

MILLIMAN RESEARCH REPORT

Mortality of dairy cows in Georgia

Understanding death and risk management in the Kakheti region

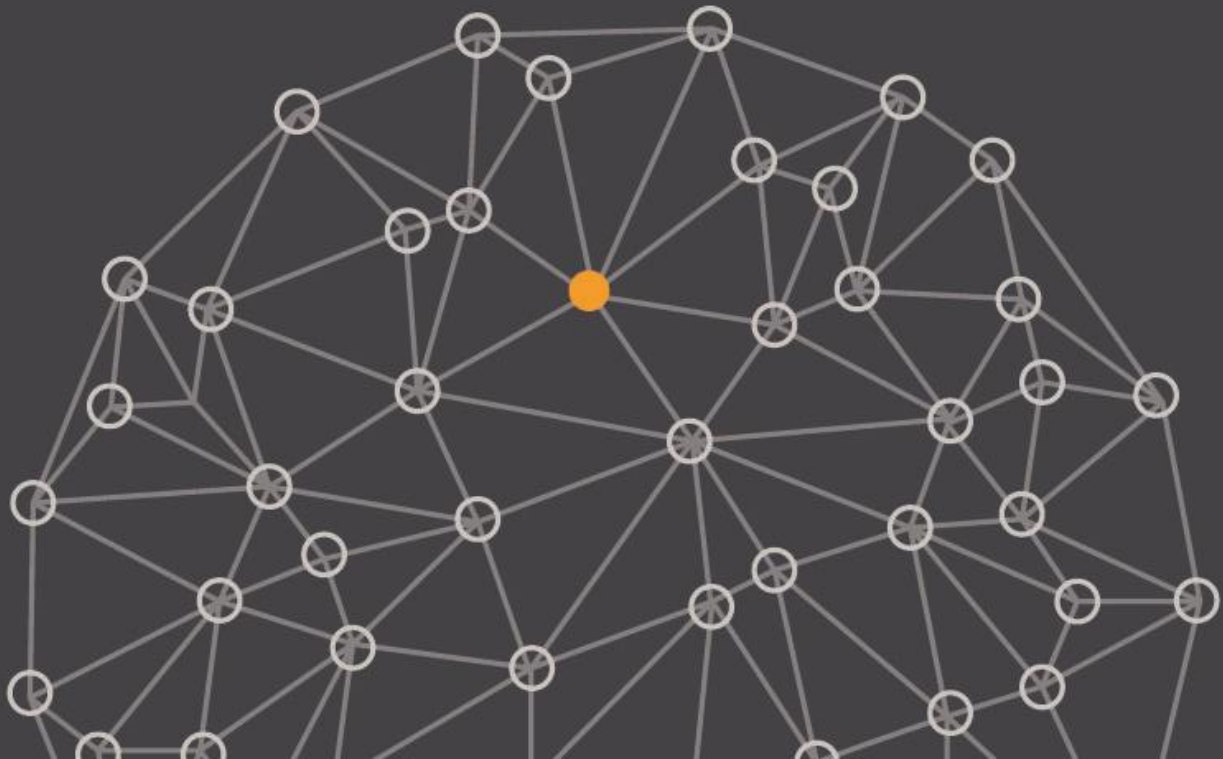
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Abbreviations

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| GEL | Georgian Lari |
| GFA | Georgian Farmers Association |
| IFAD | International Fund for Agricultural Development |
| MIC@M | MicroInsurance Centre at Milliman |
| MRRD | Managing Risks for Rural Development |
| NGO | Non-Governmental Organisation |
| USD | United States Dollar |

USD 1 = GEL 3.1, sourced from oanda.com on 26 August 2021

This report provides the results of a livestock mortality survey conducted by the MicroInsurance Centre at Milliman (MIC@M) in partnership with the Georgian Farmers Association (GFA) and commissioned by Land O'Lakes Venture37. Additional financial support was provided as part of MIC@M's Managing Risks for Rural Development project, which is funded by a grant from the International Fund for Agriculture Development (IFAD).

This report highlights some key implications for the design of valuable livestock insurance for Georgian dairy farmers. The interpretations here represent the authors' opinions on how the data supports product design, and are not those of Milliman, Land O'Lakes, or IFAD. Milliman does not intend to benefit or create a legal duty to any third-party recipient of its work. In performing any analysis in this study, the research team and authors relied on data reported by Georgian dairy farmers and other industry stakeholders. If the underlying data, information or assumptions are inaccurate or incomplete, the results of our analysis may likewise be inaccurate or incomplete.

About Land O'Lakes Venture37. Land O'Lakes Venture37 is an independent 501(c)(3) nonprofit, leveraging expertise, innovation and technology from Land O'Lakes, Inc.'s four diversified businesses. This takes shape in many ways. Whether championing food safety regulations, driving innovation through research, development, optimizing supply chain networks or offering farmers services to make informed decisions, they combine premier agribusiness know-how with local insights to create lasting impact. In the Republic of Georgia, Venture37 is working with the US Department of Agriculture (USDA) through a grant for the Safety and Quality Investment in Livestock (SQIL) to increase agriculture productivity in the Georgian dairy and beef sectors by disseminating farm management best practices and expanding private sector input. The component activities listed by SQIL include improving access to financial services and productivity through adoption of competitive farming and value-added business management practices. It is within the scope of these two activities that MIC@M has been conducting activities around the study on cow mortality and the recommendation and design of a private sector insurance product that will provide value to commercial dairy farms in the Kakheti region.

About IFAD. Working through the Platform for Agricultural Risk Management (PARM), IFAD promotes the responsible use of insurance as part of a holistic approach to managing agricultural and climate risks. IFAD invests in rural people, empowering them to reduce poverty, increase food security, improve nutrition and strengthen resilience. Since 1978, IFAD has provided USD 22.4 billion in grants and low-interest loans to projects that have reached an estimated 512 million people. IFAD is an international financial institution and a United Nations specialized agency based in Rome—the United Nations food and agriculture hub.

Executive Summary

In the MicroInsurance Centre at Milliman's first study on mortality published with IFAD in 2020, we focused on two regions of Georgia, Samtskhe-Javakheti and Kvemo Kartli. The results of the survey and the findings and conclusions that we drew from the analysis provided the basis of what would become a significantly unique insurance product underwritten by the international insurance company IRAO. The research conducted and the findings of the study were used to refine pricing assumptions and construct a more farmer-friendly approach to risk management with insurance. Following the publication of the study, Land O'Lakes Venture37 recommended that the MicroInsurance Centre at Milliman (MIC@M) conduct a similar study that would focus on midsized to large-scale dairy farms in the Kakheti region, in particular those with higher-value imported cows such as Holsteins. To get a better understanding of the overall landscape of the farming operations and the risks associated with dairy operations, we therefore include a range of farmers, from small to large-scale farms.

The intent of this study in Kakheti is to expand on the data and findings from the first study, identify any differences in mortality rates of midsized to large dairy farms compared to smallholder farms, and create a benchmark with which to design an insurance product that addresses the unique risk management needs of midsized to large farms, as well as those with higher-value cows. The key findings from this survey of 319 dairy farmers with just under 6,900 dairy cows in Kakheti include:

- **Mortality rates:** Mortality rates decreased as the farm size increased. Annual mortality rates for small (1-19 cows), midsized (20-50 cows) and large (51-900 cows) farms were found to be 3.1%, 2.1% and 1.7%, respectively. The overall mortality rate for the sample was 2.3%.
- **Mortality causes:** Metabolic disorders (21%) originating from grazing on poisonous grasses, ingesting bad feed or from bloating was the leading cause of death. Accidents (20%), such as falling from cliffs, were the second-leading cause of death.
- **Concerns of farmers:** Forty-eight percent of farmers reported that their greatest concern regarding their dairy cows is the lack of grazing land, with nearly two-thirds (63%) listing it among their top three concerns. Declining milk prices and market access rounded out the top three concerns of farmers.
- **Veterinary care:** Only 34% of surveyed farmers used formal veterinary care (with the exception of free government vaccine services) in the past year.
- **Holstein cows:** Higher-value Holstein cows were found to have different risk profiles (lower overall mortality rate, different causes of death, different productive ages) compared to local breeds.

The mortality rates listed above were in line with expectations and were similar, though a bit higher, than the mortality rates identified in the initial study in Samtskhe-Javakheti and Kvemo Kartli. Our initial premise that we would see lower mortality rates as the size of the farm increased appears to be supported by the data collected. The reasons for lower mortality rates at larger farms are likely influenced by a number of factors. The access and resources available for larger farms to purchase feed appear to have an impact on lowering the risks of comorbidities associated with grazing in the mountains, such as metabolic disorders from bad grass, accidents or wild animal attacks. Access to free open grazing lands presented itself as the greatest concern among farmers, in particular those with small to midsized farms.

This study will provide stakeholders in the dairy industry the information and the guidance needed to design risk management solutions in an effort to assist all farmers in Georgia. While more research and testing of the recommendations of this study are required, we are confident that the information resulting from the survey and analysis can be used to improve the risk management tools currently being used.

Background and rationale

Reliable data is the genesis for good decisions when assessing the challenges and risks that dairy farmers face. Understanding their risks is the first step in developing practical and effective risk management solutions that can assist farmers. In a similar study conducted on dairy cow mortality and published in 2020,¹ the MicroInsurance Centre at Milliman (MIC@M) focused on smallholder dairy farmers with fewer than 10 dairy cows (though the data set included some larger farmers as well). As part of the current study commissioned by Land O'Lakes (LOL) Venture37, we expanded our area of study to equally include farmers considered to be commercial, or midsized to large farms (20+ cows). LOL called upon MIC@M to complete a thorough study of the midsized to large dairy farms to collect, analyze and report the findings of a survey regarding the dairy cow mortality risks that these farmers faced. The findings from this study are intended to be the preface for a risk management solution, in particular dairy cow insurance, that would reflect the unique needs of midsized and large dairy farms, or farms of any size with higher-value cows. Because of the success of the first mortality study, this follow-up study implemented a similar process and structure.

The MIC@M research team determined that the most effective method to collect data was by going directly to the farmers in a random manner. Our belief that “the truth is always found closer to the customer” prompted us to design a survey that was presented to the farmer to solicit direct responses. Based on our work over the past three years in Georgia with dairy farmers, we knew that farmers were willing to share data with trusted local sources. To address these risks and find viable solutions to manage the risks, we needed to uncover the specific reasons for mortality among dairy cows, the demographic characteristics of the farms and the farming practices used. Critical to understanding the severity of risks was to quantify the overall mortality rates of the farms, but also considering the core risks that could be addressed with certain causes of deaths. In reviewing the findings of the first study, we anticipated that some of the primary reasons for mortality in smallholder farms would be similar to those in the midsized to large farms.

In order to answer these crucial questions, the MIC@M project team designed a short questionnaire, which was used to conduct phone interviews with individual farmers in Kakheti. In addition to gathering core mortality data from each of the farmers, we also used the survey to gather ancillary data on the farm characteristics, feed practices, veterinary services and experience with managing risk through the use of insurance. We sought to not only determine the causes of death, but just as importantly to identify solutions backed by data to decrease premature mortality.

The findings from this study are relevant for the entire dairy industry and its support structure to improve cow mortality for the farmers, and at the same time will provide the basis for refining next-generation dairy cow insurance products for all dairy farmers in Georgia.

Methodology

The MIC@M project team developed a structured questionnaire (see [Appendix 1](#)) to be used by the interviewers. The Georgian Farmers Association (GFA)² was contracted to conduct the interviews, which took place from 29 June to 6 August 2021. The farmers were asked a series of questions pertaining to farm characteristics, mortality causes, dairy cow pricing and farm practices. The survey was designed to last no more than 20 minutes and was conducted by phone. Training was conducted by our local team in Tbilisi with GFA to assure that the responses were accurate and met the standards of MIC@M. Microsoft Excel was used to input responses in real time and allowed all team members involved to follow progress and control quality throughout the collection process.

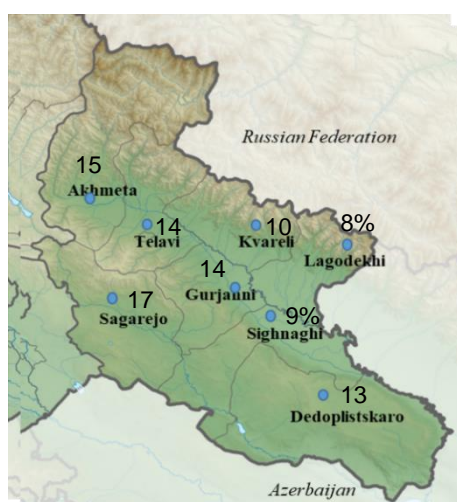
¹ Steinmann, R., McCord, M., Biese, K., Kushwah, N. & Kvariani, L. (March 2020) Mortality of Dairy Cows in Georgia: From Guesswork to Data Through Farmer Surveys (English). MicroInsurance Centre at Milliman. Retrieved 7 December 2021 from <http://www.microinsurancecentre.org/resources/documents/market-development/demand-studies/mortality-of-dairy-cows-in-georgia-english.html>.

² See <https://gfa.org.ge/en/>.

We targeted a sample size of 300+ farmers and 5,000 cows, to provide us with sufficient data to estimate reliable mortality rates. In addition to a required number of farmers and cows, we also wanted to ensure that we had a cross-section of farm types by size. While the main focus was midsized to large farms (20+ cows),³ we still included a significant percentage of smallholder farms (1-19 cows) and also requested that a small number of “specialty” or Holstein cow farms be included in the survey. A total of 321 farmers were interviewed who represented a current (July 2021) dairy cow population of 6,897. Our survey asked the farmer to report on current dairy cow counts, as well as counts and mortality of dairy cows aged 2 to 9, from 2018 to 2020. By using three years of data for mortality and herd size, we were able to observe trends in the data that were statistically sound.

The study was conducted across all municipalities in the Kakheti region. The selection of the Kakheti region was made to align with the work being done by LOL Venture37 and planned expansion of our work with IFAD. This region is moderately rich in dairy cows, with 94,000 animals.⁴ Compared to the rest of the country, Kakheti ranks fifth of 11 regions (including two autonomous republics) in number of dairy cows. The survey participants were located within all eight municipalities of Kakheti. Figure 1 illustrates the dispersion of respondents by geographical municipalities.

FIGURE 1: LOCATION OF FARMERS IN SAMPLE



The response rate was high, with nearly 46% of phone calls answered. Dairy farmer contact details were obtained from the Georgian Farmers Association, the Ministry of Environmental Protection and Agriculture of Georgia, the International Fund for Agriculture Development Dairy Modernization and Market Access (DIMMA) project and from personal contacts of our in-country consultant. GFA connected with a total of 700 households in order to complete 321 interviews, which resulted in a success rate of 46%.⁵ This success rate excludes calls to phone numbers which were out of service, in an out-of-reach area or incorrect. Of the 321 completed interviews, two responses were eliminated due to irreconcilable inconsistencies in the reported data.

The study focused on dairy cows. Generally speaking, farmers identify dairy cows as any cow in their herds that can give milk, as well as cows that are dry one season (such as due to an illness) and will milk the following season. The survey findings include references to “cows between the ages 2-9” and “total dairy cows” (includes cows older than age 9). **Our overall interest in this survey is to examine data on cows that are in their most productive years, typically ages 2 to 9 for local cows (and 2 to 5 for higher-value Holstein cows).**

Based on the results of the survey, a follow-up willingness to pay (WTP) exercise was conducted with a small number of Holstein farmers. As a particular subset of interest to stakeholders, and of growing adoption by farmers, we explored the interest and feasibility of an insurance product that covers higher-value Holstein cows in particular. An interview guide was developed (see Appendix 2) and 16 interviews were conducted, including a combination of in-person and phone interviews. The interviewed Holstein farmers, who in total owned more than 600 cows, were identified by Venture37, IRAO and via the survey database.

³ For this study, a midsized dairy farm is defined as having 20 to 50 dairy cows, while a large farm has 51 or more.

⁴ National Statistics Office of Georgia. Agriculture. Retrieved 7 December 2021 from <https://www.geostat.ge/en/modules/categories/196/agriculture>.

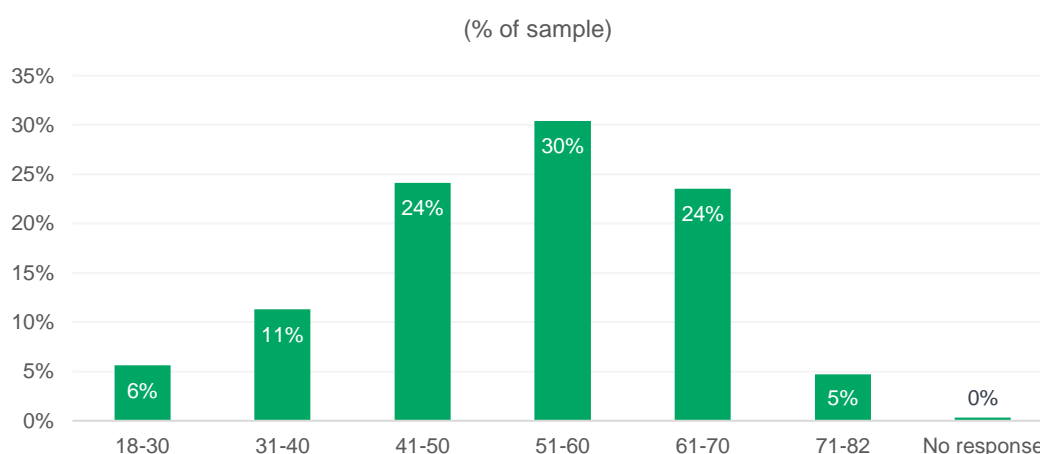
⁵ As a comparison, SurveyAnyplace’s 2021 Benchmark Report notes that its benchmark telephone survey response rate for 2021 in the US is 18%. A benchmark response rate was not identified for the Republic of Georgia.

Key findings and implications

FARMER AND FARM CHARACTERISTICS

The typical farmer profile tends to be middle-aged to older males. The youngest farmer surveyed was 18 years old while the oldest was 82. Of the 319 farmers who responded to the question about age, the largest age bracket for farmers is 51 to 60 years (30% of all farmers), as shown in Figure 2. The gender mix of respondents was 95% male and 5% female. While this distribution is not surprising, given that our previous study found an 80/20 mix of males and females it is important to note that this study is reporting findings on midsized and large farms, with some smallholders included, while the previous study was primarily on smallholders, with a few midsized and large farms. The larger percentage of male farmers may be attributable to historical preferences for males and social barriers to entry for women in commercial enterprises, and less access to investment capital to operate a commercial farm, though these factors were not studied in this research.

FIGURE 2: AGE DISTRIBUTION OF FARMERS IN SAMPLE



Farm size varies widely, but the median farmer has 13 dairy cows. The total number of cows in the sample is 6,897, resulting in an average of 21.6 dairy cows per farmer. Because we examined a cross-section of farm sizes throughout the region, our data contains some farmers that have a significant impact on the overall average; when one very large farmer with 900 cows is removed from the sample, the average number of cows is 18. While the smallholder farmers outnumbered the midsized (20-50 cows) and large (50+ cows) farmers by 65% to 35%, the size of the dairy cow population in the midsized to large sectors makes up approximately 72% of the dairy cows in the study (see Figure 3). A handful of very large farmers seem to be outliers as they together account for 17% of the cows in the sample. As the primary goal is to determine mortality trends, we are satisfied that the total number of cows in the sample exceeded the target of 5,000.

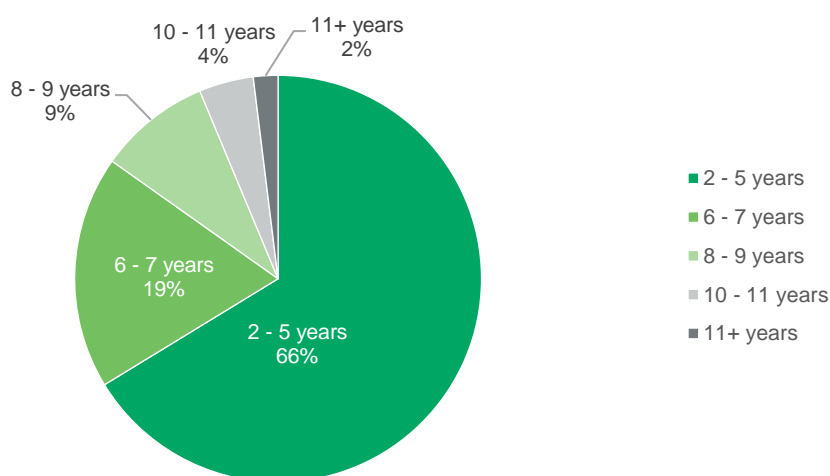
FIGURE 3: NUMBER OF DAIRY COWS IN SAMPLE BY SIZE OF FARM HOLDINGS⁶

| Size of farm | Dairy cows farmed | Farmers | | Dairy Cows | |
|--------------|-------------------|------------------|-------------|------------------|-------------|
| | | Number in sample | % of sample | Number in sample | % of sample |
| Small | 1-19 | 207 | 65% | 1,941 | 28% |
| Mid | 20-50 | 94 | 30% | 2,809 | 41% |
| Large | 51+ | 18 | 5% | 2,147 | 31% |
| Total | | 319 | 100% | 6,897 | 100% |

Most of the dairy cows in the sample are local breed cows, but 21% are Holsteins. While imported cows such as Holsteins accounted for just 0.2% of total bovine livestock in Georgia in 2016,⁷ there are efforts to increase this, including those made by Land O'Lakes Venture³⁷ and other development organizations. Therefore, this survey took a purposive approach to sampling that sought out Holstein farmers. Ninety percent of the farms in the sample are comprised of only local breeds, while 7% of dairy farms are comprised of only Holsteins or other imports. A mere 3% of farms contain a mix of both local breed and Holsteins. The fact that Holsteins and imports are found on only 10% of farms in the sample but account for 21% of the cows is due to one very large farm consisting of 900 Holsteins.

The majority of dairy cows are 2 to 5 years old. For dairy cows, youth may not equate to wisdom, but it most certainly equates to productivity and value. As a dairy herd ages, productivity declines and mortality risk increases. Almost two-thirds of the cows in the sample were reported as being 2 to 5 years old. More importantly, we found that the higher-risk and declining-productivity cows in the sample (those aged 10 years and older) made up approximately 6% of the sample. The mortality findings in this report are aimed at insurance entities as guidance to price insurance products that cover unexpected deaths of otherwise productive cows. Therefore, farmers were asked to only report mortality for cows up to age 9. For cows of advanced age, the farmer may be less willing to invest in preventive treatments, the cows may be more susceptible to animal attacks and, more importantly, the value of a cow that produces less than half the milk that a younger cow produces may lead to premature voluntary slaughter. Figure 4 illustrates the percentage of dairy cows in the study by age, demonstrating the predominant youthfulness of cows that are currently on Kakheti farms as of July 2021.

FIGURE 4: AGE DISTRIBUTION OF COWS IN SAMPLE



⁶ Size of farm was based on current number of cows at time of the survey, July 2021.

⁷ GFA (2018). Baseline Assessment of the Dairy Sector in Georgia, p. 20. Center for Agribusiness and Rural Development. Retrieved 7 December 2021 from https://gfa.org.ge/wp-content/uploads/2018/10/%E1%83%99%E1%83%95%E1%83%9A%E1%83%94%E1%83%95%E1%83%90-1-Baseline-Assessment-Dairy-Sector-in-Georgia_eng.pdf.

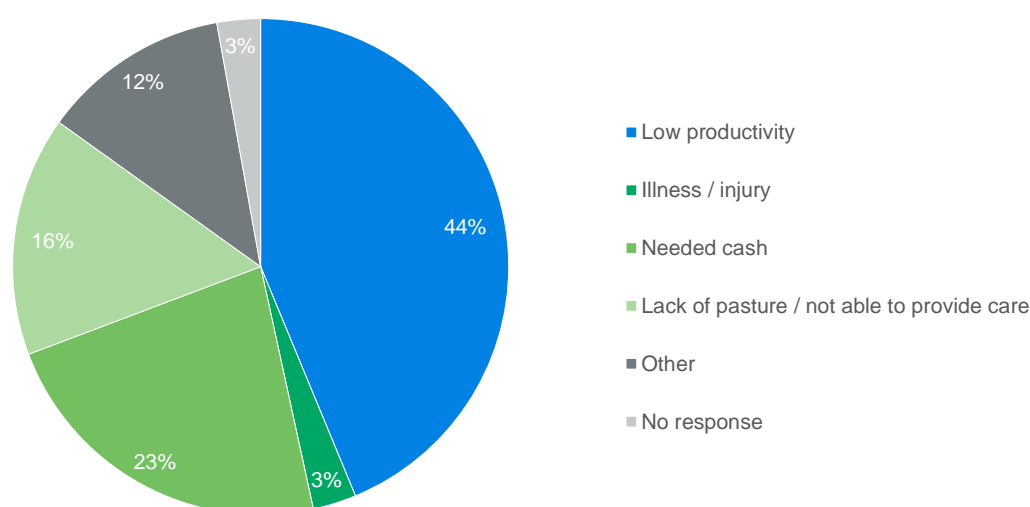
Insurance Implications Box 1: Age of Cow

Eligibility criteria for livestock insurance often include restrictions on the age of the cow at enrolment because the objective is to cover unexpected deaths of productive cows. The age of the cow is one of the primary factors in the mortality profile. In Georgia, it is generally accepted that after age 7 or 8 milk production starts to decline rapidly. As with any depreciating asset outside of the farm, investing money into an asset that is near the end of its life cycle is not a recommended practice. This is precisely the scenario that takes place with a dairy cow. At the older ages, extra investment of medicine, feed and supplements for a cow that is at the end of its productive life is unlikely. An age limit should be set so as to take into account the reality of the usefulness of an aged cow; that is, insurance products should be designed to cover as many productive cows as possible, while still managing the risk to insurers of fraud and moral hazard. It is with this in mind that we recommend that an eligibility age limit for insurance be set at or near 9 years old. Of the 6,897 cows in the survey that are at least 2 years of age and are milking, the eligible population of cows between 2 and 9 years old would be approximately 94%.

BUYING AND SELLING COWS

In 2020, 41% of farmers indicated that they had sold at least one local cow between the ages of 2 and 9 in the last year, while only 17% purchased at least one cow. These rates of activity are slightly higher than in the 2019 study of the Samtskhe-Javakheti region, in which 35% of farmers had sold a cow and 12% purchased at least one. The most common reasons given by farmers for selling cows were due to low productivity (44% of cows sold) followed by the need for cash (23%) (Figure 5). Interestingly, the need for cash was not the dominant reason for sales, despite the global pandemic; this is especially striking when compared with the Samtskhe-Javakheti data before COVID-19, in which 57% of sales were due to a need for cash. Worth noting, however, is that 16% of farmers who sold at least one cow told the interviewer that lack of pasture or lack of ability to care for the cows were among the primary reasons they sold the cows; this corresponds to the fact that a large percentage of farmers (whether or not they sold cows), indicated that lack of pasture is a top concern. This concern and others are discussed later in this report, but we believe that this may be a contributing factor to the disparity between the selling and purchasing of cows.

FIGURE 5: REASONS FOR SELLING COWS



Another reason for the low rate of cow purchases is that the typical Georgian small to mid-sized or large farmer will keep females after they're born and raise them to milking age, thus not requiring the purchasing of cows. Farmers who bought cows had two primary reasons for purchasing them: replacing an unproductive cow (47%) and as an investment in their business (24%). (Note: 27% of respondents gave no answer.) Interestingly, 54% of the cows that were purchased were higher-value, more productive Holsteins, which supports the reasoning that farmers are looking to invest in their business.

The majority of the interviewed farmers reported that the cost to buy a new local dairy cow averaged GEL 2,426 (USD 775), while the cost to purchase a new Holstein averaged GEL 7,522 (USD 2,403). Farmers who bought a cow were asked to indicate the price they paid for it, while those who did not buy a cow were asked to estimate what they would expect to pay for a local dairy cow if they were to purchase one. Those who did not purchase a cow estimated that on average it would cost GEL 2,697 (USD 861), slightly higher than the actual price paid by farmers who purchased cows, which was GEL 2,426 (USD 775). As noted above, farmers who purchased Holsteins paid an average of GEL 7,522 (USD 2,403). Although there may be a few external factors impacting the cost of a cow, such as the time of year, location and age of the cow, the relatively small difference between actual and perceived price, both for local breeds and Holsteins, indicates that the market price for dairy cows in Kakheti is well known. Those who sold their cows received an average price about 30% lower than the purchase price, or GEL 1,715 (USD 548). This is unsurprising, as many of these cows were likely sold for slaughter (lower prices) or were sold quickly in order to obtain cash (no price shopping or waiting for an appropriate time).

Insurance Implications Box 2: Cow Prices and Benefit Amounts

In designing a dairy cow insurance product, as with any other insurance product, sound practices dictate that you do not want there to be any incentive to collect on the loss of a cow more than what the value of the cow is while living. In the case of dairy cow insurance, many causes of death will result in residual value of the cow—farmers can sell the carcass to a meat processor. The death benefit amount offered by the insurer must be large enough to have value to the farmer but not so large that the sum of the residual value and the benefit paid by the insurer exceeds the market value of the cow. Simply put, there should be no monetary incentive above the market value of the cow to voluntarily slaughter a cow for anything other than approved humane reasons. In the case of a local breed dairy cow in the Kakheti region, the value of the meat sold upon death plus the amount received by the farmer if he had insurance should not exceed approximately GEL 2,400 (the reported average purchase price) for local cows, and GEL 6,875 (the estimated purchase price) for Holstein cows.

COW MORTALITY

Forty-seven percent of respondents reported that they had at least one cow death in the past three years (i.e., 2018-2020). The survey asked farmers to report all cow deaths within the last three years. Out of the 319 respondents, 149 farmers (or 47%) reported at least one cow death during that period. Of those who reported a death, roughly one-third reported that just one cow was lost during the three-year period.

The overall annual mortality rate of the sample is estimated to be 2.3% per annum (p.a.). The total number of cow deaths (ages 2 to 9) reported for the three-year period stands at 483. Farmers were also asked to report the number of dairy cows ages 2 to 9 on their farms in each of the last three years. The total number of cows during the three-year period was approximately 21,400. Together, this leads to an overall annual mortality rate of 2.3%. The survey did not include questions about when the cow deaths occurred and therefore it is impossible to say anything about trends or spikes in mortality, which would require a different research setup.

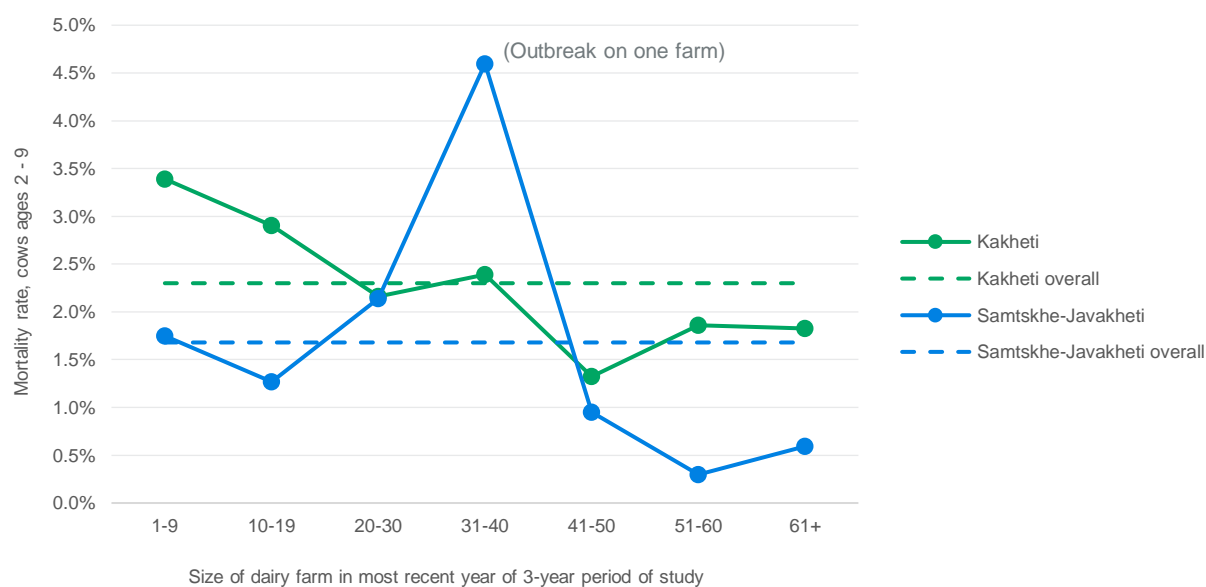
Farmers with the smallest herd sizes experienced higher mortality rates. Those farms with fewer than 20 dairy cows in 2020 experienced an overall mortality rate of 3.1%, compared to 2.1% for midsized farms and 1.7% for larger dairy farmers (see the table in Figure 6). We saw a similar trend in the prior study in the Samtskhe-Javakheti region.

FIGURE 6: MORTALITY RATE BY HERD SIZE

| DAIRY COW HERD SIZE (2020) | # OF FARMS | # OF DEATHS, COWS AGE 2-9 (2018-2020) | # OF DAIRY COWS AGE 2-9 (2018-2020) | MORTALITY RATE |
|----------------------------|------------|---------------------------------------|-------------------------------------|----------------|
| Small (1-19) | 193 | 181 | 5,905 | 3.1% |
| Mid (20-50) | 108 | 205 | 9,798 | 2.1% |
| Large (51+) | 18 | 97 | 5,715 | 1.7% |
| Total | 319 | 483 | 21,418 | 2.3% |

Figure 7 shows the breakdown of mortality rates by narrower herd size clusters, for this study in Kakheti, as well as the prior study in the Samtskhe-Javakheti region. While the mid-sized farms (20-50 dairy cows) show some variability in mortality rate, there is a general downward trend, with larger farms experiencing lower mortality rates. We note that, in the Kakheti data set, there was one very large Holstein farmer who was considered an “outlier”; the herd size was 850 in 2020⁸ (the final year used for accounting mortality), while the next-closest herd size was 140. When this farm is removed from the analysis, the mortality rate for large farms is slightly higher, at 1.9%.

FIGURE 7: MORTALITY RATE BY HERD SIZE, KAKHETI AND SAMTSKHE-JAVAKHETI



Insurance Implications Box 3: Mortality Rate Risk

For the geography and farmer populations studied, the survey data yield an overall mortality rate of 2.3%. The mortality rate gives us a snapshot of the actual reported deaths over a period of time against the size of the farm. This number, in addition to the subset numbers of small, mid-sized and large farms, can be used as an assumption underlying insurance base rates. For example, reduced risk premiums and administrative loadings may be applied for dairy farms with more than a certain number of cows.

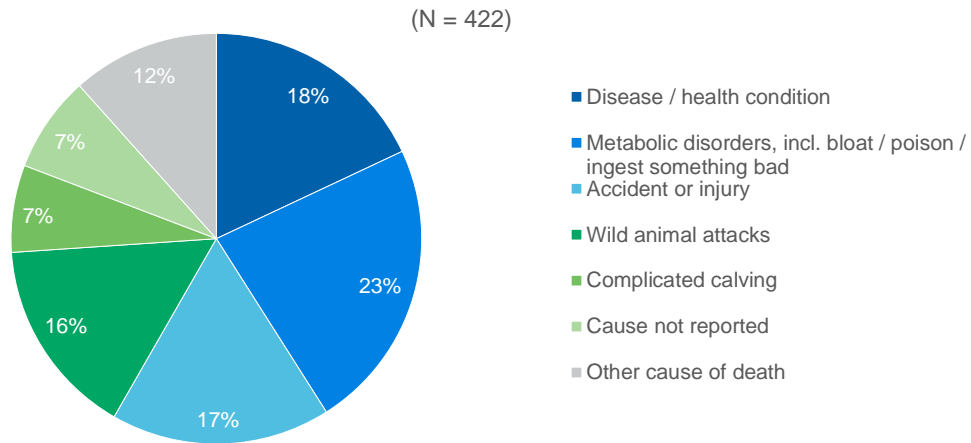
Of the mortality causes identified among local breed and non-Holstein cows,⁹ there was not one predominant cause. Consuming something harmful that results in metabolic issues accounted for the most deaths among local breed cows, around 23% (Figure 8). In Kakheti, where lack of pasture was reported as a primary concern, it could be the case that cows forage for whatever they can find to consume, and as a result end up eating something poisonous or spoiled. Eating poisonous grass, presumably in the mountains during summer grazing, was responsible for 44 of the 97 deaths, while bloating was responsible for 32 deaths. Consumption of trash or something unknown accounted for the remainder of such deaths. Accidents were found to be the second-leading cause of death, accounting for another 17% of the deaths. In the category of accidents, falling off a cliff was listed in 39 of the 73 accidents resulting in death. Diseases were the third-highest cause of death, with piroplasmiasis, a tick-borne disease being the primary culprit, accounting for 32 of the 76 cases of death due to diseases. When asked in a later question what diseases or illnesses have affected their local breed

⁸ This is the same outlier farmer who reported 900 dairy cows at the time of the survey.

⁹ The mortality risk profiles of Holstein cows are described separately, in Section E below.

dairy cows in the last year, the overwhelming response was piroplasmosis. While not always fatal, this disease is of major concern to farmers. Wild animal attacks accounted for the fourth-leading cause of death. This should not be a surprise as the region borders remote and mountainous wilderness in the eastern part of the country. Many of the municipalities border forested and mountainous lands that are home to a dense population of wolves and bears. We did not find that there was any single municipality that stood out as a hotspot for wild animal attacks.

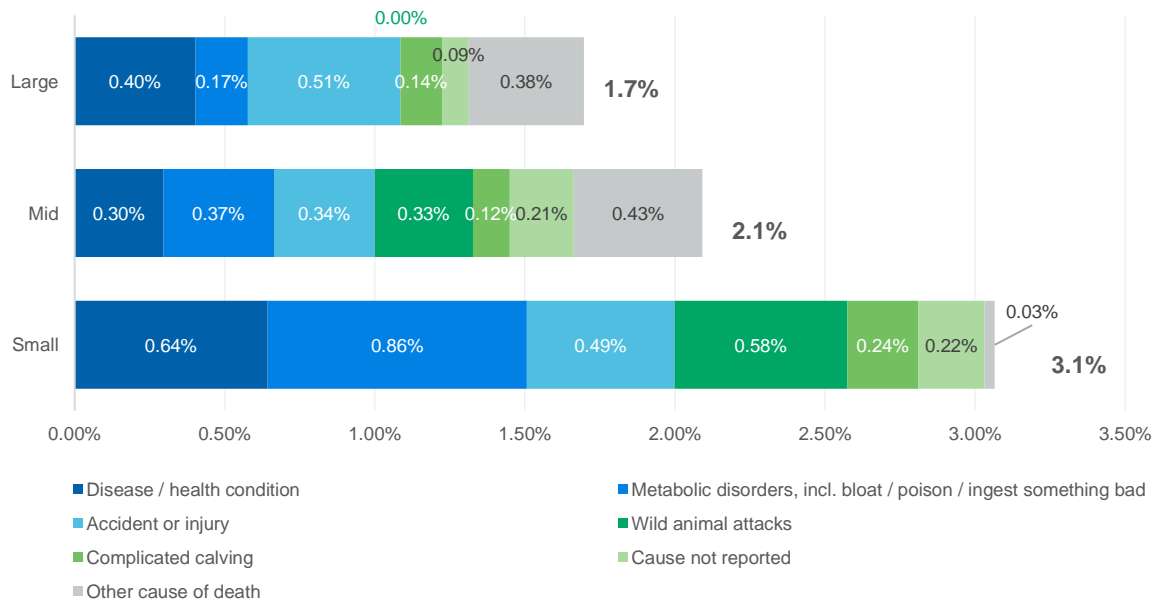
FIGURE 8: REPORTED CAUSES OF COW DEATHS (LOCAL BREED/NON-HOLSTEIN COWS)



"Other causes": 49 deaths (12%) were attributed to poor nutrition and were reported primarily by midsized farmers. Farmers mentioned "poor feeding," "unexplained weight loss," "weakening," and "drought." Again, these causes could be related to the consistently reported lack of pasture. Overheating was another common cause in this category.

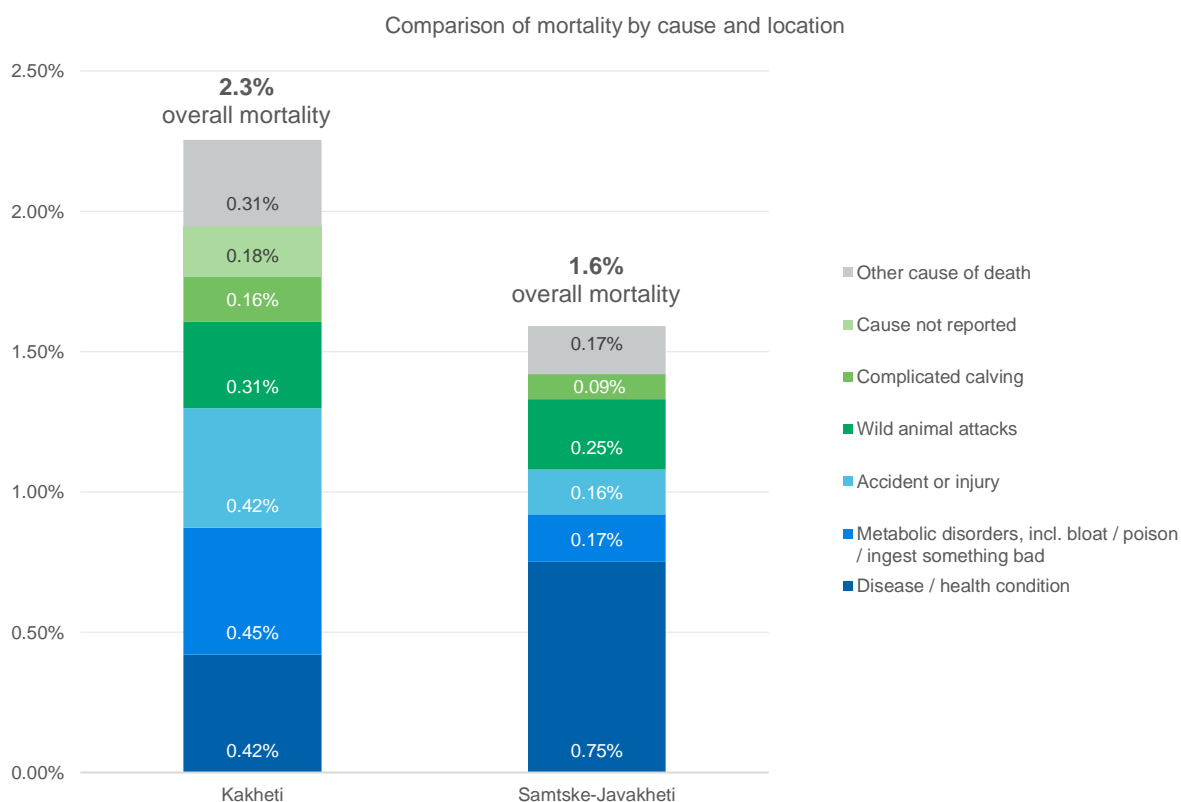
Smallholder farmers experienced a higher proportion of the risks related to grazing, particularly summer grazing in the mountains. Midsized to large farms experience significantly lower mortality due to wild animal attacks or metabolic issues (see Figure 9). They also were about half as likely to have complicated calving issues, which suggests better access to or use of veterinary care. While large farmers reported a similar rate of accidents and injuries, the causes were different: rather than falling off cliffs, the cows injured themselves in close quarters with the herd or other random accidents. Other causes of death on large farms were "unknown."

FIGURE 9: MORTALITY RATES BY CAUSE OF DEATH AND FARM SIZE



Compared to our previous mortality report in Samtskhe-Javakheti, Kakheti's higher mortality rate may be attributable to geographical differences, as well as the lack of pasture. When comparing mortality rates by cause between the two regions, Kakheti has more deaths related to metabolic issues and "other causes" (Figure 10), both of which we noted are likely due to the lack of sufficient grazing land. Kakheti also has a higher rate of accidents (including cliff falls) and wild animal attacks. Much of Kakheti is located in higher elevations with more extreme terrain, and the movement to higher elevations for summer grazing in Kakheti presents significant challenges.

FIGURE 10: COMPARISON OF MORTALITY RATES BETWEEN SAMTSKHE-JAVAKHETI AND KAKHETI REGIONS



Insurance Implications Box 4: Causes of Cow Mortality

The overall mortality rate should be just one of the factors used in pricing a dairy cow insurance product. The conditions that caused the deaths of the dairy cows also need to be considered. Farmers will be drawn to an insurance product that covers the perils they typically face in their farming year. Farmers in the Kakheti region who routinely pasture their cows in the mountainous region during the summer are at higher risks of cow mortality. Simply put, when the cows are in the summer pasture in the mountains, they are at a higher risk of wolf or bear attack, falls from cliffs, less supervision (and therefore higher likelihood of eating what they shouldn't) and, overall, less access to veterinary services if a harmful condition were to manifest. This, however, is a way of life for many of the farmers and their herds. As a result, it would be unreasonable for any policy sold to the local breed farmers to exclude accidents or diseases. Mountain feeding during the summer is often a necessity for farmers and they readily accept the risks that go along with it. However, insurers could consider the practice of moving the dairy cows to the mountains as an adverse risk and choose to do one of two things to reflect this additional risk. The first approach would be to either surcharge the premium of a farmer who practices summer feeding or provide a discount for farmers who do not practice summer pasturing in the mountains. A second approach may be to encourage farmers through cooperative buying programs or feed discounts to purchase feed and avoid the summer pasturing in the mountains. Arguably avoiding the summer pasturing in mountains is optimal but considering that Georgian farmers are rooted in tradition, and many are operating on small margins, insurers should not expect farmers to avoid the mountains without sufficient incentives.

Only 8% of farmers purchased cows to replace the ones that died (accounting for just 11% of the total cows lost). Of those farmers who lost a cow in the three most recent years, the majority (54%) replaced the cows from within the farm (e.g., keeping calves born to current dairy cows). Nineteen percent of farmers did not replace the deceased cow, including 7% who cited cost as the primary reason for the decision, all of whom were small farmers (fewer than 20 cows). As a reference point for this cost burden, those who did purchase a replacement cow after an unexpected death reported an average cost of GEL 2,232 (USD 713), similar to the GEL 2,426 (USD 775) price reported by those who purchased cows for planned reasons (i.e., natural replacement of aging-out stock or increasing investment in the farm). Another 6% of farmers indicated they did not replace their cows due to business-related reasons, such as scaling back their business, poor timing or lack of pasture. Almost 20% of farmers did not respond as to whether or not they replaced the deceased cow.

Insurance Implications Box 5: Replacement of Dead Cows

Insurers looking to protect farmers from the loss of livestock will have to position their products as better coping mechanisms than farmers currently have. With over half of Kakheti farmers replacing cows within the farm, what role does an insurance benefit play? What are the costs, advantages and disadvantages to replacing cows that die unexpectedly in this manner? For example, replacing a cow in this situation takes time, and income is lost in the meantime...insurers may need to position their offerings as a way to "get back in business" more quickly. For those 8% who did pay to replace a deceased cow, insurance could be a less expensive way to do so that eliminates the need for an unexpected expense. For the 7% of farmers who couldn't afford to replace the cow, insurance may be a way to spread out the cost and make it more affordable. A clearer understanding of how farmers currently cope with loss can help insurers better position their services.

FARMERS' CONCERNS AND RISK MANAGEMENT

Forty-eight percent of farmers reported that their greatest concern regarding their dairy cows is lack of grazing land, with nearly two-thirds (63%) listing it among their top three concerns. Farmers were asked what the top three concerns or worries they have regarding their dairy cows or milking business and the risks they face. This was an open question and the interviewer did not prompt answers. Of the 319 farmers surveyed, nearly half, or 153 farmers, indicated that lack of grazing land was their top priority. Of the farmers providing this response, the average dairy cow herd size was 19.8. This number aligns with the thought that the midsized to large commercial farms may not be as reliant on grazing as the smallholder farms due to more resources and more owned land. During our personal visits in Kakheti in April 2021, we heard from the majority of farmers that we spoke to that each year it seems that they have to take their cows further and further into the mountains to find grazing land due to the privatization of once public lands. Farmers are essentially being forced to take more risk every year as they are forced to go to higher elevations for grazing as less land is available to graze in Kakheti (and therefore they are more exposed to risks such as animal attacks, accidents and less supervised grazing). Farmers report that land that was once free to graze is now either off limits or has been sold to private interests.

Midsized to large commercial farms have concerns over declining milk prices. The second-greatest concern was milk prices and market access, identified by 36% of farmers. We found in that data that, of the 36 farms that chose milk prices as their top concern, 69% (25) were midsized to large commercial dairy farms (20-900 cows). Because the midsized to large farm are more likely to produce the volume of milk to sell to commercial processors and as such may be locked into long-term contracts, they are quite sensitive to the price of milk. Unlike the midsized to large farms, small farms may not be as reliant on income from milk sales. We found that, in the micro and small farms, the owner of the dairy cows keeps them as a second source of income while working full time at a primary occupation.

Rising cost of inputs, especially feed for the cows, was the third most frequent concern, mentioned by 14% of farmers, indicating there is likely a squeeze on margins (lower prices and higher costs). The remaining risks mentioned (all by fewer than 10% of farmers) were mainly related to lack of access to resources (shepherds, technology/equipment, veterinary care, finance, roads, water, electricity). With the exception of animal attacks (mentioned by 9%), few farmers mentioned risks directly related to the well-being of the cows themselves (e.g., poor health, accidents etc.). Only one farmer mentioned death of the cow as a key risk.

Insurance Implications Box 6: Farmers' Top Concerns

For farmers, the unexpected death of a dairy cow is not top of mind. Rather, they are focused on how to keep their cows productive and healthy. The primary challenge for Kakheti farmers is to provide enough feed and care to make their cows as productive as possible. The concern is not necessarily death, it is to find more efficient ways to maximize production. Access to pastureland was found to be a predominant cause of concern for farmers. They understand that there is risk to their incomes when they are required to travel further to find pastureland. At some point, the risk of accidents and wild animal attacks in the remote pastures will become uneconomical. It is in the interest of insurers to pursue this opportunity and to develop risk management solutions before it becomes uneconomical. Feed cooperatives, shared open pastureland and working with local land officials are all areas in which insurers and stakeholders have a role and a vested interest.

Sixty-seven percent of surveyed farmers in Kakheti bought additional feed for their cows to supplement their diet (compared to 57% in the Samtskhe-Javakheti region). Most of the surveyed farmers who reported purchasing supplemental feed purchased a combination of feeds or supplements. Of those that purchased some form of supplemental feed (213 farmers), 165 purchased grain, 158 purchased hay, 40 purchased "other feed" to include silage and alfalfa, 39 purchased a combined feed and only eight reported purchasing a supplement.¹⁰ The higher proportion of farmers purchasing supplemental feed in relation to our previous study of smallholder farmers can likely be attributed to the reported lack of pasture and grazing land. Smallholder farmers were slightly more likely overall to purchase some form of supplemental feed (68% compared to 65% of midsized to large farmers), but midsized to large farmers were much more likely to purchase "higher-value" feed, such as silage, alfalfa and feed supplements.

Sixty-three percent of surveyed farmers reported that they paid for preventive veterinarian services or treatments for prevention of piroplasmiasis. The government of Georgia currently provides several mandatory vaccinations for free—anthrax, brucellosis, foot and mouth disease and lumpy skin disease. These conditions in which the government mandates vaccination tend to be conditions that can easily spread if not prevented. The study found that almost all respondents (94%) did use some type of pill, voluntary vaccine or injections on their farms. Piroplasmiasis is a tick-borne disease that can lead to anemia, fever and, in some cases if left untreated, death. With the exception of preventive treatment of worms, it was the most mentioned preventive service that farmers gave (87% of farmers indicated that they pay for medication to prevent worms). There were similar rates of preventive medicine used across small and midsized to large dairy farmers, with the exception of blackleg (emkar), pasteurellosis, and brucellosis, for which midsized to large farmers were much more likely to pay for preventive medicine.

In assessing the overall risk management practices of farmers, we rely on preventive measures that are taken voluntarily by the farmer in addition to adherence to government-mandated vaccinations. Based on the data that was collected, the farmers in the Kakheti region appears to actively manage their risks well. It is a positive sign to see that 63% of farmers are actively preventing piroplasmiasis by buying medications to prevent the disease. In our field visits over the past two years, and in the interviews conducted, the prevalence of ticks carrying the parasite that leads to piroplasmiasis is of great concern to farmers. Taking active steps to identify, treat and prevent this disease may be helping keep mortality rates low.

Excluding free government treatments and vaccines, only 34% of farmers reported using veterinarian services last year (either by phone or farm visit). Surprisingly, it appears that, of the total number of farms in each of the three categories of small, midsized and large, the percentages using veterinary services are relatively close at 36%, 31% and 35%, respectively. The data did reveal that, in almost 80% of the cases, when asked "why did you not use the veterinarian?" farmers indicated "I took care of any treatment/prevention myself," while 3% responded that the cows didn't need treatment. None of the farmers cited cost or distance as reasons for not seeking veterinary services, but presumably at least some of the farmers who reported taking care of treatments or prevention themselves did so due to reasons of cost, distance or simply convenience. Furthermore, farmers indicated in the comments section in quite a few instances that relying on friends and relatives that are vets in the community was a common way to address issues with the cows.

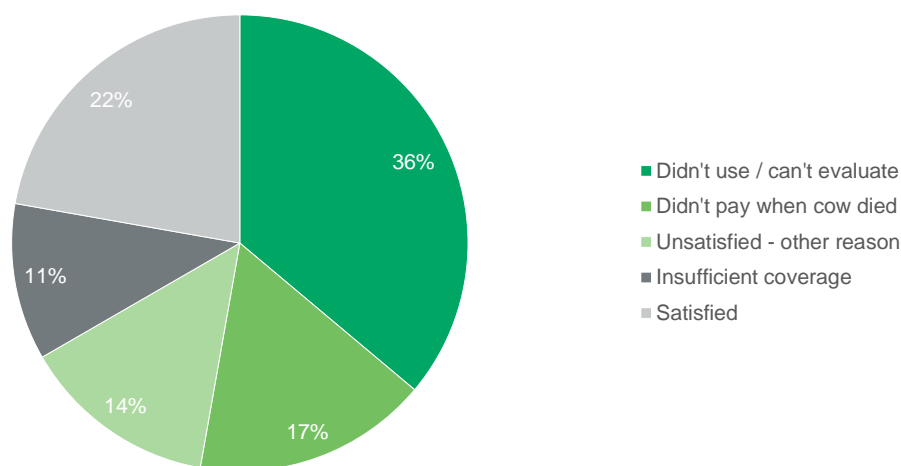
¹⁰ Several farmers purchased multiple types of supplemental feed, thus the sum is not the same as the number of farmers.

Insurance Implications Box 7: Farmers' Risk Management Practices

Based on the study, an insurer would be wise to build risk management actions into its products that assist farmers with productivity and availability of resources. For example, insurers could inquire from their policyholders if they would find value in an enhanced veterinary benefit as part of their farm or livestock insurance. This may take the form of a telephonic service or coverage for a certain number of visits for each insured animal. Prevention and treatment from a qualified veterinarian may be a way to add value to farmers while decreasing mortality rates (and payments for covered losses). Educational programs could be provided to train farmers on animal welfare, animal care, medicines and supplements, and access to credit programs could be provided through alliances and feed coops for farms in areas where pastureland is in short supply. Lack of pasture is a problem for not only the farmer but for the insurer. The health of the block of business for an insurer is directly correlated to the ability of the farmers to prosper.

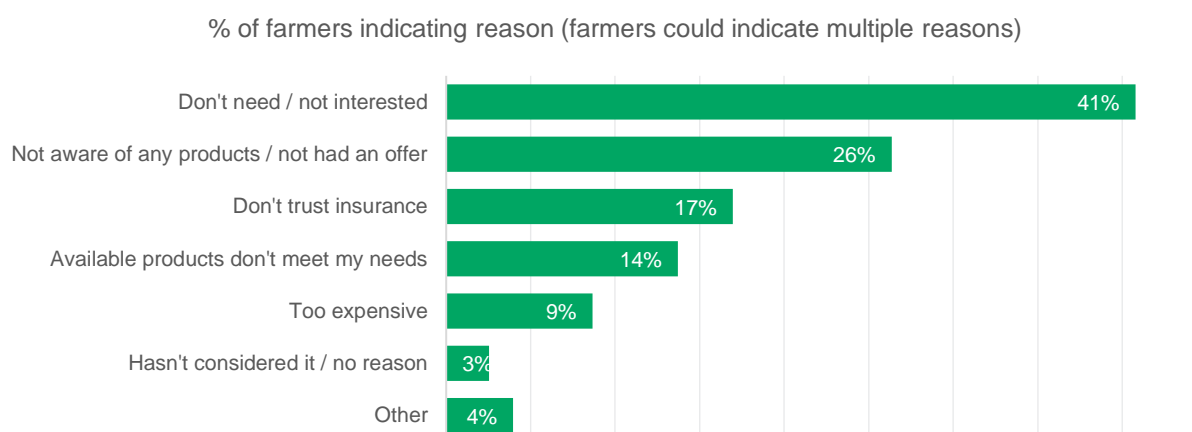
Of the 319 farmers surveyed, 87% indicated they had never insured any of their cows. Of the remaining 13% that indicated they had insured their cows (41 farmers), nearly all of them reported purchasing the insurance from a bank, and likely did so as compulsory insurance bundled with a loan. Nine of these farmers reported being satisfied with their insurance, and another 15 said they couldn't evaluate their insurance because they haven't had to use it yet. Forty-two percent (17) were unsatisfied with the product, with the main reason being that it didn't pay out when they had a death (Figure 11).

FIGURE 11: FARMER SATISFACTION WITH LIVESTOCK INSURANCE



The farmers that had not insured their cows represent a potential market of 5,540 dairy cows from 2 to 9 years old that are eligible to be insured. The top reason that farmers indicated that they have never insured their cows was a perceived lack of demand—41% of these respondents indicated they “don't need insurance” or “were not interested” (See Figure 12). More than a quarter of those who had never purchased insurance reported not being aware of any products or not being offered insurance. Another 25% of farmers identified issues related to product design—that available products either don't meet their needs (14%) or are too expensive (9%). Seventeen percent of farmers indicated that they don't trust insurance (a similar percentage to those with insurance who reported they were unsatisfied due to the fact that the insurance didn't pay out for them when they needed it).

FIGURE 12: REASONS FARMERS HAVE NOT HAD INSURANCE



Insurance Implications Box 8: Suggestions From Results to Help Expand the Market Among Non-Purchasers

Understanding why the majority of farmers have not had insurance in the past (and noting the fact that most farmers who did purchase it did so because it was compulsory) can help insurers design and market their products so as to better meet farmers' needs:

- **Inform farmers.** A quarter of the market may be a low-hanging fruit for insurers, in that they have not been aware of products or been offered insurance. Insurers should seek to distribute simple, straightforward information about their products to farmers via channels that they trust.
- **Reduce risk premium in line with mortality data.** For those farmers who indicated that cost is prohibitive (another 9% of the market), this mortality study can be informative. The risk premium of current livestock products tends to reflect a mortality rate that is much higher than what was found in the study. If insurers price livestock products closer to the risk premium indicated by the study (up to 3%), this may result in products that are more affordable and accessible to more farmers.
- **Improve trust by paying claims and simplifying products.** Building trust is often a challenge for insurers. The primary way to address this is to pay claims and to make it simple for farmers to make claims. Oftentimes insurers are "rightfully" denying claims due to exclusions in their policies, but these issues may not be clear to farmers. Products with broader coverage and fewer exclusions will go a long way towards building trust.
- **Design products to meet needs.** Fourteen percent of farmers said that products don't meet their needs—this could be because coverage amounts are not sufficient to cover losses, or because too many causes of death are excluded (thus resulting in rejected claims). As this study shows, with any unexpected cause of death (other than negligence), mortality is at a reasonable overall rate of 2.3% across all farm sizes; it should be feasible to offer comprehensive coverage at a reasonable price.

HOLSTEIN COWS

For the bulk of the survey, we asked farmers questions focusing solely on their herd and their farming practices. For certain questions, we asked the farmer to specify between Holstein and local breeds, specifically, for questions regarding milk yield, pricing of cows and mortality. The necessity to address a growing trend in the market of purchasing high-output and high-cost imported cattle was critical to understand the risk profile of these specialty cows. Our survey included 23 farmers who owned at least one Holstein, including one farmer who owned 900 Holstein cows. Seven of the 23 farmers had both local breeds and Holsteins. The data yielded some important findings that will ultimately be used to design and price a commercial high-value dairy cow insurance product. As noted in the methodology, based on these findings, we also conducted a short set of willingness to pay (WTP) interviews, in which farmers were asked their opinions regarding two options for Holstein insurance coverage. This section provides a brief summary of our findings from the survey as well as the WTP exercise.

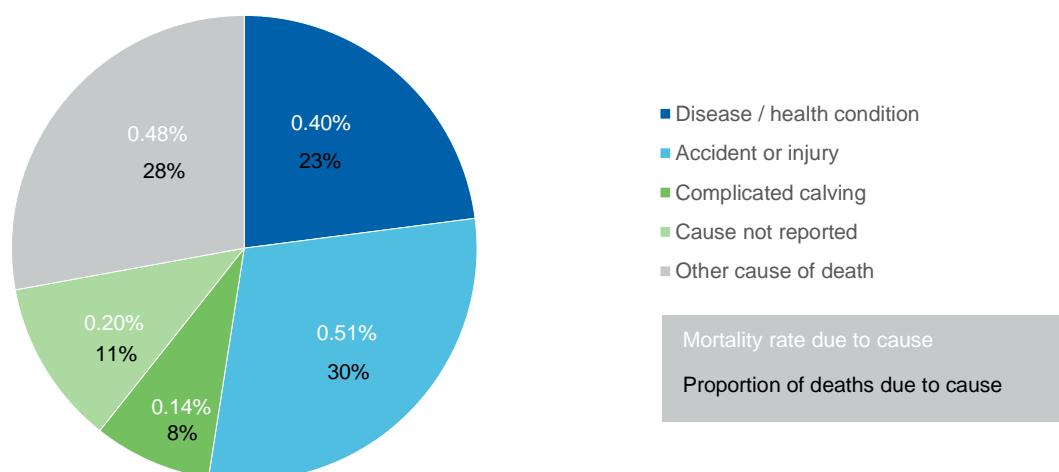
The price of Holstein cows is significantly higher than local breed cows. The consensus of the farmers surveyed as well as from Holstein importers in Georgia is that the average price of a Holstein cow to purchase as a replacement is roughly GEL 7,550¹¹ (USD 2,435). The WTP interviews, along with other key informant interviews, also indicated a higher slaughter value of Holsteins—around GEL 3,260.

The approximate age of the Holstein herd is relatively young and produces about four times as much milk as local breeds. The numbers drop off dramatically for Holsteins as they near 6 years old, with all but a handful of the Holstein cows in the sample being under the age of 6. Unlike their local breed counterparts, Holsteins produce a high volume of milk for two to three years, followed by a period of moderate productivity for another couple years, and are then sent to slaughter. Farmers with Holstein cows reported an average production of 34 liters of milk per day (26 liters, when the very large farm is excluded), versus an average of just 8.3 liters per day for local breeds.

Holstein farmers indicated that their concerns centered around economic aspects of farming. Among the 23 Holstein farmers, the greatest concerns were milk prices (57% mentioned it in the top three concerns), lack of grazing land (30%) and rising cost of inputs (26%). Predictably, Holstein farms (or farms that are predominantly populated with high-value cows) are concerned with the economics associated with the short five-year window of productivity. Milk prices are often set by annual contracts from the milk processors to account for certain expected volumes in supply and a consistency in demand. Contracts do not allow the farmer to “shop” the market for better prices throughout the year as smallholders may. Conversely, the contracts do provide the commercial farmer with a guaranteed rate and a better ability to plan for the year. The cost of inputs is of concern as well. While feed is most often thought of as the primary input, Holstein farmers are reliant on resources such as electricity and water to operate their farms efficiently. Whereas smallholders may graze their cows and do not need significant amounts of heating or cooling in elaborate barns, Holstein farmers tend to continually invest in infrastructure improvements and technology to be more efficient, which is essential for their success.

Of the 61 Holstein dairy cows that died from 2018 to 2020, disease was listed as the cause of death on four of the farms and accounted for 14 of the deaths (23%). Lung conditions or pasteurellosis were indicated as the main causes of death. Pasteurellosis, a bacterial infection in the lung, is contagious. The condition is especially concerning to midsized to large farmers who import Holsteins into Georgia. Stress in cows during shipping, intensive milking, dust, overcrowding, exhaustion and hunger can make Holsteins susceptible to the growth of this bacteria and all too often death will result. Furthermore, because Holsteins are “shed kept” or “zero grazing” and spend long periods of time in close contact with other cows, intra-herd cross-contamination and cross-infection is of great concern. Findings from the willingness to pay interviews also indicate the importance of disease-related deaths, with all but one farmer placing high importance on an insurance product covering death due to illness or disease. Death due to complicated calving was the next most important concern noted by most farmers, which accounted for just 8% of the deaths reported to the survey.

FIGURE 13: CAUSE OF DEATH OF HOLSTEIN COWS



¹¹ Survey respondents reported an average of GEL 7,522, while WTP interviewees reported an average of GEL 7,582.

It should be noted that, of the 61 deaths during the three-year period, almost 50% of them could be attributed to the one large Holstein farm of 900 cows. The death risk profile of the Holstein cows does look significantly different from that of local breed cows but is similar to that of larger farmers in general. In addition to health conditions, accidents (injuries sustained from other cows in the herd) were another primary cause of death. To a large extent, the risk profile of Holsteins is still somewhat unknown—almost 40% of the reported deaths were due to an unknown or unreported cause. (Figure 13)

The annual mortality rate for the Holstein cows that were included in this survey was approximately 1.7%.

This mortality rate may be a bit misleading as there may be a concentration of deaths during the first year that a farmer is raising Holsteins. During onsite visits to farms in Kakheti in April 2021, Holstein farmers conveyed to us that the primary risk with Holstein cows is a lack of knowledge about this breed by the farmer. Holsteins require specialized care, high levels of knowledge and facilities that can meet the highest sanitary standards. As such, farmers in the first year of Holstein farming are at a greater risk of experiencing high mortality rates than their counterparts who have experience with this breed. While our sample size for Holstein farmers is limited, and thus we cannot say with certainty, the data do seem to indicate that there is a correlation between experience and mortality: those farmers with three or less years of experience had a 4.7% mortality rate, while those with more than three years of experience only reported a mortality rate of 1.2%. As a result, we believe that the 1.7% overall mortality rate may be at the high end of the range of what is expected for experienced farmers. With adequate education, better farm practices and continued investment in technology, we consider midsized to large operations focussed on high-value cows to have less risk than smallholder local dairy cow operations. Our field research indicated significantly higher levels of hygiene are maintained at these midsized to large Holstein operations compared to the smaller farm sizes. We cannot stress enough that the experience of the farmer and the resources that are invested into the Holstein farms are directly correlated to the success of the operation and lower mortality rates.

Productivity-related risks are another risk profile consideration of Holstein cows. The intensive nature of producing 30 liters or more of milk per day takes its toll on the udders of the Holstein cows. While not reported as a cause of death in our sample, mastitis is a condition that is commonly treated and paid attention to by all farmers. We may account for the lack of reported deaths from mastitis as voluntary slaughter due to low productivity. We cannot however treat this as a mortality concern with Holsteins because they are routinely checked and treated if signs of the infection occur. Correspondingly, in the willingness to pay interviews, most farmers only placed a moderate level of importance on coverage for slaughter due to lack of productivity.

Interest in a Holstein insurance product was seemingly high, with preference given to products that would offer higher coverage values. Fourteen of the 16 farmers expressed interest in one of the two options posed, with 13 selecting a higher-value option—GEL 3,500 of coverage—despite a slightly higher premium of 5.4%, compared to a GEL 2,500 coverage option priced at 5.2%.¹² Thus, farmers indicated that a larger amount of coverage would be preferred. While there was some resistance to the pricing or uncertainty over whether the pricing was in line with what they can afford, there were a minimum number of respondents that indicated that the pricing was too high. There was a suggestion that paying for larger herds on the farm would be difficult in one payment; this may be addressed by spreading out the payments and/or offering a discount for larger herds. It should be noted that with only two known dairy cow insurance products on the market, few of the farmers had any prior exposure to information on dairy cow insurance, and thus the lack of a comparative frame of reference may have factored into the farmers' choices.

¹² Prices used in the WTP exercise were based on the estimated 1.7% Holstein mortality rate from the survey, plus conservative estimates for loadings to cover administrative expenses, commissions and a fair profit margin.

Summary of implications for livestock insurance in Georgia

As part of this survey, we committed to make recommendations and pilot an insurance product that addresses the unique characteristics of the midsized to large farm. Our work over the past three years has yielded a viable product that we believe reflects the needs of most farmers in the small and, to some extent, the midsized farms. The questions below are where we generally start in making recommendations on product design and pricing. Based on our findings from the survey, we feel confident that we can address the following questions with answers backed by data.

- Which risks should be covered?
- How much should the cover value be?
- What is a reasonable risk rate?
- Which animals should be eligible?
- What other risk management interventions could complement insurance?

Cover: all-risk mortality. For the midsized to large farms, our data suggests that the mortality associated with these farms is not concentrated in one risk or cause, but rather it is spread out amongst many causes. For the farmer who is forced to send his cows deep in the mountains for summer grazing due to the lack of accessible pastureland at lower altitudes, excluding wild animal attacks or accidents would greatly reduce the perceived value of an insurance product. The cover for midsized to large farms should cover all mortality risks. Excluding risks for the sake of reducing the overall mortality numbers will only erode the value of the product offering. Rather, insurers should consider other ways to complement their insurance offerings which would help farmers improve their risk management practices.

Sum insured: GEL 1,000 for local breed. As noted above, the insurance payment should never be so high as to provide the farmer with motivation where he would be better off when the cow is dead than alive. We have no evidence that this moral hazard exists in any size farm, but we are cautiously optimistic that by keeping the sum insured at approximately half of the replacement cost of a new cow that farmers will not be incentivized to commit fraud.

Risk rate: variable by herd size. For the geography and farmer population studied, the survey data yield an overall mortality rate of 2.3%. Based on the data received and analyzed, there are some small differences in the mortality risks that farmers face based on the herd size. Increasing herd size was associated with decreasing reported mortality: in the small, midsized and large farms, we saw a decline from 3.1% to 2.1% to 1.7%, respectively. These numbers suggest that the pricing of an insurance product based solely on mortality rates should incorporate a reduction in premium for larger farms. In addition, there was significant variation in the mortality rates by region. Some areas may contain inherently more risk due to wild animal attacks, terrain or lack of local grazing land.

Complementary risk management interventions. In addition to insurance, insurers and other stakeholders should consider additional services and initiatives which may better meet the risk management needs of farmers, as well as significantly reduce the dairy cow mortality risk:

- **Veterinary usage:** With only 34% utilizing veterinary services other than free government-sponsored vaccinations, insurers and other stakeholders of the dairy industry should increase farmers' access to and utilization of veterinary services. This could take the form of "call-a-vet" services or simply a more active educational campaign on veterinary treatment.
- **Disease information to prevent outbreaks on midsized to large farms:** While the mortality rate illustrated a correlation between the size of the farms and dairy cow deaths, these numbers could look drastically different if one large farm or municipality had an outbreak of a communicable disease. We recommend that stakeholders of the dairy industry invest resources into education and prevention of conditions such as brucellosis and piroplasmiasis to ensure that, if either is present, it is treated and contained in a timely manner.

- **Access to pastureland:** As we have described in detail in this report, farmers will do what is necessary to feed their cows. This may mean moving the cows higher into the mountains to graze as pastureland at lower elevations becomes inaccessible. Farmers with smaller herd sizes were more apt to be affected by this scenario as they indicated it was a top concern. Large commercial farms are somewhat immune to this risk as the scale of their operation affords them the opportunity to “buy-in” or produce their own feed. Feed and supplement companies in Georgia must position themselves as resources for the small to midsized farmers. Setting up feeding cooperatives may be a solution to driving down costs.

Coverage for Holstein or HV dairy cows

Insurers should consider a separate product for Holstein or high-value (HV) dairy cows. The data suggests that some special considerations must be built into the language of any policy covering high-value livestock.

Sum insured: GEL 3,500 to 4,000 for Holsteins or 50% of the market value. Holsteins are significantly more costly than local breeds and the insured amount must reflect that additional value. However, it is important that the sum insured consider the “salvage value” of the dead Holstein, as well as specific areas of loss the farmer experiences. This may be for replacement of the cow, or for lost income while the replacement cow grows to maturity, or other direct or indirect costs faced by the farmer. As per the WTP interviews, a coverage amount as close as possible to the purchase value of the cow was important to farmers. A sum insured of GEL 3,500, together with the estimated slaughter value of GEL 3,260, would provide almost 90% coverage of the estimated GEL 7,550 purchase price of a Holstein.

Risk rate: 1.7%, with total premiums up to about 5%. Based on our sample, we believe that the mortality risk corresponding to experienced farmers may be even lower than the data suggests. We saw a higher level of mortality in farms with fewer years of experience. If the insurer can mitigate against mortality risk by selectively offering insurance to farms with a minimum number of years of Holstein experience, or confirm training and proper oversight of the farmer in the first few years, we believe that this may push down the mortality rates even lower. The results of the WTP interviews indicate that a total price (including expense and profit margin) of up to 5.4% (GEL 190 for GEL 3,500 of coverage) may be on the high end of the willingness to pay continuum but not unreasonable. There were several farmers that indicated that, with larger herds, the total price may be a challenge. Thus, a moderate tiered discount for larger herds or the ability to make multiple payments during the policy period may be considered.

Eligibility age: 2 through 6 years. With high-value dairy cows, their productive life is significantly shorter than that of traditional dairy cows in Georgia. Our research shows that high-value cows begin to see dramatically reduced milk production after six years and are more likely to be culled from the herd due to their lower return on investment.

Complementary risk management interventions. In addition to insurance, insurers and other stakeholders can consider additional services and initiatives which may better meet the risk management needs of farmers. For the farmers of high-value Holsteins, some of them may include:

- **Specialised education programs:** The unique nature of the Holstein and high-value imported dairy cow breeds requires specialized care. Starting from the time that they are imported through their first calving and to the end of their productive years, these dairy cows are susceptible to conditions that local breeds are not. As such, stakeholders and insurers should ensure adequate education programs are available to promote wellness for these breeds.
- **Feed programs and alliances:** Because these high-value breeds spend most of their lives in a shed, the farmer is reliant on purchasing feed (rather than grazing). We suggest that insurers and stakeholders could take a more active role in assisting farmers negotiate better access and pricing for feed. This may take the form of creating discounts on feed for policyholders or setting up feed cooperatives for the farmers.

Conclusion

Based on the findings from our mortality study, we are more confident than ever that, with proper attention to addressing the core risks and concerns faced by farmers in Kakheti, risk management tools such as dairy insurance could lead to increased resiliency, sustainability and profitability. The mortality rate assumptions used to price dairy cow insurance are one factor to consider. In addition, addressing the issues of decreased access to grazing land and the ramifications of moving cows further into the mountains for grazing must be solved if the traditional dairy farmer is to succeed in Kakheti. Solutions may come in various forms and from a variety of stakeholders. Local and national governments, the dairy processing facilities, banks that serve farmers and insurance companies must align in various strategies to reduce the unique risks that different-sized dairy farmers face.

For high-value dairy cows (i.e., Holsteins), there are different needs and thus different risk management approaches. This study outlines an approach for insuring these dairy cows, with important details around the risk premium and risk mitigants. The WTP survey provided valuable data that will enable the insurer to develop a dairy cow insurance product that reflects the needs of this unique segment of the market.

Appendix 1: Mortality Study Questionnaire

DEMOGRAPHIC QUESTIONS

- Date of interview
- Source of contact
- Phone number
- Name of farmer
- Municipality
- Gender
- What is your Age?

FARM CHARACTERISTICS

1. How many total dairy / milking cows do you currently have on your farm?
2. Of your dairy cows, how many are:
 - Local breed
 - Holstein
 - o (If Holsteins) How long have you had Holsteins on your farm?
 - Other import
3. How many dairy cows ages 2 to 9 did you have in:
 - 1.2.3. 2020?
 - 1.2.4. 2019?
 - 1.2.5. 2018?
 - a. (If % change is >50%) I notice that the size of your farm has increased (decreased) significantly...can you provide a short explanation for why?
4. Could you please tell me the approximate age distribution of your dairy cows? How many are ages:
 - a. 2-5
 - b. 6-7
 - c. 8-9
 - d. 10-11
 - e. >11
5. How many liters of milk do you collect per cow per day on average?
 - a. Holsteins
 - b. Local breed
 - c. Other imported
 - d. Other (breed)
6. Did you **sell** any dairy cows ages 2 to 9 in the past year? (including sold for slaughter)
 - a. (If YES) how many and what kind?
 - # local breeds sold
 - # Holsteins sold
 - # other sold
 - b. (If YES) What was the average price per cow, in GEL? (*Indicate if the farmer is unable to provide an average price, and instead provides a total sale price*)
 - Avg. price - local breeds
 - Avg. price - Holsteins
 - Avg. price - other
 - c. (If YES) What was the primary reason for selling these cows?
 - Reason for sale, if other

7. Did you **buy** any dairy cows in the past year?
 - a. (If YES) how many and what kind?
 - 1.2.3. # local breeds purchased
 - 1.2.4. # Holsteins purchased
 - 1.2.5. # other purchased
 - 1.3. (If YES) What was the average price per cow, in GEL?
 - 1.2.3. Avg. price - local breeds
 - 1.2.4. Avg. price - Holsteins
 - 1.2.5. Avg. price - other
 - 1.4. (If YES) What was the primary reason you purchased these cows?
 - 1.5. (If NO) What is the average price to buy a local / Holstein milking cow (GEL)?
 - 1.2.3. Avg. price - local breeds
 - 1.2.4. Avg. price - Holsteins
 - 1.2.5. Avg. price – other
8. What concerns or worries do you have regarding your dairy cows / milking business and the risks you face? Please tell me your top 3 concerns, if any. (*Only prompted answers if they did not understand the question*)

DAIRY COW MORTALITY

9. How many of your dairy cows ages 2 to 9 died in 2018 - 2020?
 - a. Of these, how many were Holstein breed? How did each of them die?
 - b. Of these, how many were local breeds? How did each of them die?
10. How many of the dead dairy cows did you replace?
 - a. (If at least one cow replaced) What was the average cost per cow?
 - b. (If farmer did not replace all of the cows): Why did you not replace all of the cows?

RISK MANAGEMENT AND HEALTH CARE PRACTICES

11. Have you ever insured any of your cows?
 - a. (If yes) What was the name of the insurance company?
 - b. (If yes) What was the annual premium per cow?
 - c. (If yes) What was your overall satisfaction with the insurance product, and why?
 - d. (If no) Why not? (*Can select multiple options*)
 - Don't need
 - Don't trust insurers
 - Too expensive
 - Not aware of any products
 - Available products don't meet my needs
 - Other
12. How much of the following do you typically buy per dairy cow per year, in addition to grazing / your own supply?
 - a. Indicate for which types of cows (Holsteins vs. local)
 - 1.2.3. Hay
 - 1.2.4. Grains
 - 1.2.5. Feed supplements
 - 1.2.6. Combined feed
 - 1.2.7. Other
 - 1.3. (*If any supplemental feed is purchased*) How much do you estimate you spend on these in a typical year (total)?
 - 1.4. (*If none purchased*) Why not?

13. In the last year, which diseases / illnesses have affected your local breed dairy cows, and how many?
- Emkar
 - Piroplasmosis
 - Pasteurellosis
 - Hypodermatosis
 - Fascioliasis / Dictyocaulus
 - Brucellosis
 - Bloating
 - Mastitis
 - Other - # of cows affected
 - Other - name
14. *(If they have Holsteins)* In the last year, which diseases / illnesses have affected your Holstein dairy cows?
- 1.2.3. Emkar
 - 1.2.4. Piroplasmosis
 - 1.2.5. Pasteurellosis
 - 1.2.6. Hypodermatosis
 - 1.2.7. Fascioliasis / Dictyocaulus
 - 1.2.8. Brucellosis
 - 1.2.9. Bloating
 - 1.2.10. Mastitis
 - 1.2.11. Other - # of cows affected
 - 1.2.12. Other - name
15. For which diseases / conditions do you pay for preventative services, such as pills or vaccines / injections?
(Indicate which breeds)
- 1.2.3. Emkar
 - 1.2.4. Piroplasmosis
 - 1.2.5. Pasteurellosis
 - 1.2.6. Hypodermatosis
 - 1.2.7. Fascioliasis / Dictyocaulus
 - 1.2.8. Brucellosis
 - 1.2.9. Worms
 - 1.2.10. Other
16. Veterinary services
- a. How far is the nearest veterinarian service?
 - b. How many times did you call a veterinarian for advice in the last year?
 - c. How many times did the vet visit your cows in the last year? (Excluding free government treatments / vaccines)
 - d. *(If no calls / visits reported)* Why did you not use veterinary services in the last year?
 - e. *(If some vet services used)* What is the primary way that you pay for vet services?
 -
 - Other - explanation
 - f. *(If some vet services used)* How much money do you estimate you spent on veterinarian services and medicinal products, for both treatment and prevention, in the last year?

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Appendix 2: Willingness to Pay Interview Guide

| |
|--|
| 1. Name, Age, Municipality |
| 2. How many Holstein cows do you have? |
| 3. Please indicate below the value that you place on the following benefits that may be part of an insurance program: |
| <i>A. Policy will pay if cow dies of any disease or illness</i> |
| <i>B. Policy will pay if cow is slaughtered if unproductive</i> |
| <i>C. Policy will pay if cow dies during calving</i> |
| <i>D. Policy will pay if cow is killed due to wild animal attack</i> |
| 4. What is the cost to purchase a dairy cow to replace a cow that has died?(EUR) |
| 5. What is the value of milk you would receive from one dairy cow over one full year? (Answered in liters per day) |
| 6. Which plan would you have interest in if you were to buy a policy? Which one of these is valuable to you? |
| <i>A. Plan 1: Limit 2500 GEL for 130 GEL</i> |
| <i>B. Plan 2: Limit 3500 GEL for 190 GEL</i> |
| 7. How did you make your decision? |
| 8. Have you ever received any information on the cost of livestock insurance in the past? If so, why did you not decide to purchase the insurance? |

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