



Weather Based Index Insurance Technical Challenges and Opportunities

Overview

Weather based index insurance (WII), along with other types of agriculture insurance products, has the potential to be used as an efficient risk management tool for farmers and other players in the agriculture value-chain in developing countries. Many challenges exist with WII and these include among others, technical, operational and market environment related challenges.

Many technical challenges exist with WII. However, the key technical challenges relate to data, product design and pricing. These three interlinked and distinct areas are the most relevant for insurance companies, reinsurance companies, intermediaries and research agencies. They are also applicable for the distribution channels and farmers. This policy brief outlines some of the key technical challenges and proposes recommendations for each. This brief is a resource for regulatory bodies, policymakers and the insurance and reinsurance sectors; as a guideline when approaching these technical areas.

Technical challenges (i.e. data, product design and pricing) are the most relevant for insurance companies, reinsurance companies, intermediaries and research agencies (Bryla-Tressler 2011). These interlinked and distinct challenges determine the underwriting of policies and determine viability of products for business.



Scope and severity of problem

The key technical challenges faced in WII (and other types of agriculture insurance products) include the following:

- Premium rates, which are too low, imply that the products pay out very rarely (only in the most extreme circumstances), which means that there could be some loss events for which there is no (or very little) insurance compensation and consequently lead to a basis risk event (Hazell et al. 2010).
- If the premium rate is very high, it may be economically irrational to buy insurance and self-insuring or retaining the risk may be the more rational option, based on the risk preference of clients. Hence there may be very little demand for buying insurance if the premium becomes very expensive even though such a product is likely to pay out significant amounts relatively frequently. Also, if the premium is very expensive then it can erode the business case for the distribution channels, who may then find it very difficult to support such a product (Bryla-Tressler 2011).
- Products may experience very high or very low claims ratios, which implies that the product is either not sustainable or providing poor value for money to the clients. Similarly, if the products have very high or very low expense ratios, this implies that either value for money is poor or the products are not being maintained or serviced adequately.
- A key challenge for all types of agriculture insurance is the availability of reliable data and this is also a major barrier for innovation and client-value. Lack of data also contributes to higher basis risk for parametric products.
- Basis risk is a key challenge for indexed insurance products. Basis risk is the risk that there is a mismatch between the farmer/s experience and the insurance pay-out due to a difference in terms of the basis for the underlying index.
- In general, there is a lack of technical understanding and capacity from local insurance companies in terms of their understanding of index insurance and in terms of their agronomical, actuarial and underwriting capacity.
- Weather station data is often not suitable for use in pricing or for claims settlement and/or suffers from issues of data quality and accuracy.
- Satellite data is not always accessible by insurance companies and sometimes has significant cost implications.
- The presence of microclimatic zones increases the Basis risk for WII products and makes it challenging to implement pure WII solutions.

POLICY RECOMMENDATIONS

- **Pricing should be done on an actuarial fair basis, taking into account client acceptability and sustainability of the product. Under and over-pricing should be avoided.** There is a lot of variation by type of product and local context, but as a rule of thumb, gross premium rates of less than 2% (of sum insured) is too low and should be avoided both from a client-value and insurers' sustainability perspective. On the other hand, premium rates of more than 9% ('rule of thumb') is too high to be sustainable in the long term and should be avoided, particularly in the absence of significant premium subsidies from either government or distribution channels (Bryla-Tressler 2011).
- **Products should be priced at optimum expected claims and expense ratios.** Claims ratios (in the pricing) should not be very low (e.g. less than 30%) which may result in products not paying out even when some material production losses have been experienced. For example, a claims ratio of 20% implies that for every \$10 the farmer pays, she can expect only \$2 back in the end, which may imply poor value for money. Expense ratios (i.e. Expenses incurred including Commission paid/Premium) should be controlled, so that expenses do not significantly erode client value. For example, an expense ratio of 70% implies that the maximum claims ratio, which the insurer can sustain without making a loss, is 30%. This implies potentially poor client value.
- **Product design should take into account need for relatively frequent pay-outs versus providing meaningful cover.** It is usually very important that the products generate some pay-outs, albeit small, in the first 3-4 seasons. This is important for demonstrating to the farmers and other stakeholders in the market that the insurance is "working" and for strengthening customer trust and confidence. On the other hand, very small pay-outs can also be received negatively by the market. In general, products which pay out relatively smaller amounts but more frequently are probably preferable in the initial years of introducing a product, with an option to change to products, which pay out higher amounts but less frequently after consumer buy-in and demand has been established (Bryla-Tressler 2011).

- **Basis risk can be a significant issue for any type of agriculture insurance product and particularly for indexed insurance products.** Hence, from the outset basis risk should be managed through different tools. Basis risk can be addressed through very careful product structuring; avoiding very cheap products; better use of technology (e.g. satellite data) and considering different types of products (e.g. Area Yield Index Insurance) etc. Basis risk can also be addressed by developing appropriate provisions for dealing with basis risk events in both insurance and reinsurance contracts and via funding of contingency policyholder compensation fund for dealing with basis risk events.
- **To reduce basis risk and design better products, data on location of farmers and farmer level exposures should be granular enough.** The location of farmers (or reference points) via GPS coordinates and other data items (e.g. type of crop, hectares, sum insured, cost of production, expected yield etc.) should be obtained for appropriate product design. If the approximate farmer location is not known, this can lead to administrative problems and also add to basis risk.
- **The most relevant production risk related perils should be focused on during the product design work, rather than a range of perils, which can erode the value of the most relevant perils.** In some cases product value can be eroded because farmers and distribution channels have requested for multiple types of cover, which can result in the core risks (e.g. drought) not being adequately covered.
- **There should be a provision coverage over and above cost of production or the loan amount only (e.g. by insuring expected revenue).** Insuring the loan or cost of production only results in cheaper products including those, which could be pre-financed by financial institutions. However, they do not provide adequate livelihood protection for farmers. It is possible to base the sum insured on expected revenue (in terms of expected yield and price), which would result in a higher premium and a proportionately higher coverage amount (Hazell et al. 2010).
- **Simple types of cover are recommended rather than more complex types of cover. However, it is noteworthy that some products become more complicated in order to provide an accurate fit to the risks insured.** For accurate risk modelling of crops, WII products can become very complicated, which can lead to confusion and misunderstandings at both the farmer and practitioner (e.g. with insurers) levels. Hence, a simpler product structure may be preferable, taking into account mixed farming practices. However, with very simple and generic products, basis risk can also increase if the products are not closely matching the risks experienced by specific crops.
- **In designing and pricing WII, tested and proven remote sensing tools and satellite data should be used.** Satellite tools should be considered due to the scope of increasing outreach of products, speed and accuracy of weather data, reduced uncertainty (due to better data availability) and hence better insurance and reinsurance terms and pricing. However, not all sources of satellite data are equally accurate for different countries. Also, in some cases, any source of satellite data is not suitable due to the presence of microclimates and the land terrain etc.
- **Weather station data can be used for WII but only if the accuracy has been determined as a better option than remote sensing and satellite data.** Weather station data suffers from various drawbacks such as being limited in terms of outreach (by geography and crops), higher risk of data errors, delay in obtaining the data and potentially higher incidence of basis risk as weather station data is typically a point estimate only of weather conditions. However, weather station data can still be relevant and usable in particular circumstances although the accuracy needs to be thoroughly tested before use.
- **Hybrid products, that combine different types of agriculture insurance products, should be considered if they match better, the underlying risk than stand-alone products.** For example, WII can be combined with area yield index insurance for better accuracy of the products and to reduce basis risk. Similarly, WII can be combined with post-harvest insurance for named perils, such as fire cover.
- **Alternative product types and WII products should be tested carefully in some conditions such as microclimates, type of crop etc.** The presence of hilly terrain and microclimatic conditions (due to other geographical reasons) makes weather based index products very high risk in some cases. Also, if the crops are not directly dependent on weather events, which can be indexed, than weather based indexed products may not be suitable and should not be implemented in isolation. Alternative models, such as Area Yield Insurance and named peril indemnity insurance should be considered instead.
- **Product design should accommodate the profile of the farmer and the different products that may be required for emerging or dynamic subsistence farmers, compared to relatively passive subsistence farmers.** Emerging farmers may have a different risk exposure profile and significant variations in their farming practices, hence the product design should take these features into account. For example, the products may have to insure expected revenue (rather than loan amount only), be linked to farming machinery and have multi-year term.

- **Product design should take into account different sources of data, including crop yield data, weather data, and qualitative information from farmers, expert opinion and market economics data.** For index insurance products it is very important that the product based on the specific index (e.g. based on weather data) is expected to very closely match the actual crop losses and farming characteristics of the insured crops. Hence different types of correlation analysis and statistical tests can be carried out to optimise the fit of the index product to the underlying crop and local context.
- **Product design should be validated with farmers, distribution channels (head office and field staff) and other experts (e.g. agronomists).** This validation process is particularly important as good quality crop and loss data does not exist in most developing countries. Hence, a retrospective validation approach can be more useful and practical than analysis based on available data only.
- **The public sector and policymakers have a major role to play to provide different sources of data and data related guidelines as public goods.** The public sector and international agencies have a significant role to play in the provision of data, which can then be used by both public and private sector practitioners for developing and implementing agriculture insurance products. Some of the specific data related roles are the following:
 - a) Access to different sources of satellite data should be provided on a usable basis, together
 - b) Data from weather stations should be provided on a transparent and easily accessible format from national meteorological agencies, along with quality control for the data;
 - c) Manual weather stations should be automated by installation of automatic weather stations, which are able to automatically transmit data on a regular basis and with quality control in place;
 - d) Crop yield data should be provided on a sufficiently granular basis, taking into account types of crops, geographical location and farming practices;
 - e) Database on crop production losses (based on data from farmer organisations, agriculture extension officers etc.) should be collected at a very granular (e.g. village or sub-county) level;
 - f) Data on agronomical features (e.g. planting dates, length of crop cycle) should be collected from farmer organisations and agriculture research organisations.
 - g) Insurance specific data should also be collected, such as typical premium rates, loss ratios, and expense ratios for agriculture insurance from other countries. Also product design features, such as waiting periods, deductibles, franchise, exclusions, caps etc., from agriculture insurance in other countries should be collated. This would enable benchmark testing and validation of product design and pricing.

Reference

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