanised)	4.7%		0.0%		2.5%		2.9%		3.3%		5.4%		1.3%		4.1%		2.3%		3.9%	
Non-farm business equipment	9.7%	a	22.5%	b	15.0%	ab	10.7%	ab	12.3%	**	10.4%	a	25.0%	b	17.6%	ab	9.8%	a	13.1%	***
House or other structures	85.0%		95.0%	a	96.3%	a	93.6%	a	89.8%	***	83.6%	a	97.4%	b	93.2%	ab	94.7%	b	89.3%	***
Large consumer durables	99.3%		98.8%		98.8%		98.6%		99.0%		98.2%		100.0%		98.6%		99.2%		98.8%	
Small consumer durables	96.0%		100.0%		96.3%		97.9%		97.0%		95.4%	a	100.0%	a	100.0%	a	99.2%	a	97.5%	**
Mobile phones	86.7%		92.5%		86.3%		80.7%		86.0%		85.4%		89.5%		87.8%		78.9%		84.7%	
Other land not used for agricultural purposes	16.7%		17.5%		18.8%		15.7%		16.8%		15.7%		21.1%		14.9%		15.0%		16.2%	
Means of transportation	84.7%	a	93.8%	a	86.3%	a	69.3%		82.5%	***	85.0%	a	94.7%	a	86.5%	a	68.4%		82.6%	***
None	0.0%		0.0%		0.0%		0.0%		0.0%		0.7%		0.0%		0.0%		0.0%		0.4%	

[1]Sig = Significance; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A2. Percent of PDMs and SDMs reporting on overall sole or joint ownership of assets, by district.

	Primary Decision Maker (n=4438)						Secondary Decision Maker (n=4133)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Do you own any of the items that could be used to generate income?												
No	12.7%	12.2%	11.4%	14.1%	12.8%	***	14.9%	12.3%	14.0%	13.9%	14.2%	***
Yes, solely	24.0%	21.1%	19.0%	17.1%	21.3%	***	12.8%	11.0%	7.2%	10.1%	11.1%	***
Yes, jointly	63.4%	66.7%	69.6%	68.8%	66.0%	***	72.3%	76.7%	78.9%	76.0%	74.7%	***

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$)

Table A3. Percent of PDMs and SDMs reporting sole or joint ownership of various assets, by district.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Agricultural land (PDM=280) (SDM=257)												
No	10.9%	0.0%	11.5%	7.5%	8.6%		13.1%	8.8%	7.7%	13.3%	12.1%	
Yes, solely	29.7%	25.0%	15.4%	21.3%	25.4%		8.2%	5.9%	0.0%	2.7%	5.5%	
Yes, jointly	59.4%	75.0%	73.1%	71.3%	66.1%		78.7%	85.3%	92.3%	84.0%	82.5%	
Large livestock (PDM=564) (SDM=526)												
No	1.9%	2.5%	10.1%	0.7%	2.8%	***	7.6%	7.9%	15.1%	4.7%	8.0%	
Yes, solely	20.0%	21.3%	12.7%	20.0%	19.2%	***	0.4%	1.3%	0.0%	0.8%	0.6%	
Yes, jointly	78.2%	76.3%	77.2%	79.3%	78.0%	***	92.0%	90.8%	84.9%	94.5%	91.4%	
Small livestock (PDM=30) (SDM=30)												
No	0.0%	0.0%	14.3%	0.0%	3.3%		12.5%	0.0%	20.0%	9.1%	10.0%	
Yes, solely	37.5%	16.7%	28.6%	0.0%	20.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Yes, jointly	62.5%	83.3%	57.1%	100.0%	76.7%		87.5%	100.0%	80.0%	90.9%	90.0%	
Poultry (PDM=142) (SDM=134)												
No	13.1%	27.8%	13.3%	9.1%	14.1%		18.2%	16.7%	16.7%	0.0%	13.4%	
Yes, solely	24.6%	5.6%	16.7%	6.1%	16.2%		16.4%	11.1%	3.3%	9.7%	11.2%	
Yes, jointly	62.3%	66.7%	70.0%	84.9%	69.7%		65.5%	72.2%	80.0%	90.3%	75.4%	
Fish pond or fishing equipment (PDM=28) (SDM=25)												
No	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	25.0%	0.0%	12.5%	12.0%	
Yes, solely	0.0%	0.0%	50.0%	0.0%	3.6%	***	0.0%	0.0%	0.0%	0.0%	0.0%	
Yes, jointly	100.0%	100.0%	50.0%	100.0%	96.4%	***	100.0%	75.0%	100.0%	87.5%	88.0%	
Farm equipment (non-mechanised) (PDM=473) (SDM=424)												
No	1.0%	2.7%	2.8%	0.0%	1.3%		27.3%	21.7%	24.6%	25.2%	25.5%	
Yes, solely	45.5%	39.2%	42.3%	38.5%	42.3%		3.3%	2.9%	3.1%	3.7%	3.3%	
Yes, jointly	53.6%	58.1%	54.9%	61.5%	56.5%		69.4%	75.4%	72.3%	71.0%	71.2%	
Farm equipment (mechanised) (PDM=20) (SDM=22)												
No	0.0%	0.0%	0.0%	0.0%	0.0%		26.7%	0.0%	0.0%	33.3%	22.7%	
Yes, solely	64.3%	0.0%	50.0%	25.0%	55.0%		6.7%	0.0%	0.0%	0.0%	4.6%	
Yes, jointly	35.7%	0.0%	50.0%	75.0%	45.0%		66.7%	100.0%	100.0%	66.7%	72.7%	
Non-farm business equipment (PDM=74) (SDM=74)												
No	6.9%	11.1%	16.7%	6.7%	9.5%		34.5%	26.3%	15.4%	38.5%	29.7%	
Yes, solely	44.8%	11.1%	33.3%	40.0%	33.8%		13.8%	10.5%	15.4%	15.4%	13.5%	
Yes, jointly	48.3%	77.8%	50.0%	53.3%	56.8%		51.7%	63.2%	69.2%	46.2%	56.8%	
House or other structures (PDM=539) (SDM=503)												
No	8.6%	2.6%	9.1%	5.3%	7.1%		7.3%	5.4%	5.8%	1.6%	5.4%	
Yes, solely	12.6%	14.5%	11.7%	9.9%	12.1%		6.8%	4.1%	1.5%	7.1%	5.8%	
Yes, jointly	78.8%	82.9%	79.2%	84.7%	80.9%		85.9%	90.5%	92.8%	91.3%	88.9%	
Large consumer durables (PDM=594) (SDM=556)												
No	13.8%	7.6%	5.1%	10.9%	11.1%		1.8%	1.3%	1.4%	0.0%	1.3%	
Yes, solely	7.7%	7.6%	5.1%	6.5%	7.1%		12.7%	6.6%	2.7%	10.6%	10.1%	
Yes, jointly	78.5%	84.8%	89.9%	82.6%	81.8%		85.5%	92.1%	95.9%	89.4%	88.7%	

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Small consumer durables (PDM=582) (SDM=549)												
No	27.1%	31.3%	14.3%	27.7%	26.1%		0.4%	0.0%	0.0%	0.0%	0.2%	
Yes, solely	5.6%	7.5%	3.9%	5.8%	5.7%		31.1%	25.0%	18.9%	30.3%	28.4%	
Yes, jointly	67.4%	61.3%	81.8%	66.4%	68.2%		68.5%	75.0%	81.1%	69.7%	71.4%	
Mobile phones (PDM=516) (SDM=477)												
No	27.7%	32.4%	27.5%	48.7%	33.0%	***	32.2%	30.9%	36.9%	44.8%	35.4%	*
Yes, solely	42.3%	40.5%	39.1%	22.1%	37.2%	***	33.9%	41.2%	26.2%	20.0%	30.8%	*
Yes, jointly	30.0%	27.0%	33.3%	29.2%	29.8%	***	33.9%	27.9%	36.9%	35.2%	33.8%	*
Other land not used for agricultural purposes (PDM=101) (SDM=91)												
No	10.0%	7.1%	0.0%	13.6%	8.9%		15.9%	6.3%	0.0%	5.0%	9.9%	
Yes, solely	32.0%	14.3%	20.0%	9.1%	22.8%		2.3%	6.3%	0.0%	5.0%	3.3%	
Yes, jointly	58.0%	78.6%	80.0%	77.3%	68.3%		81.8%	87.5%	100.0%	90.0%	86.8%	
Means of transportation (PDM=495) (SDM=465)												
No	8.3%	10.7%	13.0%	19.6%	11.5%	**	31.9%	20.8%	21.9%	38.5%	30.1%	
Yes, solely	33.5%	26.7%	20.3%	24.7%	28.9%	**	1.7%	2.8%	3.1%	3.3%	2.4%	
Yes, jointly	58.3%	62.7%	66.7%	55.7%	59.6%	**	66.4%	76.4%	75.0%	58.2%	67.5%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A4. Percent of PDMs and SDMs who had a loan in the last 12 months from various sources, by district.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Dairy cooperative	26.3%		8.8%		42.5%		69.3%		36.2%	***	26.1%	a	6.6%		40.5%	a	70.7%		35.9%	***
Formal lender (bank/financial institution)	30.0%	b	20.0%	ab	7.5%	a	8.6%	a	20.7%	***	31.4%	b	21.1%	ab	8.1%	a	9.0%	a	21.7%	***
Informal lender	0.7%		0.0%		0.0%		0.0%		0.3%		0.4%		0.0%		0.0%		0.0%		0.2%	
Friends/relatives (charging zero interest)	6.3%		11.3%		6.3%		2.9%		6.2%		6.8%		10.5%		6.8%		3.0%		6.4%	
Union	0.0%	a	0.0%	a	1.3%	a	0.0%	a	0.2%	*	0.0%	a	0.0%	a	1.4%	a	0.0%	a	0.2%	*
Informal savings and credit groups	0.0%		1.3%		1.3%		0.0%		0.3%		0.0%		1.3%		1.4%		0.0%		0.4%	
Non-government organisation	0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	
Other	1.3%		0.0%		0.0%		0.0%		0.7%		1.4%		0.0%		0.0%		0.0%		0.7%	
None	38.7%	b	60.0%		37.5%	ab	22.1%	a	37.5%	***	36.1%	b	59.2%		37.8%	ab	21.1%	a	35.9%	***
Don't know	0.0%		0.0%		0.0%		0.0%		0.0%		0.4%		0.0%		0.0%		0.0%		0.2%	

[1]Sig = Significance; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A5. Percent of PDMs and SDMs reporting on the forms of loan taken in the last 12 months from various sources, by district.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**	**Bandung**	**Bogor**	**Cianjur**	**Garut**	**Total**	**Sig[1]**
Dairy cooperative (PDM=217) (SDM=202)												
Cash	94.9%	100.0%	100.0%	99.0%	97.7%		95.9%	100.0%	100.0%	98.9%	98.0%	
In-kind	3.8%	0.0%	0.0%	0.0%	1.4%		2.7%	0.0%	0.0%	0.0%	1.0%	
Cash and in-kind	1.3%	0.0%	0.0%	1.0%	0.9%		1.4%	0.0%	0.0%	1.1%	1.0%	
Formal lender (bank/financial institution) (PDM=124) (SDM=122)												
Cash	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	100.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Informal lender (PDM=2) (SDM=1)												
Cash	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	100.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Friends/relatives (charging zero interest) (PDM=37) (SDM=36)												
Cash	100.0%	88.9%	60.0%	50.0%	86.5%	***	100.0%	87.5%	60.0%	50.0%	86.1%	***
In-kind	0.0%	11.1%	40.0%	50.0%	13.5%	***	0.0%	12.5%	40.0%	50.0%	13.9%	***
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Union (PDM=1) (SDM=1)												
Cash	0.0%	0.0%	100.0%	0.0%	100.0%		0.0%	0.0%	100.0%	0.0%	100.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Informal savings and credit groups (PDM=2) (SDM=2)												
Cash	0.0%	100.0%	100.0%	0.0%	100.0%		0.0%	100.0%	100.0%	0.0%	100.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Other (PDM=19) (SDM=20)												
Cash	100.0%	50.0%	100.0%	100.0%	94.7%		100.0%	50.0%	100.0%	100.0%	95.0%	
In-kind	0.0%	50.0%	0.0%	0.0%	5.3%		0.0%	50.0%	0.0%	0.0%	5.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Districts with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A6. Percent of PDMs and SDMs reporting on decision making on borrowing funds, by district.

	Primary Decision Maker (n=402)										Secondary Decision Maker (n=384)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Decisions to borrow																				
Self	94.4%		94.3%		87.5%		94.8%		93.5%		82.4%		87.5%		84.6%		84.8%		83.9%	
Spouse	83.1%	a	65.7%	a	71.4%	a	76.7%	a	78.1%	*	95.7%	b	87.5%	ab	78.8%	a	93.8%	b	92.2%	***
Other HH member[2]	3.6%		2.9%		7.1%		1.7%		3.5%		2.1%		3.1%		7.7%		1.8%		2.9%	
Non-HH member[2]	2.1%		0.0%		0.0%		0.0%		1.0%		1.1%		0.0%		0.0%		0.0%		0.5%	
Decisions regarding borrowed funds																				
Self	87.7%		91.4%		83.9%		85.3%		86.8%		83.5%		84.4%		82.7%		90.2%		85.4%	
Spouse	80.0%		74.3%		73.2%		85.3%		80.1%		89.9%	b	81.3%	ab	75.0%	a	91.1%	b	87.5%	**
Other HH member[2]	3.6%	a	0.0%	a	7.1%	a	0.9%	a	3.0%	*	2.1%	a	0.0%	a	7.7%	a	1.8%	a	2.6%	*
Non-HH member[2]	2.1%		0.0%		0.0%		0.0%		1.0%		1.6%		0.0%		0.0%		0.0%		0.8%	

[1]Sig = Significance; [2]HH = Household; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A7. Percent of PDMs and SDMs who are members of various groups, by district.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Bandung		Bogor		Cianjur		Garut		Total		Bandung		Bogor		Cianjur		Garut		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Farmer group[2]	83.0%		86.3%		81.3%		82.9%		83.2%		16.4%	a	26.3%	ab	20.3%	ab	33.8%	b	22.4%	***
Youth union	8.3%		3.8%		5.0%		8.6%		7.3%		1.1%		2.6%		1.4%		1.5%		1.4%	
Forest user's group	9.7%	b	1.3%	a	1.3%	a	6.4%	ab	6.7%	***	5.0%		3.9%		1.4%		2.3%		3.7%	
Credit, microfinance, and insurance group	1.3%		2.5%		2.5%		3.6%		2.2%		1.8%	a	5.3%	ab	6.8%	ab	9.0%	b	4.6%	***
Trade and business association group	0.7%	a	5.0%		0.0%	a	0.7%	a	1.2%	***	1.4%		3.9%		0.0%		3.0%		2.0%	
Civic and charitable group	9.0%	a	15.0%	ab	10.0%	ab	20.0%	b	12.5%	***	10.7%		10.5%		9.5%		18.0%		12.3%	
Religious group	55.7%	a	71.3%	bc	60.0%	ab	86.4%	c	65.5%	***	69.6%	a	63.2%	a	68.9%	a	91.7%		73.9%	***
Women's union	2.0%		2.5%		0.0%		0.7%		1.5%		25.4%		30.3%		18.9%		29.3%		26.1%	
Other	1.3%		0.0%		1.3%		0.0%		0.8%		1.4%		1.3%		0.0%		0.8%		1.1%	

[1]Sig = Significance; [2]Includes agricultural livestock and fisheries producers groups (including marketing); * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

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

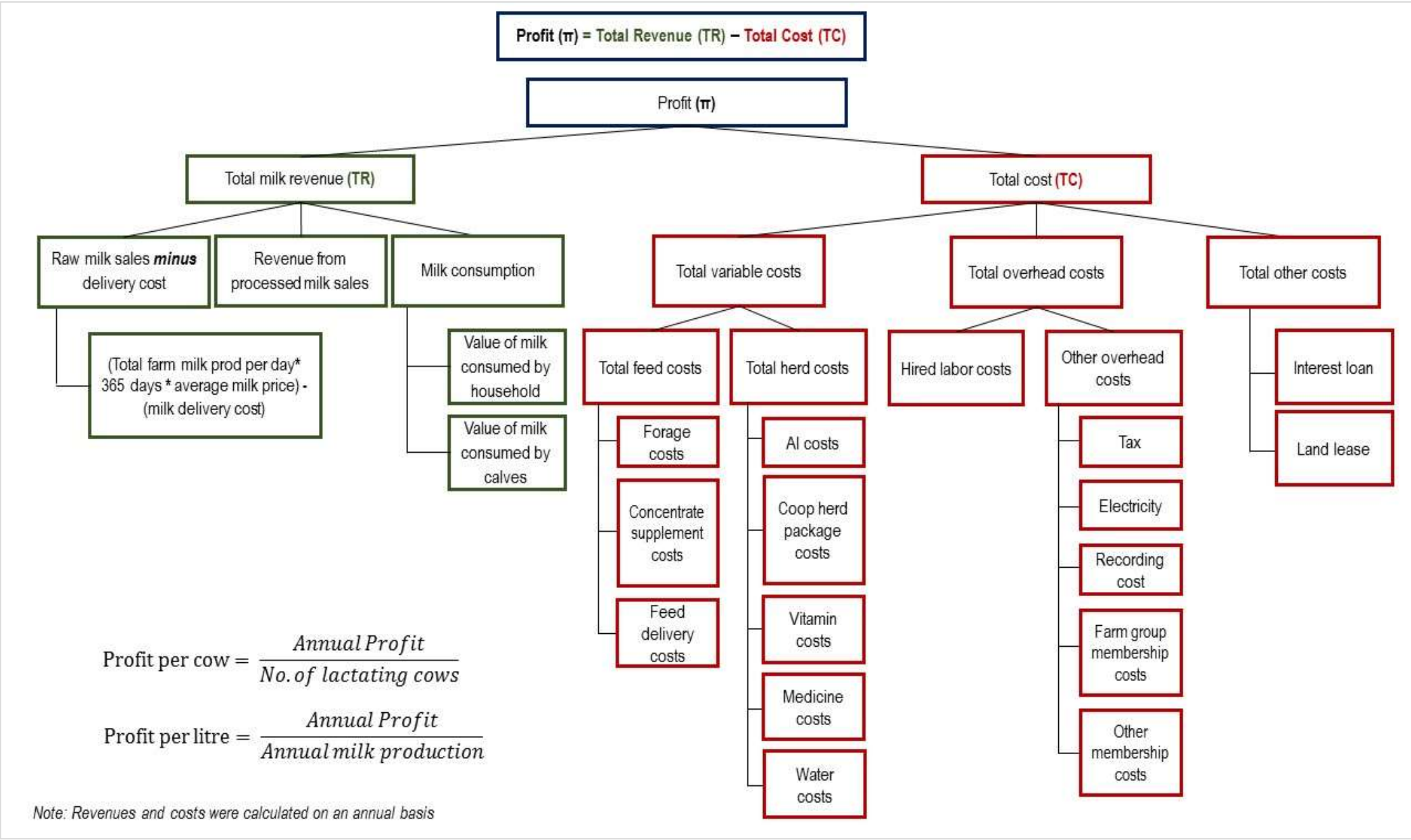

Figure 1. Details of benchmarking model to calculate dairy farm profitability. All revenue and costs were calculated per annum in IDR.

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.

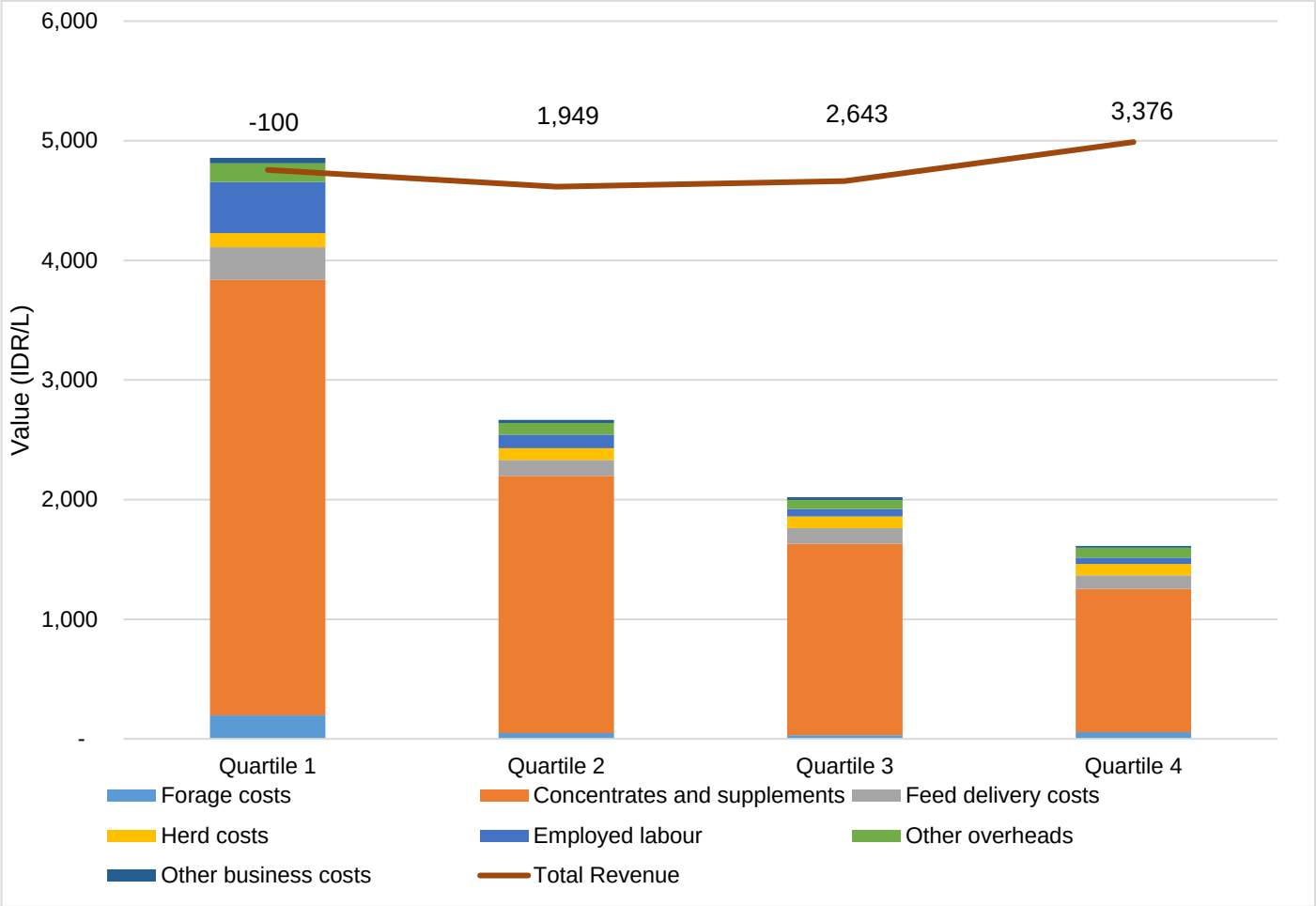

Figure 2. Comparison between profit quartiles of production costs and revenue per litre of milk produced. The total height of each column represents total costs while the brown line represents total revenue. The numbers at the top of each column represent profit per litre.

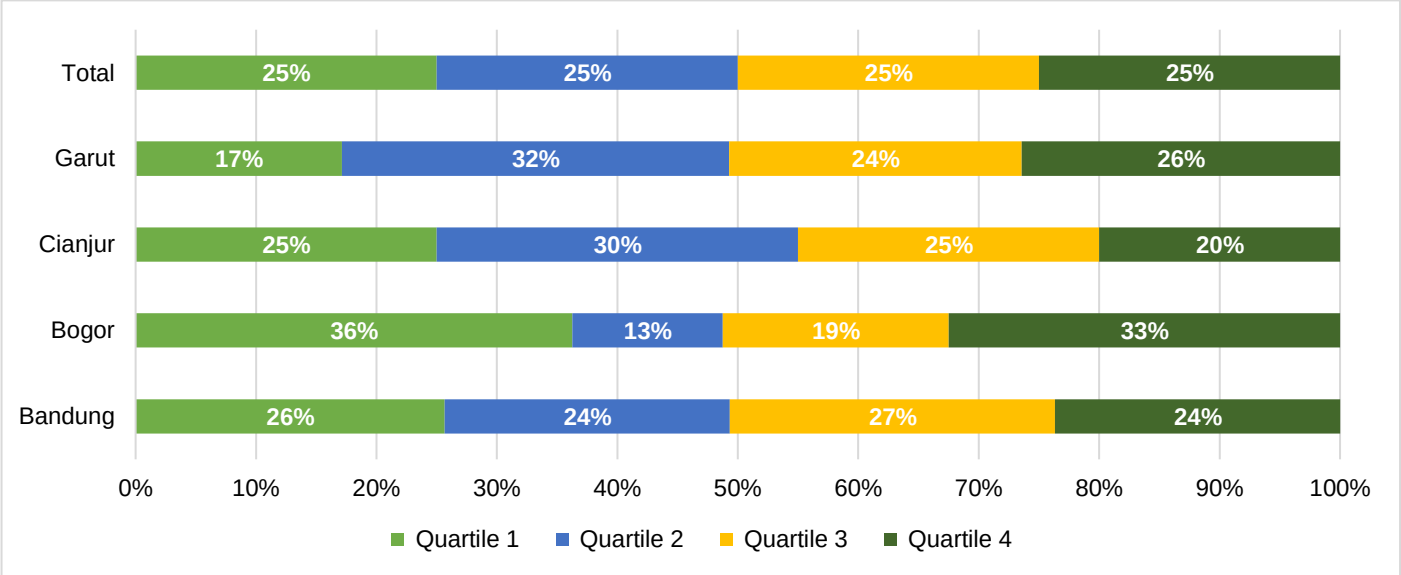

Figure 3. Distribution of profit quartiles by district.

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.

Factsheet 13.1: Profitability Comparison - Household and Farm Characteristics

Background

In the IndoDairy Smallholder Household Survey (ISHS) '*Farm-to-Fact'* series, characteristics of dairy farmers in West Java, including comparisons between the four districts Bogor, Cianjur, Bandung and Garut have so far been assessed.

In Factsheet 13, farmers were categorised into profit-based quartiles. The factsheet identified a set of farmers that are able to achieve higher profit per cow with efficient management and control of costs. Table 1 below shows the average profitability for each quartile.

In this factsheet the same household and farm characteristics presented in Factsheet 3 will be evaluated, however, this time looking for significant differences to help explain the profit quartiles.

Table 1. IndoDairy profitability quartiles.

	Average profit per cow per year	
Quartiles	**IDR**	**USD[1]**
Quartile 1	-687,253	-47.52
Quartile 2	8,652,920	598.42
Quartile 3	13,700,000	947.47
Quartile 4	23,800,000	1645.97

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

Household characteristics

A detailed summary of household and dairy business characteristics by profit quartiles is shown in Table A1 to A3 in the Appendix. The section below summarises characteristics that are and are not different between quartiles.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Age of household head and spouse

- Primary and Secondary Decision Makers for Quartile 1 (Q1) and 2 (Q2) households were significantly older than Quartile 3 (Q3); by approximately 4 years.
- Quartile 4 (Q4) households tended to be younger than Q1 and Q2 but older than Q3 households.

Proportion of household income from dairy farming

- The proportion of household income derived from dairy farming progressively increased from 76% in Q1 to 84% in Q4.

Slight difference

The following characteristics trended towards significance between profit quartiles ($p < 0.10$):

Off-farm proportion of income

- Q4 farmers derived a smaller proportion of their household income from off-farm sources (9%) compared to Q1 (15%).

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Household size
- Number of household assets owned
- House ownership
- Household head gender
- Education of household head and spouse
- Main occupation
- Years of dairy experience
- Main source of capital

Farm characteristics

A detailed summary of farm characteristics by profit quartiles is shown in Table A4 in the Appendix.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Milk production per cow per day

- There was a progressive increase for milk produced per cow per day from Q1 (13.8 litres) to Q4 (17.2 litres) as shown in Figure 1.
- Q1 and Q2 farmers were producing significantly less than Q3 and Q4 quartiles.

Number of dairy cattle

- Number of dairy cattle was lowest in the Q4 (most profitable farmers) and highest in the Q1 (least profitable farmers) with 4.3 and 7.4, respectively.
- Q4 farmers had significantly smaller herds than Q1 and Q2 farmers.
- The number of lactating cows was highest in Q1 (3.3) and smallest in Q4 (2.1).

Proportion of milking cows of total herd

- Farmers in the Q1 (least profitable) had the smallest proportion of currently lactating cows in their herd (47%).
- Q2 and Q3 had the highest proportion (56% respectively).
- Q4 farmers tended to have just over half their herd currently lactating (53%).

Time to travel to artificial insemination (AI) technician

- Q1 farmers reported the shortest travel time (15.6 minutes).
- Q3 farmers travelled the longest amount of time (22.5 minutes).
- Despite the difference being significant, it is unlikely to have substantive impacts on profitability as a shorter time for the most profitable farmers is expected. Additionally, there is only a seven-minute difference between the most extreme times.

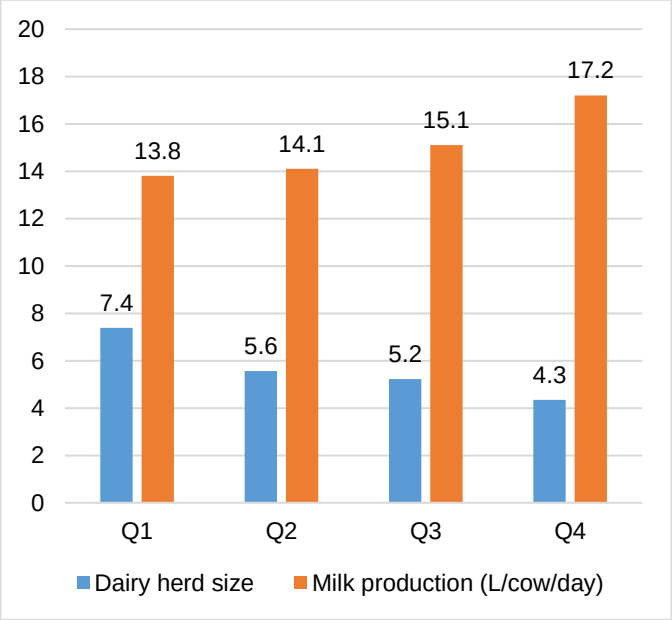

Figure 1. Daily milk production and dairy herd size by profit quartiles.

Slight difference

The following characteristics trended towards significance between profit quartiles ($p < 0.10$):

Number of calves and bulls

- Q1 farmers had the largest number of bulls and calves (2), while Q4 farmers had the smallest numbers.
- However, as a proportion of the herd bulls and calves compromised a similar amount across all quartiles; on average 25% to 28%.

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Altitude
- Total farm milk production
- Number of other ruminant livestock (beef cattle, buffalo and goats)
- Number and size of land plots
- Distance to:
  - Traditional markets
  - Milk collection centres
  - Dairy co-operatives
  - Free grass
  - Agricultural plots
  - Veterinary or animal health officer

Summary

This factsheet highlights significant differences across profit quartiles on household and farm characteristics. Key insights include:

- **Primary and Secondary Decision Makers for Q1 (least profitable) and Q2 households were significantly older thanQ3 by approximately 4 years. Q4 (most profitable) households tended to be younger than Q1 and Q2 but older than Q3 households.**
- **Number of dairy cattle was lowest in the Q4 and highest in the Q1 with 4.3 and 7.4, respectively. Therefore, Q4 farmers had significantly smaller herds than Q1 and Q2 farmers.**
- **Dairy farmers in the Q4 were able to produce more milk per cow (17.2 litres per day) with the least number of dairy cattle (4.3). This reiterates our findings from the previous factsheet, which indicated that the farmers in the Q4 were able to monitor and control their costs effectively and also achieved higher levels of milk production with a lower dairy herd size.**
- **Farmers in the Q1 had the smallest proportion of currently lactating cows in their herd (47%) while farmers in Q2 and Q3 had the highest proportion (56% respectively).**
- **Q1 farmers reported the shortest travel time (15.6 minutes) to artificial insemination technician, while Q3 farmers travelled the longest amount of time (22.5 minutes).**

In the next factsheets, animal characteristics and farm management practices will be further explored.

Appendix to Factsheet 13.1

This appendix provides summary statistics for household and farm characteristics by profit quartiles. Standard deviations (SD) are included where relevant.

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

Table A1. Household summary statistics and socio-demographic characteristics (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]**
Number of households	150			150			150			150			600		
Number of people per household:	3.87	1.49		4.08	1.52		3.97	1.24		3.86	1.47		3.95	1.44	
Adults[4]	2.63	0.94	a	2.71	0.98	a	2.50	0.84	a	2.48	0.90	a	2.58	0.92	*
Children	1.25	1.04		1.39	1.03		1.49	1.02		1.39	1.01		1.38	1.03	
House ownership:															
Owned	84.7%			82.7%			84.7%			83.3%			83.8%		
Rented	1.3%			0.7%			2.0%			2.0%			1.5%		
Other	14.0%			16.7%			13.3%			14.7%			14.7%		
Number of assets owned:															
Mobile phone	1.95	1.48		1.80	1.39		1.63	1.14		1.65	1.10		1.76	1.29	
Internet access	0.85	1.08		0.76	1.05		0.70	0.95		0.67	0.86		0.75	0.99	
Motorbike	1.57	1.13		1.49	1.10		1.45	1.05		1.36	0.98		1.47	1.07	
Car	0.24	0.64		0.09	0.31	a	0.08	0.39	a	0.09	0.35	a	0.13	0.45	***
Truck	0.00	0.00		0.00	0.00		0.01	0.08		0.00	0.00		0.00	0.04	
Television	1.26	0.67		1.15	0.53		1.15	0.48		1.18	0.49		1.19	0.55	
Refrigerator	0.47	0.67	a	0.39	0.52	a	0.33	0.47	a	0.47	0.68	a	0.42	0.59	*
Washing machine	0.23	0.44	b	0.15	0.35	ab	0.12	0.33	b	0.17	0.37	ab	0.17	0.38	*

[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; [4]Adults are ≥ 18 years of age; 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 are not significantly different at the 5% level (p > 0.05).

Table A2. Primary and secondary decision maker summary statistics by profit quartile.

Variable	Quartile 1			Quartile 2			Quartile 3			Quartile 4			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]
Primary decision maker information (n = 600)															
Gender:															
Male	96.0%			95.3%			99.3%			95.3%			96.5%		
Female	4.0%			4.7%			0.7%			4.7%			3.5%		
Age	48.70	12.01	b	48.10	11.17	ab	44.82	11.03	a	46.54	11.82	ab	47.04	11.59	**
Education (years)	6.65	3.37		6.26	3.19		6.06	3.01		6.56	2.88		6.38	3.12	
Main Occupation:															
Dairy farming	80.7%			84.0%			87.3%			88.7%			85.2%		
Farmer or fishermen	6.0%			5.3%			2.0%			1.3%			3.7%		
Self-employed/employer	2.0%			0.7%			0.0%			0.7%			0.8%		
Wage/salaried employee	8.0%			8.7%			8.0%			8.7%			8.3%		
Unpaid family/community worker	1.3%			0.0%			1.3%			0.0%			0.7%		
Unemployed	0.7%			1.3%			0.7%			0.7%			0.8%		
Other	1.3%			0.0%			0.7%			0.0%			0.5%		
Secondary decision maker information (n = 563)															
Gender:															
Male	0.0%			0.0%			0.0%			0.7%			0.2%		
Female	100.0%			100.0%			100.0%			99.3%			99.8%		
Age	43.05	10.43	b	42.01	9.42	b	38.86	9.87	a	41.09	10.52	ab	41.23	10.16	***
Education (years)	6.50	3.17		6.50	2.71		6.55	2.72		6.91	2.62		6.63	2.81	
Main Occupation:															
Dairy farming	23.6%			26.6%			25.2%			17.7%			23.3%		
Farmer or fishermen	5.0%			3.6%			2.0%			1.5%			3.0%		
Self-employed/employer	10.0%			7.9%			10.2%			12.5%			10.1%		
Wage/salaried employee	9.3%			12.2%			13.6%			9.6%			11.2%		
Unpaid family/community worker	40.0%			33.8%			36.7%			44.9%			38.8%		
Unemployed	11.4%			12.2%			12.2%			12.5%			12.1%		
Retired	0.7%			0.7%			0.0%			0.7%			0.5%		
Other	0.0%			2.9%			0.0%			0.7%			0.9%		

[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 ($p < 0.10$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$)

Table A3. Dairy business information summary statistics by profit quartile (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]**
Would you say the dairy business is for your household:															
The main business activity	89.3%			90.7%			92.0%			90.7%			90.7%		
A secondary business	10.0%			9.3%			8.0%			9.3%			9.2%		
Third or fourth	0.7%			0.0%			0.0%			0.0%			0.2%		
Proportion of household income (%):															
Dairy farming	75.83	35.76		78.57	38.03		80.19	43.01		83.87	24.91		79.61	36.07	
Off-farm[4]	14.60	31.43	a	8.05	17.82	a	9.95	21.39	a	8.53	19.12	a	10.28	23.16	*
Crops	0.99	6.09		0.17	1.08		0.43	1.88		1.42	7.46		0.75	4.95	
Horticulture	7.16	19.84		11.58	31.42		6.99	29.86		5.34	12.30		7.77	24.66	
Aquaculture	0.07	0.62		0.02	0.26		0.00	0.00		0.00	0.00		0.02	0.33	
Other Livestock	1.35	6.18		1.61	8.28		2.44	21.00		0.83	8.24		1.56	12.39	
Dairy business experience (years)	19.37	10.83		20.10	10.16		17.53	9.74		19.33	10.75		19.08	10.40	
Main source of capital in last 12 months:															
Personal	74.7%			82.7%			84.0%			84.7%			81.5%		
Loan	21.3%			14.0%			16.0%			12.7%			16.0%		
Partnership	89.3%			90.7%			92.0%			90.7%			90.7%		
Inheritance	10.0%			9.3%			8.0%			9.3%			9.2%		

[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; [4] Off-farm: 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 are not significantly different at the 5% level ($p > 0.05$).

Table A4. Farm summary statistics by profit quartile (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]**
Average altitude (km)	1.26	0.33		1.30	0.26		1.30	0.29		1.25	0.31		1.28	0.30	
Daily milk production															
Total farm (L/day)	37.47	39.46		37.86	33.64		41.20	40.38		39.58	25.77		39.02	35.24	
Per lactating cow (L/cow/day) (n=1626)	13.83	4.58	a	14.14	4.38	a	15.11	4.31		17.16	4.35		14.89	4.57	***
No. of livestock (ruminants)															
Dairy cattle	7.39	7.07		5.56	4.27	a	5.23	4.35	a	4.34	3.03	a	5.63	5.02	***
Beef cattle	0.47	4.11		0.05	0.38		0.05	0.32		0.01	0.12		0.15	2.08	
Buffalo	0.99	8.25		0.09	0.50		0.09	0.63		0.24	1.16		0.35	4.19	
Goats/sheep	0.21	1.49		0.03	0.29		0.05	0.41		0.15	0.90		0.11	0.91	
No. of dairy cattle managed															
Lactating cows	3.28	3.56	a	2.92	2.29	a	2.75	2.29	ab	2.07	1.46	b	2.75	2.55	***
Dry cows	0.50	0.93	b	0.26	0.56	a	0.27	0.83	a	0.30	0.74	ab	0.33	0.78	**
Replacement cows	1.53	1.90		1.03	1.14	a	0.89	1.02	a	0.74	0.90	a	1.05	1.33	***
Other dairy cattle (calves and bulls)	2.07	2.50		1.35	1.64	a	1.34	1.67	a	1.23	1.22	a	1.50	1.84	***
Proportion of milking cows of total herd (%)	47.21	18.70	b	56.41	20.24	a	56.23	19.72	a	53.10	23.28	ab	53.24	20.84	***
Number of land plots per farm	2.25	1.37		2.32	1.38		2.05	1.25		2.10	1.29		2.18	1.32	
Land tenure ownership and usage (ha)															
Total managed	0.82	3.69		0.42	0.66		0.38	0.74		0.35	0.57		0.49	1.94	
Total owned	0.38	2.38		0.13	0.34		0.11	0.54		0.15	0.36		0.19	1.25	
Total used for dairy production[4]	0.23	0.60		0.26	0.50		0.20	0.39		0.20	0.47		0.22	0.50	
Distances in minutes to:															
Traditional market (n=598)	21.45	14.17		25.20	15.50		25.37	18.06		25.11	18.51		24.29	16.70	
Milk collection point (n=592)	7.84	5.35		7.82	6.22		8.72	7.70		8.09	6.32		8.12	6.45	
Dairy co-operatives (n=593)	30.30	24.46		33.78	24.11		35.77	26.22		33.53	27.11		33.35	25.51	
Free grass (n=588)	21.32	19.62		21.25	16.93		23.01	20.63		20.57	18.28		21.53	18.87	
Your agricultural plots (n=582)	9.12	12.93		10.56	13.91		10.01	11.60		8.41	9.09		9.53	12.03	
House of inseminator (n=439)	15.63	13.30	a	19.96	18.17	ab	22.51	21.97	b	16.50	13.44	ab	18.61	17.22	***
Livestock clinic/veterinary doctor (n=381)	25.04	21.91		27.54	22.56		26.20	22.99		27.60	21.32		26.59	22.15	

[1]Value is 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; [4]Land used for dairy production includes for grazing dairy cattle and growing forages; 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 are not significantly different at the 5% level (p > 0.05).

Factsheet 13.2: Profitability Comparison - Individual Cow Characteristics and Farm Management Practices

Background

In the previous factsheet, an overview of the household and farm characteristics of the farmers from IndoDairy Smallholder Household Survey (ISHS) based on profit quartiles was provided. This factsheet assesses differences in dairy cow characteristics and farm management practices by profit quartiles.

The average dairy herd size in the ISHS was 5.6 with an average 2.8 lactating cows.

Individual cow characteristics

Individual production characteristics were recorded for every milking cow at the time of the ISHS. In total, 1,626 milking cows were registered.

Table A1 in the Appendix shows details of individual animal information. The section below summarises characteristics that were and were not different between quartiles.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Daily milk production

- As discussed in the previous factsheet, milk production per cow was significantly different between the profit quartiles.
- Quartile 4 (Q4) cows were producing significantly more milk per day (17.2 litres) compared to the other quartiles.
- Q1 cows were producing significantly less milk than other quartiles (13.8 litres).

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Method of breeding
- Cow age
- Cow weight
- Parity
- Age at first calving
- Calving interval

Herd management

Herd management practices for cows and calves are summarised in Table A2 and A3 in the Appendix, respectively. The section below

summaries the key characteristics different between profit quartiles in relation to how farmers managed their herd.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Timing of first colostrum feed

- A higher proportion of Q1 farmers (least profitability) fed colostrum to their calves less than hour after parturition (65%), as compared to the other quartiles.
- However, across all four quartiles more than 90% of farmers fed colostrum within 3 hours after parturition.

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Cattle housing and restraints
- Heat detection method
- Induction of oestrus method
- Amount and frequency of colostrum fed to calves
- Calf deworming
- Calf dehorning
- Age male calves are sold

Disease occurrence in cattle

The occurrence of cattle health issues, including calves and cows, is summarised in Figure 1 and Table A4 in the Appendix.

Figure 1 shows the proportion of farms that had the issue occur. In general, there was a slightly higher proportion of farms in Q1 that had the issue on their farm, as compared to Q3 and Q4. The section below summarises those that were significant.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Mange (infection of mites)

- A higher proportion of farmers in Q4 (most profitable) reported never having an issue with mites (89%), compared to the other quartiles.
- More Q1 farmers had an issue with mange compared to the other quartiles. However, farmers reported this as an 'occasional' issue.

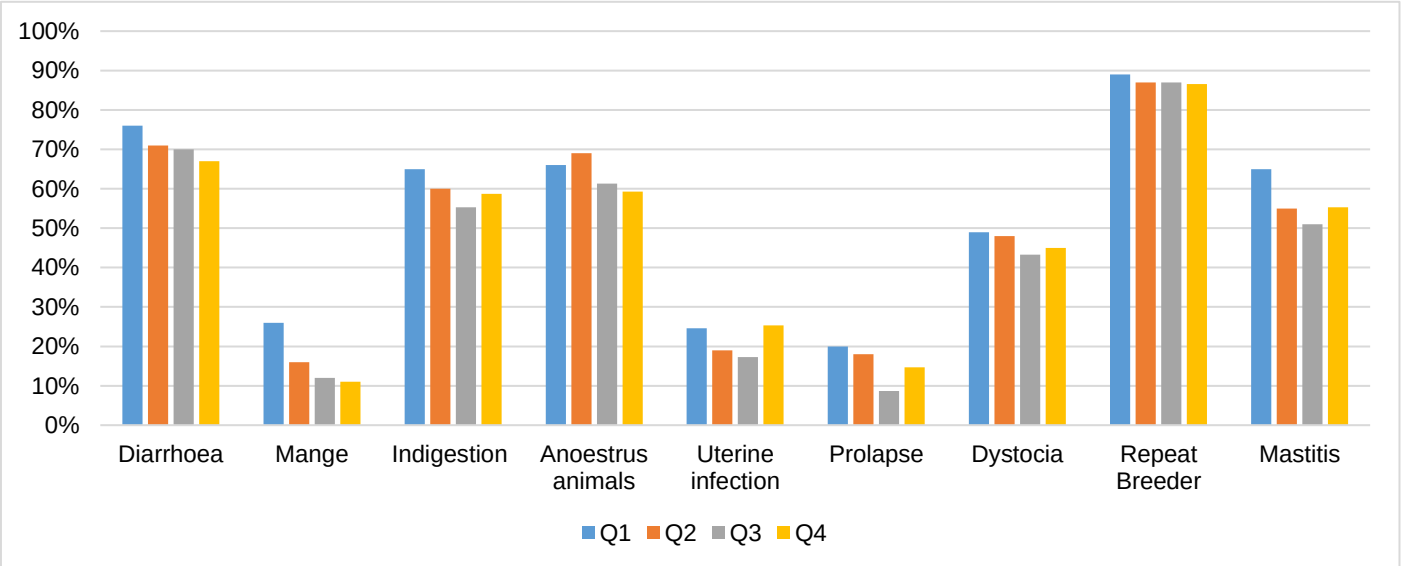

Figure 1. Occurrence of disease in cattle by profit quartiles.

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Diarrhoea in calves
- Indigestion in calves
- Anoestrus animals
- Uterine infections
- Prolapse
- Dystocia
- Repeat Breeder
- Mastitis

Summary

This factsheet highlighted differences between profit quartiles regarding a few animal characteristics, disease occurrence and herd practices. Key insights highlighted include:

- **Q4 (most profitable) cows were producing significantly more milk per day (17.2 litres) compared to the other quartiles while, Q1 (least profitable) cows were producing significantly less milk than other quartiles (13.8 litres).**
- **There were no significant differences across profit quartiles in method of breeding, cow age, cow weight, parity, age at first calving and calving interval.**
- **A higher proportion of Q1 farmers fed colostrum to their calves less than hour after parturition (65%), as compared to the other quartiles.**
- **There were no significant differences between quartiles in cattle housing restraints, heat induction method, induction of oestrus, amount and frequency of colostrum fed to calves, and calf deworming and dehorning.**
- **Cows in Q4 had a low prevalence of mange (infection of mites).**
- **There were no significant differences between quartiles in occurrence of diarrhoea and indigestion in claves, anoestrus animals, uterine infections, prolapse, dystocia, repeat breeder and mastitis.**

The following factsheet, Factsheet 13.3, provides information on dairy farm inputs across the profit quartiles.

Appendix to Factsheet 13.2

This appendix lists dairy farm management practices for the entire sample grouped by profit quartiles. Standard deviations (SD) are included where relevant.

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

Table A1. Dairy cow information by profit quartile (n = 1,626).

	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]**
Method of Breeding (n=1,626)															
Artificial Insemination (AI)	100.0%			100.0%			100.0%			100.0%			100.0%		
Cow age (months) (n=1,578)	60.07	24.41		61.42	25.53		60.08	23.28		59.16	22.55		60.27	24.08	
Cow weight (kg)[4] (n=1,571)	438.81	76.20		434.34	72.60		437.10	69.71		436.36	64.35		436.70	71.35	
Parity (n=1,616)	2.90	1.83		3.16	2.10		3.04	1.89		3.00	1.77		3.03	1.91	
Age at first calving (months) (n=1,545)	27.10	3.41		27.16	9.90		26.89	4.36		27.61	4.84		27.16	6.29	
Calving interval (months) (n=1,224)	13.60	2.47		13.63	2.53		13.55	3.53		13.57	2.58		13.59	2.81	
Daily milk production (L/cow/day) (n=1,626)	13.83	4.58	a	14.14	4.38	a	15.11	4.31		17.16	4.35		14.89	4.57	***

[1]Value is either percentage or mean; [2]SD = Standard Deviation; [3]Sig = Significance; [4]Cow weight is based on farmers' estimation; * $p < 0.10$, ** $p < 0.05$ 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 are not significantly different at the 5% level ($p > 0.05$).

Table A2. Dairy management practices by profit quartile (n = 600).

Variable	Quartile 1 Value	Quartile 2 Value	Quartile 3 Value	Quartile 4 Value	Total Value	Sig[1]
Cattle housing						
Offered shade part of the day	0.7%	0.0%	0.0%	1.3%	0.5%	
Offered shade all day	4.7%	4.7%	2.0%	4.7%	4.0%	
Continuously housed	94.7%	95.3%	98.0%	94.0%	95.5%	
Cattle restraints						
Continuously tied	98.0%	100.0%	99.3%	98.7%	99.0%	
Tied for part of the day	0.0%	0.0%	0.7%	0.7%	0.3%	
Not tied	2.0%	0.0%	0.0%	0.7%	0.7%	
Heat detection						
Visual	100.0%	100.0%	99.3%	100.0%	99.8%	
None	0.0%	0.0%	0.7%	0.0%	0.2%	
Induction of oestrus						
One shot of prostaglandin	52.7%	51.3%	44.7%	36.7%	46.3%	
Two shots of prostaglandin	4.7%	6.7%	11.3%	8.0%	7.7%	
None	30.7%	26.0%	33.3%	37.3%	31.8%	
Other	12.0%	16.0%	10.7%	18.0%	14.2%	

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

Table A3. Calves management by profit quartile.

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Timing of first colostrum feed (n = 599)						
0 - 1 hour	64.7%	56.0%	58.0%	55.7%	58.6%	**
1 - 3 hours	29.3%	42.0%	32.7%	36.9%	35.2%	**
4 - 6 hours	6.0%	1.3%	5.3%	5.4%	4.5%	**
7 - 12 hours	0.0%	0.7%	4.0%	2.0%	1.7%	**
Times colostrum is fed per day (n = 599)						
Twice a day	87.3%	82.0%	81.3%	83.9%	83.6%	
Three times a day	12.7%	18.0%	18.7%	16.1%	16.4%	
Amount of colostrum provided per feed (n = 599)						
1-2 litres	47.3%	42.7%	49.3%	49.7%	47.3%	
3-4 litres	44.7%	51.3%	45.3%	44.3%	46.4%	
More than 5 litres	8.0%	6.0%	5.3%	6.0%	6.3%	
Calf deworming (n = 600)	77.3%	84.0%	76.7%	77.3%	78.8%	
Age of deworming? (n = 473)						
1 - 2 months	1.7%	0.0%	1.7%	2.6%	1.5%	
3 - 4 months	8.6%	14.3%	6.1%	10.3%	9.9%	
5 - 6 months	69.0%	69.8%	72.2%	65.5%	69.1%	
Other	20.7%	15.9%	20.0%	21.6%	19.5%	
Calf dehorning (n = 600)	1.3%	2.7%	1.3%	2.7%	2.0%	
Age males calves sold (n = 600)						
0 - 3 months	10.0%	12.0%	14.0%	10.0%	11.5%	
4 - 7 months	51.3%	48.7%	45.3%	43.3%	47.2%	
8 - 11 months	2.7%	6.0%	7.3%	5.3%	5.3%	
12 - 17 months	8.7%	7.3%	8.0%	8.0%	8.0%	
More than 18 months	10.0%	6.0%	5.3%	4.0%	6.3%	
Not sold	17.3%	20.0%	20.0%	29.3%	21.7%	

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

Table A4. Disease occurrence in cattle by profit quartile (n = 600).

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Diarrhoea						
Never	24.0%	29.3%	30.0%	32.7%	29.0%	
Occasionally	56.7%	52.0%	54.0%	48.0%	52.7%	
Often	19.3%	18.7%	16.0%	19.3%	18.3%	
Mange						
Never	74.0%	84.0%	88.0%	89.3%	83.8%	***
Occasionally	25.3%	14.0%	11.3%	9.3%	15.0%	***
Often	0.7%	2.0%	0.7%	1.3%	1.2%	***
Indigestion						
Never	35.3%	40.0%	45.3%	41.3%	40.5%	
Occasionally	55.3%	50.0%	47.3%	50.0%	50.7%	
Often	9.3%	10.0%	7.3%	8.7%	8.8%	
Anoestrus animals						
Never	34.0%	30.7%	39.3%	40.7%	36.2%	
Occasionally	50.7%	56.7%	50.0%	49.3%	51.7%	
Often	15.3%	12.7%	10.7%	10.0%	12.2%	
Uterine infection						
Never	74.7%	80.7%	82.7%	74.7%	78.2%	
Occasionally	24.0%	18.0%	15.3%	25.3%	20.7%	
Often	1.3%	1.3%	2.0%	0.0%	1.2%	
Prolapse						
Never	80.0%	82.0%	90.7%	85.3%	84.5%	
Occasionally	19.3%	17.3%	9.3%	14.7%	15.2%	
Often	0.7%	0.7%	0.0%	0.0%	0.3%	
Dystocia						
Never	51.3%	52.0%	57.3%	55.3%	54.0%	
Occasionally	42.7%	43.3%	40.7%	38.7%	41.3%	
Often	6.0%	4.7%	2.0%	6.0%	4.7%	
Repeat Breeder						
Never	10.7%	12.7%	12.7%	13.3%	12.3%	
Occasionally	34.7%	32.7%	36.0%	42.7%	36.5%	
Often	54.7%	54.7%	51.3%	44.0%	51.2%	
Mastitis						
Never	35.3%	44.7%	49.3%	45.3%	43.7%	
Occasionally	56.7%	50.0%	44.7%	47.3%	49.7%	
Often	8.0%	5.3%	6.0%	7.3%	6.7%	

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

Factsheet 13.3: Profitability Comparison - Dairy Farm Inputs

Background

In the previous factsheet, information on individual cow characteristics and farm management practices was considered. In this factsheet, the characteristics of the IndoDairy Smallholder Household Survey (ISHS) based on profit quartiles will be studied further, focusing on farming inputs.

Dairy co-operative Animal Health Packages

Dairy co-operatives in West Java play a critical role as input suppliers for farmers, in many cases sourcing raw materials and mixing concentrates. Some dairy co-operatives provide this in the form of "package", where a portion of the milk sales from farmers goes towards covering the costs of supplying feeds, supplements and subsidising animal health services (including vets and artificial insemination). Summary statistics of Animal Health Packages across the profit quartiles are shown in Table A1 in the Appendix.

- As presented in a previous factsheet, most farmers across the profit quartile received a package from their co-operative, representing 73% of farmers.
- Although not significantly different, the percentage of farmers receiving this support was highest in Quartile 2 (Q2) (76%) while lowest in Quartile 1 (Q1) (67%).
- Based on these results, it is difficult to determine if the provision of this service would likely have a standalone impact on profitability. It would likely be determined by the quality of the inputs provided in the package and the pricing in place.

Inputs used

Inputs used by farmers in the ISHS are summarised in Table A2 in the Appendix. These inputs are a separate purchase to those supplied on the dairy co-operative Animal Health Package. The section below summarises how the proportions of inputs used differed between the profit quartiles.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Concentrates

- As shown in Figure 1 below, number of farmers sourcing concentrates was the lowest among Q4 farmers (88%) compared to Q1 farmers (97%).

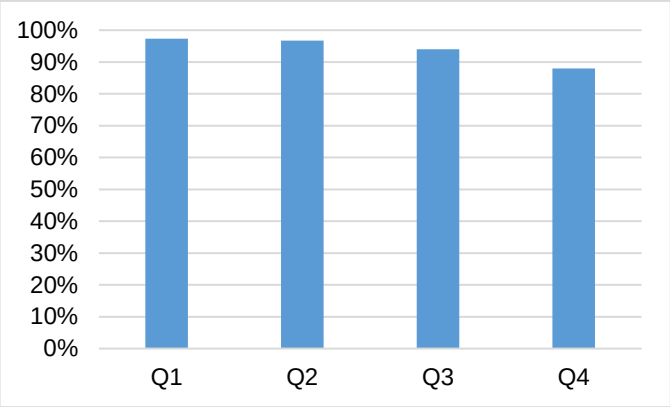

Figure 1. Use of concentrates across profit quartiles.

Medicines

- Out of the 21% total farmers that sourced medicines, 3% farmers in Q1 sourced 3 types of medicines compared to less than 1% for Q2, Q3 and Q4.

Slight difference

The following characteristics were significantly different between profit quartiles ($p < 0.10$):

Forages and grasses

- Similar to concentrates, slightly fewer farmers in Q4 (most profitable) reported the use of forage or grasses (95%) compared to the other quartiles which were over 98%.

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Artificial Insemination (AI)
- Vitamins
- Mineral mix
- Crop straws
- Forage legumes
- Feed wastes (e.g. tofu, cassava or vegetable wastes)

Quality of concentrates

Concentrates are a nutrient-dense source of energy and proteins which enables dairy cows to maximise their biological capacity to produce milk and maintain their body condition. For dairy production, sourcing high quality concentrates is essential. A key measure of concentrate quality is the crude protein (CP) content. In the ISHS, farmers were asked if they knew the CP for the concentrates they used. These results, comparing profit quartiles are presented in Table A3 in the Appendix.

- **There was no significant variation between the profit quartiles about knowledge or sourcing of concentrates, however, knowledge was generally low.**
- **Overall, only 11% of farmers who used concentrates knew the CP of the concentrates.**
- Of those farmers, the average CP was 14%, which was below the recommended 16% to optimise dairy cow performance. This would likely be due to the higher costs to source or produce higher quality concentrates.
- As previously mentioned, co-operatives are a major source of inputs, which is the case for concentrates. In the ISHS, **94% of farmers who purchase concentrates sourced them from a co-operative.**

Summary

This factsheet looked at comparison of dairy farm inputs between the profit quartiles.

- **Despite there being few input characteristics that were significantly different between profit quartiles, over the past few factsheets, there has been common theme emerging regarding the use and cost of concentrates.**
- **The use of concentrates was significantly higher among the farmers in the first quartile (97%) than the farmers in the fourth quartile (88%). This indicates that about 10% of the farmers in the fourth quartile were not using as much concentrates as the farmers in the first quartile and this was leading to cost control. This could be a result of the ability of farmers in the fourth quartile to source different feeds at lower prices, such as tofu waste, cassava waste,**

fermented soybean waste, vegetable waste, and still maximise the production per cow.

- **There was no significant variation between the profit quartiles about knowledge or sourcing of concentrates, however, knowledge was generally low.**
- **Overall, only 11% of farmers who used concentrates knew the Crude Protein (CP) content of the concentrates.**
- **94% of farmers who purchased concentrates sourced them from a co-operative.**

In an earlier factsheet on profitability (Factsheet 13), it was noted that costs associated with concentrates were one of the most significant point of outlays for dairy farmers. The potential resourceful procurement of the inputs by the farmers in the fourth quartile was resulting in an impact on the costs that these farmers were incurring which were significantly lower than those incurred by the farmers in the first quartile. Additionally, it was potentially a combination of resourcefulness and multiple feed types the most profitable farmers were using on to maximise production and reduce costs. However, this needs to be further investigated in detail.

The following factsheet, Factsheet 13.4, discusses aspects of dairy farm labour across the profit quartiles.

Appendix to Factsheet 13.3

This appendix provides a summary for farming inputs by profit quartiles. Standard deviations (SD) are included where relevant.

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

Table A1. Animal Health Packages from dairy co-operatives by profit quartiles.

Variable	Quartile 1 Value[1]	Quartile 2 Value[1]	Quartile 3 Value[1]	Quartile 4 Value[1]	Total Value[1]	Sig[1]
Farmers who receive an Animal Health Package (n = 600)	66.7%	77.3%	76.0%	71.3%	72.8%	
What is covered in the package? (n=437)						
Artificial Insemination (AI)	66.7%	77.3%	76.0%	71.3%	72.8%	
Medicine	66.7%	76.7%	75.3%	70.0%	72.2%	
Vitamin	64.0%	74.0%	74.7%	68.0%	70.2%	
Veterinary Fees	66.7%	77.3%	75.3%	70.0%	72.3%	
Reproduction Incentive	22.7%	33.3%	28.7%	27.3%	28.0%	

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

Table A2. Percent of farmers using various dairy farm inputs, accounting for those provided in the co-operative packages as shown in Table 1, by profit quartiles (n = 600).

	Quartile 1		Quartile 2		Quartile 3		Quartile 4		Total	
Variable	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**	**Value[1]**	**Sig[2]**
Artificial Insemination	32.0%		22.0%		22.0%		28.7%		26.2%	
Medicines:										
Type 1	26.7%		20.7%		15.3%		22.0%		21.2%	
Type 2	4.7%		3.3%		2.7%		3.3%		3.5%	
Type 3	3.3%	b	0.0%	a	0.0%	a	0.7%	ab	1.0%	***
Vitamins:										
Type 1	18.0%		13.3%		14.7%		14.7%		15.2%	
Type 2	2.7%		0.7%		1.3%		0.0%		1.2%	
Type 3	1.3%		0.0%		0.7%		0.0%		0.5%	
Concentrates:										
Type 1	97.3%	a	96.7%	a	94.0%	ab	88.0%	b	94.0%	***
Type 2	34.7%		28.0%		28.7%		26.7%		29.5%	
Type 3	4.7%	b	2.0%	ab	0.0%	a	1.3%	ab	2.0%	**
Mineral mix	33.3%		28.7%		28.7%		28.7%		29.8%	
Forage or grass	98.0%	a	99.3%	a	98.7%	a	95.3%	a	97.8%	*
Crop straws (rice, corn, vegetable)	14.0%		10.0%		13.3%		9.3%		11.7%	
Forage legumes	6.7%		8.7%		6.0%		6.7%		7.0%	
Feed wastes:										
Tofu waste	24.7%		18.7%		19.3%		18.7%		20.3%	
Cassava waste	23.3%		22.0%		21.3%		17.3%		21.0%	
Fermented soybean waste	0.7%		0.0%		0.0%		0.0%		0.2%	
Soybean meal	0.0%		0.7%		0.0%		0.0%		0.2%	
Palm kernel cake	0.0%		0.7%		0.0%		0.0%		0.2%	
Vegetable waste	27.3%		34.0%		28.0%		24.0%		28.3%	
Other feeds	28.0%		25.3%		20.7%		24.0%		24.5%	

[1]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 are not significantly different at the 5% level ($p > 0.05$).

Table A3. Concentrate knowledge and source by profit quartile.

	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]**
Know concentrate crude protein content (n = 575)	12.9%			10.4%			11.4%			10.4%			11.3%		
Crude protein content of the concentrate (%) (n = 65)	14.12	2.20		15.60	3.36		13.66	4.21		13.73	3.53		14.26	3.36	
Source of concentrates (n = 564):															
Manufacture from free materials	0.7%			0.0%			0.7%			0.0%			0.4%		
Co-operative	93.8%			93.1%			95.7%			92.4%			93.8%		
Inputs supplier	2.7%			3.5%			0.7%			3.8%			2.7%		
Self-mix	0.7%			0.0%			0.0%			0.0%			0.2%		
Other farmers	0.0%			0.7%			0.7%			0.8%			0.5%		
Farmer's group	0.7%			0.7%			2.1%			2.3%			1.4%		
Other	1.4%			2.1%			0.0%			0.8%			1.1%		

[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.

Factsheet 13.4: Profitability Comparison - Dairy Farm Labour

Background

In the previous factsheet, differences between dairy farm inputs were analysed across the four profit quartiles. In this factsheet, the characteristics of the IndoDairy Smallholder Household Survey (ISHS) based on profit quartiles will be further explored, focusing on aspects of dairy farm labour.

Labour sources

The dairy farmers were asked about the main sources of labour they use on the dairy farm. Figure 1 shows the main sources and distribution of labour on dairy farms by profit quartile. Results are also shown in Table A1 in the Appendix.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Main sources of labour:

- 31% of farmers in Quartile 4 (Q4) (most profitable) indicated themselves to be the only source of labour on their farm while in Quartile 1 (Q1), 22% of farmers reported themselves as the only source of labour on their farm.

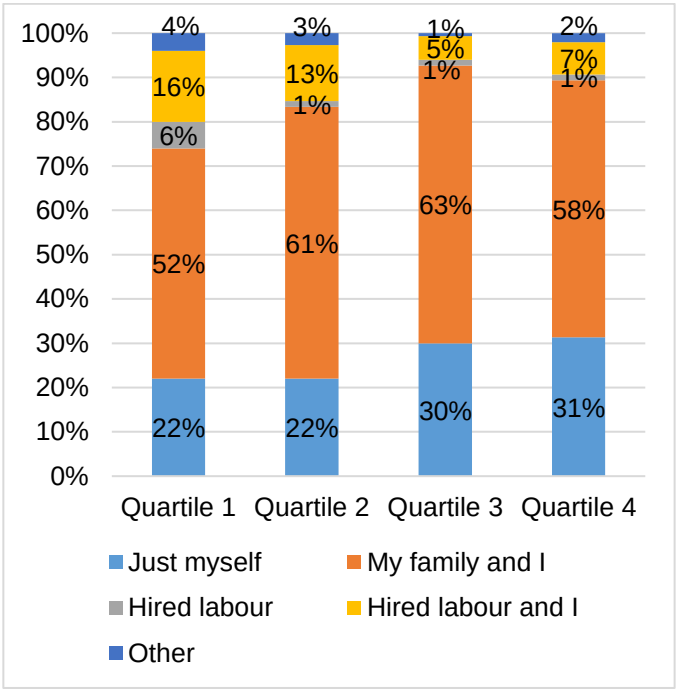

Figure 1. Main sources of labour on dairy farm.

- The number of farmers hiring labourers to work on the dairy farm was higher in Q1 (6%) compared to just 1% in Q2, Q3 and Q4.
- 16% of farmers in Q1 reported that along with hired labour, they themselves were also working on the dairy farm. This was

seen in less than half of the farmers in Q4 (7%).

- Farmers in Q1 reported the highest share of hired labour in the past 12 months with 37% compared to 11% in Q4.

Daily wage rates:

- Farmers in Q1 were paying the highest daily wage rates at IDR 48,503 which was equivalent to USD 3.30, while farmers in Q4 were paying IDR 45,280 which equals to USD 3.13.
- Farmers in Q2 were paying the lowest daily wage rates at IDR 43,909 equivalent to USD 3.03.

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Common method of payment to hired labour
- Ease of finding labour in local area

Family and Employed Labour

The number of hours dairy farmers or hired labour spend on dairy farm is an important determinant of productivity and relates to the cost of dairy farm operations.

The dairy farmers were asked to think about the different activities undertaken on the dairy farm on a daily basis and how long it took every day to complete each activity. The respondents were asked to think about this for each type of labour like the dairy farmer himself, his family or the hired labour. Table A2 in the Appendix shows results based for profit quartiles.

Figure 2 and 3 below show the total number of hours each type of labour spends on the dairy farm operations.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

- Households in Q1 (9.1 hours) and Q4 (8.8 hours) contributed similar amounts of family labour to their dairy farms. This was less than what households in Q2 (10.4 hours) and Q3 (10.6 hours) contributed.
- **Farmers in Q1 employed significantly more labour (4.3 hours per day)** compared to Q4 (0.7 hours), Q3 (1.0 hours) and Q4 (1.3 hours).

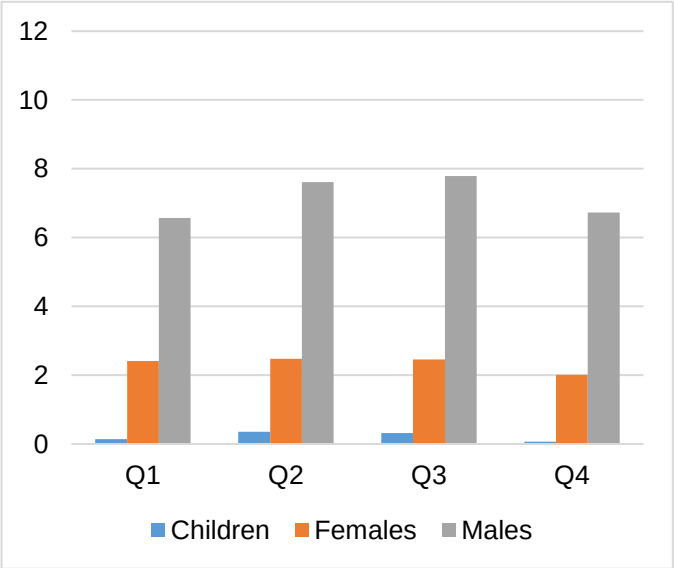

Figure 2. Family labour hours on dairy farm.

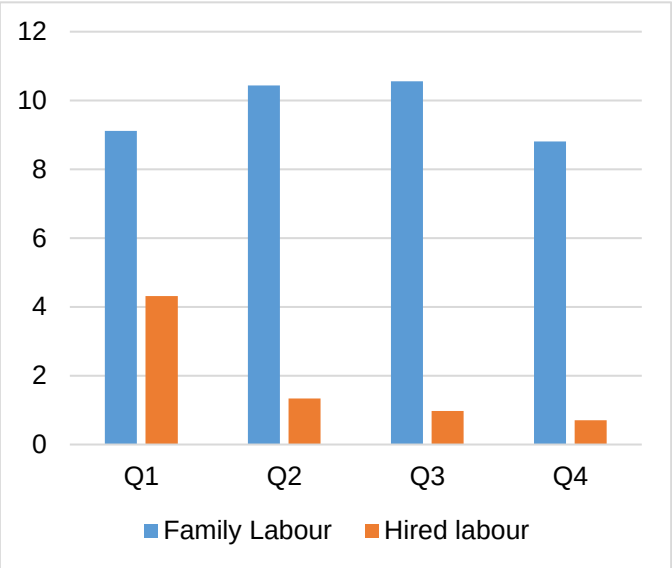

Figure 3. Comparison of family and hired labour hours on dairy farm.

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Number of hours spent by females on dairy farms

Time spent on dairy farming activities

Dairy farm owners and hired labour collectively spent significant amount of time on the farm in various activities. The amount of time both owners and hired labour spent on different activities were examined across the four profit quartiles. The results are summarised in Table A2 in the Appendix.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Collecting forages

- Across the profit quartiles, households spent more time on collecting publicly available grass (4.3 hours), as compared to hired labour (1.0 hours).
- Hired labour in Q1 spent more time (2.2 hours) cutting and carrying grass as compared to hired labour in Q4 (0.4 hours).

Milking

- With regards to milking cows, hired labour in Q1 spent significantly more time (0.61 hours) than hired labour in Q2 (0.13 hours), Q3 (0.11 hours) and Q4 (0.05 hours).

Milk handling (filtering and packing)

- Hired labour in Q4 did not spend a single minute (0.00 hours) handling milk, including activities like filtering and packing, while hired labour in Q1 spent (0.04 hours) on the same activity.

Milk delivery

- Similarly, the amount of time spent by Q1 hired labour on delivering milk was less (0.11 hours) compared to that by hired labour in Q4 (0.03 hours).
- Q4 dairy farm owners spent more time (0.57 hours) delivering milk compared to dairy farm owners in Q1 (0.46 hours).

Summary

- **Collectively the dairy farm owner and family members were the main source of labour on dairy farm.**
- **The share of farmers hiring labour to work on dairy farm was higher amongst farmers in the first quartile compared to that in the fourth quartile.**
- **Farmers in Q1 paid the highest wage rates as compared to farmers in Q2, Q3 and Q4.**
- **Cutting and carrying grass took up significant amount of time for hired labour and dairy farm owners.**

The following factsheet, Factsheet 13.5, discusses the differences between milk production, price and quality across the profit quartiles.

Appendix to Factsheet 13.4

The tables included in this appendix provide summary statistics related to labour inputs at the dairy household level for the entire sample.

Statistical significance between 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A1. Dairy farm labour statistics.

	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]**
Main source of labour (n=600)															
Just myself	22.0%			22.0%			30.0%			31.3%			26.3%		***
My family and I	52.0%			61.3%			62.7%			58.0%			58.5%		***
Hired labour	6.0%			1.3%			1.3%			1.3%			2.5%		***
Hired labour and I	16.0%			12.7%			5.3%			7.3%			10.3%		***
Other	4.0%			2.7%			0.7%			2.0%			2.3%		***
Total litres per labour unit (thousand L/person/year)	7.65	4.45	a	9.01	5.15	ab	10.12	6.63	b	12.07	5.55		9.71	5.72	***
Hired labour in the past 12 months? (n=600)	36.7%			24.0%		b	14.7%		ab	11.3%		a	21.7%		***
Number of people currently hired (n=130)	1.91	1.57	a	1.33	0.68	a	1.45	1.06	a	1.35	0.79	a	1.60	1.22	*
Employed labour daily rate (n=600)															
IDR	48,504	19,108		43,910	17,119		47,036	21,021		45,281	18,867		46,183	19,111	***
USD[4]	3.30	1.32		3.03	1.18		3.25	1.45		3.13	1.30		3.19	1.32	
Common payment methods (n=600)															
Only cash	65.3%			71.3%			63.3%			61.3%			65.3%		
Cash and meals	32.0%			28.0%			34.7%			37.3%			33.0%		
Cash, meals and milk	1.3%			0.0%			0.7%			0.0%			0.5%		
Other	1.3%			0.7%			1.3%			1.3%			1.2%		
Ease of finding local labour (n=600)															
Easy	16.7%			16.7%			20.7%			14.0%			17.0%		
Somewhat easy	19.3%			18.7%			11.3%			18.0%			16.8%		
Difficult	64.0%			64.7%			68.0%			68.0%			66.2%		

[1]Value is either percentage or mean; [2]SD = Standard Deviation; [3]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$). [4]Exchange rate: 1 USD = 14,459.50 Indonesian Rupiah on 27 July 2018.

Table A2. Number of hours spent by labour on dairy farm (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]**
Total number of labour hours on farm															
Owner's labour	9.11	4.77	a	10.44	4.22	b	10.56	3.85	b	8.81	3.15	a	9.73	4.11	***
Children	0.14	0.71	a	0.35	1.22	a	0.31	1.20	a	0.07	0.39	a	0.22	0.95	**
Females	2.41	2.64		2.47	2.90		2.46	2.51		2.01	2.33		2.34	2.60	
Males	6.57	3.81	a	7.61	3.88	bc	7.79	3.01	c	6.73	3.03	ab	7.18	3.49	***
Hired labour	4.31	9.45		1.34	3.55	a	0.98	3.83	a	0.71	2.44	a	1.84	5.71	***
Total number of owner's hours spend on															
Cut-and-carry grass	4.03	2.71	ab	4.73	2.59	bc	4.91	2.42	c	3.87	1.86	a	4.39	2.45	***
Feeding	0.87	0.78	a	0.99	0.71	a	0.88	0.57	a	0.79	0.59	a	0.88	0.67	*
Providing water	0.45	0.47	a	0.65	1.26	a	0.49	0.39	a	0.44	0.47	a	0.51	0.74	*
Milking	0.94	0.96	a	1.22	1.01	b	1.14	0.75	ab	0.91	0.57	a	1.05	0.85	***
Washing barn / cage	1.16	0.84		1.13	0.67		1.21	0.73		1.08	0.69		1.14	0.74	
Washing cows	0.87	0.94		0.80	0.74		0.91	0.78		0.79	0.89		0.84	0.84	
Cleaning equipment	0.27	0.22		0.31	0.20		0.32	0.21		0.27	0.17		0.29	0.20	
Milk handling (filtering / packing)	0.06	0.13		0.09	0.16		0.09	0.17		0.09	0.11		0.08	0.15	
Milk delivery	0.46	0.43	a	0.53	0.45	ab	0.62	0.52	b	0.57	0.56	ab	0.55	0.49	*
Total number of hours hired labour spend on															
Cut-and-carry grass	2.23	4.53		0.94	2.37	a	0.52	1.45	a	0.41	1.36	a	1.02	2.83	***
Feeding	0.37	1.09		0.05	0.25	a	0.07	0.46	a	0.06	0.33	a	0.14	0.64	***
Providing water	0.12	0.38		0.03	0.20	a	0.04	0.27	a	0.03	0.20	a	0.06	0.28	***
Milking	0.61	2.04		0.13	0.50	a	0.11	0.71	a	0.05	0.23	a	0.22	1.14	***
Washing barn / cage	0.39	1.52		0.06	0.30	a	0.10	0.64	a	0.06	0.34	a	0.15	0.86	***
Washing cows	0.37	1.07		0.06	0.25	a	0.08	0.49	a	0.05	0.28	a	0.14	0.63	***
Cleaning equipment	0.09	0.25		0.03	0.15	a	0.03	0.22	a	0.01	0.06	a	0.04	0.19	***
Milk handling (filtering / packing)	0.04	0.16		0.01	0.05	a	0.00	0.01	a	0.00	0.03	a	0.01	0.09	***
Milk delivery	0.11	0.28		0.04	0.14	a	0.02	0.11	a	0.03	0.14	a	0.05	0.18	***

[1]Value is mean; [2]SD = Standard Deviation; [3]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Factsheet 13.5: Profitability Comparison - Milk Productivity, Price and Quality

Background

In the previous factsheet, differences between dairy farm labour across the profit quartiles were considered. In this factsheet, the characteristics of the IndoDairy Smallholder Household Survey (ISHS) based on profit quartiles will be further studied, focusing on milk production, price and quality.

Milk productivity

Detailed milk production statistics are presented in Table A1 in the Appendix. The section below summarises characteristics that were and were not different between quartiles.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Milk produced per lactation

- Milk produced per lactation was calculated based on a 300-day lactation.
- In the previous factsheets, it was shown that milk production per cow per day was significantly higher in Quartile 4 (Q4) (most profitable) and progressively decreased in the other quartiles. This translated to approximately 1,000 litres difference in a cow's lactation between Quartile 1 (Q1) and Q4, as shown in Table 1.

Milk produced per labour unit

- Milk production per labour unit is an efficiency measure based on the amount of milk one person can support in a year.
- Farmers in Q1 (least profitable) were producing the least amount of milk per time spent on dairy farming activities, with on average 7,650 litres per person per year.
- Farmers in Q4 (most profitable) were producing significantly more milk (12,000 litres per person per year), approximately 50% more milk than Q1.

Table 1. Milk production per cow.

Quartiles	Litres per day	Litres per lactation
Quartile 1	13.83	4,148
Quartile 2	14.14	4,242
Quartile 3	15.11	4,531
Quartile 4	17.16	5,148

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.
- There was a significant difference between Q1 and Q4.
- The total land used for dairy farming practices (for grazing cattle or growing fodder crops) was slightly higher in Q1 (0.23 ha). However, these farmers were producing significantly less milk. This translates to approximately 823,000 litres per hectare per year.
- Compared to Q4, who manage less land (0.20 ha) and were producing more milk; they were able to produce 1,692,000 litre per hectare per year, more than double that of Q1.
- This means farmers who were more profitable were using their land more efficiently and producing significantly more milk.

The difference in milk productivity measures was significant across the profit quartiles, with the most profitable farmers using their resources, including their stock, land and time input, more efficiently.

Slight difference

The following characteristics trended towards significance between profit quartiles ($p < 0.10$):

Total farm milk production

- As previously described, total farm milk production per day did not significantly differ between profit quartiles.
- However, Q1 were producing the least amount of milk per day (37.4 litres).
- The difference in milk production between farmers in Q1 and other quartiles was not significant, with farmers in Q3 and Q4 producing 3-4 litres more per day.
- Despite having the largest herd size (7.3), Q1 farmers were producing the smallest amount of milk as total farm unit. This was likely due to these farmers having the lowest production per cow and the smallest proportion of milking cow of the total herd (47.2%), as described in Factsheet 13.1.

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Seasonal difference in milk production

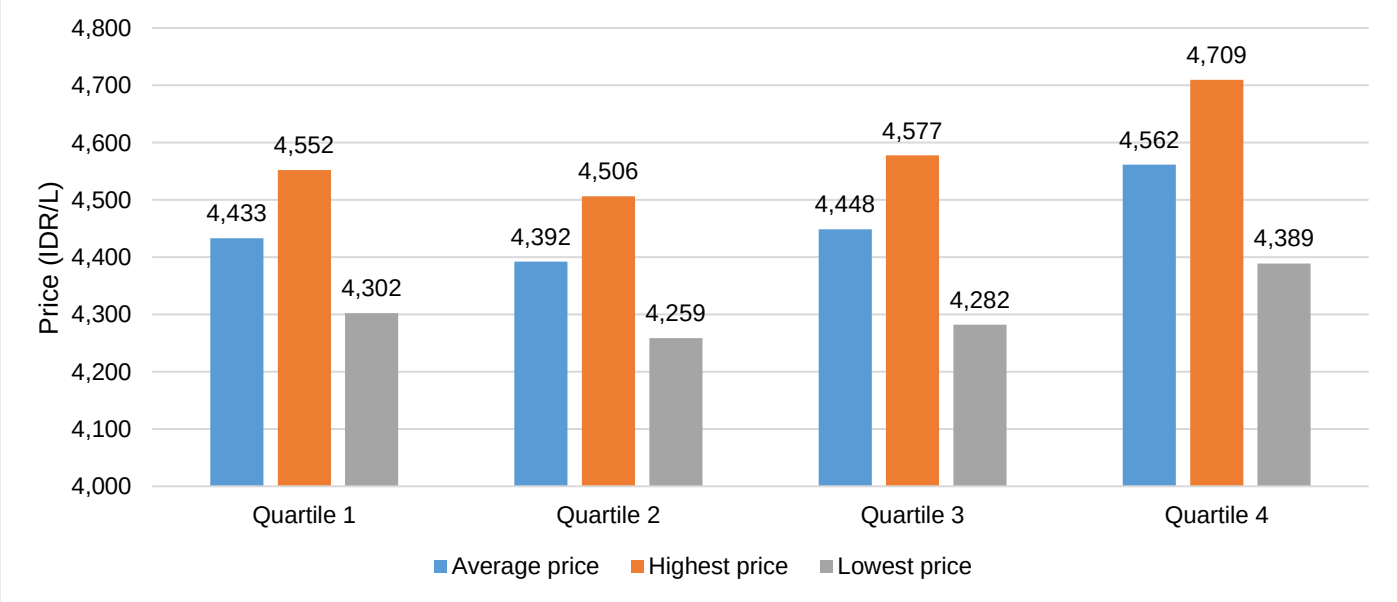

Figure 1. Farm-gate milk price across profit quartiles.

Milk price and agreements with buyers

Detailed milk price statistics and agreements with milk buyers are presented in Table A2 and A3 in the Appendix, respectively. The section below summarises characteristics that were and were not different between quartiles.

Significant difference

The following characteristics were significantly different between profit quartiles ($p < 0.05$):

Milk price

- Farmers were asked what the average, highest and lowest milk price they received per litre of milk.
- Average farm-gate milk price was significantly different between quartiles ($p < 0.05$), with Q4 receiving the highest amount (4,562 IDR or USD 0.32 per litre).
- Between the quartiles, there was a consistent trend for the average, highest and lowest received by farmers (illustrated in Figure 1).
- Q2 (low to medium profits) received lowest milk price, suggesting a significant driver for these farmers' profitability was the price received, compared to farmers in Q1 who were producing the least amount of milk.

Farmers' awareness of milk quality determining price

- While most farmers' reported milk price was determined by quality (87%), the proportion was highest in Q2 (95%), the same farmers who received the lowest price.
- The lowest proportion was reported in Q1 (79%).

No difference

The following characteristics were not significantly different between profit quartiles ($p > 0.10$):

- Form of contract with buyers
- Specific milk quality factors most important for the buyer
- Milk processing on farm

Farmers' knowledge of milk quality factors

Farmers were asked about their knowledge and awareness related to a number of factors related to milk quality, including their understanding of the concept; if they knew the measurement for their farm; and either, what the average is for their farm or why they can't find out the measurement. The responses are summarised in Table A4 in the Appendix.

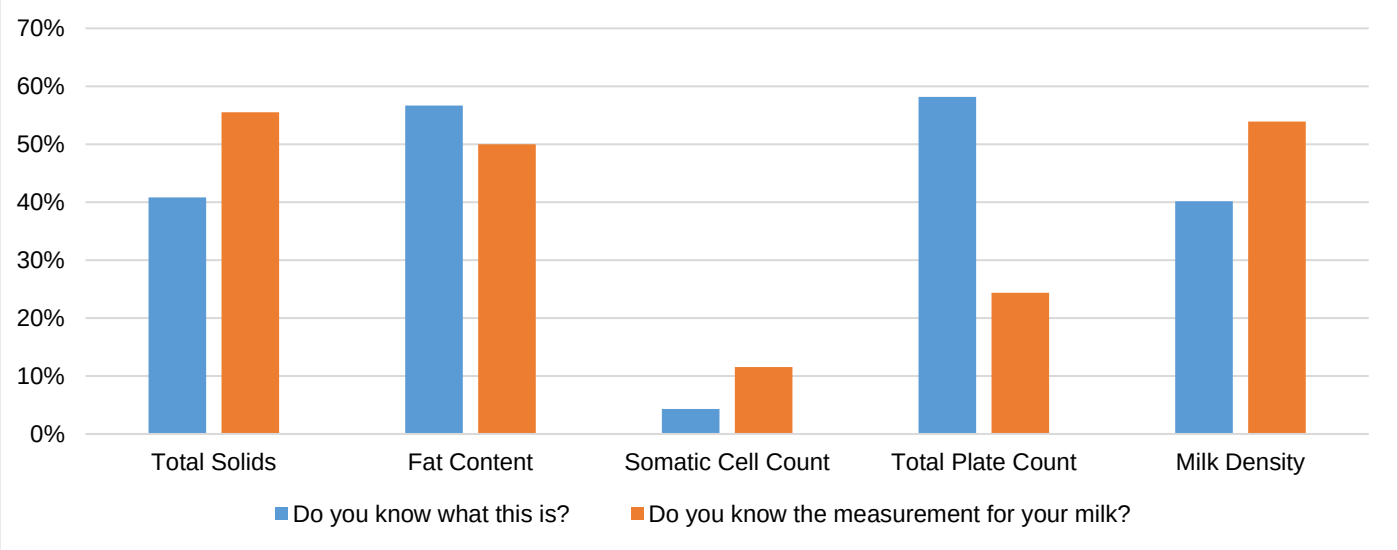

Figure 2. Farmers' knowledge of milk quality parameter.

There was no difference between farmers' knowledge of milk quality parameters across the profit quartiles. However, as described in a previous factsheet, **knowledge of milk quality factors was generally low.**

- Figure 2 summarises the proportion of farmers who knew the measurement of quality parameters for their farm based on those who understand what the concept is.
- **Less than 50% of farmers understood what total solids, milk density and somatic cell counts were conceptually**.
- Fat content and total plate counts (TPC, a measure of bacterial contamination) was understood by more farmers (57% and 58%, respectively). However, only a smaller fraction of these farmers knew the measurement for the milk they produced.

Summary

This factsheet summarises significant differences across profit quartiles regarding milk productivity, price and quality from the IndoDairy Smallholder Household Survey (ISHS).

- **The results show that farmers production per cow per day was significantly higher in Q4 and progressively decreased in the other quartiles. This translates to more than 1,000 litres difference in a cow's lactation between Q1 and Q4.**
- **Farmers in Q1 were producing the least amount of milk (7,650 litres per person per year), while farmers in Q4 were producing significantly more milk (12,000 litres per person per year), approximately 50% more milk than Q1.**
- **Farmers in Q4 were able to produce more milk while managing less land than farmers in Q1, which reflects efficient management of resources on account of Q4 farmers.**
- **Farmers in Q4 were also receiving the highest farm gate price for milk across the four profit quartiles.**
- **There was no significant difference between farmers' knowledge of milk quality parameters across the profit quartiles.**

The following factsheet, Factsheet 13.6, discusses comparison of technology adoption on dairy farms across the profit quartiles.

Appendix to Factsheet 13.5

This appendix provides summary statistics for milk productivity, price and quality by profit quartiles. Standard deviations (SD) are included where relevant.

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

Table A1. Milk production statistics by profit quartile (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]**
Milk Production:															
Total farm (L/day)	37.47	39.46		37.86	33.64		41.20	40.38		39.58	25.77		39.02	35.24	
Per cow (L/cow/day)	13.83	4.58	a	14.14	4.38	a	15.11	4.31		17.16	4.35		14.89	4.57	***
Per lactation (1000L/cow/lactation)	4.14	1.37	a	4.24	1.31	a	4.53	1.29		5.14	1.30		4.46	1.37	***
Per labour unit (1000L/person/year)	7.65	4.45	a	9.01	5.15	ab	10.12	6.63	b	12.07	5.55		9.71	5.72	***
Per land area (100,000L/ha/year) (n = 534)	8.23	16.42	a	11.28	18.3	ab	12.00	23.24	ab	16.92	30.56	b	12.08	22.90	**
Difference in daily milk production between seasons? (n=596)	72.3%			78.5%			76.0%			75.8%			75.7%		
Seasonal milk production (n = 451):															
Dry season (L/day)	37.50	36.62		35.23	30.09		38.98	37.49		39.06	24.59		37.67	32.48	
Wet season (L/day)	41.61	40.17		38.82	33.68		41.59	36.45		42.14	26.29		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). Quartiles with the same letter are not significantly different at the 5% level (p > 0.05).

Table A2. Milk prices by profit quartile (n = 600).

Variable	Quartile 1			Quartile 2			Quartile 3			Quartile 4			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	4,433.07	268.94	a	4,392.48	259.97	a	4,448.43	277.82	ab	4,561.66	617.67	b	4,458.74	390.44	***
Highest	4,551.96	273.76	a	4,506.35	280.38	a	4,577.49	297.00	ab	4,709.39	856.70	b	4,586.09	497.57	***
Lowest	4,302.38	322.88	ab	4,258.77	284.57	a	4,282.21	353.79	ab	4,389.09	591.23	b	4,307.98	407.77	***
Milk Prices (USD cents/L):[4]															
Average	30.65	1.86	a	30.40	1.79	a	30.76	1.92	ab	31.55	4.27	b	30.83	2.70	***
Highest	31.50	1.89	a	31.16	1.93	a	31.65	2.05	ab	32.57	5.92	b	31.71	3.44	***
Lowest	29.75	2.23	ab	29.45	1.96	a	29.61	2.45	ab	30.35	4.09	b	29.79	2.82	***

[1]Value is 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. [4]Exchange rate 1 USD = 14,459.50 Indonesian Rupiah on 27 July 2018 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 are not significantly different at the 5% level ($p > 0.05$).

Table A3. Arrangements between farmers and milk buyers by profit quartile (n = 600).

Variable	Quartile 1 Value[1]	Sig[2]	Quartile 2 Value[1]	Sig[2]	Quartile 3 Value[1]	Sig[2]	Quartile 4 Value[1]	Sig[2]	Total Value[1]	Sig[2]
Form of contract with buyers (n = 599)										
None	84.7%		80.0%		78.0%		78.5%		80.3%	
Written Contract	4.7%		6.0%		7.3%		5.4%		5.8%	
Verbal Contract	10.7%		14.0%		14.7%		16.1%		13.9%	
How is the milk delivered? (n = 600)										
Delivered to end-buyer location	2.0%		1.3%		3.3%		2.0%		2.2%	
Delivered to co-operative/milk collection point	93.3%		88.0%		92.0%		89.3%		90.7%	
Picked up by cooperative	4.7%		10.0%		4.7%		6.7%		6.5%	
Picked up by the buyer	0.0%		0.7%		0.0%		2.0%		0.7%	
Milk processing on-farm (n = 600)										
Filtering	99.3%		98.7%		97.3%		98.0%		98.3%	
Filtering and cool down	0.0%		0.0%		0.0%		0.7%		0.2%	
None	0.7%		1.3%		2.7%		1.3%		1.5%	
Milk priced determined milk quality (n=591)	79.1%	a	94.6%	c	91.8%	bc	83.0%	ab	87.1%	***
Most important quality factors for the buyer (n = 515)										
Total solids (TS)	29.1%		34.0%		28.9%		32.0%		31.1%	
Total plate count (TPC)	43.6%		41.1%		34.8%		36.9%		39.0%	
Fat content	35.9%		44.7%		36.3%		43.4%		40.2%	
Protein content	2.6%		4.3%		2.2%		0.0%		2.3%	
Milk density	17.1%		23.4%		23.7%		27.0%		22.9%	
Absence of adulterants	37.6%		27.7%		32.6%		29.5%		31.7%	
Body condition	11.1%		9.2%		11.1%		9.0%		10.1%	
Genetic quality	0.0%		0.7%		0.0%		0.0%		0.2%	
Liquid content of milk / watery	12.0%		10.6%		12.6%		14.8%		12.4%	
Other	9.4%		9.9%		12.6%		9.0%		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). Quartiles with the same letter are not significantly different at the 5% level (p > 0.05).

Table A4. Farmer knowledge about factors that influence milk quality (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]**
Total solids (TS)															
Do you know what this is?	45.3%			44.7%			33.3%			40.0%			40.8%		
Do you know the measurement for you milk? (n = 245)	55.9%			56.7%			56.0%			53.3%			55.5%		
What is the measurement (%) (n = 136)	11.99	0.65	a	11.53	1.55	a	11.52	0.91	a	12.05	0.76	a	11.78	1.06	*
Why don't you know the measurement (n = 109)															
I cannot measure it	23.3%			34.5%			27.3%			35.7%			30.3%		
I have not been told what the measurement is	73.3%			62.1%			72.7%			64.3%			67.9%		
Not measured by cooperative	3.3%			3.5%			0.0%			0.0%			1.8%		
Fat content															
Do you know what this is?	58.7%			59.3%			50.7%			58.0%			56.7%		
Do you know the measurement for you milk? (n = 340)	56.8%		a	40.4%		a	57.9%		a	46.0%		a	50.0%		*
What is the measurement (%) (n = 170)	4.41	2.08		4.65	2.13		4.69	3.23		3.79	0.97		4.39	2.28	
Why don't you know the measurement (n = 170)															
I cannot measure it	31.6%			20.8%			28.1%			34.0%			28.2%		
I have not been told what the measurement is	65.8%			77.4%			71.9%			66.0%			70.6%		
Not measured by cooperative	2.6%			1.9%			0.0%			0.0%			1.2%		
Somatic Cell Count (SCC)															
Do you know what this is?	3.3%			5.3%			3.3%			5.3%			4.3%		
Do you know the measurement for you milk? (n = 26)	20.0%			0.0%			20.0%			12.5%			11.5%		
What is the measurement (cells/mL) (n = 3)	520.00	.		.	.		3.00	.		12.00	.		178.33	295.93	
Why don't you know the measurement (n = 23)															
I cannot measure it	0.0%			25.0%			0.0%			14.3%			13.0%		
I have not been told what the measurement is	100.0%			75.0%			100.0%			85.7%			87.0%		
Not measured by cooperative	0.0%			0.0%			0.0%			0.0%			0.0%		
Total plate count (TPC)															
Do you know what this is?	60.0%			62.7%			52.0%			58.0%			58.2%		
Do you know the measurement for you milk? (n = 349)	21.1%			28.7%			23.1%			24.1%			24.4%		
What is the measurement (million cfu/ml) (n = 85)	1.31	2.27		0.88	1.72		1.00	1.14		1.10	1.24		1.06	1.63	
Why don't you know the measurement (n = 264)															
I cannot measure it	19.7%			22.4%			28.3%			34.9%			26.1%		
I have not been told what the measurement is	77.5%			76.1%			68.3%			62.1%			71.2%		
Not measured by cooperative	2.8%			1.5%			3.3%			3.0%			2.7%		

Variable	Quartile 1			Quartile 2			Quartile 3			Quartile 4			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 density															
Do you know what this is?	42.0%			42.7%			36.7%			39.3%			40.2%		
Do you know the measurement for you milk? (n = 241)	54.0%			48.4%			65.5%			49.2%			53.9%		
What is the measurement (kg/L) (n = 130)	1.02	0.00		1.02	0.00		1.02	0.00		1.03	0.01		1.02	0.00	
Why don't you know the measurement (n = 111)															
I cannot measure it	20.7%			15.2%			15.8%			26.7%			19.8%		
I have not been told what the measurement is	75.9%			78.8%			84.2%			73.3%			77.5%		
Not measured by cooperative	3.5%			6.1%			0.0%			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; * $p < 0.1$, ** $p < 0.05$ and *** $p < 0.01$ indicate significance at the 10%, 5% and 1% levels, respectively.

Factsheet 13.6: Profitability Comparison - Technology Adoption

Background

In the previous factsheet, milk production, price and quality were considered. In this factsheet, the characteristics of the IndoDairy Smallholder Household Survey (ISHS) based on profit quartiles will be further studied, focusing on what technologies are used by dairy farmers in West Java.

The dairy farmers were asked a series of questions to understand the level of adoption of dairy farming technologies on farm. Dairy farmers were first asked if they had ever heard or were aware of certain technologies. If they answered yes to this, they were then asked if they had ever used that technology. If they answered yes, they were further asked when they first used it and if they are still currently using it on farm.

The overall results of the ISHS data for these questions based on the districts is shown in Factsheet 9. The results provide an overall comprehensive overview of the technology adoption aspects of dairy farmers in West Java. Moreover, they give insights into technologies with low awareness, technologies with low adoption, technologies with disadoption and technologies with continued adoption.

Technologies with low awareness

Overall, the level of awareness of technologies across the profit quartiles was consistent with little significant differences. The detailed results are shown in Table A1 in the Appendix

Figure 1 shows the level of awareness about different technologies across the profit quartiles.

Significant difference

There were significant differences across profit quartiles in the awareness of the following technologies ($p < 0.05$):

Conserving forages for the dry season (hay, silage):

- More farmers in Quartile 1 (Q1) (63%) were aware about conserving forages for the dry season than Quartile 3 (Q3) (51%) and Quartile 4 (Q4) (53%) farmers.

Cooling milk in water tanks:

There was little difference between Q1 (62%) and Q4 (63%) in the awareness of cooling milk in water tanks; however, there was significantly low awareness amongst farmers in Q2 (52%) and Q3 (50%).

Milk pasteurization:

- Fewer farmers in Q4 (29%) were aware about milk pasteurisation compared to farmers in Q1 (35%).

Slight difference

There were slight differences across profit quartiles in the awareness of the following technologies ($p < 0.10$):

Nutrient feed blocks:

- The overall awareness of nutrient feed blocks was low with only 14% of farmers aware of what nutrient feed blocks are.
- Only 8% of farmers in Q4 (most profitable) were aware about nutrient feed blocks compared to 15.3% in Q1 (least profitable).

Breeding plan applied:

- There was little difference between Q1 (49%) and Q4 (51%) when it came to awareness of breeding plans; however, there was significantly low awareness amongst farmers in Q2 (38%) and Q3 (43%).

No difference

Awareness of following technologies showed no significant difference between profit quartiles ($p > 0.10$):

- Mastitis test
- High protein concentrates (16% or higher)
- Feed legume forages
- Use of high-quality grasses
- Growing animal feed crops
- Use of fertilisers
- Rubber/plastic floor for barn cage
- Teat dipping after milking
- Improving drinking water availability
- Record keeping
- Using detergents for milking equipment
- Improving milk hygiene to reduce TPC
- Automatic milking machines
- Stainless steel milking equipment
- Biogas units
- Milk processing
- Milk quality test – TPC/SCC
- UHT (Ultra High temperature)
- Synchronization oestrus
- Manure processing/manure re-use

Technologies with low adoption

The dairy farmers were asked, of the technologies that they were aware of, had they ever adopted any of them on the farm.

The results are shown in Table A2 in the Appendix and Figure 2.

Significant difference

There were significant differences across profit quartiles in the adoption of following technologies ($p < 0.05$):

Mastitis test:

- Overall, only half of the farmers (50%) surveyed had ever used a mastitis test.
- Only 34% of farmers in Q4 had done the mastitis test on their cattle compared to 58% in Q1.
- 60% of farmers in Q3 had used the mastitis test.

Biogas units:

- Overall, 28% of farmers had used biogas units on their farms.
- The number of farmers in Q1 (36%) that had used biogas units was more than the number of farmers in Q3 (19%) and Q4 (27%).

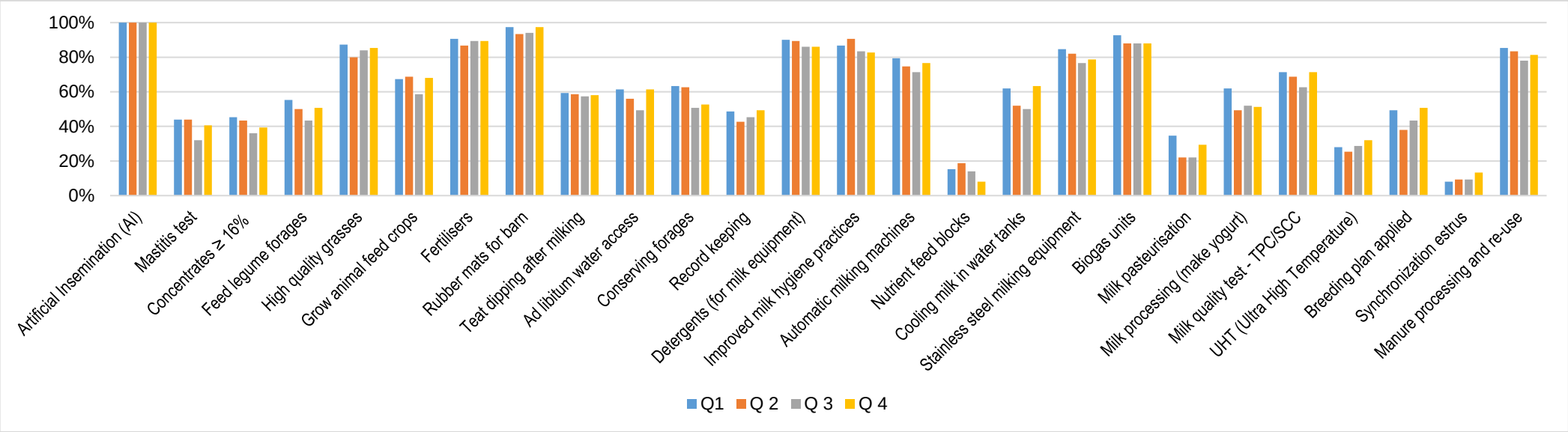

Figure 1. Comparison of technology awareness by profit quartiles.

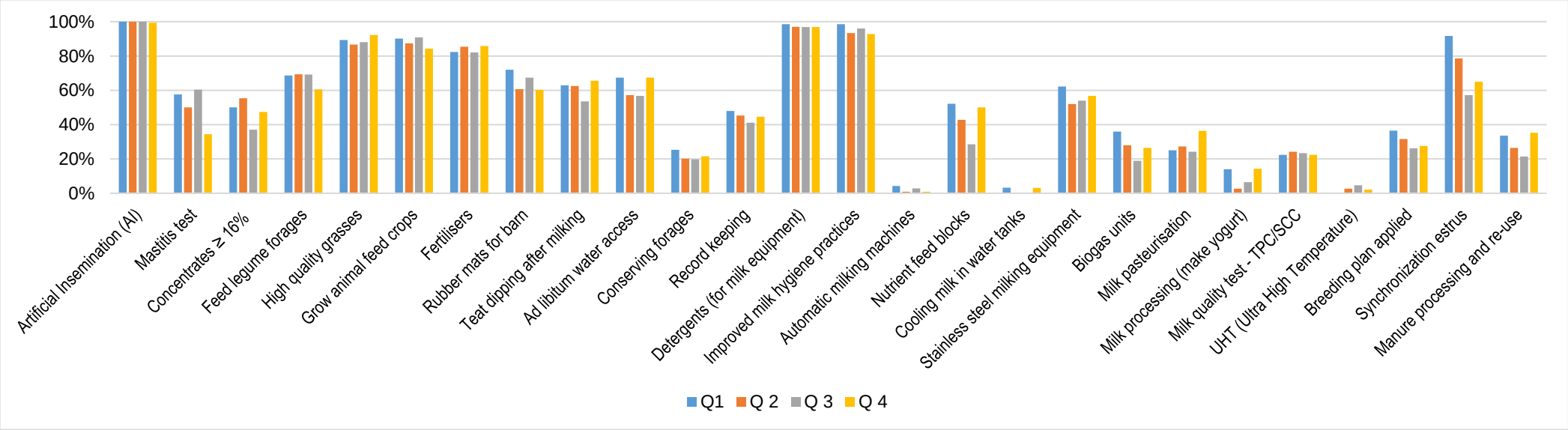

Figure 2. Comparison of technologies that have ever been used by dairy farmers by profit quartiles.

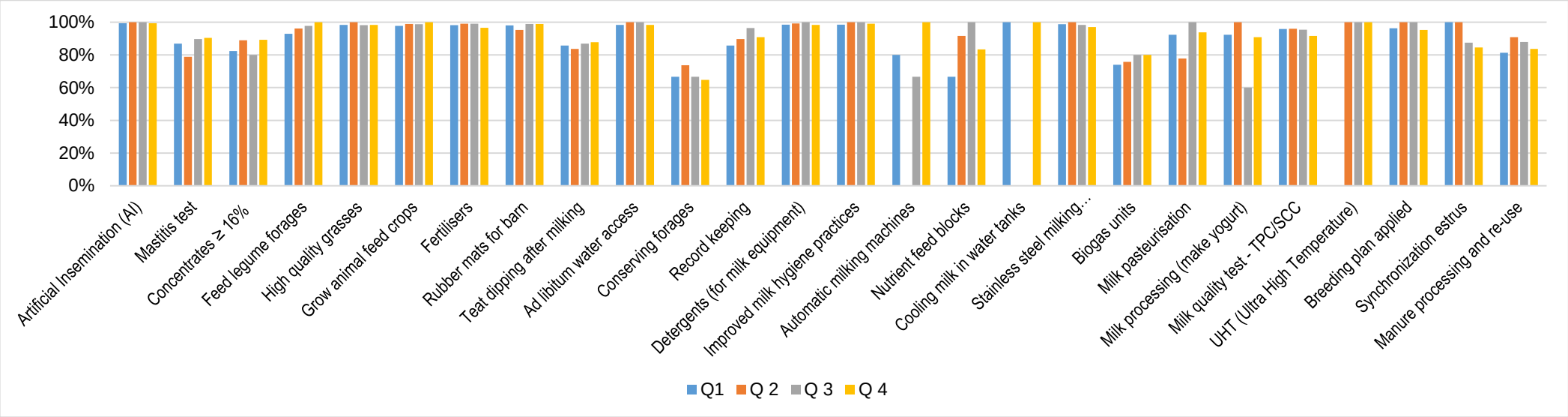

Figure 3. Comparison of technologies used since 2014 by profit quartiles.

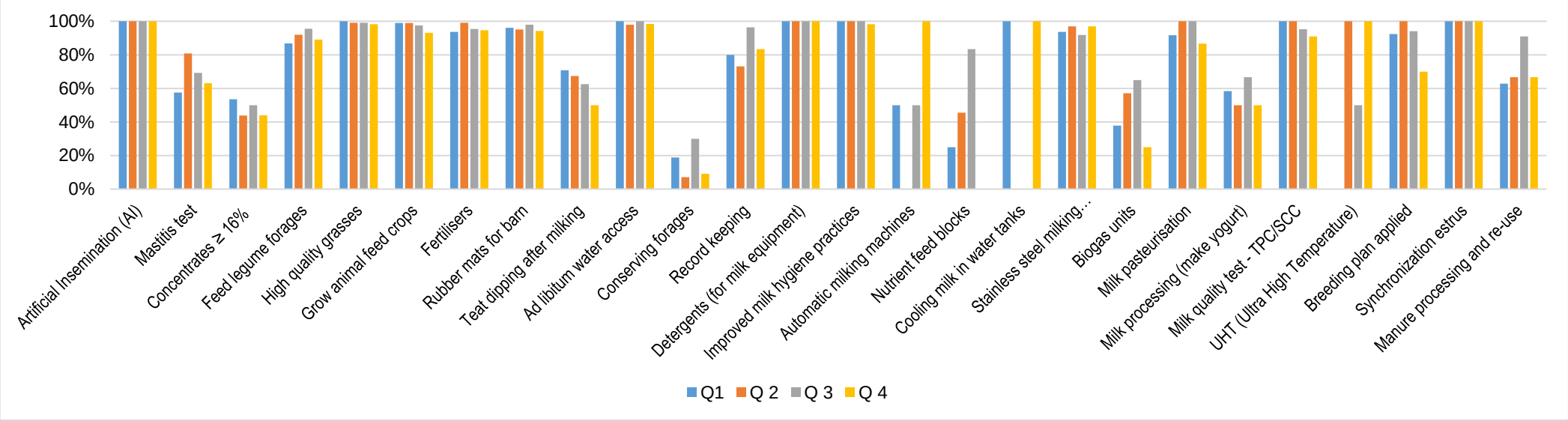

Figure 4. Comparison of technologies currently used on farm by profit quartiles.

Milk processing:

- Only a few farmers (10%) had been involved in milk processing across the four quartiles.
- Out of these, the number of farmers involved in milk processing was similar in Q1 and Q4 (14%), while considerably lower in Q3 (6%) and Q2 (3%).

Slight difference

There were slight differences across profit quartiles in the adoption of the following technology ($p < 0.10$):

Manure processing

- Number of farmers that had ever used manure processing was lower in Q2 (26%) and Q3 (21%) compared to Q1 (34%) and Q4 (35%).

No difference

Adoption of following technologies showed no significant difference between profit quartiles ($p > 0.10$):

- Mastitis test
- High protein concentrates (16% or higher)
- Feed legume forages
- Use of high-quality grasses
- Growing animal feed crops
- Use of fertilisers
- Rubber/plastic floor for barn cage
- Teat dipping after milking
- Improving drinking water availability
- Conserving forages for the dry season
- Record keeping
- Using detergents for milking equipment
- Improving milk hygiene to reduce TPC
- Automatic milking machines
- Nutrient feed blocks
- Cooling milk in water tanks
- Stainless steel milking equipment
- Biogas units
- Milk processing
- Milk quality test – TPC/SCC
- UHT (Ultra High temperature)
- Breeding plan applied
- Synchronization estrus

Technologies with disadoption

For the farmers who answered that they were aware of certain technologies and had adopted them on their farm in the past, they were asked if they had ever used these technologies since 2014 in order to identify technologies that farmers had stopped adopting or had disadopted. The results are shown in Table A3 in the Appendix.

The different technologies farmers have used since 2014 across the four profit quartiles are shown in Figure 3.

There were no significant differences across the four profit quartiles in terms of technologies with disadoption since 2014.

Technologies with continued adoption

Lastly, farmers were asked if they were still continuing to use or adopt the technologies at the time of the survey. This question was asked to the farmers only if they reported to be aware of these technologies, had ever used them and had not disadopted them since 2014.

The results are shown in Table A4 in the Appendix and Figure 4.

Significant difference

There were significant differences across profit quartiles in the continued adoption of following technologies ($p < 0.05$):

Nutrient feed blocks

- It is interesting to note that from 50% of farmers in Q4 who had ever used nutrient feed blocks, not a single farmer had reported to having this technology currently in use at the time of the survey.

Biogas units

- The number of farmers using biogas units currently in Q4 (25%) was the lowest amongst the quartiles, while farmers in Q3 (65%) and Q2 (57%) had significantly more farmers who reported that they are currently using this technology.

Breeding plan applied

- 70% of farmers in Q4 were currently using breeding plans while significantly a greater number of farmers in Q1 (92%), Q2 (100%) and Q3 (94%) were currently using this technology.

Slight difference

There were slight differences across profit quartiles in the continued adoption of following technologies ($p < 0.10$):

Growing animal feed crops

- Slightly fewer farmers in Q4 (93%) were growing animal feed crops at the time of the survey compared to farmers in Q1 (99%), Q2 (99%) and Q3 (98%).

Improved milking hygiene to reduce TPC

- While 100% of farmers in Q1, Q2 and Q3 agreed to improving milking hygiene to reduce TPC, 98% of farmers in Q4 agreed to the same at the time of the survey.

No difference

Use of following technologies at the time of the survey, showed no significant difference between profit quartiles ($p > 0.10$):

- Mastitis test
- High protein concentrates (16% or higher)
- Feed legume forages
- Use of high-quality grasses
- Growing animal feed crops
- Use of fertilisers
- Rubber/plastic floor for barn cage
- Teat dipping after milking
- Improving drinking water availability
- Conserving forages for the dry season
- Record keeping
- Using detergents for milking equipment
- Automatic milking machines
- Cooling milk in water tanks
- Stainless steel milking equipment
- Milk processing
- Milk quality test – TPC/SCC
- UHT (Ultra High temperature)
- Synchronization oestrus
- Manure processing/manure re-use

Summary

- **Majority of the farmers were aware of technologies like artificial insemination, rubber/plastic floor for barn cage, biogas units, and use of detergents for milking equipment.**
- **On the other hand, a fewer number of farmers had heard about or were aware of technologies like synchronization of estrus, nutrient feed blocks, milk pasteurisation and UHT (Ultra High Temperature).**
- **More farmers in Q1 were aware about practices like conserving forages for the dry season and nutrient feed blocks compared to farmers in Q4.**
- **With regards to awareness of majority of technologies or practices, there was no significant difference across profit quartiles.**
- **Only half of the overall surveyed farmers had used Mastitis test. Of these, the share of farmers who had used it was higher in Q1 than in Q4.**
- **Results showed no significant differences across the profit quartiles on disadoption of technologies since 2014.**
- **For technologies and practices with continued adoption at the time of the survey, there were not many significant**

differences, except the share of farmers using biogas units was lowest in Q4 compared to farmers in Q3 and Q2, and more farmers from Q1, Q2 and Q3 were using breeding plans than farmers in Q4.

The following factsheet, Factsheet 13.7, discusses farmers' attitudes, perceptions, expectations and future aspirations across the four profit quartiles.

Appendix to Factsheet 13.6

This appendix provides summary statistics related to technology adoption by profit quartile. Standard deviations (SD) are included where relevant.

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

Table A1. Comparison of technologies by level of awareness in dairy farmers by profit quartiles (n=600).

Variables	Quartile 1		Quartile 2		Quartile 3		Quartile 4		Total	
	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]
Have you heard about the technology? (n=600)										
Artificial Insemination (AI)	100.0%		100.0%		100.0%		100.0%		100.0%	
Mastitis test	44.0%		44.0%		32.0%		40.7%		40.2%	
High protein concentrates (16% or higher)	45.3%		43.3%		36.0%		39.3%		41.0%	
Feed legume forages (e.g. Leucaena)	55.3%		50.0%		43.3%		50.7%		49.8%	
Use of high-quality grasses	87.3%		80.0%		84.0%		85.3%		84.2%	
Grow animal feed crops	67.3%		68.7%		58.7%		68.0%		65.7%	
Use of any fertilisers for the grass	90.7%		86.7%		89.3%		89.3%		89.0%	
Rubber/Plastic floor for the barn/cage	97.3%		93.3%		94.0%		97.3%		95.5%	
Teat dipping after milking	59.3%		58.7%		57.3%		58.0%		58.3%	
Improving drinking water availability 24/7	61.3%		56.0%		49.3%		61.3%		57.0%	
Conserving forages for the dry seasons (hay, silage)	63.3%	a	62.7%	a	50.7%	a	52.7%	a	57.3%	**
Record keeping	48.7%		42.7%		45.3%		49.3%		46.5%	
Using detergents for milking equipment	90.0%		89.3%		86.0%		86.0%		87.8%	
Improved milking hygiene to reduce TPC	86.7%		90.7%		83.3%		82.7%		85.8%	
Automatic milking machines	79.3%		74.7%		71.3%		76.7%		75.5%	
Nutrient feed blocks	15.3%	ab	18.7%	b	14.0%	ab	8.0%	a	14.0%	*
Cooling milk in water tanks	62.0%	a	52.0%	a	50.0%	a	63.3%	a	56.8%	**
Stainless steel milking equipment	84.7%		82.0%		76.7%		78.7%		80.5%	
Biogas units	92.7%		88.0%		88.0%		88.0%		89.2%	
Milk pasteurisation	34.7%	a	22.0%	a	22.0%	a	29.3%	a	27.0%	**
Milk processing (make yogurt)	62.0%		49.3%		52.0%		51.3%		53.7%	
Milk quality test - TPC/SCC	71.3%		68.7%		62.7%		71.3%		68.5%	
UHT (Ultra High Temperature)	28.0%		25.3%		28.7%		32.0%		28.5%	
Breeding plan applied	49.3%	a	38.0%	a	43.3%	a	50.7%	a	45.3%	*
Synchronization Oestrus	8.0%		9.3%		9.3%		13.3%		10.0%	
Manure processing / manure re-use	85.3%		83.3%		78.0%		81.3%		82.0%	

[1]Value is a 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 ($p < 0.10$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A2. Comparison of technologies have been adopted by dairy farmers by profit quartiles.

Variables	Quartile 1		Quartile 2		Quartile 3		Quartile 4		Total	
	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]
Have you ever used the technology?										
Artificial Insemination (AI) (n=600)	100.0%		100.0%		100.0%		99.3%		99.8%	
Mastitis test (n=241)	57.6%	b	50.0%	ab	60.4%	b	34.4%	a	50.2%	**
High protein concentrates (16% or higher) (n=246)	50.0%		55.4%		37.0%		47.5%		48.0%	
Feed legume forages (e.g. Leucaena) (n=299)	68.7%		69.3%		69.2%		60.5%		66.9%	
Use of high-quality grasses (n=505)	89.3%		86.7%		88.1%		92.2%		89.1%	
Grow animal feed crops (n=394)	90.1%		87.4%		90.9%		84.3%		88.1%	
Use of any fertilisers for the grass (n=534)	82.4%		85.4%		82.1%		85.8%		83.9%	
Rubber/Plastic floor for the barn/cage (n=573)	71.9%		60.7%		67.4%		60.3%		65.1%	
Teat dipping after milking (n=350)	62.9%		62.5%		53.5%		65.5%		61.1%	
Improving drinking water availability 24/7 (n=342)	67.4%		57.1%		56.8%		67.4%		62.6%	
Conserving forages for the dry seasons (hay, silage) (n=344)	25.3%		20.2%		19.7%		21.5%		21.8%	
Record keeping (n=279)	47.9%		45.3%		41.2%		44.6%		44.8%	
Using detergents for milking equipment (n=527)	98.5%		97.0%		96.9%		96.9%		97.3%	
Improved milking hygiene to reduce TPC (n=515)	98.5%		93.4%		96.0%		92.7%		95.1%	
Automatic milking machines (n=453)	4.2%		0.9%		2.8%		0.9%		2.2%	
Nutrient feed blocks (n=84)	52.2%		42.9%		28.6%		50.0%		42.9%	
Cooling milk in water tanks (n=341)	3.2%		0.0%		0.0%		3.2%		1.8%	
Stainless steel milking equipment (n=483)	62.2%		52.0%		53.9%		56.8%		56.3%	
Biogas units (n=535)	36.0%	b	28.0%	ab	18.9%	a	26.5%	ab	27.5%	**
Milk pasteurisation (n=162)	25.0%		27.3%		24.2%		36.4%		28.4%	
Milk processing (make yogurt) (n=322)	14.0%	a	2.7%	a	6.4%	a	14.3%	a	9.6%	**
Milk quality test - TPC/SCC (n=411)	22.4%		24.3%		23.4%		22.4%		23.1%	
UHT (Ultra High Temperature) (n=171)	0.0%		2.6%		4.7%		2.1%		2.3%	
Breeding plan applied (n=272)	36.5%		31.6%		26.2%		27.6%		30.5%	
Synchronization oestrus (n=60)	91.7%		78.6%		57.1%		65.0%		71.7%	
Manure processing / manure re-use (n=492)	33.6%	a	26.4%	a	21.4%	a	35.2%	a	29.3%	*

[1]Value is a 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 ($p < 0.10$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A3. Comparison of technology disadoption since 2014 by dairy farmers by profit quartiles.

Variables	Quartile 1		Quartile 2		Quartile 3		Quartile 4		Total	
	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]
Have you used this technology since 2014?										
Artificial Insemination (AI) (n=599)	99.3%		100.0%		100.0%		99.3%		99.7%	
Mastitis test (n=121)	86.8%		78.8%		89.7%		90.5%		86.0%	
High protein concentrates (16% or higher) (n=118)	82.4%		88.9%		80.0%		89.3%		85.6%	
Feed legume forages (e.g. Leucaena) (n=200)	93.0%		96.2%		97.8%		100.0%		96.5%	
Use of high-quality grasses (n=450)	98.3%		100.0%		98.2%		98.3%		98.7%	
Grow animal feed crops (n=347)	97.8%		98.9%		98.8%		100.0%		98.8%	
Use of any fertilisers for the grass (n=448)	98.2%		99.1%		99.1%		96.5%		98.2%	
Rubber/Plastic floor for the barn/cage (n=373)	98.1%		95.3%		98.9%		98.9%		97.9%	
Teat dipping after milking (n=214)	85.7%		83.6%		87.0%		87.7%		86.0%	
Improving drinking water availability 24/7 (n=214)	98.4%		100.0%		100.0%		98.4%		99.1%	
Conserving forages for the dry seasons (hay, silage)(n=75)	66.7%		73.7%		66.7%		64.7%		68.0%	
Record keeping (n=125)	85.7%		89.7%		96.4%		90.9%		90.4%	
Using detergents for milking equipment (n=513)	98.5%		99.2%		100.0%		98.4%		99.0%	
Improved milking hygiene to reduce TPC (n=490)	98.4%		100.0%		100.0%		99.1%		99.4%	
Automatic milking machines (n=10)	80.0%		0.0%		66.7%		100.0%		70.0%	
Nutrient feed blocks (n=36)	66.7%		91.7%		100.0%		83.3%		83.3%	
Cooling milk in water tanks (n=6)	100.0%		.		.		100.0%		100.0%	
Stainless steel milking equipment (n=272)	98.7%		100.0%		98.4%		97.0%		98.5%	
Biogas units (n=147)	74.0%		75.7%		80.0%		80.0%		76.9%	
Milk pasteurisation (n=46)	92.3%		77.8%		100.0%		93.8%		91.3%	
Milk processing (make yogurt) (n=31)	92.3%		100.0%		60.0%		90.9%		87.1%	
Milk quality test - TPC/SCC (n=95)	95.8%		96.0%		95.5%		91.7%		94.7%	
UHT (Ultra High Temperature) (n=4)	.		100.0%		100.0%		100.0%		100.0%	
Breeding plan applied (n=83)	96.3%		100.0%		100.0%		95.2%		97.6%	
Synchronization oestrus (n=43)	100.0%		100.0%		87.5%		84.6%		93.0%	
Manure processing / manure re-use (n=144)	81.4%		90.9%		88.0%		83.7%		85.4%	

[1]Value is a 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 ($p < 0.10$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A4. Comparison of technologies currently being used by dairy farmers by profit quartiles.

Variables	Quartile 1		Quartile 2		Quartile 3		Quartile 4		Total	
	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]	Value[1]	Sig[2]
Are you currently using the technology?										
Artificial Insemination (AI) (n=597)	100.0%		100.0%		100.0%		100.0%		100.0%	
Mastitis test (n=104)	57.6%		80.8%		69.2%		63.2%		67.3%	
High protein concentrates (16% or higher) (n=101)	53.6%		43.8%		50.0%		44.0%		47.5%	
Feed legume forages (e.g. Leucaena) (n=193)	86.8%		92.0%		95.5%		89.1%		90.7%	
Use of high-quality grasses (n=444)	100.0%		99.0%		99.1%		98.3%		99.1%	
Grow animal feed crops (n=343)	98.9%	a	98.9%	a	97.5%	a	93.0%	a	97.1%	*
Use of any fertilisers for the grass (n=440)	93.6%		99.1%		95.4%		94.6%		95.7%	
Rubber/Plastic floor for the barn/cage (n=365)	96.1%		95.1%		97.9%		94.3%		95.9%	
Teat dipping after milking (n=184)	70.8%		67.4%		62.5%		50.0%		62.5%	
Improving drinking water availability 24/7 (n=212)	100.0%		97.9%		100.0%		98.4%		99.1%	
Conserving forages for the dry seasons (hay, silage) (n=51)	18.8%		7.1%		30.0%		9.1%		15.7%	
Record keeping (n=113)	80.0%		73.1%		96.3%		83.3%		83.2%	
Using detergents for milking equipment (n=508)	100.0%		100.0%		100.0%		100.0%		100.0%	
Improved milking hygiene to reduce TPC (n=487)	100.0%	a	100.0%	a	100.0%	a	98.2%	a	99.6%	*
Automatic milking machines (n=7)	50.0%		.		50.0%		100.0%		57.1%	
Nutrient feed blocks (n=30)	25.0%	ab	45.5%	ab	83.3%	b	0.0%	a	40.0%	**
Cooling milk in water tanks (n=6)	100.0%		.		.		100.0%		100.0%	
Stainless steel milking equipment (n=268)	93.6%		96.9%		91.8%		96.9%		94.8%	
Biogas units (n=113)	37.8%	ab	57.1%	ab	65.0%	b	25.0%	a	44.2%	**
Milk pasteurisation (n=42)	91.7%		100.0%		100.0%		86.7%		92.9%	
Milk processing (make yogurt) (n=27)	58.3%		50.0%		66.7%		50.0%		55.6%	
Milk quality test - TPC/SCC (n=90)	100.0%		100.0%		95.2%		90.9%		96.7%	
UHT (Ultra High Temperature) (n=4)	.		100.0%		50.0%		100.0%		75.0%	
Breeding plan applied (n=81)	92.3%	ab	100.0%	b	94.1%	ab	70.0%	a	88.9%	**
Synchronization Oestrus (n=40)	100.0%		100.0%		100.0%		100.0%		100.0%	
Manure processing / manure re-use (n=123)	62.9%		66.7%		90.9%		66.7%		69.9%	

[1]Value is a 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 ($p < 0.10$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Factsheet 13.7: Profitability Comparison - Farmers' Attitudes, Perceptions of Change and Future Aspirations

Background

In the previous factsheet, differences between the adoption status of various dairy farm technologies were analysed across the four profit quartiles.

This factsheet provides an overview of the differences between attitudes, perceptions of change, risk and expectations for the future by dairy farmers in West Java based on profit quartiles. This information builds upon Factsheet 13.1 and 13.2, which summarises household, farm and individual animal characteristics of the IndoDairy Smallholder Household Survey (ISHS).

Attitudes towards adopting new technology and practices

In the ISHS, the farmers were asked what their attitudes were towards trying new technologies, management practices and production methods. Attitudes towards adopting new technology and practices were not significantly different across the profit quartiles. Majority of the farmers (59%) indicated they waited to see other's success before trying new technology and practices, which was reflected equally across the quartiles (Table A1 in the Appendix).

Rating of prices, availability and quality of inputs and services

An aim of the ISHS was to identify how farmers perceived and rated the availability, quality and prices of essential inputs and services required for dairy farming. They also indicated how things had changed since 2014; three years prior to when the survey was conducted. The overall results of this are shown in Factsheet 10 where farmers' attitudes, future aspirations and perceptions are discussed across the four districts.

Farmers were asked how they would currently rate various aspects related to dairy farming, where: 1 = good, 0 = fair and -1 = poor.

Next farmers indicated how these aspects had changed since 2014, where: 1 = improved, 0 = no change and -1 = became worse (detailed summary statistics are provided in Table A2 and A3 in the Appendix).

The differences in current rating and perceptions of change (since 2014) across the profit quartiles are discussed below.

Farmers' current rating of availability and quality of inputs and services

Significant difference

The following farmers' perception ratings were significantly different between profit quartiles ($p < 0.05$) on:

Availability of dairy nutritional information

- Overall across the quartiles, farmers agreed that availability of dairy nutritional information was fair. The level of agreement was higher amongst farmers in Q2 and Q3 as compared to farmers in Q1 and Q4.

Slight difference

The following farmers' perception ratings trended towards significance between profit quartiles ($p < 0.10$) on:

Prices paid by buyer for milk

- Dairy farmers in Quartile 1 (Q1) (least profitable), Quartile 2 (Q2) and Quartile 3 (Q3) perceived that the prices they received from milk buyers were poor (mean value in Table A2 is < 0.00), while farmers in Quartile 4 (Q4) (most profitable) indicated that they were receiving fair prices from milk buyers (mean value in Table A2 is between 0.00 and 0.50).

Availability of extension services

- Farmers across the quartiles indicated that availability of extension services was fair. Note that level of agreement was higher amongst farmers in Q3 as compared to farmers in Q1, Q2 and Q4.

No difference

The following farmers' perception ratings were not significantly different between profit quartiles ($p > 0.10$):

*Inputs and services rated as **'good'** (mean value in Table A2 is ≥ 0.50)*

- Availability of concentrates
- Availability of credit
- Availability of veterinary services
- Availability of veterinary medicines

*Inputs and services rated as **'fair'** (mean value in Table A2 is between 0.00 and 0.50)*

- Number of milk buyers
- Quality of grass and forages
- Availability of grass and forages
- Availability of technologies to improve milk yields
- Availability of marketing information
- Roads in the district

*Inputs and services rated as **'poor'** (mean value in Table A2 is < 0.00)*

- Price of concentrates
- Availability of land to purchase

Perceived change in availability and quality of inputs and services since 2014

Slight differences

The following farmers' perception ratings trended towards significance between profit quartiles ($p < 0.10$):

Availability of dairy nutritional information

- Farmers across the quartiles indicated that the availability of dairy nutritional information had not changed since 2014, however the level of agreement was higher in Q3 and Q4.

Availability of technologies to improve milk yields

- Farmers across the quartiles indicated that the availability of technologies to improve milk yields had not changed (mean value in Table A3 is ≥ 0.00 and < 0.50) since 2014, however the level of agreement was higher in Q4.

No difference

The following farmers' perception ratings were not significantly different between profit quartiles ($p > 0.10$):

*Inputs and services that have **'improved'** since 2014 (mean value in Table A3 is ≥ 0.50)*

- Roads in the district (note that farmers in Q2 indicated that the quality of roads in their district had not changed since 2014).
- Price paid by buyers for milk (note that farmers in Q1 and Q3 indicated that the price paid by buyers for milk had not changed since 2014).

*Inputs and services that have **'not changed'** since 2014 (mean value in Table A3 is between 0.00 and 0.50)*

- Number of milk buyers
- Availability of concentrates
- Availability of marketing information
- Availability of credit
- Availability of veterinary services
- Availability of veterinary medicines
- Availability of extension services

*Inputs and services that have **'worsened'** since 2014 (mean value in Table A3 is < 0.00)*

- Price of concentrates
- Availability of land to purchase
- Availability of grass and forages
- Farmers in Q1 indicated that quality of grass and forages had become worse (mean value in Table A3 is < 0.00) since 2014, while farmers in Q2, Q3 and Q4 perceive that quality of grass and forages had not changed since 2014.

Perceived changes in farming characteristics in the past 12 months

Farmers were asked to indicate their perceptions of change in farming characteristics in the past 12 months. The results of the overall sample are shown in Table A4 in the Appendix. A breakdown by profit quartiles is shown in Table A5 in the Appendix.

Overall, 45% of households indicated that total income received for milk sales had decreased in the past 12 months, while 22% indicated that milk sales had increased.

Differences between profit quartiles are discussed below.

Slight difference

The following farmers' perception ratings trended towards significance between profit quartiles ($p < 0.10$):

Total income received from milk sales

- Half of the farmers in Q1 (50%) and Q2 (52%) indicated that income they received from milk sales had been reduced in the past 12 months, 44% farmers in Q4 indicated the same.

Total number of milking cows

- Higher number of farmers in Q4 (39%) indicated a decrease in total number of milking cows as compared to Q1 (33%), Q2 (33%) and Q3 (21%).

Total household family labour in dairy business (male)

- While there was no significant change in male household labour across the quartiles, farmers in Q1 indicated to a slight increase (1%) since the previous year while farmers in Q4 did not report any changes.

No difference

The following farmers' perception ratings were not significantly different between profit quartiles ($p > 0.10$):

- Total number of dairy cattle
- Total average milk produced per day
- Total household family labour in dairy business (female)
- Total household family labour in dairy business

Perceived change in household financial situation (compared to 2014)

The change in household financial situation is shown in Table A6 in the Appendix. This gives us a broad overview of changes experienced by households that have had an impact on their financial situation and perceived reasons for these changes.

Overall, about 50% of farmers felt their financial situation had become somewhat or much better, while 16% indicated that it had become somewhat or much worse.

The primary reasons indicated for changes in the household financial situation were changes in non-dairy livestock income (25%), non-farm income (21%) and changes in milk yields (20%).

While there were no significant differences between the profit quartiles with regards to reasons of change, compared to other quartiles a large share of farmers from Q3 (29%) and Q4 (26%) indicated they had experienced a change in non-dairy livestock income, while farmers in Q2 (26%) had experienced change in non-farm income.

Farmers' aspirations

Respondents were asked about their future aspirations for their dairy farming operations. The results are presented in Table A7 in the Appendix.

90% of farmers intended to expand their dairy farm operations.

- 10% of Q1 farmers indicated they intended to remain the same, while this was reported by only 5% farmers in Q4.
- With regards to future herd size, farmers in Q1 expected their herd size to grow to 14.4 cows while farmers in Q4 expected it to grow to 9.7 cows.
- Less than 2% of farmers across the profit quartiles intend to quit dairy farming in the future.

Table 1. Current and future dairy farm herd size.

Quartiles	Current herd size	Desired future herd size
Quartile 1	7.39	14.43
Quartile 2	5.56	10.75
Quartile 3	5.23	10.75
Quartile 4	4.34	9.76

Note in both Q1 and Q4, the proportional increase that farmers expected was more than twice as much as their current herd size, which was 7.3 cows in Q1 and 4.3 cows in Q4. This is illustrated in Table 1.

Training needs

In order to support the farmers with training that would help them achieve their ambitions for dairy farming, the farmers were asked to identify the areas they would like to receive training to improve dairy production practices. These results are shown in Table A8 in the Appendix.

As seen previously in Factsheet 10, **dairy farmers indicated a strong desire for training to increase their capacity in animal husbandry (33%), cattle nutrition and feed management (21%) and farm business management (18%).**

There were no significant differences across the quartiles with regards to preferred methods of training, with field practice as the majority choice of farmers.

Significant constraints faced by farmers

The training areas identified by farmers are further reflected in their answers when asked about significant constraints to the dairy industry from the dairy farmer's perspectives (results shown in Table A9 in the Appendix).

The top constraint identified by dairy farmers was adequate feed resources (27%).

There were no significant differences across the quartiles with regards to significant constraints faced by farmers.

Summary

- **Overall, price of concentrates and availability of land to purchase were perceived to be poor by dairy farmers. Farmers indicated that since 2014, the price of concentrates, availability of land to purchase, and the availability and quality of grass and forages had all worsened.**

- **Farmers in Q1 perceived that milk prices they received from buyers were 'poor' as compared to farmers in Q4 who perceived milk prices to be fair.**
- **Farmers in Q1 and Q3 indicated that prices they received from buyers had not changed since 2014 while, farmers in Q2 and Q4 pointed towards an improvement.**
- **There were no significant differences across the profit quartiles with regards to farmers' perceptions of change in availability and quality of inputs and services since 2014, perceptions of changes in farming characteristics in past 12 months, perceptions of changes in household financial situation since 2014, farmers' aspirations, training needs and significant constraints faced by farmers.**

The following factsheet, Factsheet 13.8, discusses the differences between quartiles in regard to aspects of gender inclusiveness in decision-making, ownership of assets and access to credit.

Appendix to Factsheet 13.7

This appendix provides a summary attitudes, perceptions of change, risk and expectations for the future by dairy farmers by profit quartiles. Standard deviations (SD) are included where relevant.

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

Table A1. Farmers' attitudes towards trying new technologies, management practices and/or production methods grouped by quartiles (n=600).

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Attitudes towards trying new technologies new management practices and new production methods:						
Always the first	11.3%	6.7%	8.0%	9.3%	8.8%	
One of the first	19.3%	18.0%	20.0%	18.0%	18.8%	
Wait to see other's success before I try them	56.7%	60.0%	62.0%	56.7%	58.8%	
One of the last	8.0%	11.3%	5.3%	8.7%	8.3%	
Never try new technologies	4.7%	4.0%	4.7%	7.3%	5.2%	

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

Table A2. Farmers' perceptions of current situation with respect to prices and quality or availability of inputs and services (1= good, 0 = fair, -1 = poor).

	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]
Prices paid by buyer for milk (n=600)	-0.10	0.77	a	-0.01	0.64	ab	-0.03	0.74	ab	0.13	0.74	b	0.00	0.73	*
Number of milk buyers(n=519)	0.19	0.65		0.22	0.62		0.17	0.56		0.25	0.60		0.21	0.61	
Price of concentrates (n=598)	-0.63	0.55		-0.58	0.55		-0.52	0.61		-0.61	0.58		-0.58	0.57	
Quality of grass and forages (n=599)	0.34	0.63		0.33	0.63		0.31	0.67		0.35	0.63		0.33	0.64	
Availability of land to purchase (n=587)	-0.45	0.74		-0.52	0.68		-0.40	0.76		-0.50	0.69		-0.47	0.72	
Availability of grass and forages(n=599)	-0.06	0.80		-0.01	0.77		0.07	0.82		0.05	0.76		0.01	0.79	
Availability of concentrates (n=599)	0.69	0.50		0.67	0.47		0.69	0.53		0.61	0.57		0.67	0.52	
Availability of dairy nutritional information (n=557)	0.20	0.68	a	0.38	0.57	a	0.39	0.62	a	0.25	0.62	a	0.30	0.63	**
Availability of technologies to improve milk yields (n=573)	0.21	0.69		0.41	0.63		0.30	0.67		0.31	0.61		0.31	0.66	
Availability of marketing information (n=546)	0.12	0.69		0.14	0.67		0.25	0.68		0.15	0.65		0.16	0.67	
Availability of credit (n=588)	0.61	0.62		0.66	0.52		0.68	0.56		0.59	0.59		0.63	0.58	
Availability of veterinary services (n=599)	0.75	0.51		0.83	0.39		0.83	0.45		0.77	0.45		0.79	0.45	
Availability of veterinary medicines (n=584)	0.68	0.52		0.71	0.49		0.73	0.49		0.73	0.48		0.71	0.49	
Availability of extension services (n=596)	0.28	0.78	a	0.31	0.77	a	0.46	0.67	a	0.24	0.80	a	0.32	0.76	*
Roads in your district (n=600)	0.21	0.82		0.20	0.84		0.14	0.79		0.18	0.87		0.18	0.83	

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

Table A3. Dairy farmers' perceptions of changes (compared to 2014) in prices and quality or availability of inputs and services (1= increased, 0= no change and -1= decrease).

	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]**
Price paid by buyer for milk (n=594)	0.44	0.68		0.60	0.60		0.48	0.71		0.59	0.67		0.53	0.67	
Number of milk buyers(n=591)	0.08	0.28		0.05	0.21		0.04	0.20		0.08	0.27		0.06	0.24	
Price of concentrates (n=593)	-0.59	0.53		-0.69	0.49		-0.57	0.56		-0.63	0.60		-0.62	0.55	
Quality of grass and forages (n=594)	-0.07	0.44		0.01	0.47		0.02	0.50		0.00	0.49		-0.01	0.48	
Availability of land to purchase (n=586)	-0.39	0.53		-0.42	0.52		-0.39	0.53		-0.43	0.56		-0.41	0.54	
Availability of grass and forages (n=598)	-0.23	0.63		-0.19	0.61		-0.21	0.63		-0.17	0.66		-0.20	0.63	
Availability of concentrates (n=595)	0.22	0.47		0.29	0.47		0.18	0.48		0.27	0.53		0.24	0.49	
Availability of dairy nutritional information(n=552)	0.16	0.42	a	0.18	0.41	a	0.28	0.47	a	0.25	0.47	a	0.22	0.44	*
Availability of technologies to improve milk yields (n=566)	0.25	0.51	a	0.28	0.50	a	0.29	0.50	a	0.39	0.49	a	0.30	0.50	*
Availability of marketing information (n=557)	0.13	0.36		0.11	0.36		0.09	0.34		0.19	0.41		0.13	0.37	
Availability of credit (n=583)	0.25	0.57		0.34	0.50		0.28	0.51		0.32	0.56		0.30	0.54	
Availability of veterinary services (n=596)	0.42	0.52		0.44	0.52		0.46	0.54		0.44	0.52		0.44	0.53	
Availability of veterinary medicines (n=583)	0.27	0.47		0.29	0.48		0.27	0.46		0.39	0.49		0.30	0.48	
Availability of extension services (n=593)	0.15	0.66		0.21	0.64		0.31	0.61		0.16	0.68		0.21	0.65	
Roads in your district (n=599)	0.50	0.65		0.42	0.75		0.50	0.66		0.50	0.74		0.48	0.70	

[1]Value is a 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 ($p < 0.10$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A4. Changes at the dairy household level in the past 12 months (n=600).

Variable	**Increased**	**No change**	**Decreased**	**N/A[1]**
Total income received for milk sales	21.8%	32.8%	45.2%	0.2%
Total number of dairy cattle	33.2%	29.8%	37.0%	0.0%
Total number of milking cows	14.2%	54.2%	31.7%	0.0%
Total average milk produced per day	18.5%	36.3%	45.0%	0.2%
Total household family labour in dairy business (male)	0.5%	96.5%	1.5%	1.5%
Total household family labour in dairy business (female)	0.0%	92.8%	0.7%	6.5%
Total household family labour in dairy business	0.3%	76.3%	0.5%	22.8%

[1]N/A = Not Applicable.

Table A5. Changes at the dairy household level in the past 12 months, grouped by quartiles (n=600).

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Total income received for milk sales						
Increased	20.0%	17.3%	26.0%	24.0%	21.8%	*
No change	29.3%	30.7%	39.3%	32.0%	32.8%	*
Decreased	50.0%	52.0%	34.7%	44.0%	45.2%	*
N/A	0.7%	0.0%	0.0%	0.0%	0.2%	*
Total number of dairy cattle						
Increased	34.7%	30.0%	36.7%	31.3%	33.2%	
No change	25.3%	29.3%	34.0%	30.7%	29.8%	
Decreased	40.0%	40.7%	29.3%	38.0%	37.0%	
N/A						
Total number of milking cows						
Increased	12.7%	13.3%	17.3%	13.3%	14.2%	*
No change	54.0%	54.0%	61.3%	47.3%	54.2%	*
Decreased	33.3%	32.7%	21.3%	39.3%	31.7%	*
N/A						
Total average milk produced per day						
Increased	16.7%	14.7%	22.7%	20.0%	18.5%	
No change	34.7%	36.0%	42.7%	32.0%	36.3%	
Decreased	48.0%	49.3%	34.7%	48.0%	45.0%	
N/A	0.7%	0.0%	0.0%	0.0%	0.2%	
Total household family labour in dairy business (male)						
Increased	1.3%	0.0%	0.7%	0.0%	0.5%	*
No change	96.7%	96.0%	98.0%	95.3%	96.5%	*
Decreased	1.3%	2.7%	1.3%	0.7%	1.5%	*
N/A	0.7%	1.3%	0.0%	4.0%	1.5%	*
Total household family labour in dairy business (female)						
Increased	88.7%	94.7%	95.3%	92.7%	92.8%	
No change	1.3%	0.0%	0.7%	0.7%	0.7%	
Decreased	10.0%	5.3%	4.0%	6.7%	6.5%	
N/A						
Total household family labour in dairy business						
Increased	0.7%	0.0%	0.7%	0.0%	0.3%	
No change	70.7%	82.7%	78.0%	74.0%	76.3%	
Decreased	0.7%	1.3%	0.0%	0.0%	0.5%	
N/A	28.0%	16.0%	21.3%	26.0%	22.8%	

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

Table A6. Change in household financial situation since 2014, grouped by quartiles.

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Change in household financial situation since 2014 (n=600)						
Much better	20.7%	20.0%	26.7%	19.3%	21.7%	
Somewhat better	25.3%	28.7%	22.7%	34.7%	27.8%	
No difference	32.0%	38.7%	34.7%	31.3%	34.2%	
Somewhat worse	20.0%	10.7%	15.3%	12.7%	14.7%	
Much worse	2.0%	1.3%	0.0%	2.0%	1.3%	
No opinion or N/A	0.0%	0.7%	0.7%	0.0%	0.3%	
Reasons for change in household financial situation (n=393)						
Change in milk prices	11.8%	7.7%	12.4%	7.8%	9.9%	
Change in milk yield	24.5%	22.0%	12.4%	20.4%	19.9%	
Change in dairy cattle price	2.0%	0.0%	2.1%	0.0%	1.0%	
Change in livestock (non-dairy) income[2]	20.6%	23.1%	28.9%	26.2%	24.7%	
Change in non-farm income[3]	20.6%	26.4%	15.5%	23.3%	21.4%	
Change in family size	2.0%	3.3%	3.1%	3.9%	3.1%	
Household member found a new job	2.0%	0.0%	3.1%	2.9%	2.0%	
Household member lost a job	0.0%	0.0%	1.0%	0.0%	0.3%	
Expenses associated with illness	1.0%	1.1%	0.0%	0.0%	0.5%	
Expenses associated with education	3.9%	1.1%	3.1%	1.9%	2.5%	
Member of household passed away	1.0%	0.0%	0.0%	1.0%	0.5%	
Other	10.8%	15.4%	18.6%	12.6%	14.3%	

[1]Sig = Significance; * p < 0.10, ** p < 0.05 and *** p < 0.01 indicate significance at the 10%, 5% and 1% levels, respectively; [2]Non-dairy livestock income includes income derived from sale of cattle.
[3]Non-farm income includes income derived from off-farm activities like wage employment, self-employment, pensions, remittances, and trading businesses.

Table A7. Future aspiration of farmers with respect to dairy farm operations, grouped by quartiles.

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Future aspiration of farmers with respect to dairy farm operations (n=600)						
Remain the same	10.0%	9.3%	8.0%	4.7%	8.0%	
Expand	86.7%	88.7%	90.0%	92.7%	89.5%	
Undecided	0.7%	0.7%	0.7%	0.7%	0.7%	
Quit	1.3%	0.0%	0.7%	0.7%	0.7%	
Other	1.3%	1.3%	0.7%	1.3%	1.2%	
Expected future herd size (no. of cows) (n=540)	14.43	10.75	10.75	9.76	11.39	*

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

Table A8. Training requirements and expectations of dairy farmers, grouped by quartiles.

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Willingness to participate in a farmer training day/workshop in village (n=600)	92.7%	90.0%	91.3%	94.7%	92.2%	
Willingness of female members of household to attend farmer training day/workshop (n=600)	72.0%	70.0%	75.3%	76.7%	73.5%	
Preferred method of training (n=575)						
Seminar	18.1%	14.2%	21.7%	17.7%	17.9%	
Theory / written material	2.8%	10.6%	4.2%	5.4%	5.7%	
Field practice	62.5%	59.6%	58.0%	56.5%	59.1%	
Farm visit	16.7%	15.6%	16.1%	20.4%	17.2%	
Preferred areas of training (n=1437)[1]						
Nutrition / feeding management	20.6%	25.1%	19.9%	20.2%	21.4%	
Animal husbandry	32.9%	32.4%	32.1%	32.9%	32.6%	
Reproduction	11.7%	10.7%	9.9%	11.1%	10.9%	
Milking practice / management	12.5%	14.1%	15.6%	14.0%	14.1%	
Farm business management	18.7%	14.4%	19.0%	19.7%	18.0%	
Other	3.6%	3.4%	3.4%	2.2%	3.1%	

[1]Sig = Significance; * p < 0.10, ** p < 0.05 and *** p < 0.01 indicate significance at the 10%, 5% and 1% levels, respectively; For preferred areas of training, farmers could select up to three options.

Table A9. Dairy farmers' perceptions of significant constraints facing the dairy industry.

Variable	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total	Sig[1]
Significant constraints to dairy industry from the dairy farmer's perspective (n=1067)						
Knowledge	6.5%	7.9%	9.5%	12.3%	9.1%	
Training	4.6%	4.1%	5.7%	7.2%	5.4%	
Quality animals	11.9%	16.5%	13.7%	14.4%	14.2%	
Feed resources	29.1%	26.6%	26.3%	24.2%	26.5%	
Availability of vet services	0.8%	1.5%	1.5%	0.4%	1.0%	
Marketing	4.6%	2.3%	3.8%	3.3%	3.5%	
Nutrition	3.5%	3.8%	2.3%	4.7%	3.6%	
Labour	5.8%	4.1%	5.0%	2.9%	4.4%	
Reproduction	4.2%	5.6%	5.0%	4.7%	4.9%	
Calf rearing	0.0%	1.1%	0.4%	0.4%	0.5%	
Other	29.1%	26.6%	26.7%	25.6%	27.0%	

[1]Sig = Significance; * p < 0.10, ** p < 0.05 and *** p < 0.01 indicate significance at the 10%, 5% and 1% levels, respectively; Farmers could select up to three constraints. The figures in this table represent a proportion of all constraints identified by farmers (n=1067).

Factsheet 13.8: Profitability Comparison - Gender Inclusiveness

Background

In the previous factsheet, information on farmers' attitudes, perceptions of changes, future aspirations and expectations was considered. In this final factsheet based on profit quartiles of the IndoDairy Smallholder Household Survey (ISHS) '*Farm-to-Fact'* series, gender inclusiveness in decision making, ownership of assets, group membership and access to credit is examined.

The approach to collecting the data using the Abbreviated Women Empowerment in Agriculture Index (A-WEAI) module was previously explained in Factsheet 11.

In this factsheet, differences in profit quartiles for decision making, access to capital and credit, and group membership will be examined with particular reference to dairy farming activities. In order to avoid biases in responses, the primary decision makers (PDMs) and the secondary decision makers (SDMs) in the household were asked the questions in this module separately.

In Factsheet 3 of the ISHS, on household characteristics, it was noted that **97% of the households' PDMs were male. Overall, 94% of households had a SDM and nearly all were females (99%).**

Activity participation

The respondents were asked questions about participation in certain types of work activities within the household.

Detailed profit quartile wise results are shown in Table A1 in the Appendix.

Slight difference

The following work activities trended towards significance between profit quartiles ($p < 0.10$):

- The number of farmers (9%) from Quartile 4 (Q4) (most profitable) engaged in **livestock raising** as an activity was considerably lower compared to farmers (15%) in Quartile 1 (Q1) (least profitable).

There were no significant differences observed between the profit quartiles for **participation in a number of other household activities**, including food crop farming and cash crop farming.

Decision making

PDMs and SDMs in the household were asked, when decisions are made regarding key work activities, who it is that normally makes the decision. Profit quartile wise results are shown in Table A2 and A3 in the Appendix.

These activities included food crop farming (grown primarily for household consumption), cash crop farming (grown for sale on the market), livestock raising (cattle, buffalo, horse, etc.), and activities related to the dairy business including selling and buying cows, forages, concentrates, maintaining herd health, and milk marketing.

Figures 1 and 2 show differences in perception of decision making of PDMs and SDMs across profit quartiles.

Significant difference

The following participations in decision-making were significantly different between profit quartiles ($p < 0.05$):

- Only 36% of PDMs (men) in Q4 reported that their spouse contributed to decision making, compared to 44% in Q1. This indicates **fewer PDMs from most profitable households perceived their spouse (wives) made decisions in their household** compared to households with lower profitability (Table A2).
- The number of PDMs from Q2 (9%) who reported that **other household members** normally contribute to decision making was higher, compared to PDMs from Q1 (4%), Q4 (4%) and Q3 (3%) (Table A2). On the other hand, this number was higher for SDMs in Q3 (5%) compared to SDMs from Q1 (3%), Q2 (3%) and Q4 (1%) (Table A2).
- 92% of PDMs from Q4 reported making decisions related to **milk marketing** themselves, while 81% of PDMs from Q1 indicated the same (Table A3).
- 7% of PDMs from Q2 reported other household members make decisions regarding **selling and buying cattle**, compared to PDMs from Q1 (4%), Q3 (3%) and Q4 (1%) (Table A3).
- Similarly, 8% of PDMs from Q2 also indicated other household members make decisions regarding **kinds and quantities of concentrates**, which is more than twice as many compared to PDMs from Q1 (3%), Q4 (3%) and Q3 (2%) (Table A3).

No difference

The following participations in decision-making were not significantly different between profit quartiles ($p > 0.10$):

- Inputs of PDMs and SDMs (Table A4) in making decisions about **food crop farming, cash crop farming, livestock raising and dairy related decisions**.
- Extent of making personal decisions for PDMs and SDMs (Table A5) regarding **food crop farming, cash crop farming, livestock raising and dairy farming.**
- Input of PDMs and SDMs on making decisions on the use of income generated (Table A6) from **food crop farming, cash**

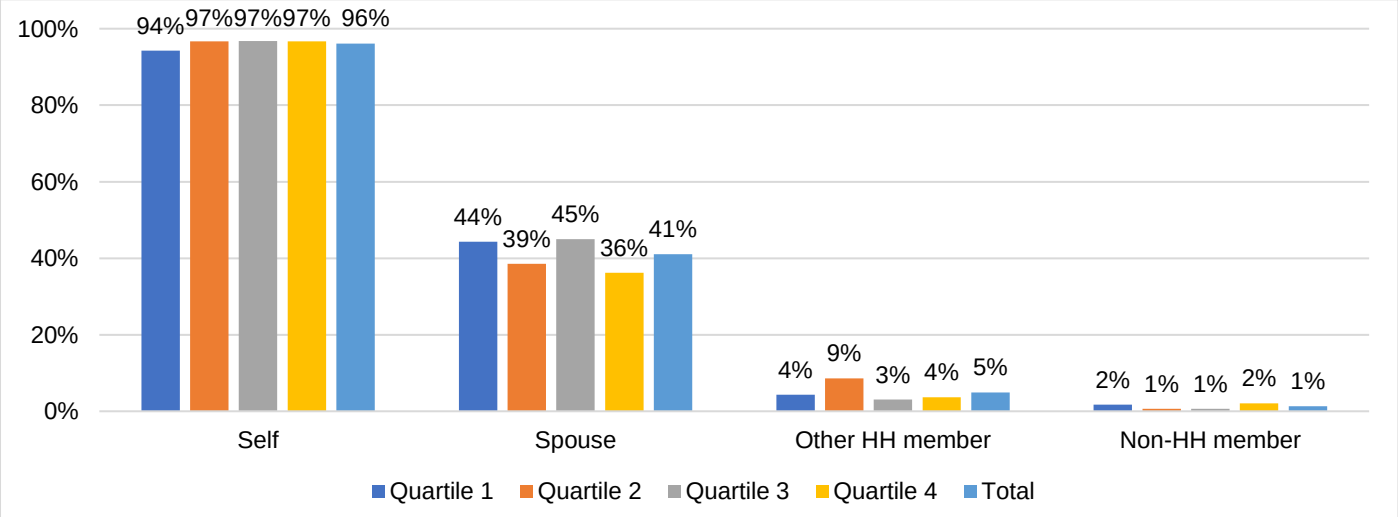

Figure 1. Perception of decision making of primary decision makers, by quartile.

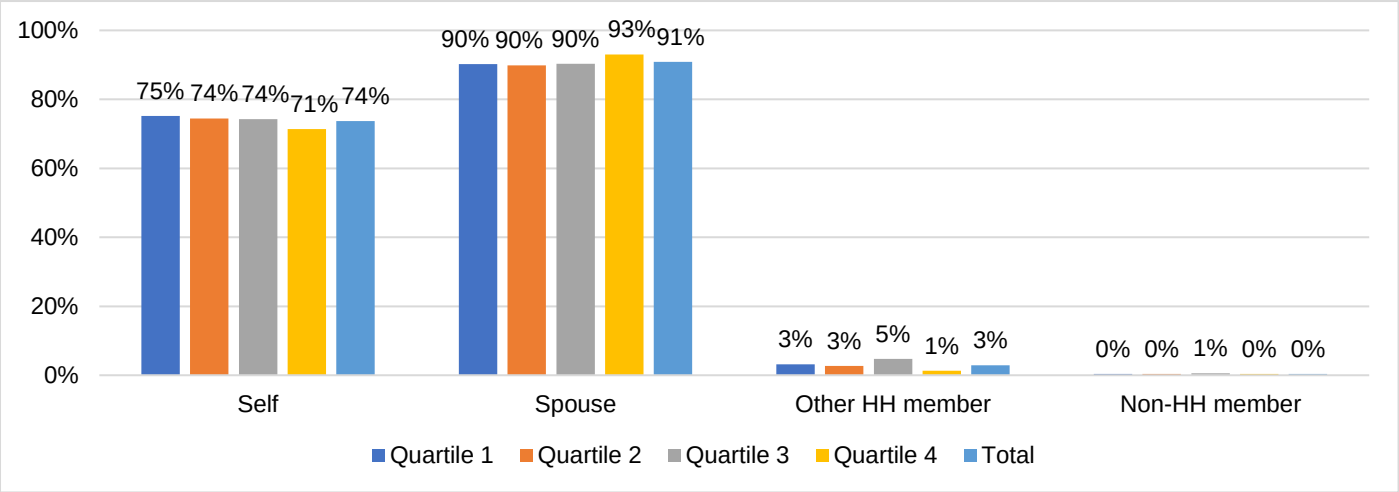

Figure 2. Perception of decision making of secondary decision makers, by quartile.

crop farming, livestock raising and dairy related decisions.

Ownership of assets

The respondents were asked about ownership of household assets and a number of other items that could be used to generate income.

Assets that were considered include: agricultural land; large (e.g. cattle, horses and buffalo) and small (e.g. goats, sheep and pigs) livestock; poultry (e.g. chickens, ducks, turkeys and pigeons); fish and fishing equipment; mechanised and non-mechanised farming equipment; non-farm business equipment; houses and other structures; large (e.g. refrigerators) and small (e.g. cookware and radios) consumer durables; mobile phones; other land (for non-agricultural purposes); and means of transportation.

Profit quartile wise results are shown in Table A7 and Table A8 in the Appendix.

Significant difference

The following asset ownership were significantly different between profit quartiles ($p < 0.05$):

- The number of PDMs who **own agricultural land pieces or plots** was lowest in Q3 (37%) while highest in Q1 (55%), Q4 (51%) (Table A7).
- The number of PDMs who **own poultry** was highest in Q2 (29%), followed by Q3 (25%), Q1 (24%) and Q4 (17%) (Table A7).
- **Joint ownership of assets** reported by PDMs was highest in Q3 (70%). This was lower across Q2 (66%), Q1 (64%) and Q4 (64%) (Table A8).

No difference

The following asset ownership were not significantly different between profit quartiles for both PDMs and SDMs (unless otherwise stated) ($p > 0.10$):

- Large and small livestock
- Poultry (for SDMs)
- Fish pond or fishing equipment
- Mechanised and non-mechanised farm equipment
- Non-farm business equipment
- Houses or other structures
- Large and small consumer durables
- Mobile phones
- Other land not used for agricultural purposes
- Means of transportation

Likewise, percentage of **SDMs reporting on overall sole or joint ownership** was not significant between profit quartiles.

Share of ownership

The respondents were asked about their perception on the type of ownership (sole or

joint) of household assets that can be used to generate income.

Profit quartile wise results are shown in Table A9 in the Appendix.

Slight difference

The following share of ownership of assets trended towards significance between profit quartiles ($p < 0.10$):

- 77% of PDMs from Q3 indicated they jointly owned **agricultural land plots** compared to Q1 (70%), Q2 (66%), and Q4 (54%). The level of sole ownership in farmers from Q4 (34%) was higher than Q1 (25%), Q2 (22%) and Q3 (18%).
- Sole ownership of **mobile phones** among SDMs was highest in Q1 (38%) followed by Q4 (31%), Q2 (29%) and Q3 (25%).

No difference

The following share of ownership of assets were not significantly different between profit quartiles for both PDMs and SDMs (unless otherwise stated) ($p > 0.10$):

- Agricultural land/plots (for SDMs)
- Large and small livestock
- Poultry
- Fish pond or fishing equipment
- Mechanised and non-mechanised farm equipment
- Non-farm business equipment
- Houses or other structures
- Large and small consumer durables
- Mobile phones (for PDMs)
- Other land not used for agricultural purposes
- Means of transportation

Sources of credit

The respondents were asked about their experience with borrowing money or other items in the past 12 months.

Profit quartile wise results of sources of loans are shown in Table A10 in the Appendix. All sources of credit were not significantly different between profit quartiles ($p > 0.10$).

There were also no significant differences across the profit quartiles on the forms of loan (Table A11) including cash, in-kind, cash and in-kind borrowed from the above-mentioned sources.

Decisions on borrowing money and what to do with it

The respondents were asked who made the decision to borrow most of the time in the past 12 months, followed by a question on who makes decisions on what to do with the borrowed funds.

Profit quartile wise results are shown in Table A12 in the Appendix.

Significant difference

The following responses were significantly different between profit quartiles ($p < 0.05$):

- PDMs from Q4 (70%) who reported their **spouse contributed to decision making to borrow** most of the time was lower compared to what PDMs from Q1 (87%), Q3 (83%) and Q2 (73%) perceived.
- SDMs from Q4 (86%) who indicated their **spouse contributed to decisions to borrow money** (most of the time) was also lower than SDMs from Q1 (94%), Q2 (92%) and Q3 (97%).

This indicates that **fewer PDMs and SDMs from most profitable households (Q4) perceived their spouses contributed to decisions to borrowing money** compared to households from other quartiles**.**

There were no significant differences across the profit quartiles when it comes to decisions on what to do with the borrowed funds.

Group membership

PDMs and SDMs were asked about formal, informal and customary groups in the community and whether they were active members of these groups.

Groups that are considered in the A-WEIA include: farmer (including agricultural, livestock, fisheries, and marketing), youth, forest, credit or microfinance, insurance, trade and business associations, civic, religious, and women's groups.

Profit quartile wise results are shown in Table A13 in the Appendix.

Significant difference

The following group memberships were significantly different between profit quartiles ($p < 0.05$):

- **Farmer group membership of PDMs was lowest in Q1** (73%), compared to other quartiles Q2 (86%), Q3 (87%) and Q4 (87%).

No difference

The following group memberships were not significantly different between profit quartiles for both PDMs and SDMs (unless otherwise stated) ($p > 0.10$):

- Farmer groups (for SDMs)
- Youth unions
- Forest user's groups
- Credit, microfinance and insurance groups
- Trade and business association groups
- Civic and charitable groups
- Religious groups
- Women's unions
- Other groups

Summary

In this factsheet, insights from the ISHS on the aspect of gender inclusiveness were examined in decision making regarding various dairy farm activities, individual and collective ownership of assets, forms of credit, decision making on borrowing money, and group membership of PDMs and SDMs.

- **There were no significant differences across quartiles in activity participation and overall decision making of PDMs and SDMs.**
- **The number of PDMs from most profitable households who perceived that women made decisions regarding farming activities in their households, was lower than that perceived by PDMs from households with low profitability.**
- **This was also true for decisions related to dairy farm activities, with more PDMs from Q4 (most profitable) making decisions themselves compared to PDMs from Q1 (least profitable).**
- **In regard to ownership of assets, PDMs from Q1 had the highest share of ownership of agricultural land and plots, compared to other quartiles.**
- **There were no significant differences with individual and collective ownership of assets across the profit quartiles.**
- **Similarly, no significant differences were noted across quartiles in regard to sources and forms of loans.**
- **Fewer PDMs and SDMs from most profitable households (Q4) perceived their spouses contributed to decision making regarding borrowing funds, compared to households from other quartiles.**
- **There were no significant differences across the profit quartiles regarding decisions on what to do with the borrowed funds.**
- **The level of farmer group membership for PDMs in Q1 was the lowest compared to PDMs from other profit quartiles.**

This factsheet concludes the 'IndoDairy Smallholder Household Survey' (ISHS) '*Farm-to-Fact*' series.

Appendix to Factsheet 13.8

The tables included in this appendix provide summary statistics related to gender inclusiveness in decision making, asset ownership, access to credit, and group membership for the entire sample.

Statistical significance between 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A1. Percent of PDMs and SDMs participating in various farm activities during the last 12 months by profit quartile.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Q1		Q2		Q3		Q4		Total		Q1		Q2		Q3		Q4		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Food crop farming	9.3%		10.0%		8.0%		10.7%		9.5%		7.1%		11.5%		8.2%		9.5%		9.1%	
Cash crop farming	26.7%		33.3%		23.3%		25.3%		27.2%		19.3%		25.9%		17.0%		21.2%		20.8%	
Livestock raising (cattle, buffalo, horses, etc.)	15.3%	a	7.3%	a	7.3%	a	8.7%	a	9.7%	*	6.4%		3.6%		6.1%		8.8%		6.2%	
Dairy farming (general)	92.7%		95.3%		94.0%		95.3%		94.3%		73.6%		79.1%		74.8%		76.6%		76.0%	
Selling and buying dairy cows	73.3%		74.0%		71.3%		65.3%		71.0%		49.3%		52.5%		50.3%		47.4%		49.9%	
Kinds and quantity of forages	92.7%		94.7%		94.7%		95.3%		94.3%		57.1%		69.8%		59.9%		57.7%		61.1%	
Kinds and quantity of concentrates	92.0%		94.0%		94.0%		92.0%		93.0%		56.4%		60.4%		57.1%		53.3%		56.8%	
Herd health	92.7%		94.7%		95.3%		94.7%		94.3%		57.1%		61.9%		59.2%		53.3%		57.9%	
Milk marketing	90.0%		93.3%		94.7%		92.7%		92.7%		49.3%		54.7%		47.6%		52.6%		51.0%	
None	1.3%		2.0%		1.3%		0.7%		1.3%		17.1%		15.1%		15.0%		11.7%		14.7%	

[1]Sig = Significance; * p < 0.1, ** 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 < 0.1). Quartiles with the same letter are not significantly different at the 5% level (p > 0.05).

Table A2. Percent of PDMs and SDMs are reporting on who normally makes the decision, by profit quartile.

	Primary Decision Maker (n=3,516)										Secondary Decision Maker (n=2,189)									
	Q1		Q2		Q3		Q4		Total		Q1		Q2		Q3		Q4		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[2]	Value	Sig[1]	Value	Sig[1]
Self	94.3%	a	96.6%	ab	96.8%	b	96.7%	ab	96.1%	**	75.2%		74.4%		74.3%		71.4%		73.7%	
Spouse	44.4%	bc	38.5%	ab	45.0%	c	36.2%	a	41.0%	***	90.2%		89.9%		90.3%		93.0%		90.9%	
Other HH member[2]	4.3%	a	8.6%		3.1%	a	3.7%	a	4.9%	***	3.1%	ab	2.7%	ab	4.7%	b	1.3%	a	2.9%	***
Non-HH member[2]	1.7%	ab	0.7%	a	0.7%	a	2.1%	b	1.3%	**	0.4%		0.4%		0.5%		0.3%		0.4%	

[1]Sig = Significance; [2]HH = Household; * p < 0.1, ** 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 < 0.1). Quartiles with the same letter are not significantly different at the 5% level (p > 0.05).

Table A3. Percent of PDMs and SDMs reporting on who normally makes the decisions regarding various farm activities, by district.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Q1		Q2		Q3		Q4		Total		Q1		Q2		Q3		Q4		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Food crop farming																				
Self	8.7%		9.3%		8.0%		10.7%		9.2%		5.7%		8.6%		7.5%		8.0%		7.5%	
Spouse	6.0%		6.7%		5.3%		6.0%		6.0%		7.1%		10.1%		7.5%		7.3%		8.0%	
Other HH member[2]	0.7%		0.0%		0.0%		0.0%		0.2%		0.0%		0.7%		0.0%		0.0%		0.2%	
Non-HH member[2]	0.0%		0.0%		0.0%		0.7%		0.2%		0.0%		0.0%		0.0%		0.0%		0.0%	
Cash crop farming																				
Self	25.3%		32.0%		23.3%		23.3%		26.0%		13.6%		16.5%		15.0%		14.6%		14.9%	
Spouse	10.0%	a	14.0%	a	13.3%	a	11.3%	a	12.2%		17.9%		22.3%		15.6%		20.4%		19.0%	
Other HH member[2]	2.0%		1.3%		0.0%		2.7%		1.5%		0.0%		1.4%		0.7%		0.0%		0.5%	
Non-HH member[2]	0.0%		0.0%		1.3%		0.7%		0.5%		0.0%		0.0%		1.4%		0.0%		0.4%	
Livestock raising																				
Self	14.0%		6.7%		7.3%		8.7%		9.2%		5.0%		3.6%		4.8%		6.6%		5.0%	
Spouse	10.0%	a	4.0%	a	4.0%	a	6.0%	a	6.0%	*	5.7%		3.6%		6.1%		8.8%		6.0%	
Other HH member[2]	0.0%		0.7%		0.0%		0.0%		0.2%		0.0%		0.7%		0.0%		0.0%		0.2%	
Non-HH member[2]	0.7%		0.0%		0.0%		0.0%		0.2%		0.0%		0.0%		0.0%		0.0%		0.0%	
Dairy business (general)																				
Self	88.7%		90.0%		91.3%		92.0%		90.5%		56.4%		61.2%		58.5%		54.0%		57.5%	
Spouse	56.7%		50.0%		53.3%		46.0%		51.5%		67.9%		73.4%		72.1%		73.7%		71.8%	
Other HH member[2]	4.0%		8.0%		2.7%		3.3%		4.5%		2.9%		2.2%		2.0%		2.9%		2.5%	
Non-HH member[2]	1.3%		1.3%		0.7%		2.7%		1.5%		0.7%		0.0%		0.7%		0.0%		0.4%	
Selling and buying dairy cows																				
Self	68.7%		70.0%		70.0%		64.0%		68.2%		39.3%		43.2%		45.6%		44.5%		43.2%	
Spouse	47.3%	ab	42.7%	ab	52.0%	b	36.0%	a	44.5%	**	45.7%		51.1%		50.3%		43.8%		47.8%	
Other HH member[2]	4.0%	ab	7.3%	b	2.7%	ab	1.3%	a	3.8%	**	0.7%		1.4%		1.4%		1.5%		1.2%	
Non-HH member[2]	1.3%		0.7%		1.3%		0.7%		1.0%		0.7%		0.0%		1.4%		0.0%		0.5%	

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Q1		Q2		Q3		Q4		Total		Q1		Q2		Q3		Q4		Total	
Variable	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**
Kinds and quantity of forages																				
Self	88.0%		93.3%		92.0%		90.7%		91.0%		38.6%		38.8%		36.1%		35.8%		37.3%	
Spouse	24.7%		21.3%		28.0%		22.0%		24.0%		49.3%	a	63.3%	a	58.5%	a	51.1%	a	55.6%	*
Other HH member[2]	4.0%	a	10.0%	a	4.0%	a	4.7%	a	5.7%	*	2.9%		1.4%		2.7%		1.5%		2.1%	
Non-HH member[2]	1.3%		0.7%		0.0%		2.7%		1.2%		0.7%		0.0%		0.0%		0.0%		0.2%	
Kinds and quantity of concentrates																				
Self	87.3%		92.7%		90.0%		87.3%		89.3%		40.0%		38.1%		37.4%		36.5%		38.0%	
Spouse	27.3%		26.0%		29.3%		21.3%		26.0%		44.3%		48.9%		51.0%		46.0%		47.6%	
Other HH member[2]	3.3%	ab	8.0%	b	2.0%	a	3.3%	ab	4.2%	*	2.1%		0.7%		1.4%		1.5%		1.4%	
Non-HH member[2]	2.0%		0.7%		0.0%		2.7%		1.3%		0.0%		0.7%		0.0%		0.0%		0.2%	
Herd health																				
Self	89.3%		92.7%		90.0%		92.0%		91.0%		47.1%		46.0%		46.3%		40.9%		45.1%	
Spouse	39.3%		32.7%		41.3%		30.7%		36.0%		51.4%		55.4%		56.5%		48.9%		53.1%	
Other HH member[2]	3.3%		8.0%		3.3%		3.3%		4.5%		0.7%		1.4%		2.0%		1.5%		1.4%	
Non-HH member[2]	0.7%		0.7%		0.0%		1.3%		0.7%		0.0%		0.0%		0.0%		0.0%		0.0%	
Milk marketing																				
Self	81.3%	b	90.0%	ab	92.0%	a	92.0%	a	88.8%	***	38.6%		38.8%		35.4%		40.1%		38.2%	
Spouse	38.0%		32.7%		35.3%		30.7%		34.2%		40.0%		48.2%		42.9%		47.4%		44.6%	
Other HH member[2]	4.0%		8.0%		3.3%		2.7%		4.5%		1.4%		1.4%		2.0%		2.2%		1.8%	
Non-HH member[2]	2.7%		0.0%		0.7%		0.7%		1.0%		0.0%		0.0%		0.0%		0.0%		0.0%	

[1]Sig = Significance; [2]HH = Household; * p < 0.1, ** 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 < 0.1). Districts with the same letter are not significantly different at the 5% level (p > 0.05).

Table A4. Percent of PDMs and SDMs reporting on how much input they have in making decisions on various farm activities, by profit quartile.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Food crop farming (PDM=38) (SDM = 46)												
No input	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	6.7%	0.0%	10.0%	4.4%	
Input in few decisions	0.0%	0.0%	12.5%	10.0%	5.3%		40.0%	26.7%	27.3%	50.0%	34.8%	
Input in some decisions	50.0%	50.0%	62.5%	20.0%	44.7%		40.0%	46.7%	54.6%	40.0%	45.7%	
Input into most or all decisions	50.0%	50.0%	25.0%	70.0%	50.0%		20.0%	20.0%	18.2%	0.0%	15.2%	
Cash crop farming (PDM=81) (SDM=110)												
No input	5.9%	0.0%	0.0%	10.0%	3.7%		4.0%	15.2%	0.0%	3.6%	6.4%	
Input in few decisions	5.9%	17.4%	9.5%	15.0%	12.4%		52.0%	36.4%	37.5%	46.4%	42.7%	
Input in some decisions	35.3%	69.6%	52.4%	35.0%	49.4%		36.0%	39.4%	54.2%	46.4%	43.6%	
Input into most or all decisions	52.9%	13.0%	38.1%	40.0%	34.6%		8.0%	9.1%	8.3%	3.6%	7.3%	
Livestock raising (cattle, buffalo, horses, etc.) (PDM=37) (SDM=34)												
No input	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Input in few decisions	12.5%	16.7%	16.7%	0.0%	10.8%		0.0%	0.0%	0.0%	16.7%	5.9%	
Input in some decisions	43.8%	66.7%	33.3%	44.4%	46.0%		62.5%	40.0%	55.6%	50.0%	52.9%	
Input into most or all decisions	43.8%	16.7%	50.0%	55.6%	43.2%		37.5%	60.0%	44.4%	33.3%	41.2%	
Dairy farming (general) (PDM = 334) (SDM=408)												
No input	1.1%	1.2%	0.0%	0.0%	0.6%		2.0%	4.9%	3.8%	7.8%	4.7%	
Input in few decisions	14.4%	9.3%	12.2%	11.8%	12.0%		38.8%	36.3%	43.4%	42.2%	40.2%	
Input in some decisions	33.3%	57.0%	48.8%	44.7%	45.8%		46.9%	47.1%	46.2%	44.1%	46.1%	
Input into most or all decisions	51.1%	32.6%	39.0%	43.4%	41.6%		12.2%	11.8%	6.6%	5.9%	9.1%	
Selling and buying dairy cows (PDM = 283) (SDM=271)												
No input	1.3%	1.4%	0.0%	0.0%	0.7%		6.2%	2.8%	1.4%	0.0%	2.6%	
Input in few decisions	10.7%	5.5%	10.1%	7.1%	8.5%		27.7%	21.1%	36.5%	34.4%	29.9%	
Input in some decisions	46.7%	64.4%	53.2%	51.8%	54.1%		49.2%	66.2%	50.0%	54.1%	55.0%	
Input into most or all decisions	41.3%	28.8%	36.7%	41.1%	36.8%		16.9%	9.9%	12.2%	11.5%	12.6%	
Kinds and quantity of forages (PDM = 177) (SDM=319)												
No input	4.4%	4.4%	2.3%	4.7%	4.0%		11.1%	18.0%	11.6%	18.1%	14.7%	
Input in few decisions	6.7%	11.1%	6.8%	7.0%	7.9%		41.7%	40.5%	43.0%	33.3%	39.8%	
Input in some decisions	46.7%	57.8%	65.9%	53.5%	55.9%		41.7%	36.0%	37.2%	41.7%	38.9%	
Input into most or all decisions	42.2%	26.7%	25.0%	34.9%	32.2%		5.6%	5.6%	8.1%	6.9%	6.6%	
Kinds and quantity of concentrates (PDM = 183) (SDM=272)												
No input	6.1%	2.0%	4.4%	10.0%	5.5%		10.9%	17.7%	14.7%	15.4%	14.7%	
Input in few decisions	24.5%	14.3%	8.9%	12.5%	15.3%		43.8%	35.3%	40.0%	21.5%	35.3%	
Input in some decisions	42.9%	61.2%	66.7%	57.5%	56.8%		35.9%	39.7%	38.7%	56.9%	42.7%	
Input into most or all decisions	26.5%	22.5%	20.0%	20.0%	22.4%		9.4%	7.4%	6.7%	6.2%	7.4%	

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Herd health (PDM = 240) (SDM=301)												
No input	1.6%	1.7%	3.1%	1.9%	2.1%		1.4%	1.3%	4.8%	10.1%	4.3%	
Input in few decisions	12.5%	6.8%	9.4%	3.8%	8.3%		34.7%	36.4%	37.4%	29.0%	34.6%	
Input in some decisions	43.8%	64.4%	57.8%	60.4%	56.3%		51.4%	50.7%	45.8%	52.2%	49.8%	
Input into most or all decisions	42.2%	27.1%	29.7%	34.0%	33.3%		12.5%	11.7%	12.1%	8.7%	11.3%	
Milk marketing (PDM = 226) (SDM=256)												
No input	6.2%	1.8%	3.7%	0.0%	3.1%		5.2%	13.4%	15.9%	10.3%	11.3%	
Input in few decisions	13.9%	19.3%	13.0%	8.0%	13.7%		39.7%	38.8%	30.2%	27.9%	34.0%	
Input in some decisions	50.8%	57.9%	63.0%	68.0%	59.3%		41.4%	40.3%	46.0%	55.9%	46.1%	
Input into most or all decisions	29.2%	21.1%	20.4%	24.0%	23.9%		13.8%	7.5%	7.9%	5.9%	8.6%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A5. Percent of PDMs and SDMs reporting on the extent of making personal decisions on various farm activities, by profit quartile.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Food crop farming (PDM=38) (SDM = 46)												
Not at all	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	6.7%	0.0%	0.0%	2.2%	
Small extent	0.0%	0.0%	12.5%	10.0%	5.3%		30.0%	26.7%	27.3%	30.0%	28.3%	
Medium extent	30.0%	60.0%	37.5%	30.0%	39.5%		60.0%	40.0%	54.6%	70.0%	54.4%	
High extent	70.0%	40.0%	50.0%	60.0%	55.3%		10.0%	26.7%	18.2%	0.0%	15.2%	
Cash crop farming (PDM=81) (SDM=110)												
Not at all	5.9%	8.7%	0.0%	5.0%	4.9%		4.0%	21.2%	0.0%	7.1%	9.1%	
Small extent	5.9%	21.7%	19.1%	15.0%	16.1%		44.0%	39.4%	45.8%	42.9%	42.7%	
Medium extent	41.2%	34.8%	42.9%	55.0%	43.2%		36.0%	36.4%	41.7%	46.4%	40.0%	
High extent	47.1%	34.8%	38.1%	25.0%	35.8%		16.0%	3.0%	12.5%	3.6%	8.2%	
Livestock raising (cattle, buffalo, horses, etc.) (PDM=37) (SDM=34)												
Not at all	0.0%	16.7%	0.0%	11.1%	5.4%		0.0%	20.0%	0.0%	8.3%	5.9%	
Small extent	18.8%	16.7%	16.7%	0.0%	13.5%		62.5%	40.0%	66.7%	50.0%	55.9%	
Medium extent	37.5%	33.3%	33.3%	33.3%	35.1%		37.5%	20.0%	33.3%	33.3%	32.4%	
High extent	43.8%	33.3%	50.0%	55.6%	46.0%		0.0%	20.0%	0.0%	8.3%	5.9%	
Dairy farming (general) (PDM = 334) (SDM=408)												
Not at all	2.2%	10.5%	6.1%	5.3%	6.0%		4.1%	11.8%	10.4%	10.8%	9.3%	
Small extent	13.3%	5.8%	13.4%	7.9%	10.2%		45.9%	40.2%	44.3%	46.1%	44.1%	
Medium extent	40.0%	45.4%	42.7%	42.1%	42.5%		37.8%	38.2%	37.7%	33.3%	36.8%	
High extent	44.4%	38.4%	37.8%	44.7%	41.3%		12.2%	9.8%	7.6%	9.8%	9.8%	
Selling and buying dairy cows (PDM = 283) (SDM=271)												
Not at all	2.7%	6.9%	6.3%	3.6%	5.0%		12.3%	15.5%	4.1%	4.9%	9.2%	
Small extent	12.0%	9.6%	5.1%	3.6%	7.8%		26.2%	25.4%	43.2%	31.2%	31.7%	
Medium extent	45.3%	49.3%	46.8%	51.8%	48.1%		50.8%	45.1%	44.6%	52.5%	48.0%	
High extent	40.0%	34.3%	41.8%	41.1%	39.2%		10.8%	14.1%	8.1%	11.5%	11.1%	
Kinds and quantity of forages (PDM = 177) (SDM=319)												
Not at all	4.4%	6.7%	2.3%	4.7%	4.5%		11.1%	23.6%	14.0%	15.3%	16.3%	
Small extent	8.9%	13.3%	13.6%	2.3%	9.6%		43.1%	36.0%	44.2%	31.9%	38.9%	
Medium extent	40.0%	46.7%	36.4%	60.5%	45.8%		36.1%	32.6%	29.1%	43.1%	34.8%	
High extent	46.7%	33.3%	47.7%	32.6%	40.1%		9.7%	7.9%	12.8%	9.7%	10.0%	
Kinds and quantity of concentrates (PDM = 183) (SDM=272)												
Not at all	8.2%	8.2%	4.4%	7.5%	7.1%		10.9%	20.6%	18.7%	15.4%	16.5%	
Small extent	20.4%	16.3%	13.3%	10.0%	15.3%		48.4%	36.8%	37.3%	32.3%	38.6%	
Medium extent	42.9%	40.8%	40.0%	60.0%	45.4%		28.1%	30.9%	30.7%	44.6%	33.5%	
High extent	28.6%	34.7%	42.2%	22.5%	32.2%		12.5%	11.8%	13.3%	7.7%	11.4%	

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Herd health (PDM = 240) (SDM=301)												
Not at all	3.1%	6.8%	4.7%	1.9%	4.2%		5.6%	7.8%	7.2%	10.1%	7.6%	
Small extent	10.9%	10.2%	10.9%	1.9%	8.8%		43.1%	37.7%	38.6%	27.5%	36.9%	
Medium extent	40.6%	52.5%	48.4%	58.5%	49.6%		40.3%	40.3%	41.0%	49.3%	42.5%	
High extent	45.3%	30.5%	35.9%	37.7%	37.5%		11.1%	14.3%	13.3%	13.0%	13.0%	
Milk marketing (PDM = 226) (SDM=256)												
Not at all	6.2%	10.5%	9.3%	0.0%	6.6%		5.2%	19.4%	17.5%	14.7%	14.5%	
Small extent	15.4%	14.0%	13.0%	6.0%	12.4%		43.1%	32.8%	28.6%	30.9%	33.6%	
Medium extent	47.7%	47.4%	51.9%	66.0%	52.7%		39.7%	35.8%	44.4%	45.6%	41.4%	
High extent	30.8%	28.1%	25.9%	28.0%	28.3%		12.1%	11.9%	9.5%	8.8%	10.6%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A6. Percent of PDMs and SDMs reporting on how much input they have in decisions regarding the use of income generated from various farm activities, by profit quartile.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Food crop farming (PDM=57) (SDM = 51)												
No input	14.3%	6.7%	0.0%	0.0%	5.3%		20.0%	12.5%	0.0%	0.0%	7.8%	
Input in few decisions	21.4%	13.3%	33.3%	37.5%	26.3%		10.0%	12.5%	25.0%	7.7%	13.7%	
Input in some decisions	21.4%	40.0%	16.7%	25.0%	26.3%		50.0%	43.8%	33.3%	61.5%	47.1%	
Input into most or all decisions	42.9%	40.0%	50.0%	37.5%	42.1%		20.0%	31.3%	41.7%	30.8%	31.4%	
Cash crop farming (PDM=163) (SDM=117)												
No input	2.5%	0.0%	0.0%	2.6%	1.2%		0.0%	5.6%	0.0%	0.0%	1.7%	
Input in few decisions	17.5%	22.0%	22.9%	23.7%	21.5%		33.3%	11.1%	24.0%	13.8%	19.7%	
Input in some decisions	32.5%	38.0%	31.4%	29.0%	33.1%		48.2%	47.2%	48.0%	55.2%	49.6%	
Input into most or all decisions	47.5%	40.0%	45.7%	44.7%	44.2%		18.5%	36.1%	28.0%	31.0%	29.1%	
Livestock raising (cattle, buffalo, horses, etc.) (PDM=58) (SDM=35)												
No input	4.4%	9.1%	0.0%	0.0%	3.5%		0.0%	0.0%	0.0%	0.0%	0.0%	
Input in few decisions	30.4%	45.5%	0.0%	15.4%	24.1%		22.2%	0.0%	44.4%	25.0%	25.7%	
Input in some decisions	17.4%	0.0%	27.3%	30.8%	19.0%		44.4%	40.0%	44.4%	50.0%	45.7%	
Input into most or all decisions	47.8%	45.5%	72.7%	53.9%	53.5%		33.3%	60.0%	11.1%	25.0%	28.5%	
Dairy farming (general) (PDM = 566) (SDM=428)												
No input	0.7%	1.4%	1.4%	4.2%	1.9%		1.0%	0.0%	1.8%	5.7%	2.1%	
Input in few decisions	23.0%	24.5%	24.1%	21.7%	23.3%		20.4%	13.6%	19.1%	18.1%	17.8%	
Input in some decisions	35.3%	34.3%	39.0%	34.3%	35.7%		39.8%	47.3%	49.1%	41.9%	44.6%	
Input into most or all decisions	41.0%	39.9%	35.5%	39.9%	39.1%		38.8%	39.1%	30.0%	34.3%	35.5%	
Selling and buying dairy cows (PDM = 426) (SDM=281)												
No input	2.7%	2.7%	3.7%	3.1%	3.1%		4.4%	0.0%	2.7%	1.5%	2.1%	
Input in few decisions	16.4%	16.2%	18.7%	18.4%	17.4%		11.6%	8.2%	17.6%	16.9%	13.5%	
Input in some decisions	33.6%	43.2%	43.0%	41.8%	40.4%		55.1%	63.0%	59.5%	43.1%	55.5%	
Input into most or all decisions	47.3%	37.8%	34.6%	36.7%	39.2%		29.0%	28.8%	20.3%	38.5%	28.8%	
Kinds and quantity of forages (PDM = 566) (SDM=344)												
No input	13.0%	10.6%	15.5%	16.1%	13.8%		23.8%	35.1%	30.7%	29.1%	29.9%	
Input in few decisions	6.5%	7.8%	7.0%	7.0%	7.1%		25.0%	19.6%	26.1%	20.3%	22.7%	
Input in some decisions	20.9%	20.4%	18.3%	16.1%	18.9%		38.8%	29.9%	31.8%	32.9%	33.1%	
Input into most or all decisions	59.7%	61.3%	59.2%	60.8%	60.3%		12.5%	15.5%	11.4%	17.7%	14.2%	
Kinds and quantity of concentrates (PDM = 558) (SDM=320)												
No input	14.5%	12.1%	17.0%	16.7%	15.1%		19.0%	22.6%	29.8%	23.3%	23.8%	
Input in few decisions	10.1%	12.8%	6.4%	10.1%	9.9%		31.7%	21.4%	23.8%	17.8%	23.8%	
Input in some decisions	21.0%	17.0%	17.7%	18.1%	18.5%		27.9%	33.3%	29.8%	32.9%	30.9%	
Input into most or all decisions	54.4%	58.2%	58.9%	55.1%	56.6%		21.5%	22.6%	16.7%	26.0%	21.6%	

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Herd health (PDM = 566) (SDM=326)												
No input	11.5%	12.7%	16.1%	14.1%	13.6%		13.8%	17.4%	16.1%	24.7%	17.8%	
Input in few decisions	10.8%	8.5%	7.7%	7.8%	8.7%		25.0%	20.9%	25.3%	16.4%	22.1%	
Input in some decisions	23.0%	26.1%	25.2%	23.9%	24.6%		42.5%	39.5%	42.5%	42.5%	41.7%	
Input into most or all decisions	54.7%	52.8%	51.1%	54.2%	53.2%		18.8%	22.1%	16.1%	16.4%	18.4%	
Milk marketing (PDM = 556) (SDM=287)												
No input	0.4%	0.4%	0.2%	0.5%	0.4%		1.5%	2.6%	4.3%	2.8%	2.8%	
Input in few decisions	2.2%	2.1%	2.0%	1.5%	2.0%		14.5%	15.8%	18.6%	11.1%	15.0%	
Input in some decisions	2.8%	2.5%	2.9%	3.0%	2.8%		39.1%	44.7%	38.6%	40.3%	40.8%	
Input into most or all decisions	4.5%	4.9%	4.9%	5.0%	4.8%		44.9%	36.8%	38.6%	45.8%	41.5%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A7. Percent of PDMs and SDMs who own various assets that could be used to generate income, by profit quartiles.

	Primary Decision Maker (n=600)										Secondary Decision Maker (n=563)									
	Q1		Q2		Q3		Q4		Total		Q1		Q2		Q3		Q4		Total	
Variable	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]	Value	Sig[1]
Agricultural land	55.3%	b	43.3%	ab	37.3%	a	50.7%	ab	46.7%	***	53.6%	b	46.8%	ab	36.7%	a	46.0%	ab	45.6%	**
Large livestock	94.7%		94.7%		93.3%		93.3%		94.0%		92.9%		94.2%		93.9%		92.7%		93.4%	
Small livestock	6.7%		4.7%		2.7%		6.0%		5.0%		7.9%		3.6%		2.7%		7.3%		5.3%	
Poultry	24.0%	a	28.7%	a	25.3%	a	16.7%	a	23.7%	*	24.3%		26.6%		25.2%		19.0%		23.8%	
Fish pond or fishing equipment	5.3%		6.7%		2.0%		4.7%		4.7%		4.3%		6.5%		2.0%		5.1%		4.4%	
Farm equipment (non-mechanised)	83.3%		76.7%		77.3%		78.0%		78.8%		76.4%		74.8%		72.8%		77.4%		75.3%	
Farm equipment (mechanised)	4.7%		2.7%		2.7%		3.3%		3.3%		6.4%		2.9%		2.0%		4.4%		3.9%	
Non-farm business equipment	14.7%		12.0%		14.0%		8.7%		12.3%		16.4%		12.2%		15.0%		8.8%		13.1%	
House or other structures	90.7%		90.0%		90.7%		88.0%		89.8%		90.7%		87.8%		90.5%		88.3%		89.3%	
Large consumer durables	98.0%		100.0%		98.7%		99.3%		99.0%		97.9%		100.0%		98.0%		99.3%		98.8%	
Small consumer durables	98.7%		98.0%		96.0%		95.3%		97.0%		99.3%		97.8%		95.2%		97.8%		97.5%	
Mobile phones	88.0%		86.7%		84.7%		84.7%		86.0%		87.1%		87.1%		81.0%		83.9%		84.7%	
Other land not used for agricultural purposes	14.7%		16.0%		20.0%		16.7%		16.8%		15.0%		16.5%		17.7%		15.3%		16.2%	
Means of transportation	86.0%		83.3%		80.0%		80.7%		82.5%		87.1%		84.2%		76.9%		82.5%		82.6%	
None	0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		1.4%		0.0%		0.4%	

[1]Sig = Significance; * p < 0.1, ** 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 < 0.1). Quartiles with the same letter are not significantly different at the 5% level (p > 0.05).

Table A8. Percent of PDMs and SDMs reporting on overall sole or joint ownership of assets, by profit quartiles.

	Primary Decision Maker (n=4,438)						Secondary Decision Maker (n=4,133)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Do you own any of the items that could be used to generate income?												
No	14.2%	12.8%	11.3%	12.6%	12.8%	**	14.6%	16.2%	12.3%	13.5%	14.2%	
Yes, solely	21.8%	21.2%	18.6%	23.4%	21.3%	**	10.9%	10.9%	11.4%	11.2%	11.1%	
Yes, jointly	64.0%	66.0%	70.1%	64.0%	66.0%	**	74.5%	72.8%	76.3%	75.3%	74.7%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A9. Percent of PDMs and SDMs reporting sole or joint ownership of various assets, by profit quartiles.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Agricultural land (PDM=280) (SDM=257)												
No	4.8%	12.3%	5.4%	11.8%	8.6%	*	9.3%	12.3%	14.8%	12.7%	12.1%	
Yes, solely	25.3%	21.5%	17.9%	34.2%	25.4%	*	6.7%	4.6%	3.7%	6.4%	5.5%	
Yes, jointly	69.9%	66.2%	76.8%	54.0%	66.1%	*	84.0%	83.1%	81.5%	81.0%	82.5%	
Large livestock (PDM=564) (SDM=526)												
No	3.5%	2.1%	3.6%	2.1%	2.8%		6.9%	7.6%	7.3%	10.2%	8.0%	
Yes, solely	17.6%	18.3%	17.9%	22.9%	19.2%		1.5%	0.0%	0.0%	0.8%	0.6%	
Yes, jointly	78.9%	79.6%	78.6%	75.0%	78.0%		91.5%	92.4%	92.8%	89.0%	91.4%	
Small livestock (PDM=30) (SDM=30)												
No	10.0%	0.0%	0.0%	0.0%	3.3%		9.1%	0.0%	25.0%	10.0%	10.0%	
Yes, solely	10.0%	28.6%	50.0%	11.1%	20.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Yes, jointly	80.0%	71.4%	50.0%	88.9%	76.7%		90.9%	100.0%	75.0%	90.0%	90.0%	
Poultry (PDM=142) (SDM=134)												
No	22.2%	7.0%	10.5%	20.0%	14.1%		14.7%	13.5%	16.2%	7.7%	13.4%	
Yes, solely	11.1%	18.6%	21.1%	12.0%	16.2%		14.7%	10.8%	5.4%	15.4%	11.2%	
Yes, jointly	66.7%	74.4%	68.4%	68.0%	69.7%		70.6%	75.7%	78.4%	76.9%	75.4%	
Fish pond or fishing equipment (PDM=28) (SDM=25)												
No	0.0%	0.0%	0.0%	0.0%	0.0%		16.7%	0.0%	0.0%	28.6%	12.0%	
Yes, solely	0.0%	10.0%	0.0%	0.0%	3.6%		0.0%	0.0%	0.0%	0.0%	0.0%	
Yes, jointly	100.0%	90.0%	100.0%	100.0%	96.4%		83.3%	100.0%	100.0%	71.4%	88.0%	
Farm equipment (non-mechanised) (PDM=473) (SDM=424)												
No	0.8%	0.9%	1.7%	1.7%	1.3%		26.2%	26.9%	23.4%	25.5%	25.5%	
Yes, solely	47.2%	39.1%	37.9%	44.4%	42.3%		4.7%	3.9%	1.9%	2.8%	3.3%	
Yes, jointly	52.0%	60.0%	60.3%	53.9%	56.5%		69.2%	69.2%	74.8%	71.7%	71.2%	
Farm equipment (mechanised) (PDM=20) (SDM=22)												
No	0.0%	0.0%	0.0%	0.0%	0.0%		11.1%	25.0%	33.3%	33.3%	22.7%	
Yes, solely	28.6%	75.0%	50.0%	80.0%	55.0%		11.1%	0.0%	0.0%	0.0%	4.6%	
Yes, jointly	71.4%	25.0%	50.0%	20.0%	45.0%		77.8%	75.0%	66.7%	66.7%	72.7%	
Non-farm business equipment (PDM=74) (SDM=74)												
No	13.6%	11.1%	4.8%	7.7%	9.5%		30.4%	29.4%	31.8%	25.0%	29.7%	
Yes, solely	27.3%	38.9%	42.9%	23.1%	33.8%		13.0%	23.5%	4.6%	16.7%	13.5%	
Yes, jointly	59.1%	50.0%	52.4%	69.2%	56.8%		56.5%	47.1%	63.6%	58.3%	56.8%	

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
House or other structures (PDM=539) (SDM=503)												
No	9.6%	5.9%	5.9%	6.8%	7.1%		4.7%	4.1%	6.0%	6.6%	5.4%	
Yes, solely	11.8%	13.3%	7.4%	15.9%	12.1%		9.5%	4.9%	3.0%	5.8%	5.8%	
Yes, jointly	78.7%	80.7%	86.8%	77.3%	80.9%		85.8%	91.0%	91.0%	87.6%	88.9%	
Large consumer durables (PDM=594) (SDM=556)												
No	13.6%	10.7%	8.8%	11.4%	11.1%		1.5%	0.0%	2.1%	1.5%	1.3%	
Yes, solely	8.8%	6.7%	4.1%	8.7%	7.1%		11.0%	10.1%	8.3%	11.0%	10.1%	
Yes, jointly	77.6%	82.7%	87.2%	79.9%	81.8%		87.6%	89.9%	89.6%	87.5%	88.7%	
Small consumer durables (PDM=582) (SDM=549)												
No	31.1%	25.2%	25.0%	23.1%	26.1%		0.0%	0.0%	0.7%	0.0%	0.2%	
Yes, solely	6.8%	5.4%	2.8%	7.7%	5.7%		31.7%	30.2%	20.7%	31.3%	28.4%	
Yes, jointly	62.2%	69.4%	72.2%	69.2%	68.2%		68.4%	69.9%	78.6%	68.7%	71.4%	
Mobile phones (PDM=516) (SDM=477)												
No	34.1%	35.4%	30.7%	31.5%	33.0%		37.7%	39.7%	34.5%	29.6%	35.4%	*
Yes, solely	40.2%	37.7%	34.7%	36.2%	37.2%		37.7%	28.9%	25.2%	31.3%	30.8%	*
Yes, jointly	25.8%	26.9%	34.7%	32.3%	29.8%		24.6%	31.4%	40.3%	39.1%	33.7%	*
Other land not used for agricultural purposes (PDM=101) (SDM=91)												
No	4.6%	4.2%	13.3%	12.0%	8.9%		0.0%	13.0%	11.5%	14.3%	9.9%	
Yes, solely	18.2%	33.3%	13.3%	28.0%	22.8%		0.0%	0.0%	3.9%	9.5%	3.3%	
Yes, jointly	77.3%	62.5%	73.3%	60.0%	68.3%		100.0%	87.0%	84.6%	76.2%	86.8%	
Means of transportation (PDM=495) (SDM=465)												
No	12.4%	14.4%	6.7%	12.4%	11.5%		30.3%	29.9%	26.6%	33.6%	30.1%	
Yes, solely	27.9%	29.6%	28.3%	29.8%	28.9%		1.6%	2.6%	2.7%	2.7%	2.4%	
Yes, jointly	59.7%	56.0%	65.0%	57.9%	59.6%		68.0%	67.5%	70.8%	63.7%	67.5%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A10. Percent of PDMs and SDMs who had a loan in the last 12 months from various sources, by profit quartiles.

	Primary Decision Maker (n=600)						Secondary Decision Maker (n=563)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Dairy cooperative	32.0%	37.3%	36.0%	39.3%	36.2%		31.4%	36.7%	36.7%	38.7%	35.9%	
Formal lender (bank/financial institution)	23.3%	19.3%	24.0%	16.0%	20.7%		24.3%	20.1%	24.5%	17.5%	21.7%	
Informal lender	0.0%	0.7%	0.7%	0.0%	0.3%		0.0%	0.7%	0.0%	0.0%	0.2%	
Friends/relatives (charging zero interest)	8.0%	3.3%	7.3%	6.0%	6.2%		9.3%	3.6%	6.8%	5.8%	6.4%	
Union	0.0%	0.0%	0.7%	0.0%	0.2%		0.0%	0.0%	0.7%	0.0%	0.2%	
Informal savings and credit groups	0.0%	0.0%	1.3%	0.0%	0.3%		0.0%	0.0%	1.4%	0.0%	0.4%	
Non-government organisation	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Other	0.0%	0.7%	0.7%	1.3%	0.7%		0.0%	0.7%	0.7%	1.5%	0.7%	
None	37.3%	40.0%	34.0%	38.7%	37.5%		0.0%	0.0%	0.0%	0.0%	0.0%	
Don't know	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.7%	0.0%	0.0%	0.2%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A11. Percent of PDMs and SDMs reporting on the forms of loan taken in the last 12 months from various sources, by profit quartiles.

	Primary Decision Maker (PDM)						Secondary Decision Maker (SDM)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Dairy cooperative (PDM=217) (SDM=202)												
Cash	93.8%	100.0%	98.2%	98.3%	97.7%		95.5%	100.0%	98.2%	98.1%	98.0%	
In-kind	6.3%	0.0%	0.0%	0.0%	1.4%		4.6%	0.0%	0.0%	0.0%	1.0%	
Cash and in-kind	0.0%	0.0%	1.9%	1.7%	0.9%		0.0%	0.0%	1.9%	1.9%	1.0%	
Formal lender (bank/financial institution) (PDM=124) (SDM=122)												
Cash	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	100.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Informal lender (PDM=2) (SDM=1)												
Cash	0.0%	100.0%	100.0%	0.0%	100.0%		0.0%	100.0%	0.0%	0.0%	0.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Friends/relatives (charging zero interest) (PDM=37) (SDM=36)												
Cash	91.7%	80.0%	81.8%	88.9%	86.5%		92.3%	80.0%	80.0%	87.5%	86.1%	
In-kind	8.3%	20.0%	18.2%	11.1%	13.5%		7.7%	20.0%	20.0%	12.5%	13.9%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Union (PDM=1) (SDM=1)												
Cash	0.0%	0.0%	100.0%	0.0%	0.0%		0.0%	0.0%	100.0%	0.0%	0.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Informal savings and credit groups (PDM=2) (SDM=2)												
Cash	0.0%	0.0%	100.0%	0.0%	0.0%		0.0%	0.0%	100.0%	0.0%	0.0%	
In-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
Other (PDM=19) (SDM=20)												
Cash	100.0%	100.0%	100.0%	85.7%	94.7%		100.0%	100.0%	100.0%	85.7%	95.0%	
In-kind	0.0%	0.0%	0.0%	14.3%	5.3%		0.0%	0.0%	0.0%	14.3%	5.0%	
Cash and in-kind	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	

[1]Sig = Significance; * $p < 0.1$, ** $p < 0.05$ 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 ($p < 0.1$). Quartiles with the same letter are not significantly different at the 5% level ($p > 0.05$).

Table A12. Percent of PDMs and SDMs reporting on decision making on borrowing funds, by quartiles.

	Primary Decision Maker (n=402)										Secondary Decision Maker (n=384)									
	Q1		Q2		Q3		Q4		Total		Q1		Q2		Q3		Q4		Total	
Variable	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**	**Value**	**Sig[1]**
Decisions to borrow																				
Self	88.9%		92.6%		96.3%		96.0%		93.5%		79.5%		82.8%		86.1%		86.1%		83.9%	
Spouse	86.9%	b	72.6%	ab	82.6%	ab	69.7%	a	78.1%	***	94.0%	ab	91.9%	ab	97.0%	b	86.1%	a	92.2%	**
Other HH member[2]	4.0%		5.3%		3.7%		1.0%		3.5%		3.6%		4.0%		2.0%		2.0%		2.9%	
Non-HH member[2]	1.0%		0.0%		1.8%		1.0%		1.0%		0.0%		0.0%		0.0%		2.0%		0.5%	
Decisions regarding borrowed funds																				
Self	84.8%		84.2%		89.9%		87.9%		86.8%		79.5%		87.9%		87.1%		86.1%		86.4%	
Spouse	79.8%		76.8%		85.3%		77.8%		80.1%		89.2%		89.9%		90.1%		81.2%		87.5%	
Other HH member[2]	4.0%		5.3%		1.8%		1.0%		3.0%		3.6%		4.0%		1.0%		2.0%		2.6%	
Non-HH member[2]	1.0%		0.0%		1.8%		1.0%		1.0%		1.2%		0.0%		0.0%		2.0%		0.8%	

[1]Sig = Significance; [2]HH = Household; * p < 0.1, ** 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 < 0.1). Quartiles with the same letter are not significantly different at the 5% level (p > 0.05).

Table A13. Percent of PDMs and SDMs who are members of various groups, by profit quartiles.

	Primary Decision Maker (n=600)						Secondary Decision Maker (n=563)					
Variable	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Sig[1]**
Farmer group[2]	73.3%	86.0%	86.7%	86.7%	83.2%	***	25.0%	23.0%	19.0%	22.6%	22.4%	
Youth union	7.3%	6.0%	6.7%	9.3%	7.3%		2.1%	0.0%	0.7%	2.9%	1.4%	
Forest user's group	6.0%	6.0%	7.3%	7.3%	6.7%		5.0%	5.0%	1.4%	3.6%	3.7%	
Credit, microfinance, and insurance group	2.7%	3.3%	1.3%	1.3%	2.2%		7.1%	3.6%	4.1%	3.6%	4.6%	
Trade and business association group	2.0%	0.7%	0.0%	2.0%	1.2%		1.4%	2.9%	0.7%	2.9%	2.0%	
Civic and charitable group	14.0%	10.0%	14.0%	12.0%	12.5%		12.9%	11.5%	12.2%	12.4%	12.3%	
Religious group	70.7%	66.7%	60.0%	64.7%	65.5%		77.1%	74.8%	72.1%	71.5%	73.9%	
Women's union	1.3%	2.0%	1.3%	1.3%	1.5%		25.0%	25.2%	29.9%	24.1%	26.1%	
Other	1.3%	0.7%	1.3%	0.0%	0.8%		1.4%	0.0%	0.7%	2.2%	1.1%	

[1]Sig = Significance; [2]Includes agricultural livestock and fisheries producers groups (including marketing); * p < 0.1, ** 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 < 0.1). Quartiles with the same letter are not significantly different at the 5% level (p > 0.05).