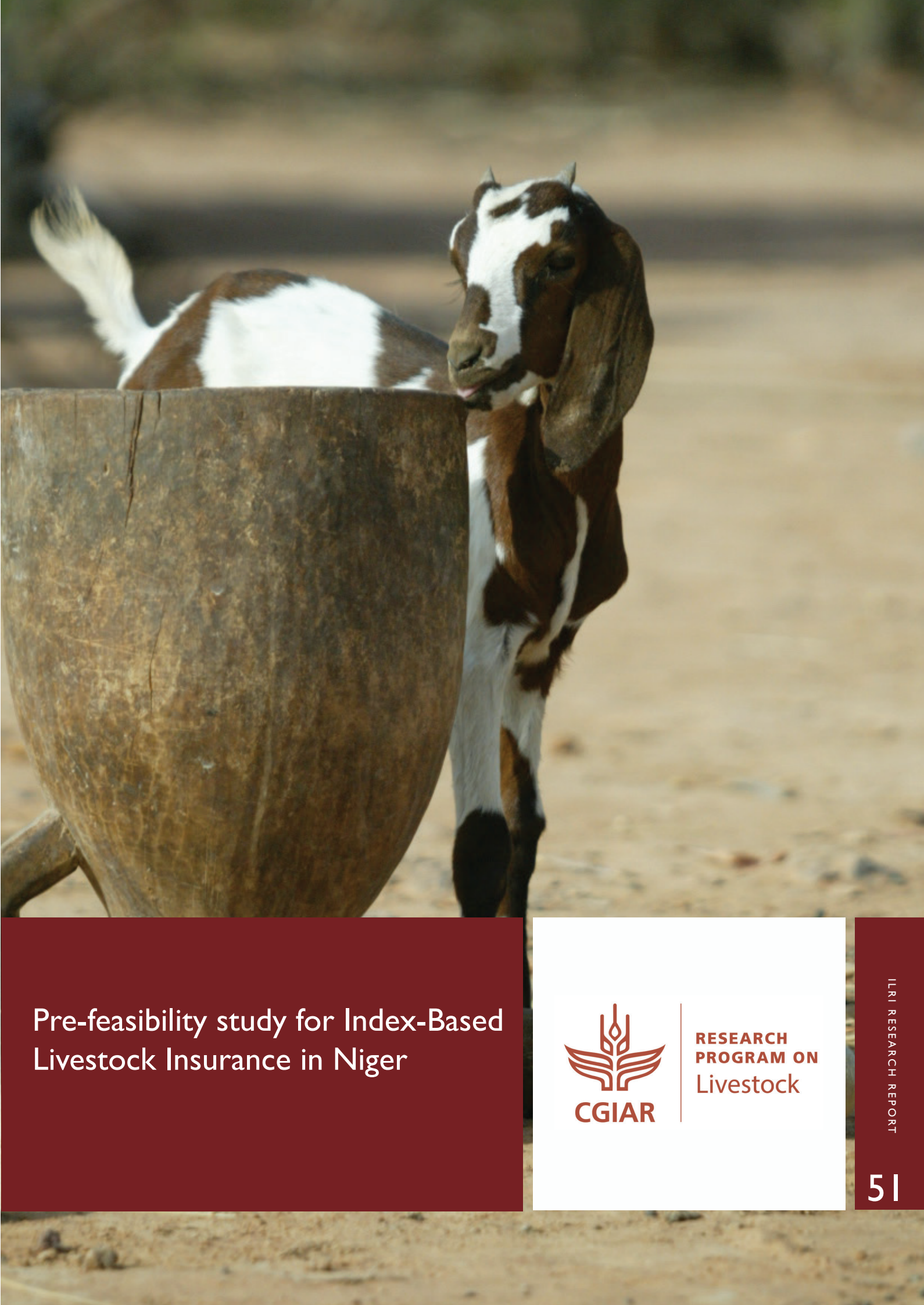


Pre-feasibility study for Index-Based Livestock Insurance in Niger

CGIAR

RESEARCH PROGRAM ON Livestock

ILRI RESEARCH REPORT 51


CORNELL UNIVERSITY
FOUNDED A.D. 1865


care

Pre-feasibility study for Index-Based Livestock Insurance in Niger

Francesco Fava,[1*] Joanna Upton[2], Rupsha Banerjee[1], Masresha Taye[1] and Andrew Mude[1]

1 International Livestock Research Institute

2 Charles H. Dyson School of Applied Economics and Management, Cornell University

* Corresponding author: f.fava@cgiar.org

June 2018

ILRI thanks all donors and organizations which globally supports its work through their contributions to the CGIAR Trust Fund

Editing, design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover photo— ILRI/Stevie Mann

ISBN: 92–9146–572-0

Citation: Fava, F., Upton, J., Banerjee, R., Taye, M. and Mude, A. 2018. *Pre-feasibility study for Index-Based Livestock Insurance in Niger*. ILRI Research Report 51. Nairobi, Kenya: International Livestock Research Institute (ILRI).

Patron: Professor Peter C Doherty AC, FAA, FRS
Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax+254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
better lives through livestock

ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

ILRI has offices in East Africa • South Asia • Southeast and East Asia • Southern Africa • West Africa

Contents

Figures

Tables

Acknowledgements

The study was conducted jointly by the International Livestock Research Institute (ILRI), Cornell University under the Care-Cornell Innovation for Impact Fund (IIF), with logistical support from CARE International.

The authors would like to acknowledge and thank Sustainable Future, which provided the IIF funds that enabled this project to proceed.

We wish to thank CARE International and CARE Niger teams for jointly writing the project proposal with Cornell University and ILRI and for providing the logistical support for the field work. We would also like to thank Kimetrica for the support in LSMS data management.

Sincere thanks to Christopher Barrett, Nathaniel Jensen, Liz Bageant, Mara Russel and Vidhya Sriram for providing valuable comments and suggestions to improve the quality of the report.

Finally, the authors wish to thank all government officials and representatives of international development organizations, private sector companies, local associations and rural communities who accepted to be interviewed as key informants or stakeholders.

Executive summary

Introduction and motivation

Both the arid and semi-arid lands of Eastern Africa and the Sahel in Western Africa are in large part populated by pastoral peoples who cope with farming these agriculturally marginal lands by practicing extensive livestock management. The incomes and food security of these populations are highly susceptible to weather shocks and climate change, along with other drivers of land degradation. Drought is by far the dominant risk pastoralists face, a risk that increasing demographic and environmental pressures further exacerbate. Drought is the leading cause of livestock mortality and productivity loss in pastoral herding communities and, as it affects entire communities at once, also renders most traditional social safety nets and coping mechanisms insufficient, often forcing households to rely on detrimental coping mechanisms that encourage a descent into poverty and limit their chances of escaping poverty.

In an effort to identify and deploy solutions that enhance the resilience of these agro-climatically vulnerable pastoral households, the International Livestock Research Institute (ILRI) and its public, private and non-profit sector partners have pursued a comprehensive research-into-development agenda aimed at designing, developing and implementing market-mediated index-based insurance. Index-Based Livestock Insurance (IBLI) relies on low-cost, accessible and reliable satellite indicators of drought to protect pastoralists from drought-related forage scarcity and consequent asset losses (Chantarat et al. 2013; Vrieling et al. 2014). Implementation of this product in Kenya and Ethiopia has produced numerous successes encompassing a wide range of positive socioeconomic impacts on pastoral households in terms of welfare, nutritional outcomes and drought-coping capabilities (Chantarat et al. 2017; Janzen et al. 2016; Jensen et al. 2017; Jensen et al 2016; Tafere et al. 2017). Meanwhile, IBLI has rapidly evolved and increased in scale from two small pilots to the Kenya Livestock Insurance Program (KLIP), a large public-private partnership spearheaded by the Government of Kenya and to an ambitious expansion program located in Ethiopia.

The success of the IBLI product in the Horn of Africa is attracting strong interest from donors, institutions and governments for use elsewhere, particularly in the Sahel, given its similar agro-ecological conditions, risk profile and considerable pastoralist population. However, scaling-up a complex financial product and implementation model to different geographic and socioeconomic contexts first requires a careful investigation of where (and to what extent) a set of essential pre-conditions are met in order to expect a return of the initial investments in terms of impacts and long-term sustainability.

The objective of this study was to design and conduct a pre-feasibility assessment for IBLI product implementation in Niger. More specifically, our aim was to investigate the potential value of IBLI and the degree of investment needed for its large-scale implementation by analyzing a set of critical pre-conditions related to the product's technical design, projected market demand, distribution infrastructure and institutional environment. In doing so, we also drew key insights and recommendations on how to tailor IBLI contract design and implementation models for diverse contexts deemed suitable for IBLI's introduction. Finally, we sought to design a methodological framework for IBLI pre-feasibility assessment that could be replicated in different countries to support regional initiatives.

Conceptual framework and methods

The scope of a pre-feasibility assessment for a locale is to determine whether that locale meets the basic requirements for development and introduction of an index-based insurance program such that the chance of long-term success (i.e., sustainable scaling) is high. This assessment includes several activities in three broad areas: biophysical feasibility, which is aimed at understanding the agro-ecological context and assessing whether existing conditions permit the technical design of the insurance product; socio-economic feasibility, which focuses on such pre-conditions for effective demand as centrality of livestock resources and impact of drought on livestock and household wellbeing; and institutional feasibility, which assesses pre-conditions of cost-effective product delivery, the institutional and regulatory environment, availability and receptivity of key stakeholders and the willingness of these stakeholders to invest in the process.

We proceeded by first identifying objective indicators within each of these categories, and then, based upon a review of the relevant literature and prior experience gained in Kenya and Ethiopia, we assessed standards or levels for these indicators that pointed toward feasibility and/or favorability of IBLI. We then assessed these indicators in Niger to the degree possible using a suitable combination of literature review, satellite data and imagery, secondary national and household-level data sources and primary data from focus group discussions and key informant interviews conducted in Niger in early 2018. Integrating these analyses allowed us to form general recommendations regarding the pre-feasibility of IBLI in Niger and to identify information gaps, potential challenges and related areas for further research.

Summary of findings

Biophysical - The IBLI product, which is based on using satellite NDVI time series as a proxy for rangeland production, is optimally suited to areas where extensive pastures dominate the landscape. On the other hand, its use is technically limited in regions where pasture production is very limited, land-use is mixed (i.e., crop and pastureland are combined) and/or there is no clear seasonality. Drought history, grazing and livestock migration patterns and trends in land condition and land use are also important factors to be considered in tailoring and assessing suitability of IBLI in a specific agro-ecological context.

Biophysical data availability in Niger is good and includes a ground biomass monitoring network encompassing over 100 physical sites that have been monitored for three decades. Findings show that, while extensive rangeland coverage is limited in the northern areas by desert and in the southern areas by increasing density of crop-based activities, roughly 40% of communes in Niger can be considered potentially feasible for IBLI model implementation. Given livestock migration patterns and the concentration of grazing lands in these areas, the actual distribution of IBLI across rural households could cover even a larger area. In addition, the frequency and intensity of droughts affecting Niger pasturelands, as demonstrated by available historical data, are similar to areas where IBLI has been successfully implemented, suggesting favorable risk profiling.

Socioeconomic - Socioeconomic feasibility hinges primarily on a strong and identifiable relationship between livestock assets and wellbeing, at both household and higher aggregate levels, as well as an identifiable relationship between drought or rangeland availability and wellbeing (via livestock or other pathways). IBLI is more likely to be desirable where drought is the most significant shock or hazard faced by households or where existing drought coping mechanisms are insufficient.

Livestock assets are in fact essential for Niger's economy, providing all or part of the incomes of roughly 87% of the population (FEWS NET 2017). These assets are, in turn, highly vulnerable to drought, which has not only cost a significant portion of national agricultural GDP over the years, but, according to nationally representative household data, constitutes the most important shock experienced by households, particularly pastoral ones. Further analysis at the household level revealed that livestock assets are indeed important for household wellbeing (as measured by consumption expenditure) and changes in wellbeing are strongly correlated with forage availability (as measured by satellite indicators). Moreover, traditional coping strategies, which land degradation and poverty have undermined in recent years, are not sufficient to the task of protecting households and communities from widespread droughts.

Institutional - Institutional feasibility is both layered and complex, involving the capacity and availability of aligned regulatory and policy frameworks, the availability of organizations and infrastructure for delivering the services required for IBLI provision and the resources and willingness of authorized institutions to catalyze and support the process toward sustainable scale. In other words, institutional capacity has to exist or have the potential to be built, to manage provision of both upstream (product development, data availability and management, regulation) and downstream (product delivery and implementation) services.

Some of Niger's strongest institutions relate to agro-ecological services, particularly data collection and analysis. While financial service infrastructure in Niger is weak overall, a number of initiatives push toward service delivery in rural areas. Mobile coverage still suffers spatial gaps in pastoral areas but is generally widespread and available in densely populated areas and at gathering points; and our assessment identified industry actors who are eager to build partnerships involving service extension. Similarly, while specific regulatory capacity related to insurance is limited, several government and civil society organizations possess capable personnel that could be enhanced to build a regulatory framework and to develop delivery mechanisms. The network of public sector, international and non-profit agencies and actors involved in the pastoral sector in Niger could be leveraged either to directly support an IBLI product or to coordinate around provision of complementary services that could support its implementation and sustainability.

Way forward

Overall, we foresee a strong potential for IBLI in Niger both in terms of uptake and impacts, contingent on sufficient investment to sustain the necessary steps required for the effective implementation of an IBLI program. To date, significant socioeconomic constraints have inhibited the development of agricultural index insurance in rural areas in Niger, including high costs, low awareness and insufficient infrastructure. Investments aimed at strengthening the requisite institutional framework in the private and public domains will also be necessary. However, lessons learned from IBLI product design and implementation in similar contexts provide the basis to efficiently overcome a number of these challenges. In turn, an IBLI roll-out with complementary programs in place to facilitate its success could have the added benefit of alleviating at least some of these constraints and opening the door for other financial sector improvements.

Acronyms

AfDB	African Development Bank
ARC	African Risk Capacity
AREN	Association pour la Redynamisation de L'Elevage au Niger
BAGRI	Bank Agricole du Niger
CIA	Central Intelligence Agency
CIMA	Conférence Interafricaine des Marchés d'Assurances
CLISS	Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel
CRS	Catholic Relief Services
DHS	Demographic and health survey
eMODIS	EROS moderate resolution imaging spectroradiometer
FCMOS	Food crises management and prevention system
FCS	Food consumption score
FEWS NET	Famine early warning systems network
FGD	Focus group discussions
GDP	Gross domestic product
IBLI	Index Based Livestock Insurance
ICT	Information communication technology
IDB	Islamic Development Bank
IFAD	International Fund for Agriculture Development
IFC	International Finance Corporation
ILRI	International Livestock Research Institute
INRAN	Institut National de la Recherche Agronomique du Niger
JRC	Joint Research Centre
KII	Key informant interviews
KLIP	Kenya Livestock Insurance Programme

LSMS-ISA	Living-Standards Measurement Study-Integrated Panel on Agriculture
MCC	Millennium Challenge Corporation
MFIs	Microfinance institutions
NARS	National Agriculture Research Systems
NDVI	Normalized difference vegetation index
NGO	Nongovernmental organization
NIS	National Statistical Institute of Niger
PPP	Public-private partnership
PRAPS	Projet Régional d'Appui au Pastoralisme au Sahel
RECA	Réseau National des Chambres d'Agriculture du Niger
SIIPE	Satellite Index Insurance for Pastoralists
SPOT	Satellite Pour l'Observation de la Terre
TLU	Tropical livestock units
UAI	Unit areas of insurance
USAID	United States Agency for International Development
WFP	World Food Programme

Introduction

Pastoralism in Niger is undeniably important, for the economy at large and especially to the lives of the rural poor. Livestock and livestock products contribute roughly 12% to GDP, forming a significant part of the livelihood of roughly 87% of the population (FEWS NET 2017). Up to six different livestock production systems are active in Niger and these fall into three general categories: exclusively livestock, livestock dominant with some crop farming and crop farming dominant with some livestock. The first category, exclusively livestock, is predominantly practiced by the Fulani people (about 7% of the national population; historically cattle-herding) and the Touareg (about 11%; primarily with camels and small ruminants). These pastoralists practice extensive herding over large areas and are either themselves transhumant or have a family member who travels with animals while other members settle near water points and/or in towns with better access to such infrastructural amenities as schools, health posts and other livelihood activities (such as artisanal work). Some members of these same groups have taken up some farming activities as well and hence fall into the second category of mostly sedentary pastoralists, though among these livestock management may still be extensive. The third group, who are predominantly Hausa (55% of the population, mostly located in the southeast) or Zarma (20%, in the southwest), are primarily farmers who also keep some livestock as savings instruments (FEWS NET 2017).

Pastoralist and farming communities in Niger have historically had a collaborative and mutually beneficial relationship, with the land and with each other. The rainfed cropping system in the southern parts of the country allows for a fallow period, during which it is naturally advantageous for herders to migrate south when water and/or pasture in the north become scarce to graze. This practice provides animals with much-needed crop residues for their nutrition and the semi-arid and sandy soils much-needed nutrients through animal manure. Further, sedentary farmers often send their own livestock north with herders in the rainy season, relocating them from young crops onto fertile pastures, while at the same time providing a source of milk for accompanying herders during the lean season. Farmers would also sometimes offer, as additional payment for the service, every other calf birthed.

The coincidence over the past decades of increasing population pressure, human-accelerated land degradation, long-term climate change punctuated by increased incidence of catastrophic droughts and agricultural policies that advantage farmers over herders (such as irrigation schemes) have considerably eroded this symbiotic system. Northern pastures and watering holes now tend to dry up earlier in the year, sometimes compelling herders to move south before harvest. Farmers, stricken by poverty and overpopulation, are tempted to cultivate pastureland in the northern fringe of the cropping areas, as well as in enclaves and transhumance corridors in the south, thereby undermining native vegetation and engendering conflict when animals feed on crops. Farmers also increasingly gather and sell crop residues as fodder, diminishing their availability on fallow fields.

In the form of long-term climate change and human-accelerated land degradation and of short-term or seasonal droughts, ecological risks underpin and, in most cases, exacerbate the numerous challenges and risks faced by Niger's pastoral population. As the primary cause of livestock illness and mortality, drought is the most pressing, immediate risk pastoralists face. In addition, it engenders such indirect risks as price volatility, food insecurity and increased incidence of conflict (FEWS NET 2017).

Over the years, several efforts have been made to address elements of the risks and challenges associated with living in this sector. Largely in response to increased population pressure and drought, in 1998 the Nigerien government began to

address land sharing arrangements with the establishment of the Rural Code, which has been implemented since about 2006. The Rural Code sets out to identify and mark the borders of pasture enclaves and corridors to protect them from encroachment by farmers and, at the same time, designates an official date each year after which herders are free to descend to graze on fallows. Some public works programs have emphasized pasture land rehabilitation to manage the ecological impacts of drought and invasive species and to seed wholesome grass varieties. In terms of drought risk mitigation, its value is currently limited as no concrete financial mechanisms exist to translate actionable information into services aimed at mitigation of or adaptation to this risk.

In an effort to identify and deploy solutions to enhance the resilience of these agro-climatically vulnerable pastoral households, the International Livestock Research Institute (ILRI) and its partners in the public, private and non-profit sectors have pursued a comprehensive research-into-development agenda aimed at designing, developing and implementing market mediated index-based insurance. Index-Based Livestock Insurance (IBLI) relies on low-cost, accessible and reliable satellite indicators of drought (i.e., the Normalized Difference Vegetation Index, or NDVI) to protect pastoralists from drought-related forage scarcity and consequent asset losses (Chantarat et al. 2013; Vrieling et al. 2014).

With initial research and design commencing in 2008 and facing similar challenges to the ones identified for Niger, the IBLI product was first sold in northern Kenya's Marsabit County in 2010 and in southern Ethiopia's Borana zone in 2012. Since then, a robust research agenda has proved IBLI to bring a range of positive socioeconomic impacts to pastoral households, both in terms of welfare-related and nutrition outcomes and drought-coping capability (Jensen et al. 2016). Meanwhile, IBLI has rapidly evolved and scaled from the two pilots to the Kenya Livestock Insurance Program (KLIP), a large public-private partnership spearheaded by the Government of Kenya and to an ambitious expansion program in Ethiopia. Currently covering 22,000 households across eight counties of Northern Kenya, KLIP intends to scale to 100,000 households across 12 counties by 2020.

The success of the IBLI product and its implementation model in terms of impact and overall program sustainability in the Horn of Africa is attracting strong interest from donors, institutions and governments toward scaling-up in different regions of Africa, particularly the Sahel. It is viewed as a means of enhancing the resilience of pastoralist households to climate shocks, while reinforcing the capacity of local private and public actors in the agricultural financial sector. However, the scaling of a complex financial product and implementation model to different geographic and socioeconomic contexts requires careful feasibility analysis.

Recognizing the need for and potential benefit of index-based livestock insurance for Nigerien pastoralists and agro-pastoralists, this study's objective was a pre-feasibility assessment for IBLI product implementation in the region. The study built on a broader effort to identify those countries in Sub-Saharan Africa characterized by a large concentration of communities whose risk-profile IBLI-like products could effectively manage (Mills et al. 2016). While that study identified Niger as a promising candidate, this effort investigated Niger's potential for IBLI implementation and the degree of investment needed for an IBLI implementation specific to Niger. During the study, we analyzed a set of critical pre-conditions related to the product's technical design, the market demand, the distribution infrastructure and the institutional environment. In doing so, we also sought to draw key insights and share recommendations on how to best tailor the IBLI product and the program pathway to the local context in view of a future implementation.

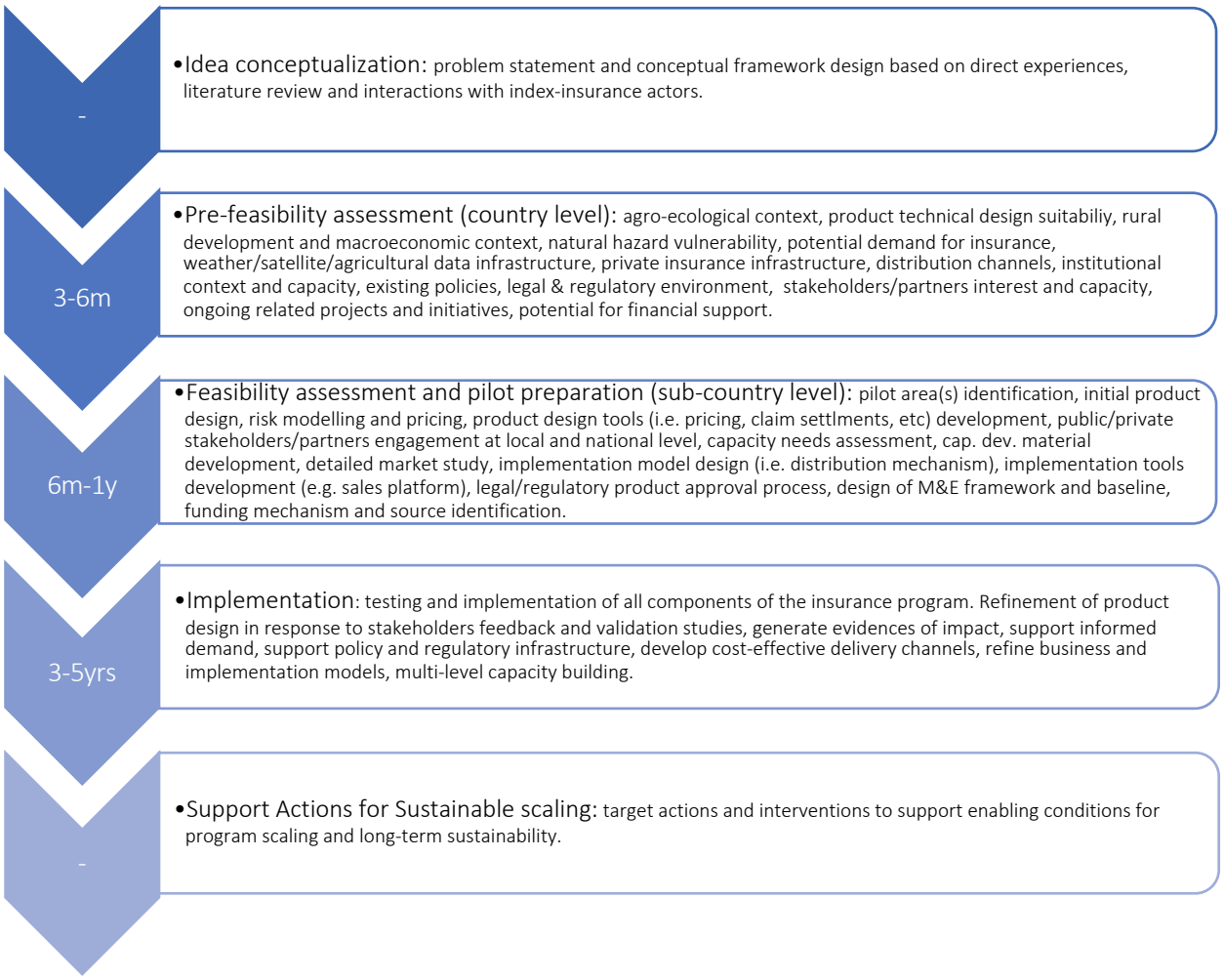
The remainder of this report is organized as follows. Section 2 lays out the scope of the analysis, pertinent definitions and the research data and methods under each area of feasibility analysis. Section 3 presents our findings, Section 4 presents a summary and preliminary conclusions and Section 5 lays out a series of steps to pave the way forward.

Research methodology

Scope of the analysis and conceptual framework

It is generally well-acknowledged that the implementation of index-insurance (II) programs requires careful planning through multiple iterative preparatory and implementation phases. As a standard framework for implementing II is lacking, this study built on the framework proposed by IFAD-WFP (2011) and on the IBLI project's direct implementation experience to propose and then clearly define the following phases: (i) initial conceptualization of the idea, (ii) pre-feasibility analysis, (iii) feasibility analysis and pilot preparation, (iv) implementation and (v) support actions for sustainable scaling (see Figure 1). Although a detailed description of each of these phases is beyond the scope of this report, it will briefly discuss some elements of this general framework to provide the context and boundaries within which the pre-feasibility study was conducted.

Figure 1. Schematic representation of the key phases of development of an index-insurance program. The time frame is indicative as it is highly context-specific. In each phase, a general list of important aspects that need to be considered is proposed.



The scope of a pre-feasibility assessment is to determine whether the basic requirements for the development and introduction of an II program are met, thus making its long-term success (i.e., sustainable scaling) probable (IFAD-WFP 2011, Shadreck et al. 2017). Concurrently, this assessment aims at identifying existing strengths and gaps at country level to provide key insights and recommendations for the next development stage. It should therefore provide essential elements to implementers, donors and governments to make an informed decision whether and where investing significant resources in designing and implementing a pilot study is worthwhile. The pre-feasibility assessment is, therefore, an essential step in deciding upon the implementation of the program, as well as informing the feasibility assessment and pilot preparation stage. This subsequent stage covers similar general categories but requires more substantial investments and field work in order to build—not just assess—the necessary conditions for pilot implementation at a sub-national level.

Pre-feasibility studies are generally performed by combining desk analysis of existing information from multiple sources and initial field interactions, with the purpose to fill any knowledge and data gaps identified from the desk analysis, to identify and engage stakeholders at multiple levels for a better understanding of the local context and to gauge the potential support of these stakeholders for an II initiative. Pre-feasibility assessment includes several activities that can be grouped into three broad areas: biophysical feasibility, socio-economic feasibility and institutional feasibility. With reference to Table 1 below, biophysical feasibility aims at understanding if the conditions for the technical design of an II product exist in terms of indicators and datasets able to accurately assess the covered risk. As such, it includes an understanding of the agro-ecological context, the risk vulnerability profile (agro-ecological) and a technical assessment of datasets/indicators for index design and accuracy assessment. The focus of socio-economic feasibility assessment are the pre-conditions for establishing an effective demand for the insurance product. Thus, it touches on several elements, including the centrality of livestock resources for the economy and the poor, the cost of disaster risk responses, the vulnerability of rural households to weather shocks and the effectiveness/sufficiency of existing coping strategies. Finally, institutional feasibility assesses the conditions required for cost-effective delivery of the product and required services and for an enabling regulatory environment to support large-scale provision of insurance. Thus, it seeks to assess existing private and public stakeholders (insurers and financial service providers, rural associations, intermediaries, NGOs etc.) and their capacity in the financial sector, government policies, legal and regulatory frameworks, potential partners and interested parties, delivery infrastructure (including ICT services) and existing complementary initiatives and projects.

Given the general scope and framework of the pre-feasibility assessment, the next step is to identify a set of indicators, as well as appropriate methods to analyze these indicators and test for critical relationships, taking into account the specific context and type of insurance product, in this case Niger and IBLI, respectively. Even though recognizing the complexity of and understanding the local context in relation to pre-feasibility are critical, designing a methodology that could limit the subjectivity of the assessment and be exportable to different countries for comparative analyses is also important. As such, within each of the key categories—biophysical, socioeconomic and institutional, we develop a generalizable definition of the necessary conditions for IBLI pre-feasibility, along with operational definitions to be clearly linked to a set of measurable indicators (Table 1).

We would emphasize that this methodology cannot provide an exhaustive account of all factors that might merit consideration in any given assessment; when possible, complementary information is provided and discussed in each of our categories. The most significant such complicating factors are those relating to domestic instability, whether in the form of political instability, armed conflict, or other threats to personal safety. One would naturally want to minimize risks to those involved and any implication in conflict in the case of a further feasibility study and/or research-intensive pilot initiative. This is not to say, however, that conflict and insecurity preclude successful implementation of an insurance product; on the contrary, one advantage of this product is a proven ability to support pastoral populations in politically fragile or insecure areas, with appropriate distribution channels and mobile technologies (as currently in the areas of Kenya and Ethiopia which border Somalia). But as such circumstances often introduce complex variables whose consideration will be specific to the given situation and timing, they are best set aside for the preliminary purposes of this study.

Table 1. General and operational definitions of IBLI feasibility and related key indicators and data sources for this study.

Conditions for IBLI pre-feasibility	Operational definition	Key Indicators	Source
Biophysical Drought is a major risk for pastoral production systems and satellite-based indicators are able to accurately track its dynamics over time and space.	Arid and semi-arid lands dominated by extensive rangelands with sufficient forage production and well-defined growing season(s), such that an NDVI-based Index of forage availability could be effectively designed.	Extensive grazing land dominance	Geospatial maps
		NDVI intensity	Satellite imagery, MODIS
		NDVI seasonality	Satellite imagery, MODIS
Socioeconomic The risk of drought-related livestock loss is shared by a large portion of the population and is a major factor preventing pastoral households to invest in growth opportunities or trapping them in poverty.	Areas where pastoralism is the dominant livelihood and is threatened by drought risk, where livestock assets are a significant contributor to wellbeing and food security for the rural poor and household wellbeing is highly vulnerable to (measurable) climatic risk.	Importance of livestock assets to the national economy and rural areas with dominant pastoral livelihood (particular among the poor)	Geospatial maps, national level statistics
		Livestock mortality/losses linked to drought	National level statistics; FGDs and KIIs
		A significant relationship between livestock assets, drought/climate indicators and household wellbeing	LSMS-ISA, satellite imagery, MODIS
		Presence–but insufficiency–of drought-related coping strategies at the household/ community levels	LSMS-ISA, FGDs and KIIs, secondary literature
Institutional There are organizational frameworks and structures providing or having the potential and network to provide index-insurance related services to cope with drought -related risks and livestock losses in livestock systems.	Presence of active insurance regulators and other enabling legal frameworks to protect clients and providers, insurance companies concretely interested in the agricultural sector (possibly with a presence in rural areas), infrastructures for cost-efficient delivery of II services and a compelling driver of economic sustainability.	Presence of financial services and infrastructure	Key Informant Interviews with local stakeholders and literature review
		Capacity to deliver agro-meteorological services and to collect relevant ground datasets (climate, forage biomass, livestock mortality, etc.)	Key Informant Interviews with local stakeholders
			Available dataset and services, scientific literature
		Presence of institutionalized community groups that facilitate access to services	Key Informant Interviews with local stakeholders and literature review
		Existing policies and regulatory frameworks that encourage an enabling environment for insurance and pastoral services	Policy documents, Key Informant Interviews with local stakeholders and literature review

Methods

Biophysical assessment

In accordance with the framework described in Table 1, biophysical feasibility for IBLI is aimed at assessing whether and where an IBLI-like product could be technically designed to estimate drought impacts in time and space in Niger. To this end, we considered three primary quantitative indicators: the dominance of extensive pasturelands, the intensity of the NDVI signal and the seasonality of the NDVI signal.

In addition to these critical indicators for IBLI product design feasibility, another set of indicators was used to assess other important elements that influence the degree of biophysical favorability to IBLI and that have important implications (e.g., premium rates) to the implementation model. These include the drought history (occurrence of major events), livestock migratory patterns and transhumance corridors and land cover changes or vegetation condition trends (e.g., land degradation).

The rationale behind each of these six indicators and the methodology used to analyze them, is as follows:

The dominance of extensive grazing lands

IBLI product design is based on using the satellite-measured Normalized Difference Vegetation Index (NDVI) time series as a proxy for rangeland seasonal production. NDVI values are averaged over wide areas (Unit Areas of Insurance, or UAI) representative of the pastures used by pastoral communities. The more heterogeneous the land cover/use (i.e., with respect to crops, forest, or rangelands), the more difficult and uncertain is the process of spatially aggregating NDVI data, especially if detailed land cover/use maps are not available. Therefore, IBLI is feasible only in those areas where extensive pastures dominate the landscape. To assess this indicator, we used Joint Research Centre (JRC) pasture and crop masks obtained by merging multiple land cover products. For Africa, multi-criteria decision analysis was used to compare six global and 16 regional land cover datasets at the country level in order to select the most appropriate one (Pérez-Hoyos et al. 2017a; Pérez-Hoyos et al. 2017b). We then quantified relative pasture and crop cover at the commune level, the second administrative division level in Niger. We choose commune level because it is comparable in terms of size and boundary design concept to the administrative units in Kenya and Ethiopia currently used as building blocks for the design of the IBLI UAI. A commune is considered feasible for IBLI if pasture area coverage constitutes above 30% of its total area and the relative proportion of crops to pasture is below 0.75. These thresholds were selected based on experiences from the development of IBLI in other regions.

The intensity of the NDVI signal

As mentioned previously, NDVI is the variable used in IBLI to assess the impact of drought on rangeland seasonal production, determine the insurance index and calculate the insurance payouts. The IBLI products assume that the target area contains sufficiently productive pastures to sustain livestock grazing such that a drought-related production deficit could impact livestock health and survival. In addition, NDVI is influenced to the presence of green vegetation and is less reliable when vegetation cover is very low. Therefore, areas that are primarily bare lands or that exhibit extremely low grass production are not feasible for IBLI product design. To measure this indicator, we downloaded eMODIS NDVI decadal imagery between 2002 and 2017 at 250m resolution (i.e., the NDVI product currently used in the Kenya and Ethiopia IBLI programs), calculated the 2002–2017 average NDVI seasonal profile at commune level and then computed the maximum seasonal NDVI value. A commune with a maximum NDVI falling below 0.2 is considered not-feasible for IBLI, as this value indicates a very sparse vegetation cover even at the peak of the vegetation growing season.

Seasonality of the NDVI signal

Another key assumption for IBLI is that pasture vegetation should exhibit clear growth seasonality, with distinct dry and wet periods so as to be able to appropriately define the insurance risk coverage period, sales windows, time of payouts, etc., thereby ultimately making the product fit for purpose (i.e., protecting pastoralist livestock in the face of drought).

Areas with limited seasonality might be either unproductive or characterized by such evergreen vegetation as in some forests and, as such, are not feasible for IBLI product design. To assess NDVI seasonality, first, we analyzed the vegetation phenology products developed by JRC (Eerens et al. 2014; Rembold et al. 2015) to check for a unimodal or multi-modal vegetation growth distribution across Niger. Once we verified that Niger as a whole presents a unimodal distribution and relatively limited spatial gradients with respect to seasonality, we calculated the 5th and 95th percentiles of the commune-level aggregated 2002–2017 NDVI values distribution using the same source dataset as for NDVI intensity. With seasonal variability (SV) as SV=NDVI (95th) - NDVI (5th), communes with SV<0.1 are considered not feasible for IBLI.

Drought history

IBLI assumes that drought is one of, if not the main, environmental risk faced by pastoralists and that drought-related forage-scarcity is a major determinant of livestock mortality. IBLI does not target other livestock loss factors, such as diseases, lack of water availability, floods, or theft. As such, it is critical to assess whether local livestock production systems have been affected by drought historically and whether local communities recognize drought as a major threat. In addition, the frequency, intensity and spatial distributions of major drought events are critical factors affecting the financial sustainability of the product, all of which need to be carefully taken into account. The assessment of Niger's drought history was performed combining a review of the literature with the analysis of the historical rangeland biomass dataset collected by the Ministry of Agriculture and Livestock.

Livestock migration dynamics

IBLI is targeting mainly nomadic and semi-nomadic communities which rely heavily on natural forage resource availability and migrate accordingly. Understanding the dominant temporal and spatial dynamics of transhumance is thus critical for defining the correct IBLI implementation model in terms of key product design parameters such as the risk period to cover and determining representative unit areas of insurance. In addition, this provides important insights on the potential distribution of the IBLI product from a marketing perspective, as major grazing areas during the wet season might host livestock coming from a much broader region (including agro-pastoral areas). The assessment of livestock migration dynamics was based on KII with national and regional institutions such as the Ministry of Agriculture and Livestock, the *Association pour la Redynamisation de L'Elevage au Niger* (AREN),[1] and the *Institut National de la Recherche Agronomique du Niger* (INRAN).[2] The information so gathered was complemented by analysis of geospatial maps of the main pasture areas, enclaves and transhumance corridors, as well as by review of the related literature.

Land cover changes and vegetation condition trends

The IBLI index is defined in terms of the anomaly of the seasonal cumulative NDVI expressed as a standard-score. As such, the active-season cumulative NDVI values are compared to the long-term averages over a historical period (e.g., 2002–2017). As is apparent, strong trends in rangelands production or abrupt land cover changes occurring in a given unit area of insurance within the historical period could impact the accuracy of the drought-related forage-scarcity assessment. This factor can be corrected for if accurate geospatial information about land transition processes is available. The assessment of this component was based on existing geospatial datasets on land cover changes in Niger and a complementary literature review.

Socio-economic assessment

From the perspective of household wellbeing, the degree of IBLI socio-economic feasibility and favorability involves investigating four important socioeconomic concepts, or linkages, that are closely related to the biophysical concepts discussed above, as well as to the subsequent discussion of institutions and infrastructure at the local level. In keeping with Table 1, these are as follows:

1 The Association for the Revitalization of Pastoralism in Niger. AREN works with pastoralists in relation to land, conflict management and development and has a strong network at the commune and regional levels, as well as in the Sahel region.

2 The Nigerien National Institute for Agronomic Research. INRAN carries out agricultural extension and education to the communities under its mandate, while also focusing on breeding fodder crops and identifying best practices for post-harvest management.

Importance of livestock for the national economy and the poor

From a national perspective, extensive livestock systems are important to the national rural economy, clearly rendering IBLI a worthwhile investment. From a development perspective, livestock assets are also important, particularly in their importance to the rural poor.

Impact of drought on pastoral assets

As IBLI focuses on the role and cost of drought, in particular to the national economy, drought, measurable through satellite-based data employed as a proxy for agricultural/rangeland production, must constitute a critical threat to household livestock assets.

Vulnerability of household wellbeing to drought

From a household perspective, IBLI demand should be greater to the extent that both livestock and drought are important for household wellbeing and thus wellbeing is associated with climate indicators via the impact of aspects of climate on livestock as well as through other pathways. While not the *only* shock that households face, drought must constitute at least a very important shock relative to the range of (both covariate and idiosyncratic) shocks and stressors households face.

Presence and (in)sufficiency of coping strategies

Given that IBLI needs to fit in with existing coping strategies and frameworks, its use is most appropriate where existing coping strategies are currently insufficient, particularly as relates to large covariate shocks like drought. IBLI must also be able to be aligned—for example through specific contract design features—with existing coping strategies, as well as socio-cultural customs and practices, such as religion, gender and conflicts.

We used a combination of data and methods to investigate these linkages and assess the previously identified pre-feasibility indicators. The socio-economic study started with a general overview of national demographic and economic indicators and with an analysis of the cost of drought for the Niger national economy. Data from the 1980s to the present were obtained from the National Statistical Institute of Niger, FAOSTAT, the African Development Bank's (AfDB) Statistical Data Portal and the UN's World Food Program (WFP) and reviewed to analyze the cost of drought in Niger.

To delve more deeply into the household-level effects of drought and to test the hypotheses behind relationships between rangeland production, household wellbeing and drought response required data on household-level livestock holdings, household wellbeing (such as consumption and food security) and shock experience. The Living-Standards Measurement Study - Integrated Panel on the Agriculture survey (LSMS-ISA), collected in collaboration with the World Bank, provides a source of such data that is widely comparable across selected contexts. With respect to Niger, LSMS-ISA is available for both 2011–2012 and 2014–2015.[3]

Using these data to address these questions has several key advantages—as well as limitations. First, as a panel tracking households across time, it permits analysis of changes over time, an essential characteristic for our analysis as IBLI is designed to address inter-temporal risks. Cross-sectional information (such as is available through Demographic and Health Survey (DHS) data) is of less value. In turn, LSMS-ISA data for Niger is nationwide and representative at the regional (eight regions) and livelihood (urban, agricultural, agro-pastoral and pastoral) levels, thus permitting some assessment of target populations and of which region or regions would be the most suitable environments for IBLI. There are, however, also limitations in this regard; the sample sizes for target populations are relatively small, limiting our ability to assess the key relationships in which we are interested with much nuance; for that, more tightly targeted datasets are required. Finally, geospatial coordinates are available for enumeration areas, thus allowing us to link household-level data with satellite-based vegetation indices time series (i.e., NDVI; see section 2.2.1 above for a description of the satellite data used) to explore the links between household-level livestock holdings, wellbeing and rangeland production indicators. In this regard as well, there are some limitations, as we cannot be sure how these locations relate to livestock migration patterns and grazing areas and the size and location of pasture areas that are most relevant to households' livestock and wellbeing.

3 Information and data available at http://surveys.worldbank.org/lsms/integrated-surveys-agriculture-ISA.

To account for such considerations and estimate plausible relationships, we made a few assumptions based on biophysical data. We excluded urban areas; while some ownership of livestock is common in urban areas, we cannot know from the data where urban dwellers pasture their livestock. Then, to match NDVI to the data, we employed a 15 km radius around LSMS-ISA enumeration areas but expand that to 50 km in extensive pastoral areas to reflect larger grazing ranges. For these areas, we then calculated the *standard*-score (with reference to the 2007–2017 period) of the average NDVI over the growing season, June-September, prior to each survey.

In addition to describing these secondary data sources, we performed regression analyses using LSMS-ISA data, so as to integrate the time dimension and more robustly assess the causal linkages between climate, livestock and household wellbeing. For simplicity, as well as straightforward replicability in other contexts where these panel data were available, we implemented a household fixed-effects model, using both weekly consumption expenditure (measured twice per year, four observations per household) and annual consumption expenditure (measured once per survey wave, two observations per household). This analysis allowed us to examine how the climate indicator (NDVI) influences the change in consumption expenditure, which serves as a proxy food security or wellbeing indicator, while controlling for all other time-invariant, unobservable household-level factors.[4] We also included livestock holdings—which change over time—and interacted livestock holdings with NDVI so as to identify both the importance of livestock in changes in wellbeing and the degree to which the influence of climate is mediated by the livestock pathway. After examining this model across livelihood zones and regions, we then ran the same analyses, but with these indicators aggregated up to higher scales, first to sampling clusters and then to districts, to examine whether the consumption influences of climate are more or less notable at higher-level aggregates than at the household level.

Institutional assessment

Institutions can be defined by their 'hard components,' also termed norms (North 1990) or ''schemas,'' and 'soft' components such as resources or social networks, which are responsible for sustaining the 'hard' components (Clemens and Cook 1999). In the context of index insurance, 'hard' components include organizational and legal frameworks, which facilitate a culture of insurance (norms or schemas) as a coping mechanism against drought-related risk. An enabling environment for legal frameworks, cost-effective delivery channels and networks of organizations that can contribute to the economic viability of an II product constitute the 'soft' components. Therefore, for purposes of IBLI pre-feasibility analysis, more focus was given to soft components, thus creating a strong linkage with the biophysical and the socio-economic indicators listed above.

Presence of financial services and infrastructure

The presence of financial service providers such as insurance companies or banks with product lines on agricultural micro-insurance is an essential element to be considered as part of a IBLI pre-feasibility assessment. It is important to assess whether these private actors have a presence in rural areas with the basic capability to understand and sell a financial product such as IBLI. This agent network could be a group-based network or individual networks of insurance companies or could be structure based within the community. Years of implementing IBLI in Kenya and Ethiopia have shown that this is an important element to be understood, not only to design the models for sales and distribution, as it is strongly tied to the community's acceptance of a newly introduced product, but also to make IBLI cost effective, a critical characteristic for an implementation to be sustainable going forward. At the pre-feasibility stage, we used a simple mapping technique of such institutions whose names we acquired through in-depth interviews with stakeholders having local knowledge of the organizations working within the region. Another critical factor that this pre-feasibility study took into consideration was the presence of ICT service providers and the role that they could play in supporting market-mediated IBLI provision.

Availability of institutions with the capacity to deliver agro-meteorological services

An important aspect to be considered in an implementation of IBLI is the capacity of local institutions to support the techni-

4 The Food consumption score (FCS) was developed following Weisman et al. (2009) by constructing a weighted sum of the frequency of consumption of different food groups over a seven-day period. The weights applied were as follows: main staples (2), pulses (3), vegetables (1), fruit (1), meat and fish (4), milk (4), sugar (0.5) and oil (0.5).

cal development of the insurance Index and to acquire the technical skills to provide the service of 'calculation agent,' the independent body that calculates Index values and payouts, guaranteeing full transparency of the process to all stakeholders (clients, private companies, government, etc.).

Within the framework of the pre-feasibility assessment, we combined information gleaned from a literature review (including international databases) and key informant interviews with local stakeholders to identify, respectively, existing datasets and organizations potentially active in agro-meteorological data collection in the pastoral areas to understand their capacity and networks. The existence and quality of historical time-series ground and remote-sensing datasets on climate and forage conditions, along with data on biomass and/or livestock mortality, constitute 'per se' an indicator of local capacity, as well as being important elements for the design of the IBLI contract and the quantification of basis risk. These kinds of datasets are often not available or are of poor quality in African countries, reflecting poor planning by and/or limited resources or capacity of local institutions. Another element considered in our study was direct experience by local organizations in the technical development of agricultural index-insurance products.

Existing policies and regulatory frameworks that encourage an enabling environment

Given that all other institutional conditions are in place, support from administrative institutions of influence and willingness to invest resources towards insurance services or interventions in pastoral areas are also essential to launch a product such as IBLI. This willingness and such interventions are needed to create an enabling environment for the entry of such services as IBLI and therefore their assessment constitutes an important part of the pre-feasibility study. Specifically, factors researched in the Niger pre-feasibility study included understanding i) who would be willing to take up the responsibility of paying premiums—country administration, donors, the private sector, or a combination of all three; ii) whether the current legal and regulatory framework would support a model of public–private partnership; and iii) whether ongoing programmes or projects currently exist with a demonstrated commitment or mandate to provide economic sustainability of IBLI during its implementation stage. Lastly, one of the key lessons learnt in the course of implementing IBLI in Kenya was the need for it to be Sharia compliant to make it inclusive for all pastoral communities. Hence, given that most of the population in Niger practices Islam, this was a critical consideration during the pre-feasibility study in engaging with those stakeholders.

Presence of institutionalized community groups to facilitate access and delivery of services

One important condition needed to facilitate IBLI distribution and uptake is the presence of institutionalized groups or structures that can serve as channels for distributing IBLI. A community typically has both informal and formal institutions. The former are organized groups or congregations that come together for a specific, need-based purpose and the latter are groups that have legally bound structures. The presence of both types of institutions is a necessary condition to facilitate IBLI distribution and uptake since potential distribution/sales models can either be embedded as part of organized, informal community structures, which come together primarily during times of emergency as a way of aiding the individuals or households in the community or can be a formally registered group with different service-providing entities constituting the network. For the purpose of the pre-feasibility study, we sought to understand the prevalence of both types of groups in Niger and the role these could play in the access and delivery of IBLI services. One consideration was also the savviness and ability of such groups and communities to embrace ICT-related interventions as a way of service delivery.

To address these factors, in addition to analyzing relevant documentation and literature, we conducted an extensive field survey in Niger (Niamey and Maradi region) in January 2018. This survey included key informant interviews (KIIs), technical and institutional meetings and some focus group discussions (FGDs) with local stakeholders. The initial selection of stakeholders and key informants was based on the set of indicators listed above and complemented with additional interactive discussions following recommendations and suggestions gathered during the process. Stakeholders were selected from multiple sources at multiple levels, including national institutions (e.g., Ministry, governmental institutions in the agricultural sector), regional bodies (i.e., ones operating across multiple countries in West Africa), international agencies and donors, financial institutions and banks, private companies in the financial and telecommunication domains (headquarters and local offices), local governmental offices, NGOs, rural associations and the farmers/pastoralists themselves.

IBLI pre-feasibility results

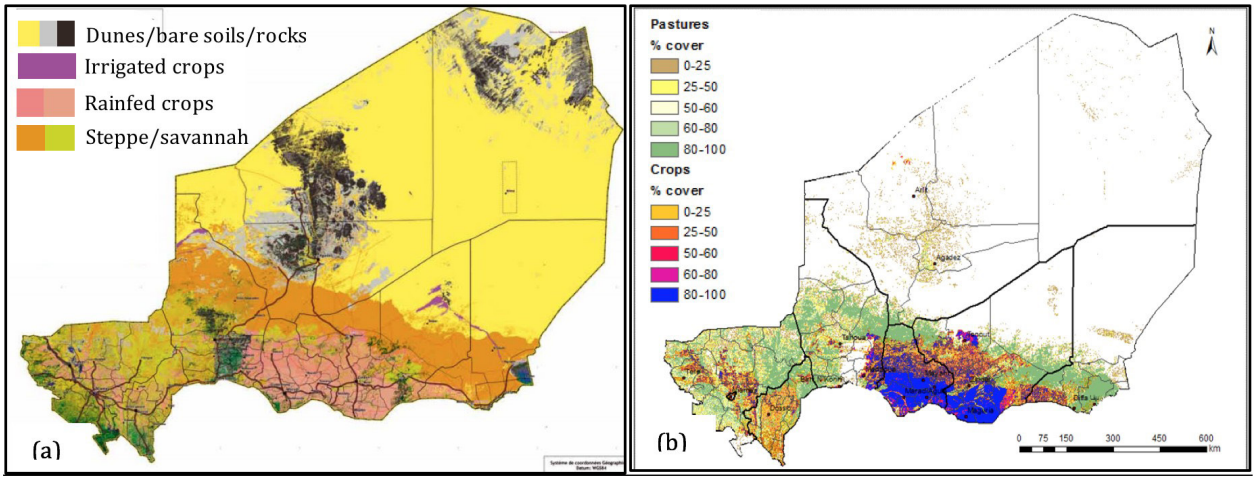
IBLI biophysical pre-feasibility

Pasture dominance and NDVI-based assessment of forage availability

Niger's territory is largely dominated by rain-fed agricultural and livestock systems; arable land accounts for only 15% of the country (USAID 2017) and a significant portion of the north is desert or unproductive. The country is characterized by three main land cover types following the south-north aridity gradient (see Figure 2 a): the southern belt, dominated by sorghum and millet rain-fed agriculture and including some regions with irrigated cash crops; the agro-pastoral belt, a large transition zone where rain-fed agriculture is mixed with pasturelands; and the pastoral belt, dominated by extensive rangelands where transhumance pastoralism is the dominant livelihood.

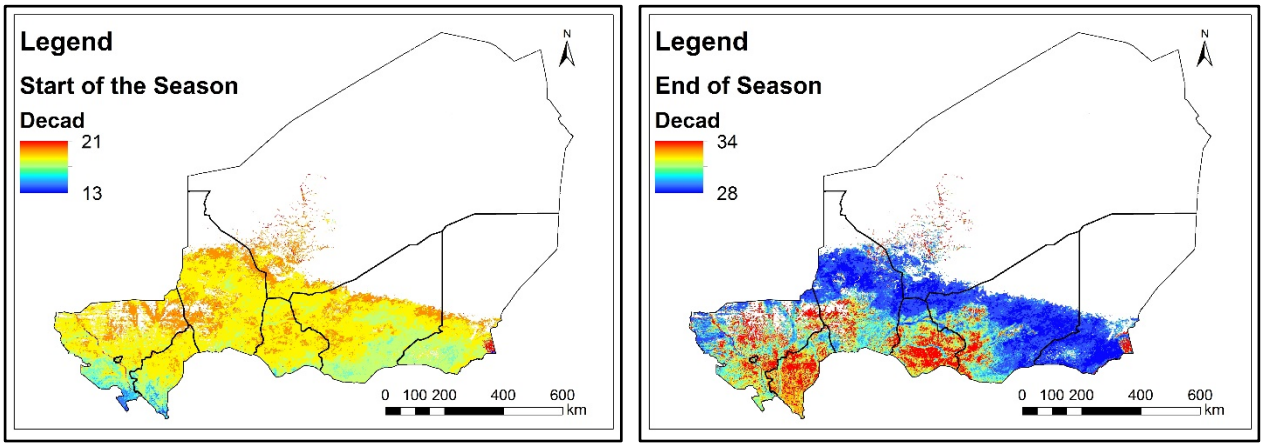
Pure, extensive pasturelands are primarily concentrated in the pastoral belt and in localized regions of the north of the country (e.g., around Agadez) (see Figure 2 b). The latter have generally low vegetation cover, but they are placed along transhumance routes and are important wet season pastures. In the agro-pastoral belt, the degree to which pasture areas are interspersed with crops varies significantly. In the central regions of Maradi and Zinder, croplands are currently dominant relative to pastures, while in the western (Tahoua, Tillabéry) and eastern regions (Diffa) pastures still cover a significant fraction of the agro-pastoral lands.

Figure 2. (a) Land cover map of Niger (Source: OSS 2015 with modifications) and (b) Pasture and crop cover maps.



Pasture percent cover is generally high in the pastoral and agro-pastoral regions (see Figure 2 b) but decreases sharply in the northern fringe of the pastoral belt and in northern Niger, suggesting limited pasture production there. Seasonality is unimodal across the entire country and its spatial variability is limited, with the vegetation growing season beginning in May/June and ending in October/November in most of the country (see Figure 3).

Figure 3. Start of the vegetation growing season (left) and end of the vegetation growing season (right) maps as derived from satellite data analysis (Source: JRC).

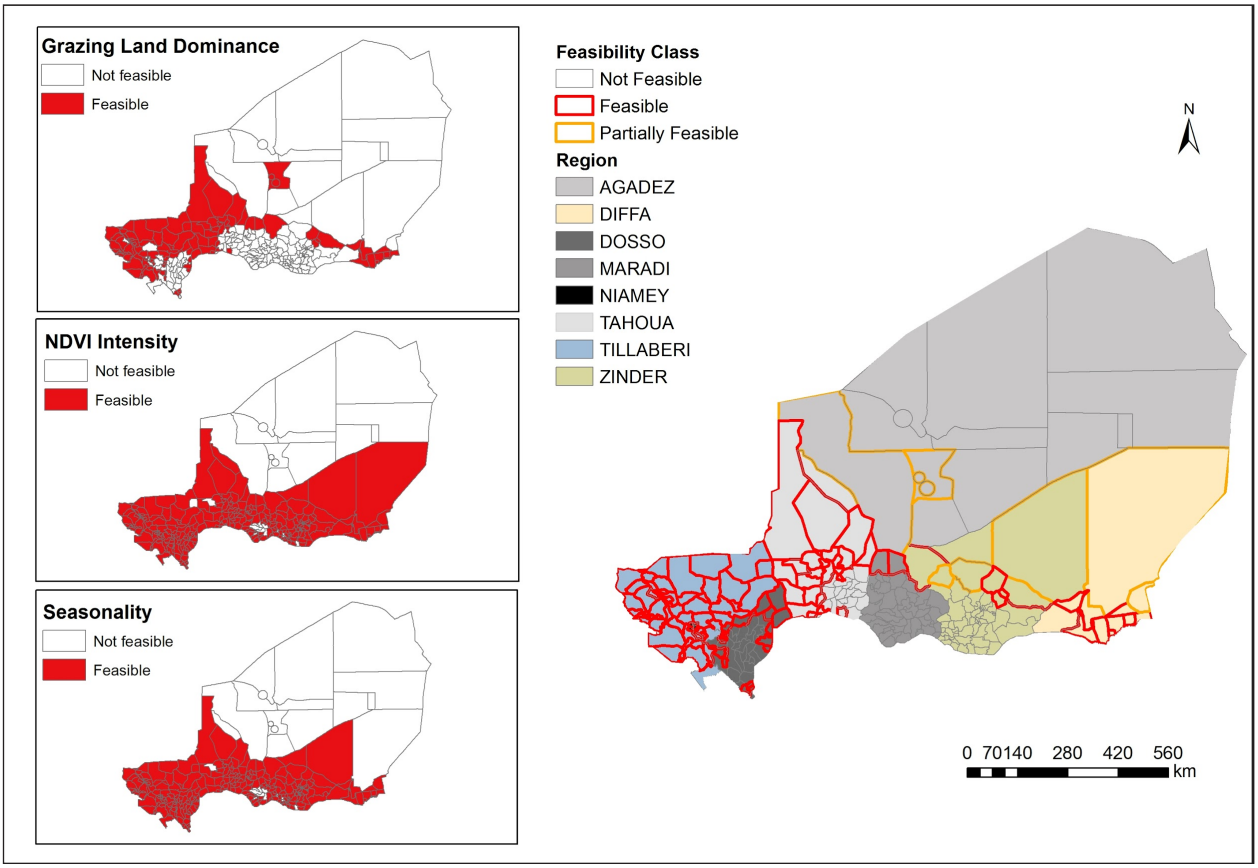


These national level observations suggest that IBLI is potentially feasible for vast areas of Niger in terms of rangeland production dynamics. However, a more in-depth quantitative analysis was considered important to understand where an IBLI-like contract based on NDVI time series could be effectively designed and what challenges might be encountered in the contract design. Figure 4 summarizes the results of the commune-level feasibility analysis based on the three indicators listed in Table 1. Grazing land dominance, which is limited in the south of the country due to high coverage of croplands and in the north from the lack of productive lands, is the primary limiting factor for IBLI feasibility. NDVI signal intensity and seasonality are non-limiting in most southern and central communes but could be too weak in the northern regions. Overall, close to 40% of Niger's communes could be considered feasible as IBLI units, covering large portions of Tillabéry, Tahoua and Diffa, the northern areas of Zinder and Maradi and some areas of Dosso. For Agadez, and in general the most arid region in Niger, the NDVI signal is very low and grazing areas are concentrated only in specific locations. For these reasons, they are indicated as 'partially feasible,' as the application of IBLI might require additional investments to adapt the design of the products to these areas.

Also supporting the general feasibility of satellite-based assessment of forage availability in Niger's pastoral areas is the scientific literature quantitatively assessing pasture biomass from satellite data at the department level, with satisfactory performance (Schucknecht et al. 2017). This study was made possible by the availability of a long-term pasture biomass monitoring network in Niger, with over 100 sites distributed across the country and observations on record since 1988 (Niger Ministry of Agriculture and Livestock). These biomass data form a rather unique dataset in Sub-Saharan Africa and could provide the opportunity to test different index-insurance product designs and more accurately quantify their basis risk.

It should be noted that the communes classified as feasible according to this analysis are those in which unit areas of insurance for IBLI could be potentially designed. However, given the migratory reality of livestock herding in the region, the demand for IBLI would likely come from a wider region, including agro-pastoral communes, as discussed later in this section.

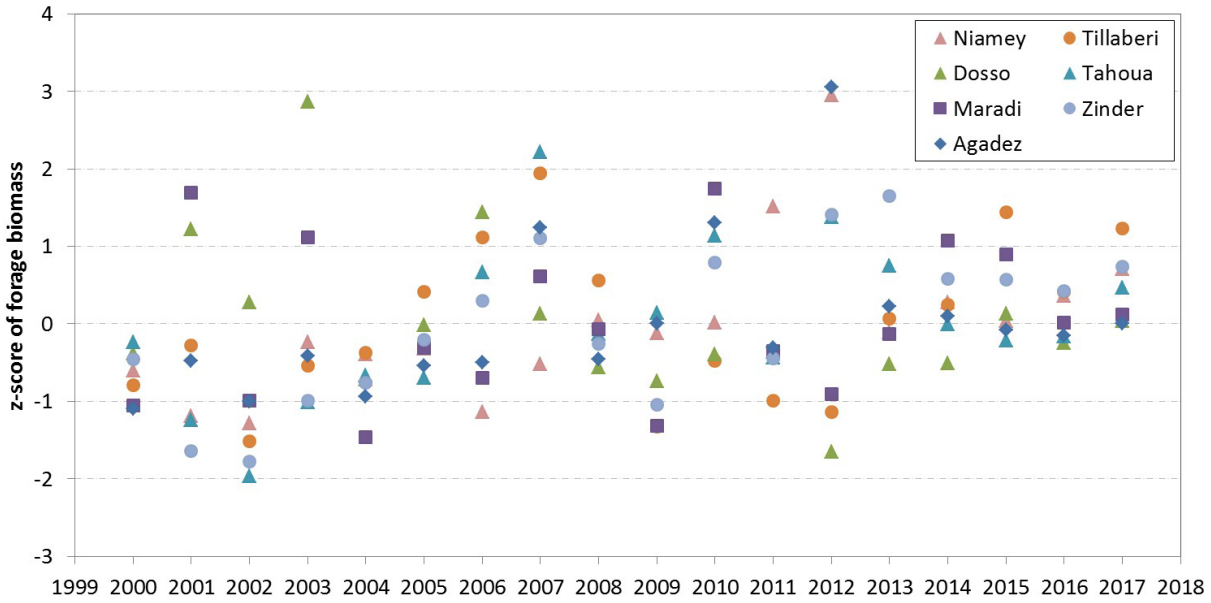
Figure 4. Biophysical pre-feasibility assessment based on the three criteria listed in Table 1. The map on the right illustrates the communes where an IBLI unit area of insurance could be potentially designed.



Climate and drought history

Niger is characterized by a hot arid steppe climate in the south and a hot arid desert climate everywhere else, according to the Köppen-Geiger climate classification (Kottek et al. 2006). As such, rainfall patterns are highly variable, making water availability for both agriculture and livestock unpredictable and vulnerable to shocks. Climate analyses suggest increasing risk of climatic variability, including both inter-seasonal and intra-seasonal changes in temporal and spatial distribution of rainfall (USAID 2017). Considering the rapid population increase, this is likely to further exacerbate the vulnerability of agricultural systems and rural populations. Drought is recognized as the most important agricultural risk in Niger, with a high probability of severely affecting both crop and livestock production and major droughts occur on average every 3–4 years (IFC-World Bank 2013). Recent severe droughts occurred in 2000, 2004, 2009 and 2011, causing livestock feed deficits of 12, 25, 70 and 41 percent, respectively (IFC-World Bank 2013). However, a more detailed review of rangeland biomass data acquired at monitoring sites from the Ministry of Agriculture and Livestock over the last 17 years reveals that most drought events were not ubiquitous across the country (see Figure 5). Overall, the frequency and severity of major droughts in Niger are comparable to those in East African countries having existing IBLI programs. Although a dedicated contract design and risk modelling exercise will be necessary to evaluate the overall risk profile of Niger in relation to potential premiums to be paid for IBLI, these observations support the likely feasibility of IBLI from this perspective.

Figure 5. Z-score of the measured forage production aggregated at Department levels for Niger in the period 2000-2017 (Source: Ministry of Agriculture and Livestock).

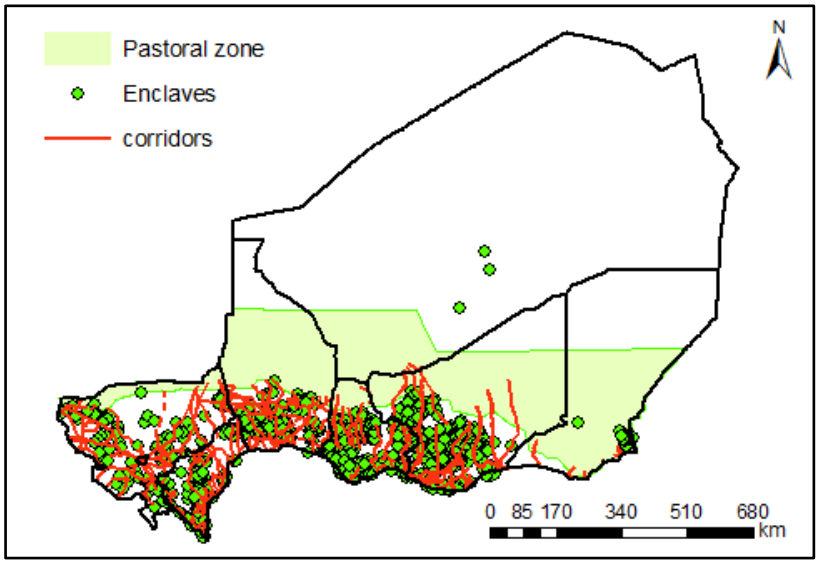


Livestock migration dynamics

A general description of pastoralist migration in Niger is presented in the introduction of this report. During the wet season, nomadic pastoralists generally move across the pastoral region, driven by forage resource availability and accessibility. These movements are generally of low-to-medium range and an increasing number of pastoral communities have a family member who travels with animals while other members settle near water points and/or in towns with better access to infrastructural amenities. During the dry season, pastoralists traditionally migrate south and access the agro-pastoral and cropping areas to feed livestock with crop residue or the remaining forage in pastoral enclaves. As mentioned in the introduction, the Rural Code of Niger currently regulates the migration process by setting the date when migration into cropping areas is allowed (i.e. after the harvest), by marking and maintaining corridors and pastoral enclaves in the crop-dominated regions and by guaranteeing free access to cropping areas to livestock during the dry season. The Rural Code also defines the southern borders of the pastoral region, beyond which cropping is not allowed. Figure 6 provides an illustration of the official pastoral area recognized by the Rural Code, as well as of the main corridors and pastoral enclaves in Niger. These general temporal and spatial migratory patterns fit well with the IBLI model, as the IBLI product as conceptualized in East Africa provides coverage for drought-related forage scarcity during the wet months of the season. During this period, pastoral communities are expected to have well-established grazing areas that could be identified and mapped to serve as unit areas for insurance design. On the other hand, it should be noted that several agro-pastoral communities and some farming communities also use to send their livestock northward during the cropping season and thus could also be interested in purchasing IBLI coverage. Although the magnitude and modalities of this process should be investigated in greater detail, this would significantly increase the area of demand for IBLI and the range of potential clients.

Another important element to emphasize is that current environmental and demographic changes, as well as conflict-related insecurity in some areas, pose serious threats to the north-south transhumance process. Pastoral enclaves, corridors and the southern areas of the pastoral zone are subjected to crop encroachment despite the Rural Code regulation, reducing the extent of grazing areas and thus increasing grazing pressure/degradation on remaining pastures. Similarly, pastoralists tend to migrate south earlier in the season, violating the Rural Code and causing conflicts with farmers; drought would tend to exacerbate this situation when competition for resources would become more acute. The implementation of drought risk management strategies such as IBLI could, in principle, mitigate against this challenge and promote social cohesion among farmers and pastoralists by providing pastoral communities additional financial resources during droughts. This would require, however, that the design of IBLI be attentive to migration dynamics and identify appropriate mechanisms for the effective use of payouts.

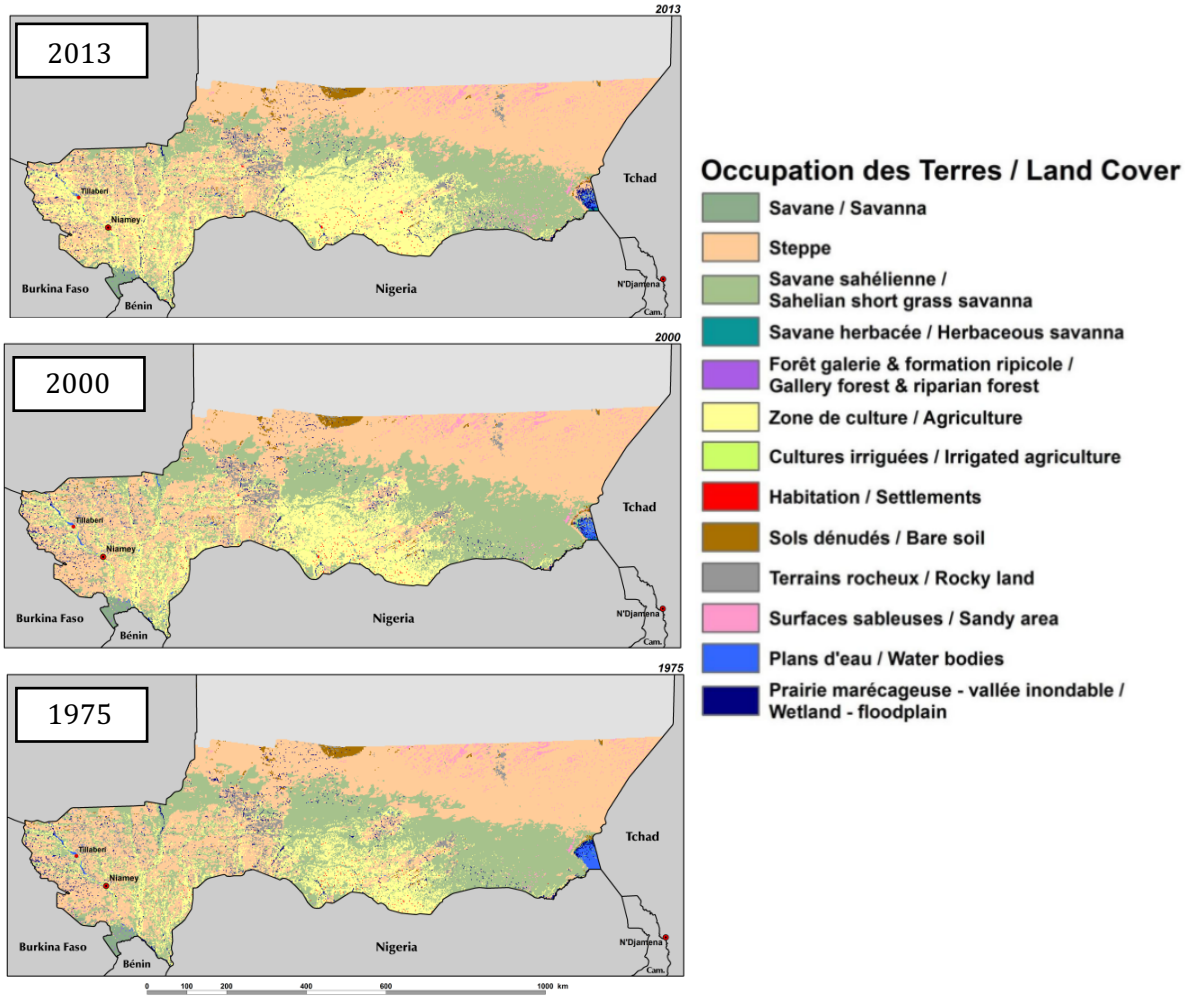
Figure 6. Map of the pastoral area, enclaves and corridors according to the Rural Code of Niger.



Land cover changes and land condition trends

Several pieces of evidence indicate that Niger is undergoing rapid land cover changes, particularly in the agro-pastoral regions (see Figure 7). Agricultural areas have steadily expanded over the last 40 years from about 12.6% in 1975 to 24.5% in 2014. The agricultural expansions have been largely done at the expense of rangeland vegetation, including high quality pasturelands such as short grass savanna and forests (CILSS 2016). The process is still ongoing despite the regulations imposed by the Rural Code on crop encroachment in the pastoral region, thereby causing social conflict. Pasture degradation is also a commonly reported issue in Niger, and in the Sahel more broadly, although degradation trend assessments are controversial (Fensholt et al. 2013). In terms of design and implementation of the IBLI product, this is a factor to accurately take into account. In the areas recognized feasible for forage-scarcity assessment based on the IBLI methodology, an accurate analysis of land cover dynamics and pasture condition trends would be imperative for correct design of the insurance product.

Figure 7. Land cover change maps of Niger 1973–2013 (Source: CILSS 2016).



IBLI socio-economic pre-feasibility

The importance of livestock assets and drought for the national economy

Niger, located in the western part of Africa, is a landlocked country in the Sahel with an estimated area of 1.267 million km^2 (CIA 2018). In 2017, the total population of Niger is 20.8 million, of which 80.6 percent lives in rural areas. With an annual population growth rate of 3.19 percent, the country is dominated by a young population (median age is 15.4 years) (World Bank 2018) (see Table 2). The extensive livestock production systems in the Zinder, Tahoua, Maradi and Tillabéry regions are home to about three-fourth of the total population (NIS 2017).

The economy of Niger is predominantly agrarian and its agriculture sector contributes 39.6 percent of the GDP and 62.31 percent of employment (AfDB 2018). An extensive crop production system exists in the southern corridor of the country stretching from the capital, Niamey, to the east southern communes of the Diffa region. The country's agricultural sector is characterized by low productivity due to such factors as erratic rainfall, poor agronomic practices regarding inputs, low levels of technology and technical skills and limited extension and credit facilities (AfDB 2013).

Table 2. Summary of demographic and economic statistics (2017).

Indicators	Figures
Population growth	3.19% p.a.
Ethnic groups	Hausa 53.1%, Zarma/Songhai 21.2%, Tuareg 11%, Fulani (Peul) 6.5%
Religion	Muslim 80%, other (includes indigenous beliefs and Christian) 20%
GDP	USD7.4 billion
Average GDP growth rate	3.9%
Agriculture	39.6% of GDP
Livestock	13% of agricultural GDP

Source: FAO 2018 and AfDB 2018

Livestock plays a vital role in Niger's national economy, but it is highly vulnerable due to the high inter-annual variability of rain and pasture production. Livestock is raised by more than 87 percent of Nigeriens (FEWS NET 2017), either as a primary or secondary economic activity. It is the major productive asset for the pastoral and agro-pastoral populations. The sector also determines levels of food security and poverty production factors in these production zones. To the national economy, the livestock sector provides approximately 13 percent of agricultural GDP (AfDB 2018) and 21 percent of total export earnings (Ministry of Agriculture and Livestock 2013). Over the past 50 years, Niger's national herd is estimated to have grown at an average annual rate of 2.33 percent p.a. in terms of Tropical Livestock Units (TLU), while the herd composition overall has not changed drastically. Regarding regional distribution of livestock, four out of the eight regions in Niger account for about 77 percent of the livestock population. More specifically, 25 percent of the national livestock population is in Zinder, 21 percent in Tahoua, 16 percent in Maradi and 15 per cent in Tillabéry (IFC-World Bank 2013).

With a high probability of occurrence and a high level of severity, drought is the most important agricultural risk affecting crop and livestock production in Niger (IFC-World Bank 2013). Characterized by rain-fed agriculture and traditional pastoral production that relies heavily on natural resources (water and pasture), both sectors are adversely impacted by spatial and temporal drought occurrences. Over the past three decades, successive drought episodes have affected household food security to the greatest extent in predominantly pastoral and agro-pastoral areas, especially the poorest in those areas (WFP 2013a).

The cost of drought for the national economy is severe, as measured either in asset losses or impacts on GDP, as summarized in terms of livestock losses in Table 3 for the droughts in 1973–74, 1984–85, 2004–2005 and 2009–2010. By other metrics, however, still more severe droughts occurred in 1995 and 1997 in terms of significant impact on the national agricultural economy. FAO's data on Niger indicates that the droughts that occurred in 1995, 1997, 2004 and 2009 cost the country 24.1, 23.1, 11.6 and 3.1 per cent of agricultural GDP respectively.

Table 3. Major droughts and impact on livestock in Niger

Year	Event	Impact
1973–74	Drought	It is estimated that Niger lost 45% of cattle, 27% of sheep and 15% of goat as a result of the 1973 drought.
1984–85	Drought	It is estimated that Niger lost 40% of cattle, 35% of sheep and 33% of goat as a result of the 1984 drought.
2004–05	Combination of drought and desert locust invasion with a high impact on grazing areas	Losses to the livestock sector were estimated at 20% for cattle and 13% for small ruminants in sample parts of the agro-pastoral zone.
2009–10	Combination of drought and loss of pasture with subsequent heavy rains and flooding	In the sample area of a study on the impact of this crisis (14 departments of 7 regions in the pastoral and agro-pastoral zones), livestock mortality rates were estimated at 25.5% for cattle, 38.6% for sheep, 31.3% for goats and 2.6% for camels.

Source: IFC-World Bank 2013

Drought, mainly in the pastoral and agro-pastoral areas, has a multifaceted impact through the loss of livestock and also productive asset depletion due to pastoralists' selling off livestock assets and then engaging in other economic activities to cope with the effects of the drought. As an example, in the pastoral cluster, due to the drought of 2009–2010, 68% of households sold livestock and 42% engaged in migration, with many engaging in sales of non-productive (37%) and productive assets (28%) (WFP 2013b).

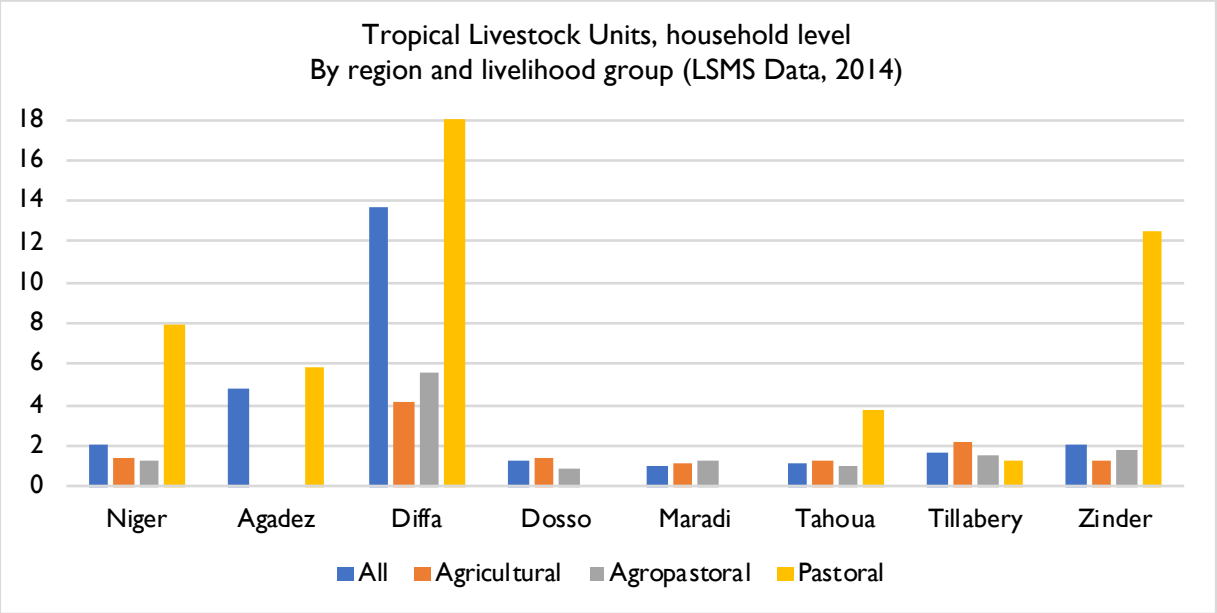
This analysis clearly demonstrates the centrality of livestock for Niger's rural economy. While a more in-depth analysis will be necessary in the next development stage of IBLI implementation to quantify the cost of drought, major drought events impose a considerable cost to the national economy and a shift of policies from emergency response to integrated drought risk management would strongly reduce these costs, as demonstrated in other African countries.

Livestock and household wellbeing

As follows from the importance of livestock at the national level, it constitutes an important asset base at the household level as well—with a large degree of variation across region and livelihood type. Figure 8 shows livestock holdings by region and livelihood group across regions according to the most recent LSMS-ISA surveys in 2014–2015. Pastoral households have, as expected, the largest average herds—8 TLU on average nationally but with an average much lower in some regions (e.g., just over 1 in Tillabéry) and higher in others (e.g. over 18 in Diffa).

Correspondingly, pastoralists have fewer other assets and engage in fewer other activities and so are worse off in other ways (see Table 4). As compared to other rural (agricultural and agro-pastoral) households, pastoral households have lower durable and productive asset indices and are much less likely to grow or sell crops.

Figure 8. Livestock holdings by region and livelihood group across regions according to the most recent LSMS-ISA surveys, 2014–2015.



They also have lower educational attainment; the average household head among pastoralists has no years of schooling, with the maximum attainment in the household averaging 1.47 years relative to the national average of 3.15 years and two years for other rural households. Naturally, pastoral households are also much less likely to either grow or sell crops, with roughly 27% of households in pastoral areas growing millet (the most common crop), relative to 92% in other rural areas.

Table 4. Household-level demographics, all households and by livelihood, 2014–2015.

	All	Rural	Pastoral
Age of Household Head (years)	47.82	47.26	48.16
Female Household Head (percent)	18%	16%	21%
Years of Education of Household Head	0.15	0.01	0
Household Size	6.16	6.39	5.8
Dependency Ratio	1.39	1.57	1.58
Maximum Educational Attainment in household (years)	3.15	2	1.47
Livestock Holdings (TLU)	1.98	1.36	8
Durable Asset Index	0	-1.1	-1.2
Productive Asset Index	0	0.04	-0.09
Percent who grow:			
Millet	55%	92%	27%
Sorghum	35%	61%	14%
Cowpeas	46%	77%	22%
Groundnuts	9%	16%	0%
Percent who sell:			
Millet	5%	9%	2%
Sorghum	1%	2%	1%
Cowpeas	14%	27%	3%
Groundnuts	3%	7%	0%
Observations	3617	1688	578

Household level vulnerability to drought

Pastoral households are also more likely to be affected by drought than other households in Niger. Figure 9 displays percentages of Nigerien pastoral households, versus all households, that self-reported having been affected by drought versus idiosyncratic shocks (i.e., household-level shocks such as illness, death in the family, and such economic losses as business failures or theft not linked to covariate shocks, which affected multiple households within a region). In both the 2011 and 2014 rounds of the LSMS-ISA survey, more pastoral households reported having suffered from drought than non-pastoral households: 33% versus 20% in 2011, 27% versus 18% in 2014. Experience of idiosyncratic shocks, on the other hand, is more similar, with 12–18% of all households reporting being affected by those.

Figure 9. Self-reported experiences of drought versus idiosyncratic shocks 2011 and 2014 (Source: LSMS-ISA).

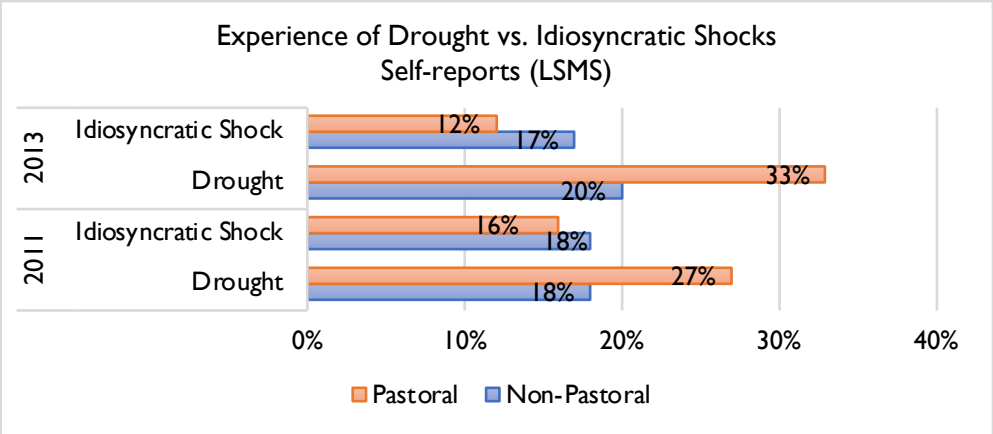
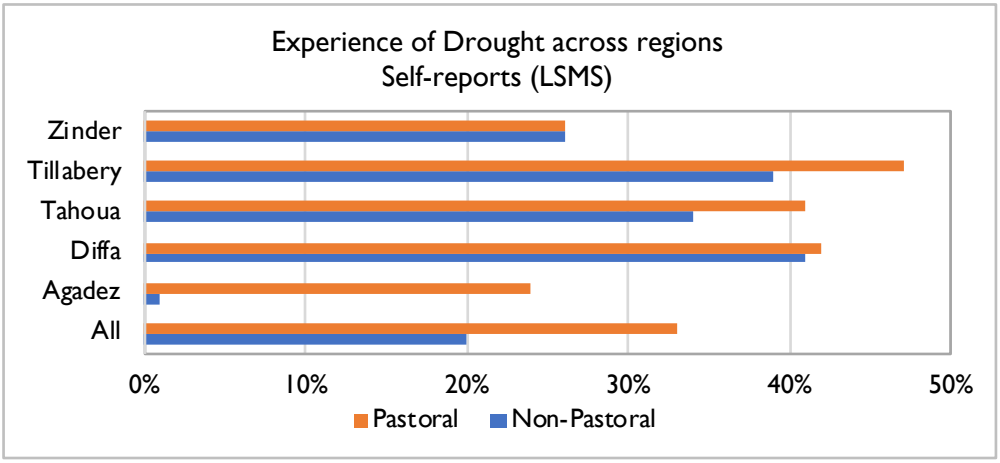


Figure 10 focuses on drought experience across regions of the country in 2014 only for pastoral versus non-pastoral households; the trend exhibited in Figure 10 holds within regions as well; in particular, the dominantly extensive pastoral region of Agadez, where 24% of pastoral households but only 1% of non-pastoral households report being affected by a drought.[5]

Figure 10. Self-reported experiences of drought across regions (Source: LSMS-ISA 2014).



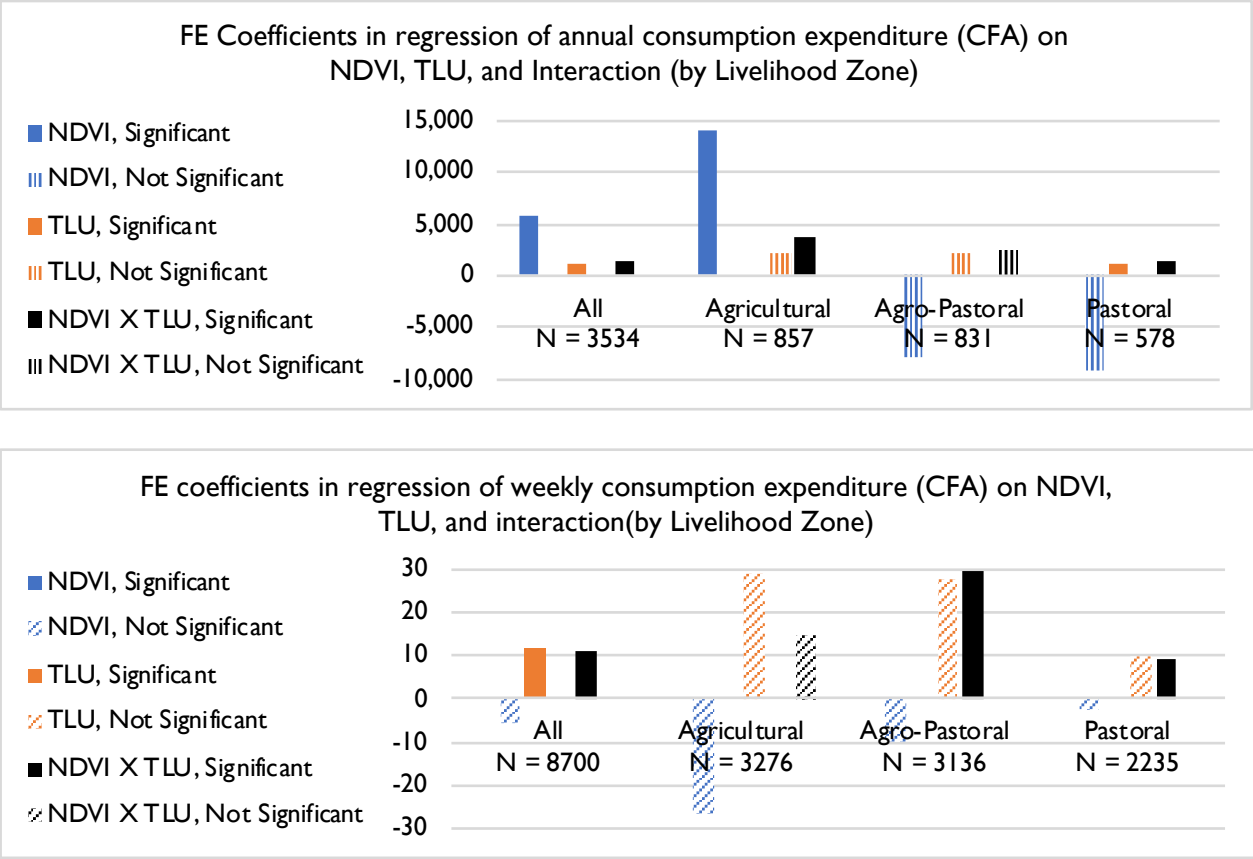
Relationship between rangeland scarcity, livestock and household wellbeing

Regression models were fit to further test the hypotheses that the relationship between rangeland scarcity, livestock and household wellbeing are important and to examine the influence of rangeland production (with NDVI serving as a proxy) on changes in wellbeing, as measured by consumption expenditure. We ran regressions to isolate this relationship, first on a national level and across livelihood zones and then by region within a given livelihood zone, for both annual (measured

5 All differences between pastoral and non-pastoral households in Figure 10 are statistically significant at the 1% level. In Figure 10 the differences at the national level and in Agadez are significant at the 1% level.

twice) and weekly (measured four times) consumption expenditures. Figure 11 summarizes the first set of regression models, showing the model coefficients of NDVI, TLU and the interaction term, with solid bars indicating statistically significant coefficients at least the 5% level.

Figure 11. Household-level fixed effect regressions of Normalized-Difference Vegetation Index (mean, z-score), Tropical Livestock Units and the interaction term on consumption expenditure, by livelihood zone.

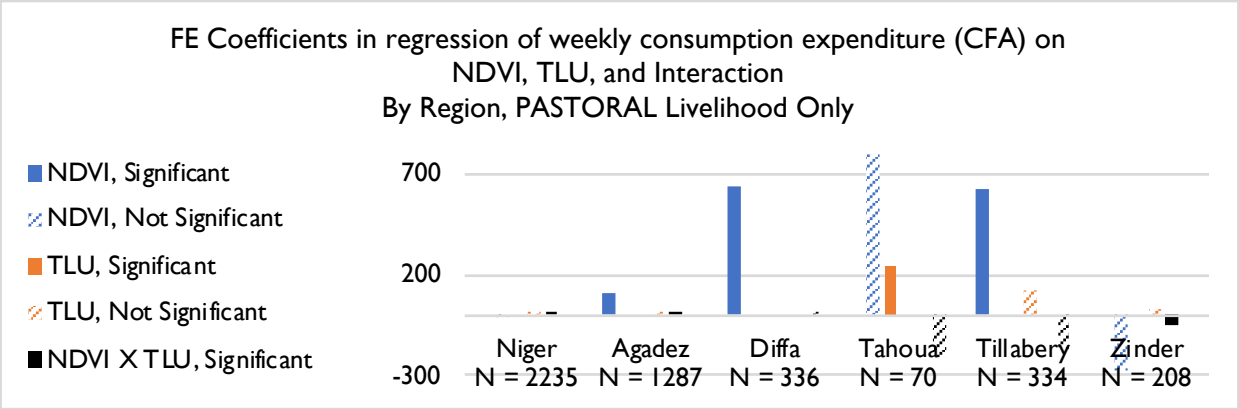


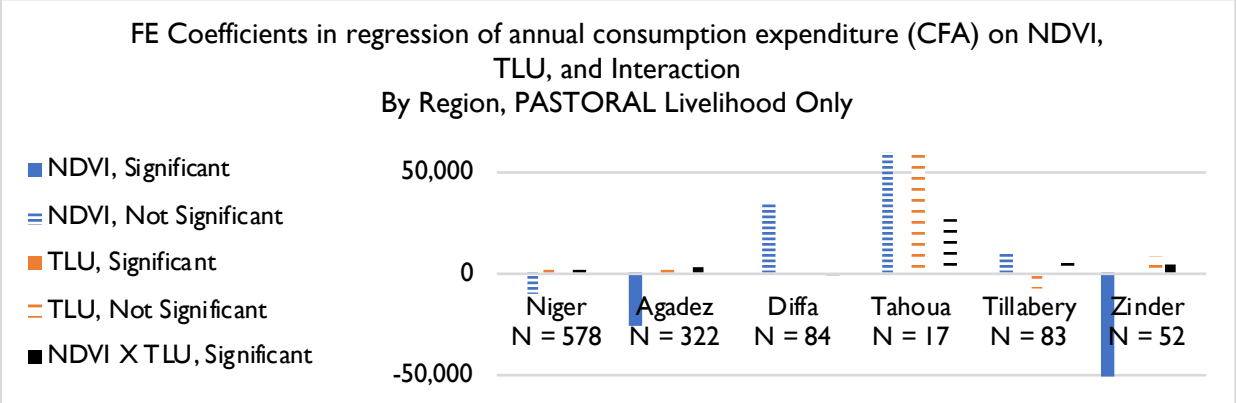
At the national level, all three coefficients are positive and significant for annual consumption, ad those for both TLU and the interaction term are positive and significant for weekly consumption expenditure. Thus, both NDVI and TLU are positively associated with changes in consumption expenditure and livestock holdings positively mediate this relationship. Stated more concretely, the model allows us to evaluate the association between consumption expenditure and a one standard deviation increase in NDVI, for a household with average livestock holdings (TLU): This one standard deviation increase in NDVI is associated with a 9,000CFA[6] greater increase in consumption, factoring in 2TLU multiplied by the interaction term and this association is statistically significant. While the influence of NDVI on its own is negative but not significant in pastoral areas, the joint coefficient—NDVI combined with the interaction term multiplied by average livestock holdings—is positive and also significant, with a magnitude of 2,400 CFS. Weekly consumption shows a similar pattern, with the joint terms positive and significant for all but agricultural areas.

We then looked more specifically at just pastoral areas, disaggregated across regions (see Figure 12). As sample sizes were somewhat small, results are weaker and may be challenged with respect to consistency. However, the result for Agadez, by far the best represented pastoral region, is consistent with the national result; while the association between NDVI and consumption expenditure is negative (–25,000 CFA), for a household with the average livestock holding of 12–18 TLU (depending on round) it becomes positive (i.e. +35,000 CFS for a household with 12 TLU). For weekly consumption expenditure we see mostly positive coefficients, with the joint influence of NDVI at average livestock holdings positive and statistically significant for the national level, Diffa and Tillabéry, positive but not significant for Agadez and Tahoua and negative for Zinder. The unexpected negative relationship for Zinder might indicate that NDVI is less reliable as an indicator of pastoral production for households located in areas where crops and pastures are interspersed, consistent with the biophysical assessment.

6 CFA is the West Africa Franc, exchange rate roughly CFA550–USD1 (oanda.com).

Figure 12. Household-level fixed effect regressions of Normalized-Difference Vegetation Index (mean, z-score), Tropical Livestock Units and the interaction term on indicators of wellbeing, by region for pastoral households only.





Finally, we explored the importance of scale by running these same models aggregated up to larger units, first sample clusters and then departments (see Table 5). We did this only for the national-level analysis, as at higher scales of aggregation the statistical power is insufficient for consistent analysis by livelihood and region. In general—while significance is lost due to small sample size—the relationships identified in the previous analyses remain consistent at higher levels of aggregation, with, on average, increasing magnitudes of coefficients on livestock and the interaction term between livestock and NDVI at higher scales. The joint influence of NDVI at mean livestock holdings also increases, with the exception of weekly consumption expenditure at the department level. The over-all predictive power of NDVI and livestock for consumption expenditure, as reflected in the *R-squared*, increases at higher scales of aggregation. These findings suggest that the relationship between climate, livestock and wellbeing may be more important at community (or higher) levels than at the household level, perhaps through general equilibrium/feedback effects. While inconclusive at this stage and using these data, this possibility may merit further investigation. This analysis could help first to identify communities or regions where greater investment in IBLI may be warranted and in turn to inform contract design around both the location scale at which IBLI provision would be most efficient.

Table 5. Fixed effect regressions, at increasing scales of aggregation.

	Annual (CFA)			Weekly (CFA)		
	HH	Cluster	Dept	HH	Cluster	Dept
NDVI, z-score	5,710*	2,070	9,990	-5.8	-106.1	-255.5*
	(3,040)	(6760)		(-30)	(-67.7)	(-151.1)
NDVI, z-score X TLU		2,380*	4,520		50.9***	91.6**
	(380)	(1300)	(7,580)	(-3.5)	(-12.2)	(-43.1)
Livestock Holdings (TLU)			11,140	11.8**	131.1***	280.5**
	(480)	(2510)	(7,240)	(-5.5)	(-32.2)	(-116)
Average Livestock Holdings (TLU)	3	2.9	2.3	3	2.9	2.3
Net expenditure implication of 1SD of NDVI, at average TLU	9,040	8,970	20,390	26.8	41.6	-44.8
Panel units	4322	260	65	4322	260	65
R-Squared	0.01	0.07	0.2	0	0.06	0.09

*, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

Household coping strategies, for drought and other shocks

Our ability to quantitatively assess coping strategies at this stage is limited, aside from the strategies reported as part of the LSMS-ISA survey of subjective shock impact assessment. These self-reports do, however, suggest very limited abilities to cope with drought. In 2014, of pastoral households who reported being affected by drought, about 20% relied on distress sales of animals, while 40% relied on savings (possibly in the form of livestock) to purchase fodder or otherwise cope and 25% reported relying on only prayer or doing nothing. Among non-pastoral households, about 25% relied on savings, while 50% resort to prayer or reported doing nothing.

Interestingly, complementary information collected during the field survey from key informants also suggests that, while no formal insurance exists, pastoralists do traditionally have recourse to an informal insurance arrangement known as Habbanaye, whereby if a household is experiencing difficulty another household (usually family) will lend it either a cow or a few small ruminants (Bevins 2016). The household in need will then keep those animals, benefiting from the milk until they give birth and will retain the offspring, returning the animals to their owners. These mechanisms can apply both to cattle and smaller ruminants, in which case they are more likely to involve women. While this is a strong traditional support structure, it provides supports to households only in the case of idiosyncratic shocks. When all households are affected similarly, such as in the case of a drought, this lending system no longer works. In fact, whilst some development agencies have implemented programs that mimic these traditions, the actual tradition of Habbanaye has reportedly been much less common in general since the significant droughts in 1984 that led to widespread livestock losses in Eastern Niger, which undermined these traditional support structures and accentuated the need for additional risk management mechanisms.

IBLI institutional pre-feasibility

The agriculture sector in Niger is mainly supported by government subsidy and external aid, with the main stakeholders being the banks, micro-finance institutions, famers' organizations, co-operatives, unions and some private sector companies (IFC 2013; Shadrek et al. 2017). As noted above, one of the long-standing traditional methods of risk management has been the concept of Habbanaye (Bevins 2016). Over the years this system has evolved from an ad-hoc community risk management system to solidarity groups whose members have been able to mobilize funds to provide small loans, thus providing basic financial services (ibid.). These groups are often centered around and/or involve women, which would indicate the importance of considering the intra-household dimension, or how contract structures may affect men and women differently.

As far as the formal insurance sector is concerned, the general/conventional insurance is generally an underdeveloped service sector contributing to only 0.6% of the country's GDP, with an annual turnover of only USD37 million as of 2010 (IFC-World Bank 2013). Even though micro-insurance would appear to be a necessary response to the almost absent social protection systems in many West African countries, including Niger, no significant investments have been made in this area (Thebaud 2016).

Over time, several projects and institutions have been developed to help deal with and manage climate-related risks in Niger (Shadrek et al. 2017). In particular, following the 2005 food crisis, the government enhanced its Food Crises Management and Prevention System (FCMOS) towards improving food security. This led to four dominant institutional systems under almost 10 different line ministries, with a focus more on emergency response and less on risk management (ibid.). This has led to certain challenges in the institutional environment: i) high reliance on donor funding and external actors; ii) weak implementation of strategy and policy documents; iii) frequent creation of strategy documents because of political and institutional change; iv) challenged coordination efforts between different technical components during emergency or crisis situations; and iv) partial integration of crisis prevention in various national development strategies with more focus on crisis response (ibid.).

We proceed by summarizing some of the main insights gained through literature review and a series of direct interactions with different organizations and stakeholders during the field work conducted in Niger. The following is organized according to the main criteria presented in Table 1.

Financial services and infrastructure

The insurance sector in Niger is made up of four general insurance and one life insurance company (IFC 2013), Niamey seems to have the highest number of companies providing life, vehicle and health insurance at 37%, followed closely by Maradi at 34%, with other regions in Niger having between 10% and 14%. Agricultural insurance, with the exception of a few instances of locust insurance and insurance on farm equipment under automobile insurance (IFC 2013), is almost non-existent in the country. Exacerbated by overall low social and economic performance at the national level, the capacity of insurance companies, limited delivery channels, low infrastructural amenities, limited financial literacy and limited financial capacity among key actors in the sector have hindered the development of strong and impactful agricultural (crop and livestock) insurance. Most agents and brokers working with private insurance companies are concentrated in urban and crop-producing areas.

Despite the overall poor financial service infrastructure, during the field survey, an increasing presence of microfinance and cooperatives in rural areas was found, including in the pastoral regions of Maradi. The *Bank Agricole du Niger* (BAGRI)[7] has an agency network covering main locations in the pastoral areas of Niger (e.g., Dakoro, Tahoua, Tillabéry, Diffa, Agadez) and participated in financial literacy development projects in pastoral regions. ASUSU SA offers microfinance services (including Islamic finance) with a dense network of agencies distributed across the rural and pastoral areas of the country.

Noteworthy is that the telecom company Orange has a Memorandum of Understanding with ASUSU SA regarding the introduction of agriculture insurance in the near future. In terms of telecom infrastructure for financial service delivery, both main telecom companies in Niger, Orange and Airtel, have a mobile money system that is largely functional. To the best of our knowledge, no other ongoing initiatives on financial service delivery through telecommunication channels exist in Niger. However, Orange (i.e., its product development office) has expressed a strong interest in offering agricultural extension services and in supporting initiatives to increase rural financial literacy, consistent with the company's behavior in Mali and Burkina Faso.

Institutions with the capacity to deliver agro-meteorological services

Based on INRAN and the AGHRYMET Regional Centre, the overall infrastructure and capacity for delivering agro-meteorological services in Niger can be considered good. AGRHYMET, in particular, has been responsible for collecting and processing the aforementioned data on changes in biomass in the rangelands since 1988, in collaboration with the Niger

7 Agricultural Bank of Niger

government (Ministry of Agriculture and Livestock) and for joining these data with remote-sensing data in real time. Efforts are also ongoing to use tablets and digital platforms to collect data on rangeland conditions. AGRHYMET, a part of the *Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel* (CILSS),[8] is also mandated to provide early warning information on a regular basis to support governments in managing drought. INRAN has a dense network of offices in the rural areas of Niger to provide extension services and support capacity development activities in the agriculture/livestock domain. According to our preliminary assessment and interactions, these stakeholders boast significant capabilities in the agronomic and agro-meteorology domains, an important asset for eventual IBLI piloting initiatives.

Policies, regulatory frameworks and enabling environment

This component of the pre-feasibility assessment briefly reviews the government policies, priorities and regulatory frameworks that are currently in place in Niger in relation to drought risk management and insurance. This is a critical element to preliminarily assess the degree of investment that will be required to both introduce an IBLI initiative and to steer it toward successful large-scale implementation.

Interactions with the Ministry of Agriculture and Livestock revealed that current policies and development interventions are aimed at addressing three main areas identified as major risk types for the country—environmental, economic and social risks, especially in the face of climate change. One important policy document mentioned is the National Disaster and Risk Management Policy (under development), the objective of which is to improve the country's resilience to natural hazards through selected disaster risk management interventions in targeted areas. In terms of projects, the World Bank Niger Disaster Risk Management and Urban Development initiative[9] has allocated 20% of its total budget of USD100 million for risk financing. Insights obtained from interviews with key informants also revealed that the African Development Bank, along with the Islamic Development Bank (IDB) and the World Bank, are working to provide significant development loans for institutional and infrastructure development in the rural and, in particular, the pastoral areas of Niger.

As for the regulatory framework, the Directorate of Insurance Control, with the Ministry of Finance, is a signatory of CIMA (*Conférence Interafricaine des Marchés d'Assurances*) towards the creation of an enabling environment for insurance markets. The Ministry of Agriculture and Livestock is currently working to formulate an inclusive approach to development to address challenges facing Niger's pastoral regions. Though the overall policy and regulatory framework, particularly for the insurance sector, seems relatively weak, interactions with representatives from the government and development organizations revealed interest in creating a favorable environment for insurance.

International development organizations and international donors have shown strong interest in providing assistance in the pastoral areas under climate-smart agriculture initiatives and social protection interventions. One of the initiatives worth mentioning for Niger is the *Projet Régional d'Appui au Pastoralisme au Sahel* (PRAPS), a regional project supporting pastoral livelihoods. The Niger chapter's focus, in particular, is strengthening pastoral production systems by contributing to mitigate climatic shocks by supporting and strengthening initiatives preventing asset losses related to drought.[10] More recently, the US Government, under its Millennium Challenge Corporation (MCC), has collaborated with the Government of Niger on a five-year project worth USD437 million to promote economic growth and reduce poverty. More specifically, this project is meant to address issues related to water access for agriculture, livestock trade barriers and government regulations on business.[11]

Moreover, there was interest in investing in pastoral areas to increase social cohesion amongst pastoral and agro-pastoral communities, with IBLI having the potential to play a significant role. Some of the development organizations that had not heard of IBLI were willing to gain a better understanding of the product and evaluate its potential role in their broader agenda, as well as in exploring its potential advantages for community cohesion, engendering equality between pastoral and sedentary populations and considering gender roles.

8 Permanent inter-state committee to fight against drought in the Sahel.

9 See http://projects.worldbank.org/P145268/?lang=en&tab=overview for further information.

10 See http://praps-niger.org/ for further information.

11 See https://www.mcc.gov/news-and-events/release/release-012618-niger-entry-into-force for further information.

Experience from Kenya shows that the government has a critical role in the sustainable scaling of IBLI through support of public/private partnerships, introduction of dedicated policies and regulations and maintenance of a favorable enabling environment. However, a strong interest by international organizations and donors is an essential prerequisite at the early development stages of IBLI implementation in order to give the initiative a sufficient incubation time and build the necessary infrastructure and capabilities of private and institutional stakeholders. This would be especially relevant in Niger where the current institutional framework shows substantial weaknesses.

Institutionalized community groups facilitating access and delivery of services

The literature suggests that farmers' co-operatives are active in most parts of Niger and most Nigerien farmers are organized through co-operatives (IFC 2013). Like co-operatives, there is a significant presence of micro-finance institutions (MFIs), which provide credit to farmers through the co-operatives. The afore-mentioned ASUSU SA seems to be a prominent player in this context and is operating also in pastoral areas. Most of the NGOs working in the area, such as SNV, Catholic Relief Services (CRS) and CARE, are linked with the MFI associations for the purpose of facilitating creation of business development models.

Where the extension, education, marketing, sales and distribution of IBLI are concerned, pastoral associations such as AREN are particularly active in Niger. AREN, for example, has an active membership of 120,000 pastoralists and has worked with private radio stations as part of their five-prong approach for education and extension. AREN, along with the *Réseau National des Chambres d'Agriculture du Niger* (RECA),[12] has been involved in delivering information on market prices, water availability, pasture conditions, etc., to its members. Interactions with officials from the Millennium Challenge Fund of the USAID also revealed the presence of an expanding network of private veterinary service providers, which the government on several occasions has commissioned to carry out vaccination drives and to provide animal health services to communities. Each of these entities has a network of 20–30 auxiliaries who are trained to provide vaccinations and treat and report disease outbreaks. In view of future IBLI piloting initiatives, an in-depth investigation of the MFI and pastoral association structures would be required, including the services that are currently being provided, the capacity in which IBLI could be embedded as one of the products or services provided and the role that these organizations could play to channel IBLI distribution in pastoral areas. In addition, exploring the possibility of leveraging the already existing networks of the afore-mentioned NGOs and international organizations would be important.

Another important goal of our interaction with the local NGOs and MFIs operating in Niger's financial sector was to assess the extent to which it would be necessary to introduce Sharia-compliant IBLI in Niger, as already implemented in the Muslim-dominated counties of Kenya. While the dominant religion in Niger is Islam, our engagements yielded no explicit indication of the need for a Sharia-compliant product. Nevertheless, ASUSU SA offers Islamic finance solutions as a complement to standard financial products and other stakeholders suggested that this could be an important aspect for consideration and thus would certainly require a more detailed investigation during subsequent stages of IBLI implementation.

Overall, this assessment illustrates key strengths and weakness of the institutional environment in Niger in view of IBLI piloting and implementation, suggesting this is the area where major challenges for IBLI could arise and where significant investments would be necessary, particularly in market and capacity development activities and in awareness creation. However, it emphasizes also the presence of a range of actors and institutions that have shown a keen interest in supporting IBLI-related interventions in Niger in different critical areas of IBLI implementation, including policy advocacy, capacity development, insurance product and service provision and resource mobilization.

12 Nigerien national network of agricultural sectors.

Conclusions

In this report, we present a pre-feasibility assessment for the introduction and piloting of IBLI in Niger, considering agro-ecological, socioeconomic and institutional factors. The study objective was to provide development partners, local institutions and the Government of Niger with a sense of the value that IBLI could offer for efficiently managing the considerable cost recurrent droughts impose on both the economy and the welfare of Nigeriens. As such, the study results provide insights into the degree of investment that may be required to develop a large-scale, sustainable IBLI program in Niger and underlines the steps and stakeholders that would be required to successfully deliver it. Also included in this report are recommendations for priority areas requiring increased focus during the next phase of IBLI program development. This phase, the feasibility and pilot preparation stage, will require investigation of the same general issues explored during the pre-feasibility assessment to be addressed but at a much greater depth of investigation.

To meet the goals of the pre-feasibility study, a conceptual framework and a set of measurable indicators and datasets (i.e. geospatial data, satellite indicators, LSMS-ISA, national statistics, etc.) have been proposed to define IBLI feasibility with a rigorous process, potentially replicable elsewhere. This basic set of indicators has been integrated with contextual analysis and qualitative research to add more depth to the recommendations and offer broader insights on the potential implementation modality of IBLI in Niger.

The following paragraphs summarize the main findings of this study in relation to the different components of IBLI feasibility.

Biophysical

From a biophysical perspective, Niger presents generally favorable conditions for developmental planning of an IBLI pilot. Drought is a major hazard for pasture production (with major events occurring every 3–4 years) and causes major impacts on livestock. The extensive pasturelands located in the northern fringe of the Sahel (arid), which are the main grazing areas during the rainy season for nomadic pastoralists, have a well-defined seasonality and sufficient production to be efficiently monitored by satellite data. In addition, Niger has a set of long-term datasets on pasture biomass and socioeconomic indicators in the pastoral region that will prove extremely useful in accurately designing and tailoring the IBLI contract.

The total area potentially favorable for IBLI model application touches close to 40% of the communes and covers vast areas in Tillabéry, Tahoua, Diffa and significant areas of Maradi and Zinder. However, as this area includes the main wet season grazing lands for the whole country, the effective area of IBLI distribution/sales could be much larger. As regards Agadez, a more in-depth analysis would be necessary to understand the possibility of designing IBLI for specific grazing areas within that region.

Socio-economic

Livestock is an important component of the livelihood of the rural poor in Niger, providing all or part of the income of 87% of the population. While herding practices vary, large areas of the country are primarily extensive grazing areas, thus facilitating establishment of an empirical relationship between satellite-based indicators (in combination with biomass data) and livestock risks. Pastoral herders recognize drought as the major risk affecting their livelihoods and socioeconomic

(e.g. increased population and economic activities) and environmental changes have drastically reduced the effectiveness of traditional drought-coping strategies. Through diverse avenues, including livestock holdings, drought poses risks to household wellbeing as measured both by consumption expenditure and dietary diversity.

Overall, there are several strong indicators of the considerable impacts that a solution such as IBLI, which would help pastoralists and agro-pastoralists manage drought-related livestock losses, could have on both household welfare and the national economy. Contract design and distribution mechanisms could also be designed so as to conform with local religious practices, as well as potentially reinforce traditional coping mechanisms and enhance community cohesion.

Institutional

In terms of institutional and local networks and capacity to deliver and create awareness about the IBLI product, Niger has a good infrastructure and the capacity to deliver agro-meteorological services at a national and regional level. Another positive element is the strong role and networked ground presence in Niger's rural areas of NGOs and pastoral associations that clearly recognize the need and additional value of insurance to drought risk management. Similarly, government institutions seem to have the human capacity for extension and education activities and a strong working relationship with pastoral associations. Finally, the telecommunication infrastructure seems acceptable and expanding and during the pre-feasibility phase, private actors in the sector demonstrated a certain ability and a strong interest in the digital financial and extension service applications in agriculture (e.g. Orange and Airtel money are already active in Niger) that form the crucial backbone of IBLI provision. These positive elements are counterbalanced by substantial structural weakness in the private sector with respect to agricultural insurance and a very limited presence of financial institutions in pastoral areas. Financial literacy is extremely low among farmers and pastoralists and institutional capacity in the agricultural insurance domain is weak. In terms of the legal and regulatory context, the Niger Ministry of Finance is a signatory of CIMA (*Conférence Interafricaine des Marchés d'Assurance*s).

In summary, although the general institutional context appears conducive for supporting an IBLI pilot, significant challenges and investment needs should be anticipated to increase financial literacy and create awareness, develop capacity at all levels, develop insurance private sector and financial institutions support and constitute a regulatory and legal framework, along with more in-depth understanding of the community networks to facilitate an efficient service provision model.

Recommendations and way forward

Overall, we foresee a strong potential for IBLI in Niger both in terms of uptake and impacts, provided sufficient investments are made to sustain all steps required for product implementation, given the existing limitations in the financial risk management domain, along with the limited resources that the Niger Government could probably initially invest to support such an initiative. Significant socioeconomic constraints have inhibited the development of agricultural index insurance in rural areas in Niger, including high costs, low awareness and insufficient infrastructure. However, the IBLI product overcomes a number of these issues—such as the need for costly verification. In turn, the need is great to alleviate many of these constraints and an IBLI roll-out—with complementary programs in place to facilitate its success—could have the added benefit of alleviating these constraints and opening the door for other financial sector improvements.

Significantly, given the strong similarity in both the agro-ecology and rural socio-economic structure of Sahelian West Africa Countries, as well as the strong regional interconnections in the institutional framework (for example through CILSS) and between pastoral associations, we see a promising opportunity for scaling IBLI broadly, once tailored to the Sahelian context and piloted.

As a way forward, the next step would be an extensive feasibility and IBLI pilot preparation study. According to the results of the pre-feasibility assessment, this should incorporate the following elements and considerations:

- Comprehensive analysis of IBLI product design customization, risk modelling and product pricing. This report has highlighted the unique elements of the Niger pastoral context (i.e., north/south migration patterns, ongoing trends and land cover changes, landscape heterogeneity) and subsequent analyses would need to be done with these in mind. For example, a more in-depth study would be necessary for the Agadez region, in particular, to assess whether it would need to be included in the pilot design.
- In-depth comprehension of potential constraints to IBLI related to the insecurity and conflict situation in the country. Although IBLI has been successfully implemented also in regions with high-insecurity (e.g. Mandera and Garissa, Kenya), the feasibility and pilot preparation stage should take into careful consideration insecurity-related constraints in the demand, supply and scaling of IBLI, especially for the pilot implementation.
- Further study of the relationship between drought and household wellbeing. While initial findings with available data show a relationship between drought and household wellbeing, further study is warranted to more precisely define the nuances of this relationship. For example, data collection could provide better insight into specific grazing areas for households whose animals are affected, livestock ownership and management behavior among pastoralists, a wider set of wellbeing indicators (e.g. nutritional).
- Analysis of potential complementary interventions to enhance IBLI effectiveness and facilitate uptake and scaling. Among other issues, it is critical to address the process of pastoralist dry season migration to the southern agro-pastoral and farming areas, which is a major cause of conflict and food insecurity. IBLI indemnities for scarce forage production at the end of the wet season (i.e. before migration) could contribute, for example, to social cohesion between farming and pastoral communities by a carful design of the indemnity distribution modality.
- Role of community institutions and gender in adoption of financial services. Initial findings from this study suggest the critical role that community institutions and traditional insurance methods play on the social fabric in Niger pastoral areas. Therefore, we recommend a further in-depth study to understand their evolving role during drought situations

and whether these structures can play as facilitators for the uptake of a product like IBLI.

- Micro-insurance industry analysis. While the pre-feasibility study identified key actors to support market development and product supply, it is important to assess whether or not the insurance market has, or can develop, essential characteristics for index insurance to be profitable and sustainable (Shadrek et al. 2017). Hence, the next stage of implementation would require a more detailed analysis of the micro-insurance industry in Niger—including insurance demand and supply, rural insurance culture and delivery channel options—so as to design the most efficient IBLI implementation and distribution mechanism.

- Elaboration of a suitable IBLI sales model, at micro- and/or meso-levels. The social fabric in Niger relies heavily on its social capital and various traditional practices reinforce this social cohesion. Similarly, IBLI purchase options should be designed to also strengthen existing social cohesion. Therefore, we recommend that two fundamentally different contract options be investigated: i) a regional- or commune-level contract, wherein communities or community groups are the primary client and ii) individual-based contracts in the spirit of Habbanaye (the traditional insurance practice among community members), but with the additional option of collective insurance of a group within a community or a village. To facilitate IBLI uptake, the possibility of subsidies, including the form these would take and of Sharia-compliant products should also be carefully investigated.

- Enabling conditions in markets and community awareness. The next steps should include a careful analysis of market-mediated mechanisms for the use of indemnities (e.g. linkages to livestock and forage markets, water resources, veterinary services, paying farmers for crop residues etc.) and broad sensibilization of communities as to the mutual benefits of the migration process and more efficient use of resources through exchange (e.g. crop residue). These steps would also require partnering with regional pastoral associations and relevant departments in the ministries to institutionalize the customary laws around post-harvest animal grazing.

- Public/private capacity needs assessment. As public and private capacity building is a priority area of intervention identified by this study, one of the key areas of assessment would be around human capital and the capacity to understand as well as carry out extension services. This would apply primarily to the public institutions that are mandated for extension and education towards technology adoption. For the private sector, capacity assessment would be mainly in the areas of i) human, financial and technical capacities; ii) product/service development; iii) existing extension and awareness programmes; iv) market and distribution channels; and v) regulatory frameworks. This assessment will also be useful in understanding existing capabilities for creating or customizing existing content related to IBLI, such as pocket books, picture books, digital learning courses on product features of IBLI and the analytical tools for assessing the effects of the different interventions as part of an IBLI pilot.

- Disaster risk financing and social protection. A review of existing disaster risk financing mechanisms (early warning, sovereign insurance - ARC, micro-insurance) and the social protection policy framework in Niger is needed in order to contextualize IBLI within a harmonized country or CILSS strategy for drought risk management. Our assessment indicates that, while there are currently no active nation-wide social protection and index-insurance programs in Niger, many initiatives are in the planning stage. It would therefore be important to integrate IBLI with existing efforts to avoid replication and to support the development of efficient, harmonized drought risk management policies at the national level using complementary interventions.

- Digital channels/ICT. This study confirmed that radios can be an important player in any information dissemination strategy. More information is, however, required related to the number of radio stations available, the kind of programs they typically broadcast and coverage of the population. Insights from the pre-feasibility assessment phase suggest that mobile penetration is relatively high, albeit with some gaps in highly extensive pastoral areas. As such, mobile phones could be used as a means of extension and outreach for IBLI, as well as of dissemination of information on pasture conditions (index readings); an integrated approach for providing information on various issues of concern (water availability, feed and forage, livestock prices, veterinary services, etc.) on a single platform is worth consideration. As such, a more detailed investigation of mobile network coverage, mobile penetration (smart or feature phones) and mobile usage in the pastoral regions should be considered.

- Establishing a framework for a public-private partnership to underlie an IBLI program. In order to foster a PPP framework to support and complement IBLI, a detailed institutional analysis involving considerable engagement with the range of public and private organizations capable of offering the suite of services required to support IBLI implementation is needed. The aim of such an analysis would be to identify or develop a consortium of institutions/organizations that are well positioned or mandated to assume the requisite roles and responsibilities of regulation, coordination, awareness creation, underwriting, etc. and to design an appropriate framework to define operating modalities.

References

African Development Bank (AfDB). 2018. Statistical Data Portal. Niger National Outlook. Accessed 24 Apri 2018 from http://dataportal.opendataforafrica.org/apps/atlas/Niger

African Development Bank (AfDB). 2013. Niger combined 2013–2017 country strategy paper and portfolio review. October 2013.

Bevins, W. 2016. *Habbanaye: Applying a traditional practice for a more resilient future in the Sahel*. Brief – Lutheran World Relief.

Central Intelligence Agency (CIA). 2018. The World Fact book: Niger. Accessed on 18 April 2018 from https://www.cia.gov/library/publications/the-world-factbook/geos/ng.html

Chantarat, S., Mude, A.G. and Turvey, C.G. 2017. Welfare impacts of index insurance in the presence of a poverty trap. *World Dev.* 94: 119–138.

Chantarat, S., Mude, A.G., Barrett, C.B. and Carter, M.R. 2013. *Designing index-based livestock insurance for managing asset risk in Northern Kenya*. J. Risk. Insur. 80(1): 205–237.

Comité permanent Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS). 2016. *Landscapes of West Africa—A window on a changing world*. Ouagadougou, Burkina Faso. CILSS, p219. doi:10.5066/ F7N014QZ.

Clemens, E.S. and Cook, J.M. 1999. Politics and institutionalism: explaining durability and change. *Annu. Rev. Sociol.* 25: 441–466. http://dx.doi.org/10.1146/annurev.soc.25.1. 441

Eerens, H., Haesen, D., Rembold, F., Urbano, F., Tote, C. et al. 2014. Image time series processing for agriculture monitoring. *Environ. Model. Softw.* 53: 154–162.

FEWS NET. 2017. Niger, Staple Food and Livestock Market Fundamentals. http://fews.net/sites/default/files/documents/reports/FEWS%20NET%20Niger%20MFR_final_20170929.pdf

Fensholt, R., Rasmussen, K., Kaspersen, P., Huber, S., Horion, S. et al. 2013. Assessing land degradation/recovery in the African Sahel from long-term Earth observation based primary productivity and precipitation relationships. *Remote Sens* 5: 664–686.

Food and Agriculture Organization of the United Nations (FAO). 2018. FAOSTAT statistics database. Rome, Italy. http://www.fao.org/faostat/en/#country/158

IFAD-WFP. 2011. Weather Index-based Insurance in Agricultural Development. A Technical Guide. https://www.wfp.org/content/weather-index-based-insurance-agricultural-development-technical-guide

IFC-World Bank. 2013. *Private Sector Investment to Build Climate Resilience in Niger's Agricultural Sector: Agricultural Insurance Market Assessment*. Final Report. The International Finance Corporation, World Bank Group.

IPCC. 2014. Fifth Assessment Report: What's in it for Africa. Climate and Development Knowledge Network.

Janzen, S., Jensen, N. and Mude, A. 2016. *Targeted social protection in a pastoralist economy: Case study from Kenya*. OIC Scientific and Technical Review 35(2): 587–596.

Jensen, N., Ikegami, M. and Mude, A. 2017. I*ntegrating social protection strategies for improved impact: A comparative evaluation of cash transfers and index insurance in Kenya*. The Geneva Papers on Risk and Insurance - Issues and Practice. doi:10.1057/s41288-017-0060-5.

Jensen, N., Barrett, C., Mude, A. 2016. Index Insurance Quality and Basis Risk: Evidence from Northern Kenya. *Am J Agric Econ.* 98(5): 1450–1469.

Kottek, M., Grieser, J., Beck, C., Rudolf, B. and Rubel, F. 2006. World map of the Köppen-Geiger climate classification updated. *Meteorol. Z.* 15: 259–263.

Millennium Challenge Corporation (MCC). 2018. https://www.mcc.gov/news-and-events/release/release-012618-niger-entry-into-force. Accessed 14th May 2018.

Mills, C.J., Jensen, N.D., Barrett, C.B. and Mude, A.G. 2016. *Characterization for index-based livestock insurance*. ILRI Research Report 39. Nairobi, Kenya: ILRI. https://hdl.handle.net/10568/75978

Ministry of Agriculture and Livestock. 2013. Niger development strategy for sustainable farming. SSDEL 2013–2032. Niamey, Niger.

National Statistical Institute (NIS) of Niger. 2017. National Statistics book. http://www.statniger.org/statistique/index.php and http://niger.opendataforafrica.org/

North, D.C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge University Press, Cambridge.

OSS. 2015. Niger: Atlas des cartes d'occupation du sol - Projet Amélioration de la résilience des populations sahéliennes aux mutations environnementales - REPSAHEL.

Pérez-Hoyos, A., Rembold, F., Gallego, J., Schucknecht, A., Meroni, M. et al. 2017a. Development of a new harmonized land cover/land use dataset for agricultural monitoring in Africa. In: ESA-Esrin (Ed.) ESA World Cover 2017 Conference. Frascati, Rome (Italy).

Pérez-Hoyos, A., Rembold, F., Kerdiles, H. and Gallego, J. 2017b. Comparison of global land cover datasets for cropland monitoring. *Remote Sens* 9. doi:10.3390/rs9111118.

PRAPS. http://praps-niger.org/. Accessed 14 May 2018.

Rembold, F., Meroni, M., Urbano, F., Royer, A., Atzberger, C. et al. 2015. Remote sensing time series analysis for crop monitoring with the SPIRITS software: new functionalities and use examples. Front. *Environ. Sci.* 3:129–134. doi:10.3389/fenvs.2015.00046.

Schucknecht, A., Meroni, M., Kayitakire, F. and Boureima, A., 2017. Phenology-Based Biomass Estimation to Support Rangeland Management in Semi-Arid Environments. *Remote Sens* 9(5): 463. doi:10.3390/rs9050463.

Shadreck, M., Groenendaal, H. and Dugger, C. 2017. *Risk Modelling for Appraising Named Peril Index Insurance Products: A Guide for Practitioners. Directions in Development.* Washington, DC: World Bank. doi:10.1596/978-1-4648-1048-0. License: Creative Commons Attribution CC BY 3.0 IGO.

Tafere, K., Barrett, C.B., Lentz, E. and Birhanu, A. 2017. *Insuring wellbeing? Buyer's remorse and peace of mind effects from insurance.* Policy Research Working Paper No. 8256. World Bank. https://openknowledge.worldbank.org/handle/10986/28917 License: CC BY 3.0 IGO

Thebaud, B. 2016. *Livestock Insurance for Mobile Herders in West Africa*. Workshop Proceedings. Les Résidences Mamoune. Dakar, Senegal. 2–3 November.

USAID. 2017. Climate Risk in Food for Peace Geographies: Niger. https://www.climatelinks.org/resources/climate-risks-food-peace-geographies-niger

Vrieling, A., Meroni, M., Shee, A., Mude, A.J., Woodard, J. et al. 2014. Historical extension of operational NDVI products for livestock insurance in Kenya. *International Journal of Applied Earth Observations and Geoinformation* 28: 238–251.

Weisman, D., Bassett, L., Benson, T. and Hoddinott, J. 2009. *Validation of the World Food Programme's Food Consumption Score and Alternative Indicators of Household Food Security*. IFPRI Discussion Paper 00870.

Word Bank. 2013. *Agricultural sector risk assessment in Niger: moving from crisis response to long-term risk management.* Report No. 74322-NE

World Bank. 2018. World Data: Niger. Accessed on 28th of March 2018 at https://data.worldbank.org/country/niger

World Food Programme (WFP). 2013a. Economics of early response and resilience in Niger. WFP Country Report. Rome, Italy.

World Food Programme (WFP). 2013b. *Recovering from drought in Niger: trend analysis of household coping, 2007–2011*. Rome, Italy. http://projects.worldbank.org/P145268/?lang=en&tab=overview. Accessed 03 May 2018.

ISBN: 92–9146–572-0

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

The International Livestock Research Institute (ILRI) works to improve food and nutritional security and reduce poverty in developing countries through research for efficient, safe and sustainable use of livestock. Co-hosted by Kenya and Ethiopia, it has regional or country offices and projects in East, South and Southeast Asia as well as Central, East, Southern and West Africa. ilri.org

CGIAR

CGIAR is a global agricultural research partnership for a food-secure future. Its research is carried out by 15 research centres in collaboration with hundreds of partner organizations. cgiar.org