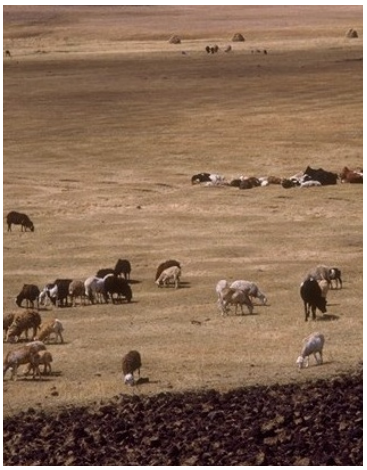
Using satellite data to insure camels, cows, sheep and goats: IBLI and the development of the world's first insurance for African pastoralists



CGIAR RESEARCH PROGRAM ON Dryland Systems

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

Using satellite data to insure camels, cows, sheep and goats: IBLI and the development of the world's first insurance for African pastoralists*

Iddo Dror, Shreya Maheshwari and Andrew Mude

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* Iddo Dror prepared this case study with case writer Shreya Maheshwari and IBLI team leader Andrew Mude as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. It was prepared in collaboration with the IBLI team and benefited from useful insights by a range of partners and collaborators of the IBLI program. We gratefully acknowledge their contributions. This work was funded through a UKAID Accountable Grant Arrangement for Index-Based Livestock Insurance, Arid Lands Support Programme. Project code 202619-101.

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Contents

Introduction

On a hot morning in Nairobi in 2014, Andrew Mude, team leader for the Index-Based Livestock Insurance program ('IBLI' hereafter), looked out of his office window at cows grazing on Ngong Hills' green pastures, but his mind was elsewhere.

In a few hours, he had to attend an executive management meeting where he was expected to recommend IBLI's next steps. But Mude was still undecided; should he recommend that the IBLI team focus exclusively on its current sites in northern Kenya and southern Ethiopia, and work to develop IBLI into a large-scale, proven and sustainable program in these regions? Or should he go along with demands to expand quickly to multiple sites worldwide? It was necessary for IBLI to grow, but Mude was not yet sure of the direction and trajectory of its growth.

IBLI, developed by the International Livestock Research Institute (ILRI) in collaboration with Cornell University and the BASIS Research Program at the University of California, Davis, was the first index-based insurance product that protected pastoralists in drought-stricken areas in Africa from losing their primary asset—livestock. Studies[1] had shown that IBLI coverage had a significant impact on these pastoralists' assets, investments and consumption capacity. IBLI had received funding and support from some of the largest international donors, including the governments of the UK, the EU, Australia, the US and the World Bank Group (WBG). The Government of Kenya too had acknowledged IBLI's social welfare benefits, and together with the WBG, was exploring avenues to fund and scale-up IBLI rapidly as a public-private type program within Kenya. While IBLI had been hailed by the media, donors, and partners alike as an effective and much-needed product, it had yet to mature into a large-scale, sustainable program with well-developed institutions in Kenya.

Despite residual challenges in outreach and institutional development, IBLI's donors and other key stakeholders were eager to expand it to East and West Africa (including countries like Somalia, Mali and Burkina Faso) that were also home to large pastoralist populations. Some in the IBLI team supported this strategy, as they were concerned that if IBLI did not expand now, its low sales figures in Kenya would be insufficient to demonstrate its impact, and might even raise questions about its sustainability—causing donors to lose interest. Yet, Mude worried that if they expanded too quickly, the current IBLI sites might suffer, damaging IBLI's reputation and demand everywhere and causing the entire program to collapse.

Mude wondered which of these paths was the best way to expand IBLI into a sustainable, well-received product. Should the IBLI team focus on strengthening the program in Kenya, or on expanding it to new territories? Was it possible to do both successfully?

1. Janzen, Sarah A. and Carter, Michael R. 2013. The Impact of Microinsurance on Asset Accumulation and Human Capital Investments: Evidence from a Drought in Kenya. Research Paper No. 31. Geneva, Switzerland: International Labour Organization (ILO) Microinsurance Innovation Facility. Microinsurance Innovation Facility.

The International Livestock Research Institute

Founded in 1974[2] and based in Nairobi, Kenya, the International Livestock Research Institute (ILRI) was a world-class agricultural research organization that enhanced food security and reduced poverty in low-income countries through path-breaking research that improved the value, efficiency and sustainability of livestock.

To fulfil its motto of "better lives through livestock", ILRI partnered with governments, civil society, academia and the private sector to deliver economic, health and environmental benefits to the poor through better livestock science and investments.

ILRI was a member of one of the world's largest agricultural research consortiums, the CGIAR Consortium, whose research generated billions of dollars of economic benefit around the world.

2. The International Laboratory for Research on Animal Diseases (ILRAD) and the International Livestock Centre for Africa (ILCA) merged in 1994 to form the International Livestock Research Institute (ILRI). ILRI celebrated its 40 year anniversary in 2014.

Developing Africa's first index-based livestock insurance

Droughts in the ASAL region

More than three million pastoralists lived in the arid and semi-arid lands (ASALs) of northern Kenya and southern Ethiopia, which suffered from crippling droughts routinely. These pastoralists had faced four major droughts in the last 10 years alone.

Severe droughts had devastating effects on pastoralists. They relied primarily on livestock for their livelihood but these frequent droughts often weakened or killed many of their animals. As a result, pastoralists were often forced to sell what remained of their livestock in distress sales for little money. Once they lost their sole source of income, some pastoralist households were compelled to cut back on meals and other essential consumption. Thus, losing their livestock often pushed pastoralists into a chronic poverty trap, rendering them some of the most vulnerable populations in the world.

Product development

To help these pastoralists, ILRI developed an index-based insurance product called IBLI. IBLI insured pastoralists against the risk of losing their primary asset, livestock, during drought. Studies[3] had shown that such an insurance product would spur both consumption and investment for these pastoralists, helping to improve their living standards.

Index-based insurance

IBLI was not like traditional insurance, as it did not pay individual clients for actual loss experienced on a case-by-case basis. In the infrastructure-deficient ASAL region, it was too costly to verify individual loss claims. There was also a high possibility of moral hazard[4] and adverse selection[5] in individual insurance that does not apply for index-based insurance. Instead, IBLI pays out to all policyholders in a geographically-defined area whenever the index/data indicated a certain level of livestock loss across the region. The index thus reflected livestock mortality in the region, and would be used to determine when to pay pastoralists.

3. Janzen and Carter (2013).

4. Moral hazard refers to the situation in which one party in a transaction has an incentive to take more risk than it otherwise would, because it is protected against that risk by another party. Because index-insurance makes payments based on an index that individuals cannot cheaply manipulate, the incidence of moral hazard is drastically reduced vis-à-vis traditional insurance.

5. Adverse selection: refers to the tendency of more risk-prone individuals to self-select into an insurance contract.

Solving the data puzzle

To accurately compensate pastoralists for their loss, the IBLI team had to construct the index using data that was closely correlated with livestock mortality. Livestock in the ASAL region depended entirely on forage for nutrition. Thus, the level of forage available in the region strongly predicted livestock mortality.

This forage availability data used was derived from satellite imagery released by NASA. These satellite images showed the density of greenery in a given location on land. Exhibit 1 provides details of the data used. ILRI scientists applied filters and algorithms to this satellite data to construct the IBLI index, which was designed to pay out when forage availability data predicted livestock deaths beyond a certain level (reflected by the index reading going beyond a certain 'strike point ').

Structure and coverage of IBLI

One IBLI contract covered livestock for a year, but had two potential pay-out periods—at the end of the long and short dry seasons, in March and October respectively. Clients could buy IBLI only during a two-month 'buying window' before the start of the two dry seasons; this helped mitigate adverse selection, as clients couldn't predict weather conditions for the next season at the time of buying IBLI.

Exhibit 2 shows the structure and coverage of IBLI in Kenya. IBLI's index was designed to provide the maximum possible insurance to pastoralists while still being cost-conscious. Households chose how many livestock to insure. The contract had a 'strike level' or deductible that represented the threshold level of predicted livestock mortality (in %) above which the insurance would pay out. Actuarially fair premiums were calculated for the insurance. Exhibit 2 provides further details about the IBLI contract, deductibles and premiums.

Testing the market

The IBLI team wanted to test whether the index accurately reflected the risk of the target client and whether the contracts met the pastoralists' needs. For this reason, IBLI's team carried out in-depth community and household surveys between 2007 and 2009 in the Marsabit district of Kenya—the first site for the IBLI pilot—to gauge the nature of loss and risk perceptions, test the appetite for an IBLI product, and assess their willingness to pay. Exhibit 3.

The survey confirmed that the IBLI index was highly correlated with actual livestock mortality losses experienced by pastoralists in the region.[6] While conducting the survey, IBLI researchers also introduced potential clients to IBLI and gauged the demand and willingness to pay among the population. Prior to the launch of sales in January 2010, the team conducted a baseline survey of 924 households in the area that it has since revisited annually and provides a wealth of data to test the welfare impacts of IBLI.

Past research had indicated that the IBLI team would need to educate potential clients about insurance in order to ensure initial uptake and continued engagement. Since these communities had little prior experience with insurance, IBLI teams had to explain basic insurance concepts like risk, before introducing the IBLI product. The IBLI team used a variety of creative education tools such as insurance simulation games, edutainment videos, radio programs, plays and cartoon strips to present IBLI to clients. The team also experimented with IBLI knowledge by giving some of the sample households access to a full-day educational session conducted as a game, while others were not provided such a session.

The results of the marketing and outreach campaigns, documented in Exhibit 4, were as ILRI expected. Pastoralists who bought the IBLI product had better knowledge of the product than those who did not buy it. Thirty-nine per cent of those who attended the specially designed IBLI educational game bought the product, as opposed to 26% amongst those who did not attend. Similarly, those who purchased insurance heard about IBLI from 2.89 sources on average, versus 1.72 sources for those who did not. Clearly, more education and marketing yielded better purchase of IBLI, and to ensure that IBLI gained traction, the IBLI team would have to undertake extensive outreach efforts.

However, ensuring that such extension campaigns reached a critical mass of clients was both difficult and costly. IBLI clients had low financial literacy, were spread out across vast areas, had difficulty understanding the concept of risk, confused insurance with savings products or lottery, were unfamiliar with insurance jargon, and did not understand or trust satellite data. Additionally, Marsabit suffered from many infrastructural deficiencies that made home-to-home selling difficult. IBLI and its partners also had trouble finding, recruiting and incentivizing the right local agents to sell policies. Pastoralists in turn expressed clearly that they viewed one-shot sales efforts suspiciously and instead wanted continuous education efforts and free access to agents before they would trust IBLI.

6. Chantarat, S., Mude, A.G., Barrett, C.B. and Carter, M.R. 2012. Designing Index-Based Livestock Insurance for Managing Asset Risk in Northern Kenya. Journal of Risk and Insurance.

Launching IBLI

In January 2010, IBLI was first offered for sale in the Marsabit district of northern Kenya. ILRI signed on Equity Insurance Agency (EIA) as the insurer and UAP Insurance Company was the underwriter in Africa. Swiss Re, the world's second largest reinsurance company, known for its due diligence and quality underwriting, signed up to offer reinsurance for the product. The launch was greeted by much excitement in local and international media, as well as in the international development community.

Growing pains

Exhibit 5 gives information about the number of contracts sold and the value of premiums collected during the first IBLI rollout. While the numbers were promising, the IBLI team encountered several challenges during this commencement period.

Their partner EIA did not deploy the point of sale (POS) devices as per their contract, and were unable to arrange any backup sales method either. With failing sales systems, the IBLI team rushed to transport EIA agents, who were the only ones authorized to make sales, throughout the vast sales zone. Some key towns were visited only once during the six-week sales window, and some interested customers were unable to purchase IBLI, causing them to lose confidence with the product.

Problems with delivery systems persisted, and the August/September 2010 sales campaign had to be cancelled. In the January 2011 sales period, the IBLI team and its partners introduced several changes to the sales process. Trainers were trained using an interactive curriculum, extension workers were put through a more stringent selection process, and local chiefs were trained to endorse the product in their communities. UAP also introduced its telephone-based transactions platform to process IBLI's transactions (which eventually processed over 70 percent of the sales). Despite all these efforts, IBLI sales declined substantially, as shown in Exhibit 5.

Part of the reason for lower sales was that clients had to purchase insurance before the start of the rains, so they did not know if the current contract would pay out or not. Furthermore, as with other index-insurance products, demand fell because no payout had been made yet, causing clients to question IBLI's benefits.

The first IBLI payout

After a severe drought in 2011, the IBLI pilot made its first payout in the Marsabit district in northern Kenya in October 2011. Details of the payout are in Exhibit 6.

A study[7] conducted after the payout found that IBLI delivered the intended value to pastoralists. Exhibit 7 details the findings of the study. Insured households were 20-40% less likely to sell their livestock assets, or reduce spending on meals. Research would later show that IBLI reduced damage to the pastoralists' asset base, prevented harmful long-term consequences and brought down malnourishment rates in the region. The first payout results made a strong case for IBLI as an effective social welfare program.

7. Janzen and Carter (2013).

Partnership woes

With positive feedback and strong evidence of success from IBLI's first payout, the IBLI team expected sales to increase. However, EIA and UAP were not prepared to execute new sales on time. As a result, there were no sales in the next sales period, and IBLI failed to capitalize on the payout's positive effects. The IBLI team had initially signed an exclusive contract with EIA and UAP, but decided to end the contract after the companies failed to fulfil their duties.

This experience raised a crucial issue for Mude and his team. IBLI was a part of ILRI, a research organization, where 'last mile implementation' was considered a 'mission drift'. The IBLI team had therefore wanted to leave implementation to its partners. Yet Mude realized that IBLI was operating in a tough environment. Pastoralists were an entirely new clientele and even existing players in the region, like EIA, had difficulty reaching them. After experiencing the adverse consequences of being 'hands off', the IBLI team realized it needed to be more proactive in helping partners' develop their implementation capacity. This was no easy task for a research organization and Mude worried that implementation was not their core competency. Mude also knew that partners would have to take ownership of their roles to ensure IBLI's sustainability, yet he wondered if it might be useful for ILRI to systematically work to develop capacity for key implementation competencies and for organizations critical to sustainable delivery of IBLI over time.

New partnership

When APA Insurance Company came on board in 2012, ILRI agreed to play a greater supportive role and the IBLI team collaborated closely with them during the August/September 2012 sales period. Yet despite all efforts, sales fell further, as detailed in Exhibit 5.

The biggest reason for low sales was that IBLI and APA changed the compensation structure for sales agents—or village insurance promoters (VIPs). As Exhibit 8 shows, these same VIPs had received higher compensation under Equity and UAP, because their salaries had been subsidized by a grant from ILO's Microinsurance Facility. But APA and the IBLI team cut down on subsidized salaries in an effort to accelerate the program towards commercial sustainability. This move backfired. By mid-September, half of the previous VIPs declined to work.

Mude said, "We realized a bit too late that commercial commissions could not be the sole remuneration for agents who had to hunt for clients that were spread out across a vast space, had low uptake and paid small premiums to begin with." It became clear to the IBLI team that IBLI was operating in a specialized context, and it was premature to impose very ambitious targets for commercial viability on IBLI. This experience also convinced IBLI's donors to continue providing more support to commercial partners in the initial years.

Refining the IBLI product

IBLI continued to refine and improve the program with each successive rollout, using measures such as providing colour-coded maps describing payout (provided in Exhibit 9), introducing a sharia-compliant version of IBLI in predominantly Muslim regions through Takaful Insurance of Africa Ltd., etc. A selection of IBLI-covered clients also received payouts in 2013 and 2014, which were met with approval by policyholders, who agreed that the index readings were effective and compensated them fairly.

IBLI continued expanding, by adding new sites like Wajir and Isiolo within Kenya in 2013 and increased its partner network, working with international organizations like Mercy Corps and World Vision Kenya. This expansion received good press, including from reputed publications like The Economist, along with much donor and political support. In 2012, IBLI started a pilot in southern Ethiopia, an area which was geographically similar to northern Kenya. ILRI already had its principle campus in Ethiopia with hundreds of staff members based in the country, so IBLI could benefit from a strong country presence and was able to expand to Ethiopia comfortably. In some ways, the IBLI staff considered southern Ethiopia an extension of their sites in Kenya.

Despite all of this, as Exhibit 5 shows, sales figures did not improve, and remained in the low hundreds in 2013 and 2014. Mude worried that if IBLI didn't make enough sales in the first few years in Kenya, pastoralists would write-off the program and the IBLI team would fail to demonstrate IBLI's welfare impact (thus potentially losing funding support for the research program as well).

Commercial sustainability versus public subsidies

Most agricultural insurance around the world required huge upfront investments to catalyse informed demand and reach a critical mass. IBLI was no different.

Research and experience had shown the IBLI team that initial public subsidies were needed to stimulate demand and to cover the fixed costs of marketing and developing IBLI in the ASAL region. This was at odds with the initial intention of developing a commercially viable IBLI scheme. Yet the IBLI team felt these subsidies were justified by the fact that IBLI reduced the total cost to society—a position that was echoed by the Government of Kenya, the WBG and other stakeholders. Many of the pastoralists who benefited from IBLI would have otherwise relied on cash or food subsidies from the government, or worse yet, have sustained irreversible health and economic damages. IBLI's subsidies were thus economically justified to the extent that they saved the government and international donors aid money. The IBLI team also considered commercial sustainability to be secondary to the overall well-being of pastoralists. Donors too supported temporarily postponing IBLI's quest for commercial sustainability.

However, the sales agent remuneration issue had served as a cautionary tale to the IBLI team. It showed how subsidies could distort a program, and potentially destroy it once they were withdrawn. Many other parts of the IBLI program, including product research and development, marketing and outreach costs, were subsidized by donor funding and Mude worried about what would happen if such subsidies were withdrawn in the future.

Expanding within Kenya: deepening strategy

The Government of Kenya / World Bank approach

Impressed with the evidence of IBLI's efficacy at delivering social benefits to an underserved population, the Government of Kenya and the WBG began talks to create a National Livestock Insurance Program, based on the IBLI contract. Under the Program, the Government of Kenya would purchase an index-based livestock insurance cover for approximately 100,000 targeted pastoralists in several of Kenya's counties. The Government intended to subsidize nearly 100% of the costs of the program for the first 3-5 years, though it intended to scale back and gradually remove subsidies when the commercial market for such an insurance became mature. It therefore wanted insurance companies to interface directly with potential clients to catalyse informed demand, though it was unclear whether insurers had the capacity to do so.

The plan was for the IBLI team to be intimately involved in designing the new contracts for this program, and advise the government on implementing the program, including how to target and select various populations, how to engage the private sector, how to cut down the operational costs of distributing payouts through platforms like M-pesa[8], etc.

While the Government of Kenya and the WBG were keen to start the program by 2015, they still had to figure out a lot of small details and negotiate the sometimes conflicting interests of different stakeholders. However, both these plans of internal expansion in Kenya would initially be entirely donor-driven and dependent on government support, and would likely involve heavy premium subsidies. While excited about the opportunity, Mude kept wondering what would happen if the government were ever to withdraw support.

8. M-pesa is a mobile-based money transfer and microfinance service, launched by Safaricom Ltd. in Kenya in 2007, which allows users to transfer, withdraw and deposit money easily with just a mobile phone. Over 70% households in Kenya—most of whom are poor, in rural areas, and without access to traditional bank accounts—use m-pesa. M-pesa thus leverages technology for financial inclusion by providing underserved low-income households an inexpensive, safe and instant way to transfer money.

Expanding into new geographical areas: broadening strategy

While IBLI still had much left to accomplish in Kenya, it was already attracting the interest of key stakeholders (e.g. governments, donors and partner non-profits) around the world owing to its proven welfare benefits and potential for social impact. Some of these donors were eager to expand it to other countries like Senegal, Mali, Mauritania, India, Botswana and Tunisia—all of which had poor pastoralist populations—as soon as possible. While still in early stages, IBLI was approached about whether it would set up operations in a couple of these countries, including some with very large pastoralist populations. In both countries, in addition to donor support, the initial messages indicated a favourable political climate with a supportive government, as well as credible players from civil society interested in becoming part of the outreach/distribution network, and reputable insurance companies interested in underwriting the risk.

Mude saw the potential, but was also concerned about many unknowns, not only with the partners in these potential new locations, but also with what it would mean to set up a new country operation in a location where ILRI and IBLI did not yet have a strong presence.

Crucial decision

Jimmy Smith, the Director General of ILRI, was in favour of expanding IBLI as quickly as possible. "Andrew, be bold!" Smith would often tell Andrew. Others within IBLI also subscribed to Smith's view. Brenda Wandera, IBLI's Market and Capacity Development Specialist explained, "There is a real opportunity to be seized. Donor interest is a huge incentive for expansion, but more importantly, we will be able to reach and serve pastoralists in many other countries. Besides, we have to remember that if we wait too long, donor funding and interest for expansion might wane. So we should expand more aggressively while IBLI is in demand and donors want to back it."

There was also the worry that sales in Kenya might be too slow to sustain funding in the long run. New sites would reduce the risk of donors getting frustrated. It would buy the IBLI team more time to increase overall sales and generate global research insights to prove IBLI's value for money, thereby pre-empting potential criticism of its high upfront costs.

Brenda noted, "We should hedge our bets, rather than invest everything into one site. International expansion will give us the opportunity to test the strength of the concept in diverse sites, and help us better showcase the real benefits IBLI provided to pastoralists. We face very tough conditions, in northern Kenya and southern Ethiopia, with many accompanying challenges. If we keep IBLI limited to this region alone, we will be doing disservice to the program's overall legitimacy and value."

Since IBLI was a donor-funded program, Mude acknowledged that these considerations were important for the team. Yet Mude believed in evidence-based scaling up. "I want to use a model that has been perfected in one place and can be replicated in others," said Mude. "I'm not sure that the Kenyan model is ready yet since feedback from each successive sales period has prompted new changes in our research and operational strategy in Kenya."

Others in the team feared that the program had not yet hit a critical uptake mass, which the deepening options in Kenya could potentially provide much quicker than any alternative. If IBLI moved to other countries too quickly, without putting into place the conditions and institutions needed to ensure IBLI's sustainability in Kenya and Ethiopia, it would lose its momentum and credibility in these two countries. Even though partners seemed keen for IBLI to expand, some within IBLI wondered if the risk would be worthwhile, especially when there was a concrete opportunity to scale up in Kenya.

The IBLI team also faced a significant human resource crunch. IBLI had a small team of 15 people, catalogued in **Exhibit 10**, which was already busy with new extension efforts in Kenya and Ethiopia. Many people in the team were relatively new recruits and several key members of the team had recently left to pursue further studies or other interests. Furthermore, it had proven challenging for Andrew to recruit skilled people for IBLI who were willing to relocate to sites like Ethiopia, who possessed some basic cultural competency like local language skills, and most importantly, who had the right overlap of research, marketing and implementation skills required to grow IBLI further.

Mude sat back at his desk mulling over the different options and challenges before him. He recognized that all the members of his team wanted to ensure IBLI's best interests, but held greatly differing views about what that meant — they were looking to him to lead the IBLI program to the next level.

The goal was clear: to grow IBLI. But when and how should this growth take place? If IBLI stayed in Kenya, how could it keep donors happy and build a sustainable program? If they moved to new countries, how could they use their insights to be successful elsewhere, while ensuring that the Kenyan and Ethiopian programs were not adversely affected? Could they do it all, or would they have to choose? Being either overzealous or overcautious could harm IBLI. As ILRI's senior management team gathered together to plan its 2015-2017 cycle, it was time for Mude to present a clearer, better direction for IBLI.

Exhibit 1 IBLI data

Problems with data

The country of Mongolia developed the first index-based livestock insurance contract for pastoralists based on direct measured livestock mortality. Some data on herd mortality is available for northern Kenya and southern Ethiopia, however the coverage is inadequate and inconsistent. The quality of data about livestock mortality and drought predictions was insufficient by itself to adequately reduce the risk borne by the target population. If any insurance product used this data alone, it would likely be low on efficacy, value and demand.

For IBLI to work, it needed another indicator variable that was highly correlated with the insured event.

To accurately design and price insurance contracts, the IBLI team had to instead find a measure that was:

- Highly correlated with local livestock mortality;
- Reliable and cheaply available for a large number of locations;
- Not manipulated either by the insurer or the insured; and
- Historically available to test the pricing of the product.

Satellite imagery solved the IBLI data problem

The Normalized Difference Vegetation Index (NDVI) met all these conditions. The NDVI is constructed from data that is remotely sensed from satellites, and is an indicator of the level of photosynthetic activity in the vegetation in a given location.

Since the late 1980s, the United States' NASA and National Oceanic and Atmospheric Administration have produced composite NDVI images of Africa, and have built a valuable archive of these data from June 1981 to the present, which are available in real time and free of charge.

Since livestock in pastoralists systems depend entirely on available forage for nutrition, the NDVI would theoretically be a strong indicator, not only of the vegetation available for livestock to consume, but consequently of livestock mortality as well.

Using NDVI to create a livelihood-optimized index

While NDVI had properties that made it reliable as the basis for an insurable index, it also had to have value for the insured in this particular instance. In other words, NDVI data had to predict livestock mortality rates reasonably precisely so that any index insurance based on NDVI would be able to accurately compensate the policyholders for their loss.

To test how closely NDVI data predicted livestock mortality rates, the IBLI team turned to household-level livestock mortality data collected monthly since 2000 in several communities in Kenya's ASAL districts by the Government of Kenya's Arid Lands Resource Management Project (ALRMP) and by the USAID-funded Pastoral Risk Management (PARIMA) Project. They used this data set to statistically estimate the relationship between NDVI measures and observed livestock mortality. The team found that there was a statistical predictive relationship between average livestock mortality within a specific area and the satellite-based indicator of forage availability NDVI.

The team then worked with these herd history data to create an optimal insurance index that is defined as the function of the NDVI data. This index is simple, replicable, and inexpensive to establish and has a high correlation with herd mortality data so that it provides the maximum possible insurance value to the pastoralist population.

Exhibit 2. IBLI structure and summary of key features

The risk

Index-Based Livestock Insurance (IBLI) is a product that is designed to protect against drought-related livestock mortality. IBLI compensates pastoralists for predicted livestock losses due to severe forage scarcity due to drought.

The index

The index in IBLI is predicted livestock mortality. It is calculated by using a measure of pasture availability that is recorded by satellites, called the Normalized Differenced Vegetation Index (NDVI). This vegetation measure is fed into a response function that relates pasture availability with drought related livestock mortality.

Contract strike level

The index threshold above which payouts must be made is called the strike level. The strike levels for IBLI are either 10% or 15%. The clients select which contract they would like to purchase. In other words, IBLI will compensate if predicted livestock mortality is above 10% or 15%, depending on the type of contract purchased.

Geographical coverage of contract

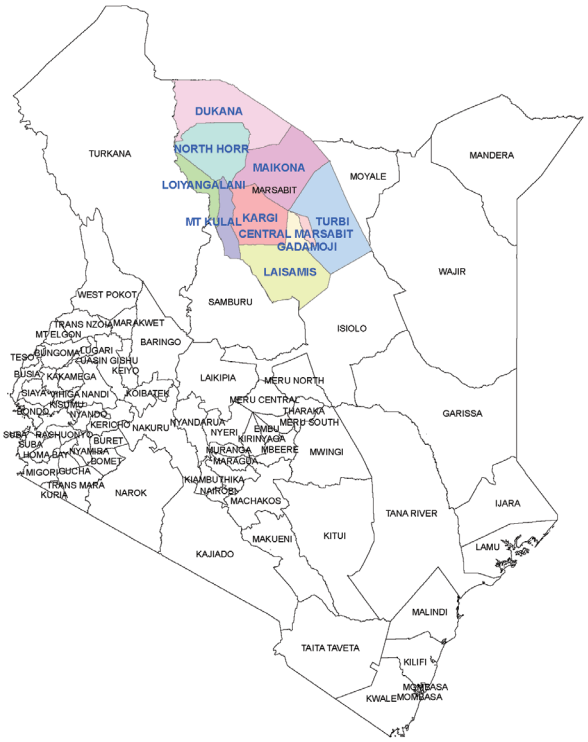
The larger Marsabit district will be covered by ten separate contracts. These are based on the divisional boundaries consisting of Central, Gadamoji, Laisamis, Loiyangalani, Mt. Kulal, Kargi, Maikona, Turbi, North Horr, and Dukana divisions.

The significance of geographical clustering

1. The index—predicted livestock mortality—is given at the division level. That means that Central, Gadamoji, Laisamis, Loiyangalani, Mt. Kulal, Kargi, Maikona, Turbi, North Horr, and Dukana divisions could all have a different index level. Because insurance payments are made according to the index level, this means that IBLI may make different payments across all the divisions. Every insurance policyholder within the same division, however, will receive the same rate of insurance payment (if the index is above the strike or trigger that they chose).

2. As will be explained below, premiums are different in all the divisions of Marsabit.

IBLI Location and Geographical Coverage (Marsabit, Kenya)



Contract premiums

The premiums for IBLI vary every season depending on the forage conditions in the previous season, which will also give an insight on the forage conditions in the coming season. The premiums for Marsabit for Aug/Sept 2014 are as follows:

Table 1: August/September 2014 premiums for IBLI

Contracts	15%	10%
Central marsabit	6.2%	7.5%
Gadamoji	6.1%	7.4%
Laisamis	6.5%	7.8%
Loiyangalani	8.2%	10.4%
Mt kulal	5.8%	7.0%
Kargi	6.4%	7.7%
Maikona	6.4%	8.1%
Turbi	6.4%	7.9%
Dukana	5.9%	7.9%
North horr	7.7%	9.9%

Premiums are different in the different divisions due to the differences in the type of livestock they keep in the area, as well as the forage conditions in the same.

These rates are applied to the value of the herd to be insured in order to give the amount that that must be paid for livestock insurance.

Consumer premium rates do not equal total market premium rates. A 40% premium subsidy has been provided by DFID, EU and AusAID to cushion the pastoralists until the market forces push the prices down.

Insurable livestock unit

The standard livestock types for a pastoral herd will be covered. These are: camels, cattle, sheep and goats. To arrive at a value for the insured herd, the four livestock types will be transformed into a standard livestock unit known as a Tropical Livestock Unit (TLU). TLU is calculated as follows:

- 1 Cattle = 1 TLU.
- 1 Camel = 1.4 TLU.
- 1 goat/sheep = 0.1 TLU.

The examples below show two different herd sizes and how they can be calculated into TLU:

Example 1. If you would like to insure 3 cattle and 20 goats/sheep,your TLU insured is $3\times1 + 20\times0.1 = 5$ TLU.

Example 2. If you would like to insure 4 cattle, 7 camel, and 12 goats/sheep,your TLU insured is $4\times1 + 7\times1.4 + 12\times0.1 = 15$ TLU.

Value of the insured herd

Once total TLU are calculated, you need the value of a TLU to determine the value of the total herd. Using average prices for livestock across Marsabit, we have arrived at a set price per TLU insured of KES 20,000. Using the examples above, the total value of the herd will be as follows:

Example 1: 5 TLU x 20,000 = KES 100,000

Example 2: 15 TLU x 20,000 = KES 300,000

The premiums are then applied to this to arrive at the amount one would pay for IBLI coverage for the year.

Time coverage of IBLI

The figure below presents the time coverage of the IBLI. The contract is an annual contract whose coverage spans from beginning of March of one year to February of the next year or from beginning of October of one year to end of September of the next year. IBLI will only be sold within specific time frames—the first sales period is from 1 January to 28 February and the second sales period is from 1 August to 30 September. Contracts must be sold within this timeframe as the rainy season beginning right after that may give the potential buyer information about the likely conditions of the season to come that would unfairly affect his/her purchase decision.

This annual contract has two potential payout periods: At the end of the long dry season in October and at the end of the short dry season in March. At these points of time, if the index reads greater than 10% or 15% depending on the type of contract purchased, the insurance will pay clients

Temporal structure of IBLI contract

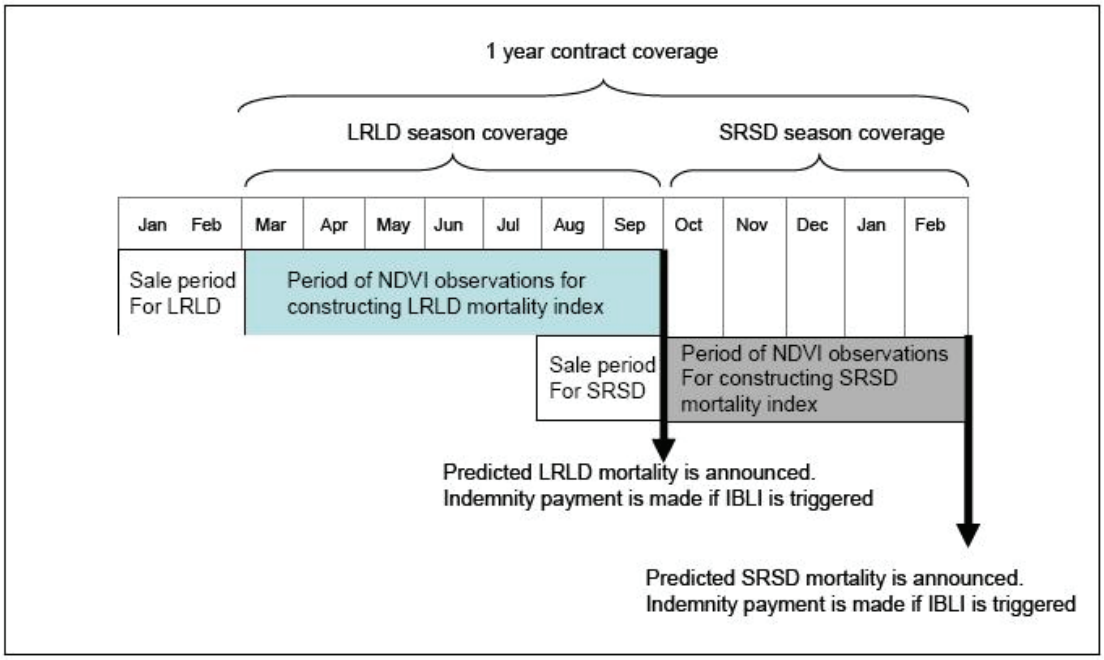


Exhibit 3 IBLI research, data collection and impact evaluation

Overview

The IBLI pilot was conducted after a rigorous impact evaluation system was put in place. This began with a series of surveys and community engagement exercises with various households across Marsabit in 2008 and early 2009. This first wave of data collection was intended to identify and analyse the risk profile of the community, testing their appetite for risk, and soliciting information necessary to help guide the design of appropriate and precise IBLI products for the community. In addition, to ensure that IBLI would make sense to them and have some practical value, the surveys were also used as a means to introduce potential clients to IBLI and gauge the demand and willingness to pay for such a product.

Once these data were analysed and used to design the IBLI contract and, on this evidence-base, rally the interest of key stakeholders (such as insurance companies, and development and donor agencies), IBLI researchers designed an elaborate multi-year impact evaluation survey. The survey strategy was designed to ensure that they could attribute impacts estimated across various welfare indicators, to IBLI. This survey (first implemented in October/December 2009), in particular provided an important baseline, underlining various parameters of interest for subsequent monitoring and evaluation.

Aims of the survey

At the onset, IBLI was a product that promised, in theory, considerable social and welfare benefits for pastoralists. However, its actual impacts and effects of securing livestock assets in pastoral settings by way of an IBLI-type product were not quantified and remained relatively unknown. It was believed that IBLI could act as a productive safety net for households affected by livestock losses after drought years and help them effectively manage the resulting shock. IBLI was also hypothesized to provide households with incentives to invest in livestock by reducing the risk inherent in keeping livestock in a vulnerable system. Furthermore, by increasing the collateral value of an otherwise risky asset, IBLI could potentially enhance financial deepening in pastoral areas, making credit more available and catalysing related market opportunities. There may also be several unexpected market, environmental and behavioural impacts that would be important to study. These, in a nutshell, were and continue to be the objectives of the research agenda that continues to this day and has thus far produced a suite of important insights.

Methodology

This sample size was distributed across the 16 sub-locations in Marsabit on the basis proportional allocation using the 1999 household population census statistics. There were only two exceptions to this rule: a minimum sample size of 30 households and maximum of 100 households per sub-location; to participate in a panel survey. The next step was to draw the actual sample. In all survey sites, a list of all inhabitants was developed with chiefs and local elders. The IBLI research team with the local enumerators went to each and every sub-location and in a painstaking process accompanied by local elders and assistant chiefs and wrote down names of all household heads. Other lists, such as food aid distribution, were also included or used to augment what was collected. In addition, key informants were asked to classify households into three wealth groups based on livestock holdings; 1. Low (less than 10 TLU[9]), 2. Medium (between 10 and 20 TLU), and 3. High (more than 20 TLU). For each sub-location, random sampling was stratified by wealth class. However, because in several instances there were too few among the high wealth category, all such households were included.

The data available includes household-level information collected annually (beginning in 2009) for 924 households. Each household has been revisited annually to track the dynamics of change across a range of key variables. Household attrition-rate has been less than 5% annually. In each round of the survey, households were asked to answer questions about health, education, livestock holdings, herd migration, livelihood activities, income, consumption, risk preferences, market interactions, assets, and access to credit and many more aspects.

In order to incentivise uptake of IBLI, a direct subsidy encouragement was provided through the use of discount coupons given to a sub-sample of the surveyed households in each of the 16 study sites. Coupon recipients were randomly selected from all the surveyed households in each study site as follows: forty percent (40%) of the sample did not receive any discount. The remaining 60% received discounts with the distribution being 10% of the sample in each of the following discount levels (10%, 20%, 30%, 40%, 50% and 60%). The coupons provided, upon presentation to insurance sales agents, entitled the household to a discount on premium for the first 15 TLU insured.

In addition, half of the sample communities were randomly selected, and within them half of the sample households were selected to attend a full-day educational session, including experimental games used to convey the complex concepts of index insurance. The games were designed to explain the inter-temporal benefits of insurance by simulating herd sizes over several years. They also explained that payouts were triggered by droughts, and that if a drought did not happen and payouts were not triggered, their premiums would not be returned.

9. Tropical Livestock Unit or TLU (1 TLU = 1 cattle = 0.7 camel = 10 goats/sheep)

Exhibit 4 Relationship between extension effort and IBLI uptake

After the first sales window in January and February of 2010, IBLI conducted a survey of several households it had reached through its sales campaign, and asked them several questions, including whether they had bought IBLI nor not. For the 887 households for which IBLI had complete data, 241 households purchased IBLI, versus 646 who did not.

Those who bought IBLI had considerable more correct knowledge about the IBLI program and had heard about IBLI from a larger number of information sources.

Fifty percent of survey households in half of the survey communities were randomly selected to play a comprehensive insurance game (McPeak et al. 2010), designed to improve their understanding of the product. Those who played the game were more likely to have purchased insurance.

The table below summarizes the relationship between various extension efforts and IBLI uptake:

Bought insurance?	Number	IBLI knowledge*	No. of information sources	Played game
No	646	1.29	1.72	0.26
Yes	241	2.11	2.89	0.39

*Average number of correct responses from a survey of five questions about IBLI designed to test understanding of the product.

Exhibit 5 IBLI sales data for Marsabit, Isiolo and Wajir

IBLI sales data (Marsabit) from January 2010 to September 2014

Sales period	No. of contracts sold	No. of TLUs* insured	Total value of TLUs insured (USD)	Total value of premiums paid (USD)
Jan/Feb 2010	1975	5965	1,193,080	46,602
Jan/Feb 2011	638	1309	261,700	9824
Aug/Sept 2011	508	835	167,100	10,858
Aug/Sept 2012	216	411	82,220	3546
Jan/Feb 2013	214	457	81,240	3288
Aug/Sept 2013	117	146	34,933~	2669
Jan/Feb 2014	113	42	11,573	1089
Aug/Sept 2014	288	159	42,666	3423

*Tropical Livestock Unit or TLU (1 TLU = 1 cattle = 0.7 camel = 10 goats/sheep)

^UAP replaced by APA Insurance

~TLU Values increased from KES 15,000 (USD 200) to KES 20,000 (USD 267)

- Exchange rate used = KES 75 to USD 1

IBLI sales data (Isiolo) from August 2013 to September 2014

Sales period	No. of contracts sold	No. of TLUs* insured	Total value of TLUs insured (USD)	Total value of premiums paid (USD)
Aug/Sept 2013	68	399	106,507	10,000
Jan/Feb 2014 (APA)	46	78	20,693	1997
Aug/Sept 2014 (TIA)^	60	96	31,867	1422
Aug/Sept 2014 (APA)	104	180	48,080	4522

*Tropical Livestock Unit or TLU (1 TLU = 1 cattle = 0.7 camel = 10 goats/sheep)

^Takaful Insurance of Africa to also sell IBLI in Isiolo

~1 TLU = KES 20,000 APA, KES 25,000 TIA

Exchange rate used = KES 75 to USD 1

IBLI sales data (Wajir) from August 2013 to September 2014

Sales period^	No. of contracts sold	No. of TLUs* insured	Total value of TLUs insured (USD)	Total value of premiums paid (USD)
Aug/Sept 2013	101	339	112,967	6857
Jan/Feb 2014	240	657	219,033	14,950
Aug/Sept 2014	150	385	128,376	9002

Exhibit 6 IBLI payouts in Marsabit, Kenya

Time period	Region	Total clients	Value (USD)
October 2011	All five divisions of Marsabit: Central and Gadamoji, Laisamis, Loiyangalani, Maikona and North Horr	638	25,397
March 2013^	Payout in North Horr	69	672
March 2014~	Payout in North Horr and Loiyangalani	73	879

^UAP replaced by APA Insurance

~TLU Values increased to KES 20,000 (USD 267)

*Exchange rate used = KES 75 to USD 1

Exhibit 7 Key highlights from an IBLI impact study

- There was a 22–36% average reduction in the number of insured households who anticipated selling livestock to cope with the 2011 drought (a 50% drop overall), which enhanced their ability to recover from the drought.
- Insured households were 27–36% less likely to reduce meals on average (overall drop of nearly 33%), which indicated there would be a reduction in malnourishment in the food insecure region.
- Insured households would be 42–50% less dependent on food aid and 0–26% less reliant on other aid.
- The study concluded that these results "suggest that insurance can help households to protect assets during crises, without having a deleterious effect on human capital investments."

About the study

Professor Michael Carter and Sarah Janzen from the Department of Agriculture and Resource Economics at the-University of California, Davis, conducted an in-depth research study of the impact of the Index-Based Livestock Insurance (IBLI) program in Kenya.

Data for the study was collected by the International Livestock Research Institute, Cornell University, Syracuse University and the BASIS Research Program at the University of California at Davis.

The study was funded by the UK Department for International Development, the USAID, and the World Bank's Trust Fund for Environmentally and Socially Sustainable Development.

Source: Janzen, S.A. et al. 2013.

Exhibit 8 IBLI sales agent compensation structure

	Under equity & UAP (Jan 2010–	Under APA (Aug 2012–Jan 14)	Under APA (Aug 14)
Daily fee	KES 500	None	See table below
Commission per sale	KES 50	6% of contract price	See table below

MARSABIT—JF14			
100–50%	KES 300 daily allowance and bonus		
49–20%	KES 200 daily allowance		
19–10%	KES 150 daily allowance		
9–0%	KES 100 daily allowance		
Weekly target	%		Daily allowance
20,000.00	100%	20,000.00	300
20,000.00	95%	19,000.00	300
20,000.00	90%	18,000.00	300
20,000.00	85%	17,000.00	300
20,000.00	80%	16,000.00	300
20,000.00	75%	15,000.00	300
20,000.00	70%	14,000.00	300
20,000.00	65%	13,000.00	300
20,000.00	60%	12,000.00	300
20,000.00	55%	11,000.00	300
20,000.00	50%	10,000.00	300
20,000.00	49%	9,800.00	200
20,000.00	45%	9,000.00	200
20,000.00	40%	8,000.00	200
20,000.00	35%	7,000.00	200
20,000.00	30%	6,000.00	200
20,000.00	25%	5,000.00	200
20,000.00	20%	4,000.00	200
20,000.00	19%	3,800.00	150
20,000.00	10%	2,000.00	150
20,000.00	5%	1,000.00	150
20,000.00	0%	-	

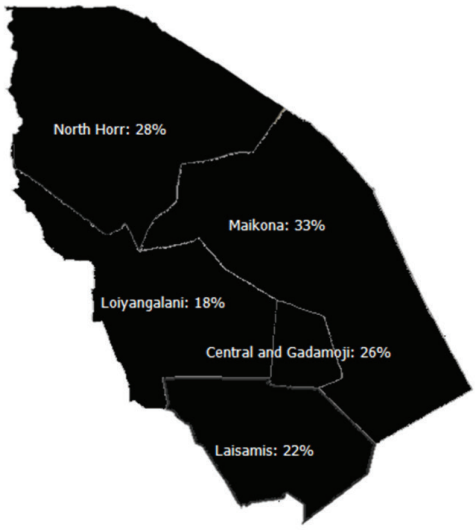
Exhibit 9 Colour-coded map describing IBLI's state of Marsabit index, October 2011

INDEX BASED LIVESTOCK INSURANCE
Index announcement for October 2011

- The IBLI color legend below describes the state of the index in a simple and easy to understand format.
- The actual index percentage are only presented when the index is above 10% (Red or Black color) as this is where the index number signifying the increasing loss of livestock becomes important for insurance payouts
- Recall that insurance Payouts are made when the index is above 15%
- For the October 2011 payout period, payouts are triggered in all divisions.

Green	**Good Regime Stable:** Here, the division in question is within a good regime and is characterized as stable. This means that the forage conditions are above normal and are either improving or at least have not worsened over two consecutive months. Index readings do not relate to livestock mortality due to forage scarcity.
Yellow	**Good Regime Worsening:** While the division in question is characterized by better than average forage cover over the past year, the situation has been consistently worsening within the past two months (that is to say that the past two months the forage situation has been lower than the long run average). Index readings do not relate to livestock mortality due to forage scarcity.
Orange	**Bad Regime Moderate:** The sum of forage available over the past year has dropped below the long-run average. However, while the division in question is under considerable stress, the model **predicts less than 10% average livestock mortality**. At these levels the model is not as accurate in predicting losses as they are not yet widespread.
Red	**Bad Regime Accute**: Average livestock deaths predicted to be **between 10 and 15%**. At this level, model predictions become more precise. The situation is quite serious but not yet classified as severe. The IBLI product has not yet triggered and at least individuals are expected to cater to this level of losses.
Black	**Bad Regime Severe:** The drought is now severe. Forage scarcity has been pronounced over a long period and greater than 15% of livestock in the area are predicted to have died. Insurance payments have been triggered.

Index reading for Marsabit – October 2011



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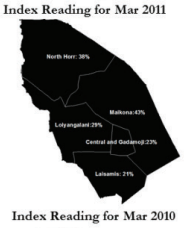
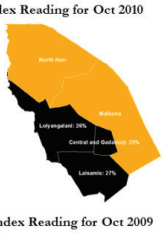
Previous Index readings for Marsabit

Index Reading for Mar 2011

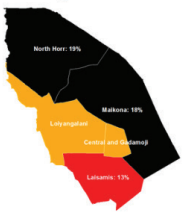
Index Reading for Oct 2010



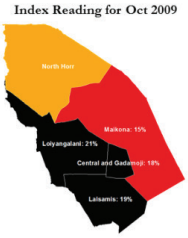
Index Reading for Mar 2010



Index Reading for Oct 2009



Index Reading for Mar 2009



Index Reading for Oct 2008

Exhibit 10 IBLI structure (October 2014)

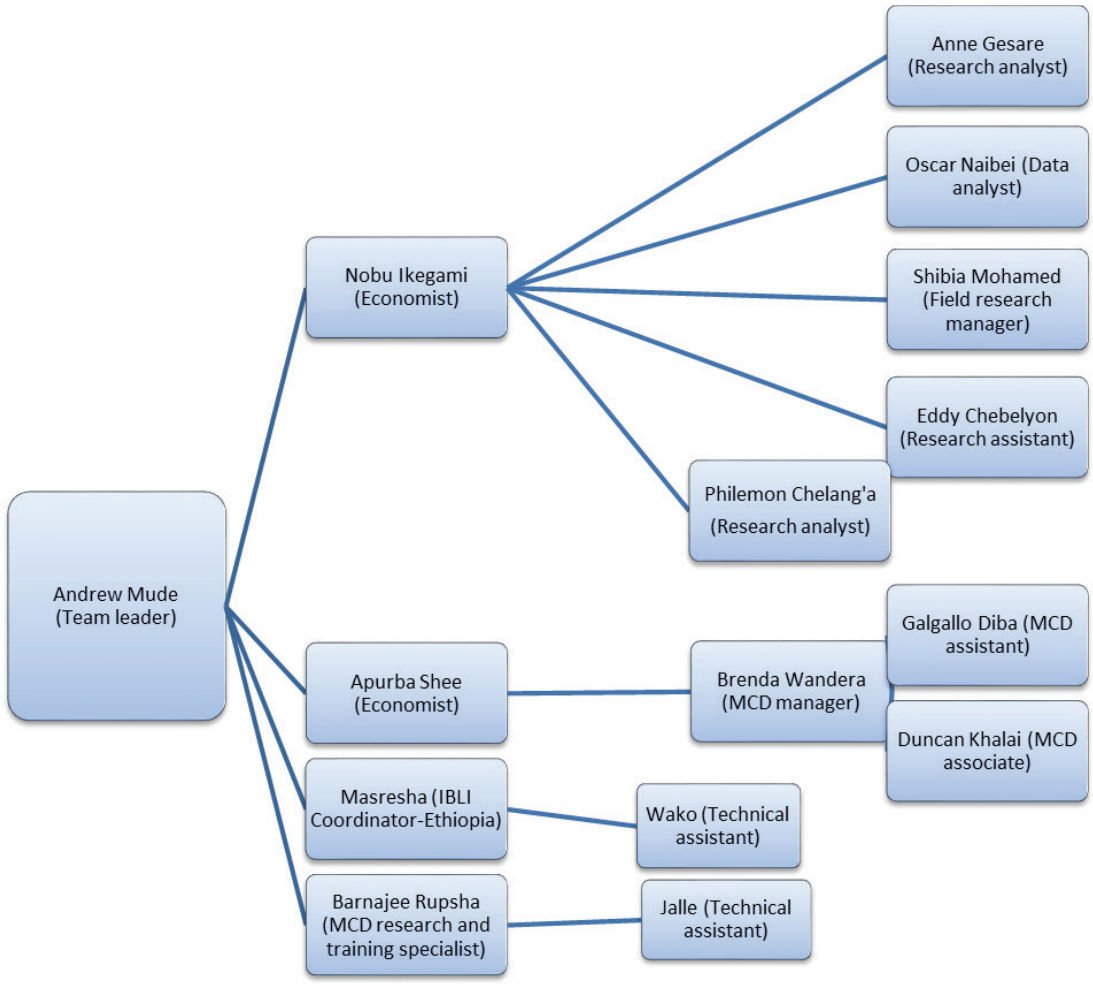


Exhibit 11 IBLI photos

A pastoralist with his livestock in Isiolo

A pastoralist in Wajir with her IBLI receipt (ILRI/Riccardo Gangale)

Marsabit, Kenya

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