

# **MICROENSURE**

## **Weather Index Crop Insurance**

**Implementation, product design, challenges, and  
successes - lessons learned in the field**

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## What is weather index crop insurance?

Weather indexed crop insurance was originally designed to provide compensation to poor smallholder farmers when rainfall during a crop growing cycle is insufficient for them to grow and optimize their yields. It has also proved to be a valuable tool for unlocking rural credit and hence improving rural livelihoods. MicroEnsure has partnered with the World Bank and major insurance companies such as Swiss Re to design weather index products in Africa and the Philippines.

Typically, these products are non-indemnity and parametric. They are not linked to actual losses, but based on an objective measurable weather parameter. In this case, rainfall deficiency at the local weather station, rather than by what happens in the field.

It is not possible to take measurements on each individual farm, so rainfall levels are taken at local meteorological stations. Participating farmers within a 20 kilometre radius of a station are assumed to have received the same amount of rainfall and to be affected in a similar manner. In the case of severe drought, all farmers in this 20 km radius will receive compensation.

In developing economies, in order for crop insurance to have a meaningful global, or even national impact on the rural economy, indexed insurance products are a necessary first step. There are numerous advantages of weather index products in preference to traditional insurance. For example, the objective measurements reduce fraud opportunities, the mechanism is simple, easy to administer, and payouts are automatic, so there is no need for affected farmers to file a claim or an expensive loss verification procedure.

By enabling poor farmers to manage risk, the product provides a safety net that will prevent them falling back into destitution in the case of severe drought. But it is as an enabler of microcredit that microinsurance helps the rural poor take another step away from poverty and hunger. Small scale farmers have historically been unable to access loans. These loans are used to purchase improved farm inputs such as drought resistant seed and fertilizer needed to increase productivity and raise their living standards. Agricultural lending in areas prone to drought has simply been viewed as too high risk, and few farmers can provide any form of collateral. But with an insurance arrangement that will pay off part or all of the loan in case of severe drought, lenders are becoming increasingly willing to provide loans.

Thanks to their insurance protection, farmers in Malawi received loans from Opportunity International Bank of Malawi (OIBM) and Malawi Rural Finance Corporation (MRFC). The farmers used these loans to purchase certified groundnut seed and fertilizer. If there is a drought, that triggers a payout and that money will be paid directly to the bank in order to pay off the farmers' loans. If there is no

drought the farmers will benefit from selling the higher value production. This arrangement, input lending coupled with a weather indexed insurance policy, has allowed the farmers in the pilot area to access new finance and by doing so invest in a higher yield, higher return activity. It has allowed the participating banks to expand their lending portfolio while mitigating their risk. Index based weather insurance could help farmers not only manage their risk but also free capital to invest in their farms.

## The Malawi experience

Agricultural lending is considered very risky by most financial institutions in Malawi and other sub-Saharan countries. Drought is usually cited as the greatest risk to the lenders as it has been shown that there is a very high correlation between drought and agricultural loan defaults. The World Bank drought index insurance seems to have been accepted by farmers, lenders and the insurers as the best way to manage drought risk. It is assumed that the rainfall received at the station is the same as that received by the farmer. Though this is usually not true, cases of severe drought will usually affect all farmers within a 20 kilometre radius in a similar manner. The insurance program aims to protect farmers against the potentially devastating effects of these severe droughts.

To clarify how the product works, consider the data from one weather station called Chitedze Research Station in Malawi. This station was part of a pilot scheme for groundnut farmers in Malawi during the 2005/6 growing season. There are three major growth stages of a groundnut plant, namely establishment and vegetative growth, flowering and pod formation, and pod filling and maturity. Agronomic research data shows that for the soil type around Chitedze a groundnut crop will start to suffer from water stress when the cumulative rainfall within each growth period is below the trigger level indicated in the table below.

Growth period	Days in growth period	Trigger (mm)	Limit (mm)	Payout rate per mm below trigger(MWK)	Sum insured per acre (MWK)
Establishment and vegetative growth	30	60	30	28.5	5,701
Flowering and pod formation	50	160	30	16.9	5,701
Pod filling and maturity	60	100	20	16.9	5,701

If the amount of rainfall received at the weather station is below 60 mm for the first phase, the insurer will pay MWK 28.5 (approx. \$0.20) per each mm below 60. However when the amount is below 30mm, which is given as the limit, the crop is expected to

have suffered from too much water stress that even if there are good rains thereafter, the crop will not recover. Thus at and below this trigger level, the total sum insured is payable. The interpretation is the same for all phases. At the end of the growing period, the payout from each phase will be added to come up with the total payout for the whole contract. If this amount is more than the loan given to the farmer i.e. 5701, the insurer's payout will be limited to the loan amount. The payout is made to the financial institution which then uses the amount to clear off the loan with any surplus passed on to the farmer.

The sum insured is made up of the cost of the seed, the cost of insurance, the loan amount, and the interest payable. The reason for including interest is that in cases of severe drought farmers will not be able to pay back anything and hence the insurer has to pay off the interest on the loan as well.

In the case of partial drought, the insurance payout as calculated from the schedule will be paid to the lending institution with the balance to be paid off by the farmer. In this pilot project, all the farmers who are growing this seed have signed agreements with the National Smallholder Farmers Association (NASFAM) whereby they are all required to sell the crop to it. NASFAM has memoranda of understanding with the lending institutions whereby it will deduct the amount owed by the farmer before giving them the balance of the proceeds. Where there is no drought NASFAM will deduct the whole loan amount and pay to the lenders. NASFAM will pay the farmers a price which is higher than they can get from alternative markets in order to ensure that they sell to them.

Another interesting feature with this product is the 'NO' sowing condition. Agronomic studies revealed that farmers usually plant their crop after receiving 25mm of rain within a ten day period. Farmers in Chitedze told us that they sow groundnut within the period 11 November to 20 January. The start date of the insurance contract is dynamic. The contract starts on the first day of the first dekad to receive 25mm of rainfall.

Each month is divided into three periods called dekads. The first two dekads are 10 days long with the last period comprising whatever days left in that month. Sowing is expected to occur within the period 11 November 2005 to 20 January 2006, i.e. in the first of the seven dekads to receive total rainfall equal or above 25mm. If recorded rainfall for each of the dekads is below 25mm then sowing would be assumed to have failed and insurers will pay off the farmer's total loan and interest.

So if the sowing condition is not met by end of sowing period, the insurer will make a payout and the client's debt will be cleared. It should be noted that there are times when the farmer will have plentiful rainfall and still receive a payment and vice versa. This is part of the "basis risk" of the product. It is important to remember the product's main benefit is when there is a catastrophic drought. Summary of the pilot statistics for 2005 / 2006:

Lender	Weather Station insured against	Farmers Insured	Sum insured per farmer / acre (MKW)	Premium per farmer (MKW)
OIBM	Kamuzu International Airport	464	5467.45	382.72
	Chitedze Research Station	116	5701.23	570.12
MRFC	Kasungu	231	5467.45	382.72
	Nkhotakota	83	5393.72	323.62

## Weather index implementation process

The success of the Malawi project has been underpinned by a rigorous nine step project implementation process that is described below.

### Step 1. Opportunity assessment

The first step is to ascertain if weather index insurance is actually achievable in the country - unless all of the essential elements are in place, it is unlikely that crop insurance will be successful. Opportunity assessment usually requires a site visit to all the stakeholders involved. These will include:

Meteorological services in order to determine data availability and infrastructure conditions. It is imperative to determine that sufficient weather stations are in place, and that they are working properly. Historical data going back 30 years is the standard requirement for designing these products. Although it is possible with less data, reinsurers are likely to add a data uncertainty margin to the premium if there is only say 20 years data.

Insurers in order to gauge their appetite for carrying the risk and understanding the product/market implications.

The insurance regulators in order to assess their view of the product and legal implications of launching a weather index product. If the regulator is not supportive, the pilot will not be able to commence and can cause significant delays.

Product distributors. Finding the right distribution channel for this product is key to its success. There are a number of potential distributors including banks, SAACOs, MFIs, and agri-business organisations. This is seen as the most important link in the distribution chain, and it is necessary that the distributor fully understands what risks weather index insurance can and cannot cover.

It is also necessary to understand the crop supply chain and to ensure that any distributor has sufficient commitment to the project. This must be more than an initial enthusiasm for what is seen as an exciting innovation, as the distributor will be the link to participating farmers.

Local agronomists and extension services. Such organisations, which might be university or government departments, provide agronomic and farming practice information required to build the complex weather index insurance model.

### **Step 2. Product design**

Actual product design starts with collecting detailed climatic and agronomic data and developing prototype contracts. Once all the data has been gathered and verified, contracts with key stakeholder are tested and product approval secured.

### **Step 3. Product pricing**

Following the product design, the next step is to undertake the detailed product pricing process, or if working with a reinsurer, develop term sheets and spreadsheets that allows the reinsurer to price the contracts. There is a need to take into account loadings such as commissions and taxes, and there may also be a need to do activity based costing with the product distributor to find out what their administrative loadings should be.

### **Step 4. Development of product administration tool kit**

A number of tools have to be developed including product workflows, product manuals, and contract monitoring sheets - a spreadsheet where users input rainfall amounts received at the weather stations, and a recording of whether a payout has been generated or not. The sheet is developed and agreed with all stakeholders and is password protected to ensure the spreadsheet is not corrupted.

### **Step 5. Client education**

It is normal practice to develop printed materials to be used by field officers to train the farmers about the principles of insurance, premiums and claims process. In many cases where insurance is introduced, there is a general lack of knowledge among farmers, and often a mistrust of insurance. These objections have to be overcome.

Experience has shown that one of the most effective ways of developing such tools is a workshop where the product is explained and stakeholders are requested to identify the features they think should be communicated to farmers. Ideally, these workshops should include some of the participating farmers as they can provide a valuable perspective on what their colleagues can understand and value.

### **Step 6. Farmer recruitment**

The first pilot scheme with ground nut farmers in Malawi, starting in the 2005-6 growing season involved smallholder farmer groups organized by the National Smallholder Farmers Association (NASFAM). Recruitment may be through a variety of farmers' cooperatives, product marketing organizations, or other social aggregators. Once the distributor is in place, key staff and field officers undertake training of trainer (TOT) sessions in order that they can then provide the necessary education at client level. They can then hold client training meetings and identify and register interested farmers.

### **Step 7. Risk transfer**

It is necessary that MOUs should be signed with key stakeholders, and especially the data providers to ensure appropriate and timely data delivery to all concerned parties. The product distributor then uses the farmer register to develop premium schedules which can be forwarded to the insurer. The policies are issued to the product distributor who acts as policyholder with the farmers. Where applicable, reinsurance arrangements are finalized.

### **Step 8. Contract monitoring**

Contract monitoring sheets and other product tools are distributed to relevant stakeholders who are obliged to enter appropriate data during the contract period.

### **Step 9. Claim processing**

If a claim has been generated, the contract monitoring sheet will reveal the amount, and the product distributor simply needs to fill out a claim form with amounts per weather station and send this to the insurer. The insurer will then make the payments within an agreed period, usually about 21 days.

## **Product options**

The first pilot schemes in Malawi were based on the standard three phase model that takes into account crop water requirement during vegetative growth, flowering, and maturity periods. Payouts are made if the aggregate rainfall received during each period is below the crop water requirement for that phase. This structure was used for groundnuts and maize, but experience in the field and discussion with product distributors and other stakeholders revealed a shortcoming in the model. If there is very little rainfall at the start of a phase but a lot of rainfall during the rest of the period, the model would mask the deficit and excess and show a normal reading. So

the aggregation over a period introduces some basis risk, i.e. the risk the farmers experience is sufficiently different from the insurance payouts.

The advantage of the three phase structure is that it is very easy for farmers to understand. This is a primary consideration where insurance is being introduced for the first time. This option will continue to be available to those farmers and distributors willing to accept this aggregation basis risk.

As a development in weather index crop insurance, MicroEnsure and local stakeholders developed a new model to address the deficiency in the existing model. The methodology for constructing this new model is described below:

**Step 1.** Split the crop growth period into one week or two week periods.

**Step 2.** Aggregate the amount of rainfall received in each block.

**Step 3.** Compare rainfall amounts received in each block with water requirements per block and note the per block excesses or deficits.

**Step 4.** Multiply each block excess or deficit by block weighting. This weighting is currently being determined subjectively through discussions with farmers and agronomists who have shown that certain periods are more drought or excess rain sensitive than others. For example, those periods when fertilizer is applied are given a higher weighting as a crop is likely to suffer if it experiences insufficient or excess rain at this point.

**Step 5.** Sum up the weighted deficits.

**Step 6.** Compare the weighted deficits or excess against the set trigger, and determine the amount over the trigger, if any.

**Step 7.** Multiply the amount over the trigger with the payout rate per mm to determine the total payout amount.

This model is capable of further more complex development that takes the weekly moving average and compares this with weekly water requirements. This is reflected in step 3 above. The length of the block in this model will vary according to the specific crop. For example, in Malawi, paprika would use 15-day blocks.

## **Prerequisites for programme success and expansion**

However well designed the product, implementation of weather index crop insurance in developing countries requires considerable on-going management and stakeholder inputs. The Malawi projects have demonstrated clearly how constant monitoring in the

field has resulted in the design of a more efficient model than the original three phase product. It should be noted that conditions in different countries, or even different regions of the same country, vary widely and it is difficult to imagine one model's being directly applicable to another situation without adaptation.

Several prerequisites have been identified as essential elements of promoting a successful crop insurance programme that will form a strong platform for increasing scale. Some of these are identified below:

A competent local project manager must be in place to ensure that all the complexities of the programme are effectively handled and stakeholder obligations are met.

A committed meteorological services authority is absolutely essential to provide timely and reliable data.

An adequate weather infrastructure must be in place with sufficient operational weather stations not only for pilots but also for future expansion.

The distribution channel must be competent as well as committed to the project. There has to be a sophisticated understanding of technicalities of insurance and agronomics, and outside expertise should be brought in supplement distributor knowledge where appropriate. The Malawi project has generated considerable interest throughout sub-Saharan Africa and beyond, and there is some danger that enthusiasm for weather index crop insurance in some markets will lead to experimentation at the expense of properly designed and planned projects. There is a real need to properly research and evaluate any potential project prior to commencement.

Finally, every crop insurance programme requires well capitalized risk carriers who have a clear understanding of the market. An understanding of data provision including the need for proxy data in some cases that increases the margin for error in pricing calculations, and profit limitations and opportunities in the rural agricultural market place.

## **Major challenges**

MicroEnsure has designed and refined weather index products since the initial Malawi groundnut pilot started in 2005. The many lessons learned highlight some of the major challenges that are still present in bringing index linked crop insurance to smallholder farmers throughout the developing world. We have designed drought and typhoon products that are planned for launch in the Philippines and products in Tanzania and Rwanda due to launch in 2009.

## **Some of these challenges are outlined below.**

Client education is, and will continue to be, a major challenge for crop or indeed, almost any type of microinsurance in the developing world. Our research in Africa and Asia, conducted through Microfinance Opportunities, has shown both lack of understanding of insurance and often little trust in insurance by potential clients. The situation will only be addressed by developing appropriate financial education for clients, and providing effective structured training of trainers in product distribution organizations. In Malawi, monthly Transformation' meetings are held with smallholder farmer groups to disseminate financial education and technical agricultural knowledge. One of the lessons learned is the need to hold periodic meetings with clients to assess knowledge uptake and address shortfalls in the curriculum.

Smallholder farmers are often unwilling to pay premiums for a stand-alone product. Our research has demonstrated time and again that one of the most frequently asked questions by clients is, "Do I get my premiums back if I don't make a claim?" This lack of understanding is frequently found among clients who have already taken out insurance.

Because risk is not verified on the ground with weather index products, they are open to basis risk as the risk of the experienced loss can fail to match the calculated loss.

There must be a sustainable value chain for the crops in the marketplace. Crop insurance is not a panacea. It can only work within existing supply chain mechanisms and is dependent on sufficiently developed infrastructures. The effects of other agricultural risks such as low selling price need to be factored into the complex equation.

## **Success Stories**

Although there has yet to be a drought leading to a significant number of claims, there is a significant impact on the livelihoods of poor farmers who have taken out crop insurance. They have been able to access agricultural loans for the first time enabling them to purchase drought resistant seed and fertilizers. This has produced dramatic increases in yield, often well over 200%, and has enabled farmers to diversify away from the staple maize into cash crops to supplement their incomes.

To date, there is a lack of scientific research into the impact of microinsurance in general and weather index products in particular. In the future, it is hoped that this gap will be filled by qualified industry researchers.

However, as first step MicroEnsure recently conducted a field survey of poor smallholder farmers in Malawi. This series of face-to-face interviews provides anecdotal evidence of the economic and social benefits of crop insurance coupled with agricultural lending. All of those interviewed experienced very significant increases in yields, and they all increased the cultivated area of their farms. All of them introduced at least one cash crop. Several were able to build new houses or barns and buy oxen and carts. They were able to send their children to school and open savings accounts.

Questioned specifically about yield, productive land, and farm improvements, the farmers provided the following results in just two growing seasons:

- 100% increased their crop yield
- 100% increased the amount of land in production
- 100% diversified into from staple cash crops
- 66% bought oxen or ox carts, or both
- 33% built new barns or other farm buildings from increased earnings
- 33% were planning to introduce irrigation in order to increase the growing season

Asked what other socio-economic benefits resulted:

- 33% were able to build new brick houses
- 50% increased the amount of schooling for their children
- 50% opened savings accounts
- 100% received financial and technical education
- 100% expressed confidence in their financial future education

The last words are from Harry Kafakalunda, one of the smallholder farmers surveyed, “The benefits for me are a better living standard, better food, I have been able to build a better house, and I have bought an ox cart from last year’s earnings. This would not have been possible before.”

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