Determining insurable units for index-based livestock insurance in northern Kenya and southern Ethiopia

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Background

Since 2008, the International Livestock Research Institute (ILRI), in collaboration with partners, has undertaken extensive research in designing, developing and implementing market-mediated index-based livestock insurance (IBLI) products to protect pastoralists from drought-related forage scarcity (Mude et al. 2011; Vrieling et al. 2014, 2016). The IBLI project was first piloted in Marsabit in 2010, and has since been scaled up in the most arid and semi-arid lands (ASAL) in northern Kenya and the Borana region in southern Ethiopia.

IBLI contracts target extensive livestock systems in drylands where land use and access is largely based on complex informal rules and livestock herders migrate across large areas in search of feed and water for their animals. Therefore, the identification of the geographic areas that constitute an insurable unit represents a key step in IBLI contract design, requiring the active participation of local communities for appropriate demarcation. This brief describes this process, henceforth referred to as 'clustering'.

The clustering process has been refined over the course of the IBLI project. It exemplifies the case of a multi-stakeholder participatory approach linking scientific analysis and local knowledge, while facilitating the awareness, understanding and acceptance of the product by local communities.

The rising need for the scaling up and out of IBLI necessitates a standardized and replicable approach to the process of conducting the clustering exercise. Partners and stakeholders alike—who need to understand the significance of clustering in developing a robust contract for index insurance—have motivated this documentation process. This brief aims to provide the basic principles for the appropriate clustering of insurable units that can guide other efforts in the development of similar contracts.

IBLI contract design

The process of contract design has distinct but interlinked features which broadly include: source datasets; geographical coverage; temporal coverage; index and pay-out functions; risk models and pricing models. Each feature has distinct characteristics, some of which are fixed, while others require customization in accordance with the geographic, administrative and socio-economic context. Clustering is a fundamental step in the determination of the geographic coverage of IBLI contracts, with important implications for the overall contract design.

IBLI contracts are based on publicly available normalized differenced vegetation index (NDVI) satellite imagery to determine relative seasonal forage scarcity in a specified geographical area, denominated as an insurable unit (Chantarat et al. 2013). Monitoring of the forage conditions is continuous and tracked using decadal NDVI data,

available since the year 2000, thus drawing on the benefits of a long-term dataset of historical observations. NDVI values are averaged over the insurable units (i.e. geographic coverage) and summed over the relevant rainy—or forage growing—season(s) (i.e. temporal coverage). Finally, the deviation of the current seasonal data from the long-term historical average is computed to assess the seasonal forage availability and derive the index for any insurable unit. Pay outs are distributed proportionate to the level of forage scarcity if the index falls below a pre-determined threshold (i.e. risk modelling).

The use of average NDVI over insurable units is based on the premise that drought is a covariate shock and that pastoral communities affected in a particular area are deemed to suffer in equal measure. It should be noted that a key concern of index-insurance products is that pay outs might not reflect the loss experienced by individual pastoralists (the so called 'basis risk'). Thus, for accuracy and acceptability, the index should be tightly correlated with forage scarcity and reflect relative conditions on the ground. Forage access should be relatively homogenous for herders residing in the same insurable unit. In addition, involving the target community in the clustering process does not only result in more precise and relevant risk-coverage, it also serves to create awareness and build trust in the index-based insurance concept.

Defining insurable units (clustering)

Pastoral areas of eastern Africa are mainly located in drylands, characterized by a high degree of spatial heterogeneity of land cover/land-use. Administrative units might not reflect these socio-ecological patterns, but are important in correctly identifying a given community and for the practical implementation of insurance (e.g. service delivery, client identification, etc.). As such, the clustering process uses administrative units as the first building block. The subsequent process consists in aggregating the administrative units until there is a general consensus across stakeholders about the confines of the newly defined insurable unit. Generating insurable units in relation to existing administrative units aims at ensuring that the units reflect pastoralists' livestock grazing experiences, as well as meet the operational and logistical requirements of implementing partners, insurance companies. Therefore, the general approach to a clustering exercise is participatory. The engagement has the basic successive steps described in the following paragraphs, which are followed systematically to ensure the accurate and replicable demarcation of IBLI insurable units.

Mobilization of participants

The mobilization process involves bringing stakeholders (individuals and/or institutions) with experience of the agro-ecology, socio-economy and administrative boundaries of the target county to a discussion forum facilitated by a team of index-insurance experts. Such a forum might include multiple stakeholders at different levels, including county government agricultural extension officers, religious leaders, local administration officers, chiefs, pastoralist representatives, local NGO representatives, etc.

The use of a multi-stakeholder approach is based on the belief that local institutions and or individuals are intuitively and experientially more knowledgeable of geographic, administrative and socio-economic context of the target communities, thereby making them critical stakeholders in the identification process.

This process requires a degree of customization, depending on the target location, but follows the same basic methodological approach. For instance in Kenya, mobilization is undertaken at county government level through the relevant line ministry for the selection of the participants of this exercise. The contact county individuals need to have been briefed on the project objectives and the experience required by expected participants. The participants are then brought together to undertake the clustering exercise.

Introducing IBLI

It may be difficult for participants who are new to the project to understand the process and the significance of clustering unless they have been properly briefed on how IBLI works. The index-insurance expert team makes a series of structured presentations on the rationale of the project, functioning and main contract features of IBLI, (i.e. risk covered, index, trigger/exit levels, premiums, insurable units and the IBLI contract cycle). This gives participants the capability to contribute objectively to clustering process.

Creating clusters

The main objective of clustering is to delineate precise insurable units from existing administrative boundaries. It is necessary to display updated official maps of the administrative borders during stakeholder sessions, preferably printed in poster form so participants can use them as worksheets to brainstorm optimal ways of demarcating the new boundaries. The sketches are subsequently converted into the final insurable units using GIS software, thus modifying the original administrative boundaries for the purposes of IBLI.

Wards in Kenya and kebeles in Ethiopia are the preferred standard basic building blocks for the identification of insurable units. They are generally considered as being inhabited by a distinct group of pastoralists with substantial commonalities in terms of herding experiences. It is on this premise that wards are either grouped with others to form a cluster or left as standalones, depending on the set of factors discussed in the next section. In exceptional cases, wards are split into sub-units, and physical barriers (e.g. rivers) or administrative sub-locations are considered to act as borders for insurable units. However, relatively small units are generally avoided as they are not representative of the broad geographical areas used by pastoral communities for grazing, especially during droughts.

The delineation of units is then carried out through a guided discussion during which stakeholders are asked to design the new units based on their intuitive and experiential understanding of the following factors that are given equal weight and assumed to summarize pastoralist experience of grazing land use:

- **Rainfall patterns:** Weather conditions vary significantly across space. Rainfall patterns are critical factors in determining rangeland production. Rainfall in most of northern Kenya, for instance, has a bimodal rainfall distribution pattern. However, factors such as topography may have a strong effect on local precipitation patterns, and some areas may experience more erratic rainfall patterns, thus influencing the seasonal forage availability.

- **Agro-ecological factors:** The spatial heterogeneity of agro-ecological factors (e.g. soil properties, plant species, etc.) influences the distribution and availability of forage resources, especially during stress periods. Different rangeland types could be favourable for certain livestock species and periods, unfavourable for others, or even not suitable at all. Agro-ecology is, thus, a crucial decision-making parameter for pastoralists' herd migration decisions.

- **Grazing/herd migration patterns:** Pastoralists have traditional patterns of migration during normal and stress periods. When these patterns are identified, they provide additional information useful for defining cluster boundaries. Physical barriers, ethnic boundaries and water availability may greatly influence migration patterns and can be effectively identified through stakeholder engagement.

- **Naming of insurable units:** The naming of insurable units is crucial, particularly when clustering involves the grouping of smaller units or splitting of larger ones, necessitating the coining of new names. In such cases, new names are suggested by the participants, debated and broadly agreed. It is necessary to use names that are acceptable to all communities.

- **Vetting and conclusion:** Several key components make up a successful clustering exercise. The final step tends to be the vetting of the resultant insurable units by participant stakeholders. They verify and endorse the proposed units. This step is undertaken after the presentation of the final map of clustered units. After validation, the units henceforth form the basis for the official delineation of insurable units which are used to determine the forage scarcity levels and distribute the pay outs. Figure 1 is an example of the final sketch developed in Turkana county.
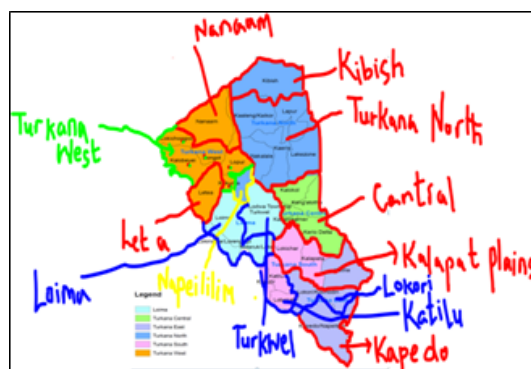

Figure 1. Map of Turkana insurable units, as shared with stakeholders at the end of the clustering process

Conclusions

This brief illustrates a generalized methodology for delineating insurable geographic units for the implementation of the IBLI contract, a process called clustering. This procedure has been refined over time and it is now used in the framework of the Kenyan Livestock Insurance Program and other projects to scale out IBLI in East Africa.

Despite the apparent simplicity of this process, its correct and accurate implementation is a fundamental step in the establishment of an IBLI product in new areas. Multiple stakeholders are informed about fundamental IBLI-related concepts and directly involved in the decision about unit boundaries. This creates the necessary awareness and acceptance for IBLI to be adopted.

Considering the trajectory of IBLI towards scaling out to new geographic contexts in Africa (Mills et al. 2016), future research steps will involve further standardization of the methodology, and the development and testing of information and communications technology-based approaches to the facilitation of interaction with stakeholders and improvement of the process objectivity and reproducibility.

Acknowledgements

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