The Potential for Scale and Sustainability in Weather Index Insurance

for Agriculture and Rural Livelihoods

WFP

IFAD

Enabling poor rural people to overcome poverty

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Acronyms

AIC	Agriculture Insurance Company of India
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CIRC	Chinese Insurance Regulatory Commission
CONAGUA	National Water Commission, Mexico
CRMG	Commodity Risk Management Group, World Bank (now Agriculture Risk Management Team)
EROS	Earth Resources Observation and Science Center, U.S. Geological Survey
FAO	Food and Agriculture Organization of the United Nations
FCIC	Federal Crop Insurance Corporation, United States
GAIC	Guoyuan Agricultural Insurance Company, China
GRM®	Municipalized Risk Group [Grupo de Risco Municipalizado], State of Rio Grande do Sul, Brazil
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFFCO	Indian Farmers Fertiliser Cooperative
IMD	India Meteorological Department
INISER	Nicaraguan Insurance Institute [Instituto Nicaragüense de Seguros]
IRI	International Research Institute for Climate and Society, Columbia University
ITGI	IFFCO Tokio General Insurance Company, India
LAFCU	Lume Adama Farmers' Cooperative Union, Ethiopia
LEAP	Livelihoods, Early Assessment and Protection (software application), WFP and World Bank
M&E	monitoring and evaluation
MPCI	multi-peril crop insurance
NAIS	National Agricultural Insurance Scheme, India

NASFAM	National Smallholder Farmers' Association of Malawi
NBFC	Non-Bank Financial Company
NDVI	Normalized Difference Vegetation Index
NISCO	Nyala Insurance Company, Ethiopia
NMA	National Meteorological Agency, Ethiopia
NOAA	National Oceanic and Atmospheric Administration, United States
PAC	primary agricultural cooperative society, India
PACC	Climate Contingencies Programme [Programa de Atención a Contingencias Climatológicas], Mexico
PRF-RI	Pasture, Rangeland, Forage Rainfall Index Pilot Programme, United States
PRF-VI	Pasture, Rangeland, Forage Vegetation Index Pilot Programme, United States
PROAGRO	Programme to Guarantee Agricultural Activities [Programa de Guarantia da Atividade Agropecuária], Brazil
PSNP	Productive Safety Net Programme, Ethiopia
PTTS	Seed-Swapping Programme [Programa Troca-Troca de Sementes], State of Rio Grande do Sul, Brazil
REST	Relief Society of Tigray, Ethiopia
SAA	Department of Agriculture and Supply [Secretaria de Agricultura e Abastecimento], State of Rio Grande do Sul, Brazil
SMS	Short Message Service
WBCIS	Weather Based Crop Insurance Scheme, AIC, India
WFP	World Food Programme
WMO	World Meteorological Organization
WRMF	IFAD-WFP Weather Risk Management Facility
WRMS	Weather Risk Management Services, India
WRSI	Water Requirement Satisfaction Index, FAO

Executive summary

Risk is inherent in agriculture. Farmers face a variety of market and production risks that make their incomes unstable and unpredictable from year to year. Input prices may increase out of reach, crops may be destroyed by drought or pest outbreaks, selling prices may plummet and harvests may rot in poor storage facilities. In many cases, farmers also confront the risk of natural catastrophe. Assets and lives may be lost due to severe droughts, hurricanes, earthquakes and floods. The type and severity of the risks confronting farmers are particularly burdensome to small-scale farmers in the developing world. Unless adequately managed, agricultural risks slow economic development, hamper poverty reduction and contribute to humanitarian crises.

Many risks can be managed. Farmers, rural communities, financial service providers, input suppliers, private insurers and relief agencies each have strategies for coping with chronic and catastrophic risk. But the difficulties and costs involved in managing covariate risk (those risks that affect large numbers of people at one time) are especially challenging. Farmers and rural communities typically cannot manage covariate risk without outside help. Unfortunately, outside help faces many challenges. Financial service providers have limited their activities in rural areas. Input suppliers typically serve only the least risky clients. Even help from governments and relief agencies is costly and can be ineffective.

In recent years, however, an increasing number of pilot programmes have tested an innovative idea in managing covariate risk in agriculture: index insurance.[1] Weather index-based insurance is a financial product linked to an index highly correlated to local yields. Indemnifications are triggered by pre-specified patterns of the index, as opposed to actual yields, reducing the occurrence of moral hazard and adverse selection and eliminating the need for in-field assessments. In addition, because the insurance product is based on an independently verifiable index, it can also be reinsured, thus allowing insurance companies to efficiently transfer part of their risk to international markets.

The Weather Risk Management Facility, a joint undertaking of IFAD and WFP, reviewed a range of recent experiences with index insurance programmes around the world, analysing the key actors, features of the products, and their successes and challenges. These pilot programmes have demonstrated the great potential of index insurance as a risk-management tool. They suggest that index insurance could not only provide an additional effective, market-mediated solution to promote

[1] This paper focuses on the use of weather index-based insurance, but will also use the term ‘index insurance’ for the sake of simplicity and brevity.

agricultural development, but it could also make disaster relief more effective. As such, index insurance can benefit clients beyond agricultural producers: governments, relief agencies, financial service providers, input suppliers, businesses, agricultural processors, food companies, farmers' organizations and producers' associations could all use index insurance.

While the potential benefits of index insurance are great, implementation can be difficult. Small producers often do not understand the benefits of insurance – and often cannot afford it. The cost of premiums, especially in major scaling up, can be daunting. But high premiums can put index insurance out of the reach of those who need it most. Subsidies for index insurance are an option, although subsidies carry their own problems.

However, even when producers want and can afford index insurance products, insurers are not always prepared to offer them. It is noteworthy that in nearly all the cases examined for this paper, private insurers were not the first to offer index insurance. The public sector, multilateral agencies and NGOs appear to have taken the lead, in part because private insurers feel constrained by the 'first mover' problem; that is, the first insurer that invests in research and development of index insurance products will not be able to prevent competitors from copying them. This reluctance by the private sector appears to be compounded by the high-basis risk associated with too few weather stations, the lack of awareness of insurance among clients, and the need for marketing intermediaries. At a minimum, the challenges and costs of retailing directly to producers make the use of aggregators such as farmers' organizations, financial service providers and food processors essential.

The many hurdles indicate that important public goods need to be in place, and a facilitating role played by non-profit organizations, donors, and others, in order to launch index insurance in most regions. Without such an infrastructure, private insurers are unlikely to break into the sector. For the scaling up of index insurance, governments and donors will need to intervene more actively by playing important enabling and facilitating roles and supporting the development of the sector. Key support areas for governments and donors include:

- Providing ongoing technical assistance, training, and product development;
- Educating clients about insurance;
- Promoting innovation;
- Facilitating access to reinsurance;
- Developing national weather services, infrastructure, data systems and research;
- Creating an enabling legal and regulatory environment, and designing sound national rural risk-management strategies; and
- Supporting impact studies.

This analysis has distilled eight principles to help index insurance reach scale and sustainability:

- Create a proposition of real value to the insured, and offer insurance as part of a wider package of services;
- Build the capacity and ownership of implementation stakeholders;
- Increase client awareness of index insurance products;
- Graft onto existing, efficient delivery channels, engaging the private sector from the beginning;
- Access international risk-transfer markets;
- Improve the infrastructure and quality of weather data;
- Promote enabling legal and regulatory frameworks; and
- Monitor and evaluate products to promote continuous improvement.

While not a panacea for poverty, nor the sole solution for at-risk producers, index insurance shows great promise as a tool to reduce the severe effects of weather-related phenomena on people who depend on agricultural production for their livelihoods. Index insurance seems to be more effective when part of a larger package of risk management strategies and services. Given the consequences of global climate change, index insurance may also play a role in supporting adaptation strategies in developing countries. To be successful, index insurance will require great public and private investment, as well as a willingness to measure success objectively and adjust strategies accordingly.

Chapter 1
Risk in agriculture

The problem

Agricultural production is a risky business. Farmers face a variety of price, yield and resource risks that make their incomes unstable and unpredictable from year to year. In many cases, they are also confronted by the risk of catastrophe. Crops may be totally destroyed by drought or new pest outbreaks, input costs may increase and product prices may plummet because of adjustments in local or world markets, and assets and lives may be lost due to hurricanes, fires and floods. The types and severity of the risks confronting farmers vary by farming system, agroclimatic region, local policy, and institutional settings, but agricultural risks are particularly burdensome to small-scale farmers in the developing world. Their livelihoods depend to a large extent on agricultural production, and their access to formal financial services is usually very limited. Unless well managed, agricultural risks slow economic development and poverty reduction, and contribute to humanitarian crises.

Types of risk in agriculture

Risks can be characterized according to a number of elements, including:

Covariance. The degree to which they are correlated across households within a community or region, ranging from independent (affecting one person) to highly covariate (affecting everyone at the same time);

Frequency. How often they occur;

Types and severity of losses incurred. Shortfalls in seasonal production and income, damage to assets and loss of life.

As illustrated in Table 1, at one extreme are highly covariate risks that generally occur with low frequency (such as floods, hurricanes and severe drought), but that can have catastrophic impacts within affected regions. For example, the 2002 drought in Ethiopia affected most of the country and led to 12.5 million people requiring food aid. In addition to short-term humanitarian challenges arising from loss of life, production and income, the associated loss of or damage to key assets can make recovery slow and uncertain. Without help, many people may slip into long-term poverty.

At the other extreme, there is a wide array of risks that are weakly if at all covariate, but that occur with high frequency. These risks impact more randomly on individual households (e.g. deaths and illnesses of people or livestock), but the proportion of total households affected each year is often predictable. Many of the risks that affect seasonal yields and production are the result of localized weather and pest problems that affect groups of households – or even just some fields within a farm. For example, a severe frost might be localized to a mountain valley, or an aphid attack might destroy a minor crop within a single community.

Between these two extremes lie a variety of risks that are moderately covariate and that occur with moderate frequency. These include losses in production and income or damage to assets due to less-severe drought, excess rainfall, or market and price

Table 1. Types of risk and loss – and local capacity to cope

Type of risk		Type of loss			
Degree of covariance	Frequency	Life	Assets	Seasonal production/ income	Examples
High	Low	Widespread loss of life and injuries from catastrophic weather events such as hurricanes, floods or severe drought Little or no capacity to cope locally; recovery is difficult and slow	Widespread loss of homes and productive assets from catastrophic weather events Little or no capacity to cope locally; recovery is difficult and slow	Impacts of catastrophic weather events on regional production and income can be severe, with limited local coping capacity Recovery can be slow if lives and assets are also lost	Catastrophes such as tsunami, severe drought, flood, hurricane or earthquake
Medium	Medium	Some loss of life and widespread health problems can arise from seasonal malnutrition Moderate capacity to cope with the effects of the shock locally; recovery occurs	Widespread loss of animals from drought or contagious diseases Moderate capacity to cope locally and slow recovery. Some people fall into poverty traps	Loss of income from poor market prices; regional production and income impacts can be widespread owing to shrinkage of the rural non-farm economy Moderate capacity to cope locally and quick recovery if assets are not lost as well; some people fall into poverty traps	Less-severe drought or excess rainfall in critical periods, new pest outbreaks and animal diseases
Low	High to medium	Deaths, accidents and illnesses that affect a predictable share of the population each year Some local capacity to pool these risks, but recovery from losses can be slow for the households involved	Loss, damage or disease of a predictable share of the total stock of homes or productive assets each year Good local capacity to pool these risks, but recovery from losses can be slow for the households involved	Low yields for some farmers due to a variety of localized weather and pest problems Good local capacity to cope with these risks; recovery is usually quick	Localized weather and pest problems (e.g. frost in a particular valley, pest outbreak in certain fields)

risks. These kinds of risks can have widespread economic ramifications throughout a regional economy. Agricultural losses affect farm incomes, other agricultural wages and food supplies. They spill over into the rural non-farm economy when people who earn incomes in the agriculture sector cannot afford to purchase other goods and services for their households. Widespread defaults on loans undermine rural financial systems. The loss of productive assets can push households into poverty, from which it may be difficult to recover in subsequent years.

How risks are traditionally managed

Over time, those involved in the agriculture sector have developed a range of relevant risk-management practices. Rural households and communities, financial institutions, agricultural traders, private insurers, relief agencies and governments all use a variety of both ex ante measures to reduce risk exposure and ex post methods of coping when losses occur.

Households and communities

At the micro level, rural households have developed a wide range of methods for managing many of the more frequent and weakly covariate risks. Ex ante measures include crop diversification, farm fragmentation and share-cropping; ex post methods include using credit, temporary employment and savings. Communities also play important roles. Within communities, people pool risks among households; for example, they may share food stocks or rely on kin support networks. Among communities, risk-sharing arrangements help manage some of the more covariate risks affecting assets and seasonal production and income – for example, transhumant grazing rights among pastoral groups help protect livestock production and breeding animals (McCarthy et al. 1999).[2]

These household and community risk-management methods are surprisingly effective at handling risk, and they have enabled rural societies to survive over countless generations, even in many arid and semi-arid regions subject to severe drought. But they do have significant limitations.

Risk-avoidance strategies can have high opportunity costs (e.g. the income foregone by not exploiting the most profitable land uses and technologies because of their higher risk). Some studies estimate that average farm incomes could be 10-20 per cent higher in the absence of risk (Gautam, Hazell and Alderman 1994; Sakurai and Reardon 1997). This trade-off between risk and average income increases greatly with the level of risk aversion (Hazell, Bassoco and Arcia 1986). Despite their best efforts to manage risk, farmers are still perceived as risky borrowers by banks, and this perception reduces their access to credit and raises interest charges. The net effect of these limitations can be to trap farmers in low-productivity farming.

[2] 'Transhumance' is the seasonal migration of livestock to suitable grazing grounds.

Traditional risk-management arrangements frequently fail to provide an adequate safety net for the poor, especially against high-severity, low-frequency risks. Owning few assets, poor people have few options for coping with significant losses. They are often forced to sell important assets used for daily survival and income (e.g. livestock), or to use savings, which further adds to the long-term impact of natural hazards. Following local production shocks, they are also more exposed to food price increases and to any contraction in local employment opportunities and wages. There is a growing literature showing that repeated asset losses and income shocks can conspire to keep poor households trapped in poverty (Barnett, Barrett and Skees 2008).

Traditional risk-management methods are least effective at handling low-frequency, highly covariate risks that affect many people simultaneously (Sarris and Christiansen 2007). These events can overstretch the capacity of kin support networks and other community coping measures. They may also involve loss or damage of assets, making recovery more uncertain and slower. Many vulnerable people can slip into poverty and become trapped. These failures are all the greater when major life-threatening catastrophes occur.

As a covariate risk, drought shows some of the most dramatic evidence of the failure of traditional coping strategies. Detailed studies of the impact of severe droughts in Ethiopia (Webb and von Braun 1994), eastern India (Pandey, Bhandari and Hardy 2007) and southern India (Hazell and Ramasamy 1991) all show that, in percentage terms, income losses can far exceed initial production losses, because after the initial shock, there is an associated collapse in local agricultural employment and wages, non-farm income and asset prices. Broader evidence of the impact of weather shocks confirms not only the significant short-term hardships that result, but also how temporary health and nutrition problems and the loss of productive assets such as livestock can undermine long-term earning capacity (Fuente and Dercon 2008; López-Calva and Juárez 2008; and Grosh et al. 2008).

In many areas, risk management is further undermined by growing population pressures on natural resources, leading to greater vulnerability when risk events occur. What was once a manageable shock can now be a catastrophe. Flooding, for example, can have a more severe impact on livelihoods as population pressures push communities onto the more arable land near waterways, which is also more susceptible to flooding. Smallholders in developing countries are extremely vulnerable to such natural disasters, as nearly 75 per cent of the 1.3 billion people living on less than a dollar a day depend on agricultural activities (World Bank 2007). Many live on ecologically fragile land and depend on agriculture, livestock production, fisheries and forestry. Climate change is also increasing the frequency and severity of many weather-related risks, further undermining the effectiveness of traditional risk-management methods.

Financial service providers and input suppliers

Banks and other financial service providers are often reluctant to lend in rural areas or for agricultural activities because they perceive them to be risky. They are especially concerned about covariate risks (as many borrowers working in the same sector may face a severe shock at the same time and default on their loans), but even independent risks can be difficult to manage (rescheduling loans with small-scale farmers is costly, and eventual repayment is uncertain).

These issues compound the already difficult challenges in offering financial services to rural communities. The rural population is more widely dispersed, and the infrastructure may be poor and more susceptible to problems. Customers in rural areas demand a different range of products than urban clients, and this may require diverse, highly tailored systems, staff capabilities, marketing campaigns, and so on. In addition, the overall capacity of potential staff in rural areas may be more limited. Longer searches and more training would be required in order to staff rural branches.

Thus, when working in rural areas, financial institutions place a great deal of emphasis on ex ante risk reduction. Microfinance institutions use borrowing groups to self-manage independent risks that affect the repayment capacity of individual households. Commercial banks tend to require collateral and to lend to larger farmers in less risky regions. The net result is less lending to agriculture than the sector demands, particularly among smallholders living in higher-risk areas.[3] Many microfinance institutions simply avoid lending for agriculture.

Many input suppliers (such as those selling seed and fertilizer) could sell on credit, but they have limited capacity to handle the covariate risk associated with agriculture. As a result, they must require payment on delivery – a requirement that many small-scale farmers cannot meet. Thus high-risk areas are trapped in a vicious circle.

Private insurers

Private insurers have typically been reluctant to insure crop and livestock yields. Moral hazard and inadequate risk assessment information make product design difficult. The high frequency and covariate nature of certain risks can expose insurers to large payouts. As a result, premium rates are often too expensive for many farmers to afford without subsidies.

Private insurers prefer to sell microinsurance against independent risks, such as life, fire and accident insurance. In the few cases in which they do offer crop insurance, they limit it to specific perils such as hail or frost damage – and they mostly sell to commercial farmers for high-value crops (e.g. large grain growers in South Africa, or vegetable growers in Mexico who export to the United States).

[3] Of course, lenders should not be expected to make all loans in extremely fragile environments (e.g. crops that require a lot of water in drought-prone areas); but most lenders avoid risk altogether.

Governments and relief agencies

Governments and relief agencies frequently intervene where losses have a catastrophic impact and the local coping capacity is weak or non-existent. Driven by humanitarian concerns, their primary objective is to save lives and rebuild assets. Although humanitarian interventions have proven indispensable in times of need, they have also been beset by a number of problems:

- It is difficult to target relief aid to the truly needy; large leakages to others are common.
- Emergency relief might arrive too late.
- Food aid can distort incentives and depress local prices for farmers. Moreover, once disaster assistance has been institutionalized, and people know they can rely on it, people may inadvertently be encouraged to increase their future exposure to potential losses. Assured compensation for flood damage to homes, for example, can lead to the construction of more houses in flood-prone areas.
- Funding for humanitarian relief in the face of catastrophes is not assured, and it often depends on appeals to international donors after the crisis has already occurred.

Many governments have attempted to help farmers manage more frequent and less covariate risks in order to protect assets and promote development (e.g. crop insurance and livestock feed programmes during droughts). The experience has generally been unfavourable, at a high cost with low gain. These kinds of risks are subject to moral hazard and asymmetric information problems, and their higher frequency makes the premiums too expensive for farmers, unless they are heavily subsidized. The government itself may find this level of support unsustainable over time; and the loss adjustment and payout process can be difficult to manage effectively.

When assessing vulnerable populations, governments have typically failed to adequately differentiate between those who can afford insurance and those who cannot. If suitable commercial risk-management instruments are available, some households are quite capable of bearing and managing most of the risks they face and do not need access to subsidized government interventions, except in the event of major disasters. But there are many vulnerable households that lack this capacity, and for which all risk-management interventions serve primarily as social safety nets. These safety nets can only be provided on a heavily subsidized basis. Mixing these two types of clients leads to the design of public interventions that are heavily subsidized for all and that end up being very costly, both in terms of their direct government cost and the economic inefficiencies they create through distorted incentives. If a clear distinction between the needs of these two types of households could be precisely differentiated, then more-efficient, targeted instruments could be designed.

Chapter 2
Weather index-based insurance

The concept of index insurance is not new.[4] Proposals for this type of insurance were first articulated by Halcrow (1948) and Dandekar (1977), and area-yield insurance has been tried on a heavily subsidized basis in Canada, India, Sweden and the United States (Miranda 1991; Mishra 1996; Skees, Black and Barnett 1997). The Australian Government commissioned a feasibility study of rainfall insurance in the mid-1980s, but decided not to pursue it (IAC 1986).

Index insurance is a financial product linked to an index highly correlated to local yields. Contracts are written against specific perils or events (e.g. area yield loss, drought, hurricane, flood) that are defined and recorded at regional levels (e.g. at a local weather station). Indemnifications are triggered by pre-specified patterns of the index, as opposed to actual yields, which eliminates the need for in-field assessments. In addition, because the insurance product is based on an independently verifiable index, it can be reinsured, thus allowing insurance companies to transfer part of their risk to international markets.

All buyers in the same region are offered the same contract terms per dollar of insurance coverage. That is, they pay the same rate of premium and, once an event has triggered payouts, receive the same rate of payout; their total payout depends on the value of the insurance coverage purchased. Payouts can be structured in a variety of ways, ranging from a simple zero/one contract (i.e. once the threshold is crossed, the payment rate is 100 per cent), through a layered payment schedule (e.g. a one-third payment rate as different thresholds are crossed), to a proportional payment schedule.

There are several advantages to index insurance. Since all buyers of the same contract pay the same premium and receive the same indemnity per unit of insurance, regardless of their actions, index insurance avoids the problems of adverse selection and moral hazard. Thus a farmer with rainfall insurance possesses the same economic incentives to manage her crop as an uninsured farmer.

Once established, index insurance can be less expensive to administer than traditional agricultural insurance, because there are no on-site inspections or individual loss assessments to perform. It uses only the data of a regional index, which can be based on data that are available and generally reliable. At the extreme, contracts could

[4] This paper focuses on the use of weather index-based insurance, but will also use the term 'index insurance' for the sake of simplicity and brevity.

even be rather like traveller's cheques or lottery tickets to any willing buyer, though the existing insurance law in many countries would not allow this option.

Index insurance also has its disadvantages. It is expensive to launch: significant resources and technical expertise are required to conduct the initial research and development, build the capacity of local insurers and others in the delivery channel, effectively raise the awareness of potential clients and market the product, and, in some cases, access data.

Index insurance is potentially useful at different levels: at the micro level, households can benefit from the additional risk-management strategy; at the meso level, financial service providers, input suppliers and traders can balance their portfolios and manage certain business constraints; and at the macro level, index insurance can aid governments and relief agencies in development and disaster management.

Table 2. The framework – index insurance for disaster relief and development, and the various beneficiaries

	Index insurance for disaster relief	Index insurance for development
Macro Government	Government protects itself against shocks: early liquidity/ first relief outlays	Government reinsures insurers
Relief agency	Funds its operations through an index-based risk-transfer contract or provides coverage through an index trigger contingent voucher	
Meso Financial service provider (FSP)	Government could use banks, FSPs, input suppliers, farmers' associations and NGOs to distribute vouchers for catastrophe insurance	FSP buys portfolio insurance or group insurance to retail to farmers, linked to credit
Farmer association		Farmers' association buys group insurance to retail to farmers, linked to credit
Input supplier		Input supplier buys group insurance to retail to farmers, linked to input purchases
NGO		NGO buys group insurance to retail to farmers
Micro Farmer	Farmer receives explicit, redeemable, predictable coverage against a well-defined shock, and the premium is paid for mostly by government	Farmer buys insurance as part of a package (e.g. credit and other financial services, technology, agricultural information)

Drawing on social protection literature (Grosh et al. 2008) and a recent publication on index insurance by the International Research Institute for Climate and Society (Hellmuth et al. 2009), one sees that index insurance can be used as a tool for disaster relief or for development:

Index insurance for disaster relief would protect people – their lives, health and assets – against catastrophic losses. It could help save lives and livelihoods through faster, more cost-effective responses to disasters.

Index insurance for development helps farmers protect their investments, can open doors to ways to increase incomes (e.g. contract farming, access to credit), and can be part of a wider strategy to help farmers escape poverty.

Of course, these two roles are not independent, but the primary objective of the products will be different, and thus the design, delivery channels and clients of these products will also be different.

Index insurance for disaster relief

Index insurance could help manage catastrophic and highly covariate risks such as hurricanes, floods and severe (possibly back-to-back) droughts. The clients for these products would typically be the public or NGO relief agencies that respond immediately after catastrophes. The purpose is to provide rapid and early assistance to help affected people cope with and recover from natural disasters. The insurance should be written against weather events that correlate highly with loss of life, livelihoods and major assets, and for which public relief is often given.

One way the relief agency could use index insurance would be to retain the insurance payouts and use them to directly fund its own relief efforts (Case Study 1: Mexico). The index insurance could provide timely and certain access to funds in the event of an insured catastrophe. By selecting a weather-based index that is an early or lead indicator of an emerging crisis, an insurer can make quick payments to relief agencies and households, avoiding the usual delays incurred when relief agencies must first demonstrate an emergency and then appeal for donations from governments and donors. Studies have shown that the earlier that relief arrives after a shock, the greater its effectiveness in cushioning adverse welfare impacts, avoiding the distress sale of assets and speeding up recovery (Dercon, Hoddinott and Woldehanna 2005).

As another approach, the relief agency could work in an ex ante manner and distribute insurance vouchers every year to targeted households, which could then cash them in during an insured emergency and use the funds for their own discretionary purposes. These benefits could be amplified if relief agencies distributed insurance coupons to households in advance of a catastrophe, since households could then have direct access to cash to meet some of their immediate needs. The use of vouchers would enable relief to be more precisely targeted to the more vulnerable households. Since the voucher distribution would be undertaken annually, appropriate targeting procedures could be developed, avoiding the more chaotic allocations and associated leakages that can arise when relief must be hastily distributed. There are many questions and challenges associated with this idea that still need to be fully considered, including the logistical and operational implications of retailing such vouchers (e.g. what would happen if potential beneficiaries lose their vouchers in the catastrophe?; where could beneficiaries redeem the vouchers if the catastrophe chokes off supplies to markets and dramatically increases the price of what is left?), the massive raising of public awareness required, and the risks to the reputation of the relief agency, among others. In practice, some combination of the first and second options may be best.

Using index insurance for disaster relief would also have implications for the way relief is funded. Instead of ad hoc fundraising whenever emergencies arise, the financial needs of relief agencies could be annualized in the insurance premium. Governments and donors would then face a predictable annual contribution, which could be easier to budget for. However, changeable government objectives and donor priorities could undermine the sustainability of this approach over time.

Index insurance for development

Index insurance for the promotion of agricultural development seems most promising for helping households, financial service providers and input suppliers manage low- to medium-frequency, covariate risks such as drought, major pest outbreaks and excess rainfall (see Table 2 on page 23). To serve a development purpose, the index should be defined against events that are highly correlated with regional agricultural production or against the loss of key productive assets. However, extending insurance to high-frequency, weakly covariate or independent risks (e.g. localized hail damage or small-scale flood events) would make it difficult to identify regional indices that have an acceptably low level of basis risk (the potential mismatch between index-triggered payouts and the actual losses suffered by the policy holder). Moreover, households and financiers often have alternative and more cost-effective ways of managing these less covariate risks (see Table 1 on page 14).

With development-focused index insurance, households can play an important role in protecting their productive assets and consumption, thereby putting themselves in a position to pursue riskier, but potentially more profitable farming strategies. However, these gains may be too modest on their own to justify paying an unsubsidized insurance premium each year.

The real payoff from development-focused index insurance arises when it unlocks access to high-value markets, modern technologies and inputs, agricultural information, and credit and other financial services (Case Study 2: India – PepsiCo). Such comprehensive agricultural development packages can lead to game-changing increases in farm productivity and income. For example, financial service providers and input suppliers may be more willing to provide credit to farmers who insure their loans with index products. Moreover, there could be a formal link between the insurer and the financial service provider, so that the lender is assured access to part or all of the insurance payout in the event of a default caused by an insured risk. The insurance could be packaged with the loan, enabling the bank to collect directly from the insurer.

A key question is whether index insurance for development can reduce poverty. The literature on poverty suggests that insurance can sometimes allow poor people to leverage significant growth in their livelihoods and avoid slipping back – or deeper – into poverty in bad years. But index insurance targeted to this group may need to be subsidized, at least in its early stages, before insured households have

Box 1. PepsiCo contract farming and index insurance

To protect the farmers in its supply chain from weather events, PepsiCo offers index insurance as part of its contract farming programme. The insurance is sold through the ICICI Lombard General Insurance Company, an international insurer, and managed by Weather Risk Management Services (WRMS), a private broker and weather station operator. PepsiCo added index insurance to its contract farming package not only to limit farmers' weather risk, but also to establish long-term relationships with farmers and limit the risk in its supply chain.

In its contract farming arrangement, PepsiCo offers an extensive package of services: high-quality potato seed; access to fertilizers, pesticides and other chemicals; technical advice on production practices; fixed purchase price and incentives from the beginning of the season; weather information and advisories via mobile phone Short Message Service (SMS); and the index insurance.

PepsiCo sets a base buy-back price for its contract farmers at the beginning of the season and offers incremental price incentives according to:

- Quality of the potatoes (+Rs 0.30/kg);[5]
- Use of fertilizers and pesticides (+ Rs 0.25/kg); and
- Purchase of index insurance (+Rs 0.15/kg).

In PepsiCo's experience, the main drivers that influence a farmer to purchase index insurance include:

- Higher buy-back price from PepsiCo;
- Ability to finance the premium and other production costs through a loan;
- Trust in the various actors involved (e.g. corporation, processor, insurer, local representatives);
- Demonstration of timely payouts in previous seasons;
- Perceived need to mitigate the risk of losing the significant upfront costs of production, in part to cover the production costs for the following season; and
- Dissatisfaction with the government area-yield insurance programme.

Overall, in the PepsiCo contract farming programme, index insurance plays an important role in a wider package of services and information that links smallholders to markets.

[5] In March 2009, US$1=50.56 Indian rupees (Rs).

achieved sufficient income growth to afford the premiums. Of course, subsidies on a longer-term basis can create perverse incentive problems. Nevertheless, their use may still be a more cost-effective and less distorting approach than some types of safety net programmes.

Another important question is whether to insure development providers or to insure farmers directly. Each strategy has potential benefits and pitfalls.

There is continuing debate as to whether financial service providers (or other actors in the supply chain) would be interested in using index insurance to cover their own lending portfolios against low-frequency, highly covariate events. In principle, such policies would protect their capital against widespread defaults during major catastrophes. But these policies would not help their household-level borrowers cope with risk, nor would they help repair providers' relationships with clients after the clients have defaulted. The provider would still have the bad loans on its records, and it would be very reluctant to lend to these borrowers again. As a result, financial service providers may prefer that their borrowers use the index insurance as part of their household risk-management strategy and thus deal directly with the risk where it occurs. In this case, the ultimate responsibility for repaying the loan remains with the individual borrower, while in times of distress, the payouts from the index insurance would repay the debt and prevent the eventual rescheduling of or default on the loan.

That said, the retailing of products such as index insurance directly to individuals is the most difficult, time-consuming and costly approach, particularly in developing economies with limited access to financial services. The use of aggregators (e.g. agricultural processors, input suppliers, financial service providers, farmers' associations) is key to reducing these transaction costs, reaching more clients, and eventually bringing the reach of the products to a meaningful scale. To achieve this, index insurance products could be designed to cover the portfolios of aggregators as well as the household-level risk of individual farmers. Under this strategy, the aggregators that are still facing major systemic risks could mitigate part of the risk with an index insurance policy, while a longer-term effort reaches out to cover individual households with index insurance as part of a wider development and disaster management approach.

Challenges for index insurance

Demand

Relief agencies would provide the demand for disaster-relief index insurance. While the number of contracts written may be few, their size could be large enough to constitute a market and attract bids from international insurers. There are many areas in which humanitarian crises are sparked by major weather shocks, and where public and NGO relief agencies could usefully be insured with an index product. An important constraint, however, would likely be the hesitation of governments to use public funds to pay insurance premiums that in most years do not generate a visible return. Another constraint is the tendency of policymakers to underestimate the frequency and impact of low-probability, covariate events. The demand for this kind of insurance is currently stimulated by multilateral agencies such as the World Food Programme (WFP) (Hess, Wiseman and Robertson 2006) and the World Bank (World Bank 2009, 24), and programmes along these lines have emerged in a few countries (Case Studies 1 and 3).

Demand for development index insurance will most likely come from regions where the assets and livelihood strategies of farm households are widely exposed to weather-related risks. Drought insurance, for example, might be an attractive proposition in drought-prone agricultural areas. Studies in drought-prone areas have demonstrated that farmers are often willing to pay 12-20 per cent above the pure risk cost for drought insurance (Gautam, Hazell and Alderman 1994; Sakurai and Reardon 1997; Binswanger and Sillers 1984; McCarthy 2003). In contrast, demand would likely be low in an agricultural area located near an urban manufacturing centre, where farmers have important sources of non-farm income that reduce their vulnerability to drought; similarly, an irrigated agricultural area with assured water supplies would likely show little demand.

Demand for development index insurance has been an important question in China. Data from the National Statistics Bureau indicate that revenue from agricultural activities accounts for only one third of the total income of a smallholder in China. Many farmers engage in other activities to generate income and diversify risk (e.g. seasonal work in town, small businesses). In addition, production costs are low, representing approximately 7-9.5 per cent of total income, meaning that some farmers consider the cost of insurance that would cover only production costs unappealing (Case Study 4: China).

Farmers' willingness to buy insurance may be greater when it is tied to credit. Their willingness is also greatly influenced by their knowledge of how index insurance works, socio-economic factors such as education, and their initial level of wealth (Patt et al. 2009; Giné, Townsend and Vickey 2008). This finding suggests that the demand for insurance can be increased through promotional and educational efforts. Of course, the manner in which products are designed and marketed is also important, as is the perceived reliability of the insurer or intermediary providing the insurance (Patt et al. 2009).

Though farmers may be willing to pay what they consider an affordable premium, the actual premium depends on the cost of the pure risk premium. If the probability of the insured event is too large, then the pure risk cost can become prohibitive. As a practical rule of thumb, events that occur more frequently than once every seven years may be too costly for most farmers to insure without a subsidy. While insurance might initially seem too expensive for many households, it could become more affordable if it overcomes barriers to technology, high-value markets, or credit and other financial services, and enables insured households to significantly increase their expected incomes.

More generally, demand for index insurance may be constrained by the availability of other government risk-management interventions, such as subsidized crop insurance, bank credit guarantees, or relief employment programmes. In India, for example, the private provision of weather insurance was crowded out by a heavily subsidized area-yield insurance programme provided by the Government. Once it started subsidizing premiums for private insurers as well, sales of policies sold by private companies increased noticeably. In China, the Government began making

Box 2. Using role-playing games to understand farmer demand for index insurance

Farmers often have difficulty understanding insurance products; they lack experience with them and have little trust in insurers. These conditions pose serious challenges to any scaling-up efforts, particularly with regard to the index-based microinsurance products bundled with credit for inputs, such as improved seed or fertilizer.

Building on previous experiences, the IFAD-WFP Weather Risk Management Facility (WRMF) supported the design of a game that simulates decisions in a weather insurance market associated with agricultural inputs. By illustrating the risks and opportunities of index insurance aiming to facilitate access to loans, the game sought to:

- Investigate the extent to which people in rural communities without a history of using insurance can learn the basic concepts of insurance when its main elements are described;
- Ascertain whether participating in an interactive learning process, where participants make decisions in a simulated insurance market, can significantly improve their understanding of insurance; and
- Investigate the willingness to pay for different levels of coverage and products.

The game was piloted among Ethiopian and Malawian farmers in 2008 and yielded two valuable insights:

- Farmers are interested in complex microinsurance services. The evidence from this activity strengthens the argument that there is demand for insurance services bundled with credit among vulnerable communities, and that there may be interest in a slightly more costly scheme that helps cover some livelihood expenses in times of drought.
- Simulation games can support educational and marketing efforts to introduce insurance. The survey analysis indicates that the game was at least as good as a conventional lecture approach in conveying most of the key insurance concepts (and better at one key dimension related to trust). While further analysis is needed, this market simulation approach may prove useful in scaling up, particularly among illiterate people facing climate risks. Future work could yield more reliable results and insights into the determinants of farmers' learning and preferences in regard to index insurance.

This approach can stimulate a participatory discussion on how to define the key parameters of the insurance scheme (e.g. cost of premium, magnitude of payout, probability of event insured). Oxfam America is piloting a demand-driven index insurance product for farmers in Ethiopia, designed with the help of a similar game. The Environment Finance Group of the United Nations Development Programme (UNDP) will also use the game to illustrate the potential of risk transfer for development during a retreat for country officers in the Slovak Republic, and it could become a valuable part of wider efforts to promote risk transfer.

Source: Pablo Suarez and Anthony Patt, unpublished research for the WRMF.

large investments in multi-peril crop insurance (MPCI) in 2006,[6] significantly subsidizing the premium, which could undermine the further development of index insurance. However, as the implementation of MPCI entails several challenges, index insurance could be used to complement the MPCI policies and facilitate the Government's wider risk-management efforts (Case Studies 2 and 4).

Contract design and basis risk

Designing index insurance contracts is extremely complex, in part due to the effort required to identify a weather index that correlates highly with agricultural loss and thus minimizes basis risk. As mentioned earlier, basis risk is the potential mismatch between the index-triggered payouts and the actual losses suffered by the policy holder. With index contracts, it is possible for policyholders to receive a payout even when they have suffered no losses, and conversely, policyholders may not receive a payout when they have suffered a loss. Moreover, an individual farmer with rainfall insurance could lose her crop to drought and not receive an indemnity if the drought is not recorded at the reference weather station. The diversity of microclimates often found within relatively small geographic areas means that basis risk is an inherent and widespread problem.

There are a number of ways to reduce this risk. One is to limit the insurance to the kinds of low-frequency, highly covariate weather risks that impact most people in a region. Individual losses are then much more likely to be highly correlated with the insured weather station event. This approach works best for disaster-relief index insurance. It can also work for development index insurance, with the understanding that alternative arrangements would be needed to help households manage more frequent, less covariate risks.

Another approach is to identify weather indices that minimize basis risk for as many households as possible in a region. Recent developments in crop-weather modelling, as well as participatory approaches to the design of insurance contracts, have demonstrated the potential to reduce basis risk, but the cost of developing these indices can be high. They are also unlikely to transfer from one small region to another, which makes scaling up more difficult and costly.

Basis risk can also be reduced by increasing the number and distribution of weather stations in order to better capture spatial variation in climatic conditions when writing contracts. However, adding weather stations can be costly (both to set up and maintain), and new stations have no site-specific historical record.

Lack of historical data can sometimes be overcome by using existing records in the proximity of the new station, in combination with remote sensing data, to create 'synthetic' and triangulated data sets for the new station. There is also interest in new

6 MPCI products are based on shortfalls of expected yield, not the damage caused by a particular event. They use a farmer's yield history as a baseline, and the shortfall is determined either on an area basis or for each individual farmer. Usually the insured yield is 50-70 per cent of the farmer's historical average yield.

types of indices that can be assessed remotely with satellites, such as cloud cover or soil moisture content for a chosen region during critical agricultural periods. This kind of data is becoming increasingly available and it may have the potential to replace weather stations for disaster relief insurance. Despite this potential, the writing of such contracts for individuals is constrained by a credibility problem: people may not trust payout decisions made by insurers on the basis of 'unseen' data that may, because of basis risk, fail to correlate highly with their own on-the-ground observations.

Apart from basis risk, insurance companies are usually not prepared to design index insurance products for agriculture. The adoption of creative solutions such as the ones mentioned above (e.g. cloud cover, soil moisture) could be quite useful, but these are even more challenging for most insurance companies. As a result, companies in the developing world usually need significant support and training to design index insurance contracts, which obviously limits their diffusion and expansion.

Reinsurance

While insuring for covariate risks reduces basis risk, it increases the total amount of payouts in any one season, because when an insured event occurs, everyone must be paid at the same time. Moreover, if the insured risks are indexed against different rainfall stations that happen to be highly correlated, then in some years the insurer may have to make very large payments in multiple regions. Ontario's Forage Rainfall Plan insurance, for example, has experienced loss ratios varying between 0.02 (in 2008) and 4.77 (in 2001).[7] The insurer can hedge part of this risk by diversifying its portfolio to include indices and sites that are not highly and positively correlated, which is more likely possible in larger countries. But it may also be necessary for the insurer to sell part of the risk to international financial markets.

International reinsurance is already available for some natural disaster risks. The simplest form is a stop-loss contract in which the primary insurer pays a premium to get protection if its losses exceed certain levels. Other forms of reinsurance are also common. Quota-share arrangements involve sharing both premiums and indemnities. Despite significant growth in recent years, the reinsurance markets for index insurance are still thin, with few large international firms and a limited appetite for weather index-based contracts.

As an alternative to reinsurance, recent developments in global financial markets are making it increasingly feasible to use new financial instruments to spread covariate risks more widely, such as weather derivatives and catastrophe bonds. However, the high transaction costs associated with these arrangements have been a major impediment to their use in developing countries and for agricultural risk management. These costs could be reduced if governments play a role in aggregating risk nationally and in insuring part of the aggregate risk itself before going to the

[7] The loss ratio for an insurance company is equal to total claims paid out plus adjustment expenses, divided by total earned premiums. Insurance companies with very low loss ratios are collecting significantly more in premiums than they are paying out in indemnities, while those with very high loss ratios may not be collecting enough premiums to pay claims and expenses and still make a profit.

global market. The need to go to this market could initially be reduced if international development banks or others in the capital markets provide governments with contingency loan measures. In this way, a pooling arrangement or the government would have sufficient capital to pay all losses if it experiences a bad year. While this arrangement raises concerns about the crowding out of private reinsurers, it could be especially valuable during the early years of an insurance programme, until an adequate reserve has been built up.

Chapter 3
Key drivers of sustainability and scalability of weather index insurance

In the past, crop insurance programmes have performed poorly, presenting numerous logistical and administrative challenges and lacking sustainability. But new interest in market-mediated approaches to risk management, along with new opportunities for insurers to pool covariate risks in international financial markets, make index insurance appealing. In addition, growing concern for the need to adapt to climate change is emerging as an important driver of weather insurance. As a result, numerous pilot programmes have been launched in recent years, with the active engagement of a diverse range of actors (including governments, donors, multilateral agencies, international reinsurers, relief agencies, NGOs, private insurers, banks, input suppliers, food marketing companies and farmers' organizations). Table 3 provides the details of 36 such ventures, including six disaster-relief insurance programmes in 21 countries and 30 agricultural development index insurance programmes in 19 countries.

The table highlights the diversity of the index insurance world. Development insurance programmes range from privately provided and unsubsidized schemes – linked to comprehensive packages of agricultural development information and services for farmers – to publicly provided, heavily subsidized schemes with weak or no value propositions. An example of the former is the PepsiCo potato out-grower programme (see Case Study 2), while for the latter, the Agriculture Insurance Company of India (AIC) offers area-yield and drought insurance on a heavily subsidized basis to all takers (Case Study 5). Disaster relief programmes vary from international insurance arrangements that directly underwrite government relief costs to programmes run by NGOs that provide disaster relief insurance directly to communities or farmers (see Case Study 3: Ethiopia). They also vary with the type of index used. While most programmes use weather indices, others use indices based on crop-cutting (i.e. harvest) estimates of area yields (e.g. AIC in India, see Case Study 5), county-level livestock mortality rates (e.g. Mongolia) and biophysical model estimates of range productivity (e.g. Canada and the United States, see Case Studies 6 and 7).

Most of the programmes are still young and have yet to reach large numbers of beneficiaries. Among the agricultural development programmes, India has achieved the greatest success, with a number of private weather insurance schemes that together

Table 3. Sustainability and scalability of weather index insurance

	Category	Country	Insured party	Lead agency
1	Development	Ethiopia	Farmers	Nyala Insurance, World Bank and WFP
2	Development	Ethiopia	Village	Adi-Ha, Oxfam/IFRC
3	Development	India	Farmers	MicroEnsure and Kolhapur District Central Cooperative Bank (KDCCB)
4	Development	India	Farmers	ICICI Lombard (private insurer)
5	Development	India	Bank	NBFC agricultural loan portfolios
6	Development	India	Farmers	IFFCO-Tokio (private insurer)
7	Development	India	Farmers	PepsiCo
8	Development	Indonesia	Slum dwellers	Munich RE, TATA, GTZ
9	Development	Jamaica	Input supplier	JP Foods, Private insurer
10	Development	Kenya	Farmers	Syngenta Foundation
11	Development	Malawi	Coop	World Bank, Opportunity International
12	Development	Malawi	Coop	World Bank, MicroEnsure
13	Development	Nicaragua	Farmers	World Bank
14	Development	Philippines	MicroEnsure and Malayan Insurance Company	MicroEnsure
15	Development	Tanzania	MicroEnsure	MicroEnsure
16	Development	Peru	Farmers	La Positiva
17	Development	Rwanda	Coop/Farmer	MicroEnsure and Ministry of Agriculture (MINAGRI)
18	Development	South Africa	Coop/Farmer	Investec (Investment bank) – coop
19	Development	Thailand	Bank/Farmer	BAAC (ag bank)
20	Development	Ukraine	Farmers	Credo-Classic (Insurer)
21	Development	Thailand	Farmers	Government
22	Development	Canada	Farmers	Government
23	Development	USA	Farmers	Government
24	Development	USA	Farmers	Government
25	Development	China	Farmers	Guoyuan Agricultural Insurance Company, WFP, IFAD
26	Development	Mongolia	Herders	World Bank
27	Development	India	Farmers	AIC (public ag insurer)
28	Development	India	Farmers	BASIX (MFI)
29	Development	Brazil	Farmers	Programa Seguro Agricola Basico (government), AgroBrasil
30	Development	India	Farmers	ERGO-HDFC
31	Disaster relief	Caribbean	16 countries	CARICOM, World Bank
32	Disaster relief	Ethiopia	Government	Government, WFP
33	Disaster relief	Malawi	Government	Government, DFID, World Bank
34	Disaster relief	Mali, Kenya, Ethiopia	Project/Villages	MVP, Earth Institute, MCC
35	Disaster relief	Mexico	States	AGROASEMEX, PACC
36	Disaster relief	Ethiopia	Farmers	IFPRI

Type of risk covered	Year (most recent available)	Estimated bene- ficiaries	Total sum insured (US$ thousands)	Reinsured	Premium subsidized	Tied to credit
Drought	2009	139	44	no	no	no
Drought plus other risk-reduction activities	2009	200	9	no	yes	no
Excess rainfall and drought	2009	4 770	480	yes	yes	yes
Rainfall	2009	65 000	21 150	yes	no	no
Rainfall	2008	5 000	n/a	yes	no	yes
Weather index	2009 (1st half)	70 000	n/a	yes	no	no
Late blight disease	2008	4 575	3 812	yes	no	yes
Flooding	2009	500	13	yes	no	yes
Hurricanes	2008	1 050	1 080	yes	no	no
Drought	2009	200	7	no	no	no
Excess rainfall and drought	2006	1 710	150	no	no	yes
Drought	2008	2 587	300	yes	no	yes
Drought and humidity	2009	9	2 211	yes	no	yes
Typhoon	2009	500	n/a	yes	no	yes
Excess rainfall and drought	2009	339	101	yes	no	yes
Area yield index	2008	51	67	no	no	yes
Excess rainfall and drought	2009	500	32	no	no	yes
Frost	n/a	n/a	n/a	yes	no	no
Drought	2008	388	300	no	yes	yes
MPCI	2004	2	n/a	no	no	no
Price fluctuation insurance	2009	n/a	n/a	no	yes	no
Rainfall	2008	1 945	46 302	no	yes	no
Rainfall	2009	12 685	455 314	yes	yes	no
Rainfall (Vegetation index)	2009	3 015	78 795	yes	yes	no
Drought	2009	482	56	no	yes	no
Livestock mortality	2009	3 281	5 000	no	yes	no
Excess and deficit rainfall, humidity and frost	2009 (*kharif*)	1 088 313	371 000	yes	yes	yes
Rainfall	2009 (1st half)	5 000	n/a	yes	no	no
Drought, hail and rain	2007	14 893	11 914	yes	yes	no
Rainfall	2009	n/a	n/a	yes	yes	no
Total numbers		**1 287 134**	**998 137**			
Hurricane and earthquakes	2007	n/a (16 countries)	120 000	yes	yes	no
Drought	2006	316 000	7 300	yes	yes	no
Drought	2008		5 000	yes	yes	no
Excess rainfall and drought	2007	55 000	652	yes	yes	no
Excess rainfall and drought	2008	800 000	132 562	yes	yes	no
Drought	2009	373	7	no	yes	no
Total numbers		**1 171 373**	**265 521**			

have sold 2.1 million policies since 2003.[8] Private insurers reached over 150,000 farms in 2009, and the public AIC programme reached more than one million beneficiaries that year. Of the disaster relief programmes, Mexico's has achieved scale and continues to grow, benefiting approximately 800,000 households in 2008, up from 600,000 in 2007.

IFAD and WFP recently completed a joint review of many index insurance programmes. Some were recently launched, and it is too early to evaluate their performance. A small number failed to generate sufficient demand and were discontinued (Case Study 8: Ukraine). But many others show promise and, while not yet achieving large scale, are providing valuable lessons for the future.

Offering a wide range of experiences, these case studies highlight key principles for successful programme performance and suggest avenues for reaching scale. What follows is an overview of lessons learned, along with specific examples from the IFAD-WFP review, but the reader is encouraged to examine the full case studies, in the annex, to appreciate these principles in context:

- Create a proposition of real value to the insured, and offer insurance as part of a wider package of services;
- Build the capacity and ownership of implementation stakeholders;
- Increase client awareness of index insurance products;
- Graft onto existing, efficient delivery channels, engaging the private sector from the beginning;
- Access international risk-transfer markets;
- Improve the infrastructure and quality of weather data;
- Promote enabling legal and regulatory frameworks; and
- Monitor and evaluate products to promote continuous improvement.

Create a proposition of real value to the insured, and offer insurance as part of a wider package of services

Index insurance is most effective when integrated into broader agricultural development and disaster management initiatives. Products should be affordable and relevant, mitigating an important weather risk and meeting client demand. Overall, index insurance products should present clients with real value, be it part of a contract farming package offered by private-sector actors or part of a social protection policy. Purchase of the product must make economic sense to the buyer.

With disaster-relief index insurance, relief agencies and vulnerable households need to be offered products that provide timely, credible and fair relief in times of crisis. Contracts could be held at the macro level, offering governments cost-effective and timely ways to react to disasters, thus responding to these risky situations more effectively. As with all disaster relief programmes, subsidies would play a key role in expanding coverage and covering the most vulnerable populations.

[8] WRMF Weather Index Insurance database, internal document.

Box 3. Start-up and scaling up of weather index-based insurance

Minimum conditions for start-up

- An enabling environment, including the effective legal and regulatory system to enforce contracts and supervise insurance, and in which subsidized risk-management options do not crowd out market-driven products;
- Adequate infrastructure (e.g. weather stations) to provide unbiased weather data and minimize basis risk;
- Credible, cost-effective and commercially viable national insurers, whose payments are guaranteed by a credible authority, and intermediaries that market and package insurance with relevant inputs, technology, agronomic and weather information, and/or financial services;
- Coverage of the 'right' risks (i.e. infrequent, but high-impact events that threaten livelihoods or cause traditional coping mechanisms to fail), using an index that captures that risk well, minimizing basis risk;
- Availability of cost-effective products, for which clients find that the benefits of transferring risk are greater than the costs.

Conditions for sustained scaling up

- Payouts that are based on objective, transparent, verifiable and understandable criteria, and which reach clients soon after the insured event;
- Trusted, credible intermediaries and insurers;
- Tangible coverage. People need to be able to relate to the expected benefits (payouts in certain cases) of the contractual relationship;
- Transparency and understanding. Farmers have a good understanding of their risk exposure, and the function and benefits of a risk transfer instrument;
- Adequate and sustained demand for risk transfer products;
- Affordable, high-value products, and new ones over time as conditions evolve and farmers develop their businesses;
- Smart subsidies for disaster-relief insurance products, minimizing costs by adjusting the targeting to match changing circumstances (i.e. the number and types of people who remain vulnerable as the local economy develops). Any subsidies used to launch development index insurance products should be phased out over time;
- Access to adequate reinsurance arrangements to prevent insurers from defaulting in years when large payouts are made.

With development index insurance, products should catalyse access to credit and other financial services, technology or new markets, and they should help generate significant additional income. These value-added products, which complement existing risk-management strategies, can be attractive even without subsidies. The additional income created must be substantial, that is, it should be more than just enough to cover the insurance premium. Products must be affordable and cover the most relevant risks with minimal basis risk, and there must be opportunities to finance the premium (e.g. credit, savings or other contractual arrangements with input suppliers or agricultural producers in contract farming).

Ideally, all products should constitute part of a wider, income-enhancing package of services:

India – PepsiCo. This index insurance programme was designed to cover potato crop losses due to late blight disease, which in turn is associated with weather events that can be indexed. The insurance comes with credit and a market contract, and it offers substantial income gains to participating farmers. The programme states the insurance premium and benefits clearly, and it integrates the premium payment into the overall package (Case Study 2).

Malawi – tobacco. Among the 350,000 smallholders who grow tobacco, less than 15 per cent currently have access to formal credit, which is widely needed to buy key inputs for tobacco production. As weather-related risks are the main impediment to local bank lending, the World Bank's Commodity Risk Management Group (CRMG)[9] joined with local banks, insurance companies and contract farming companies to provide index insurance that covers the value of the input loan, not the crop. If there is a drought, the insurance payout repays part of the loan costs. By buying the insurance, farmers can access credit, obtain modern inputs and receive production advice – and thus increase their production and incomes.

India – IFFCO Tokyo General Insurance Company (ITGI). ITGI offered insurance through its parent company's fertilizer programme (Indian Farmers Fertiliser Cooperative – IFFCO) and used its rural network for distribution. This unusual alliance leveraged cost-efficient delivery channels to cross-sell insurance with fertilizer and seed, two standard farm purchases. In this partnership, ITGI provides technical advice, product education, training and marketing skills to the secretaries and staff of member cooperatives to enable them to sell the insurance products (Case Study 5).

Programmes that did not offer a wider range of services faced additional problems:

India – BASIX. Working together, ICICI Lombard, the World Bank, International Finance Corporation (IFC) and BASIX were the first to successfully launch index insurance products in the country. Unlike the examples above, however, the BASIX insurance programme is not linked to credit, despite this being a key constraint on growth for many smallholders. The programme provides credible insurance against drought and excess rainfall, is reasonably priced and is delivered through an established banking network that reaches small farms. However, the number of contracts sold has remained disappointingly low, and the scheme may not be sustainable. BASIX may introduce credit-linked weather insurance in the future (Case Study 5).

[9] Now the Agriculture Risk Management Team.

Programmes that do not adequately address the real needs of clients face more challenges:

> **China**. The Government launched a pilot MPCI product in 2006. Among its limitations, the sum insured is considered inadequate by farmers, covering only part of the crop production costs (excluding labour), which are relatively low, representing some 7-9.5 per cent of total income. Because farmers have other activities to generate income and diversify risk (e.g. seasonal work in town, small businesses), the sum insured seems even less significant.[10] Index insurance was sold as a complement to MPCI to cover farmers' uninsured drought risk; the pilot index product was slightly cheaper than MPCI, but, for the same sum insured, covered far fewer risks (Case Study 4).

Build the capacity and ownership of implementation stakeholders

Having local stakeholders in the lead is critical, especially to overcome initial challenges, and it is important to build their capacity continuously. There are many hurdles in establishing index insurance programmes that make spontaneous, market-driven development difficult. In nearly all pilots to date, an outside agent or champion initiated and catalysed action. These actors attracted sufficient resources to overcome missing public goods and roles (e.g. insufficient weather stations, and inadequate insurance laws and regulations), and they established reinsurance arrangements. They also helped train local brokers, insurers and other intermediaries, who typically had no prior experience with index insurance, and they coordinated the agrometeorological research needed to identify viable insurance products. In some cases, these actions identified and cultivated national champions, who then played key leadership roles in jump-starting developments at national and local levels.

A local champion is necessary to overcome initial set-up challenges. Having someone on the ground to manage the details, especially with the various agencies and actors involved, is critical to getting all the various organizations and interests working together. Similarly, it is important to employ locally based and locally connected, skilled project management, which has an incentive to see these initiatives succeed.

It is also crucial to support technical assistance initiatives and build capacity at the diverse market levels, including regulators, insurers, farmers' associations, financial service providers and clients. This training and awareness-building should start early in the pilot and continue throughout product launch and evaluation. It has not been sufficient to provide only initial training and then leave implementation partners to follow through on their own.

Product development and piloting is an involved process with many twists and turns, and it can take a long time. Rushing the process can undermine market

[10] Data from the National Statistics Bureau indicate that revenue from agricultural activities accounts for only one third of a smallholder's total income in China.

education and awareness campaigns and weaken product sales and performance. Products that perform poorly in their first season, or that consumers do not understand or for which they have unreasonable expectations, risk poisoning the market for future ventures. This point is especially relevant in markets where products must overcome a long history of bad experiences with insurance.

And even when all goes well, after the initial design, products still need to be reviewed and continuously improved, responding to changes in the market and the availability of new information and technologies. The amount of time required to effectively (and comprehensively) pilot test a product is probably three to five years. The required training – both of the consumer and of the personnel responsible for introducing the product – cannot be fully achieved in only one year of operation. Moreover, it is difficult to test a product unless the index has been triggered and there are claims to evaluate. This condition is, of course, unpredictable.

Malawi. In 2005, CRMG launched a pilot programme in which index insurance was used as a means to manage the risks of providing credit to farmers. As experience with agricultural insurance here was minimal, CRMG was central in the process of building capacity, working to raise awareness and stimulating the interest of potential partners. It also played an important coordinating role in working with insurers, banks and the National Smallholder Farmers' Association of Malawi (NASFAM) to design and roll out the product. This kind of focused capacity-building was essential in getting the first index insurance pilot off the ground.

India – PepsiCo. PepsiCo recognized the need to address the significant weather-related risks that were affecting its potato out-growers and, by extension, its supply chain. It worked with ICICI Lombard and WRMS to develop a risk-management product as part of its package of services for out-grower farmers. As a result, in coordinating with these other actors, PepsiCo was playing a major role in providing technical support to smallholders in all phases of the farming season (Case Study 2).

India – BASIX. In 2003, an IFC/World Bank design for an index insurance product sparked the interest of BASIX in piloting it. Together they cultivated the interest of reinsurers and launched the first successful pilot of index insurance in India. The local insurance product manager at BASIX, who was key to the success of this pilot, later went on to become an insurance broker, further developing the weather index insurance market (Case Study 5).

Nicaragua. The leadership of a local insurer was vital to this successful pilot. Capacity-building in both the private and public sectors was particularly valuable, as private-sector actors saw incentives to develop innovative products. Local insurers, motivated to open a new line of business in agriculture, served as a catalyst for discussions on the conditions needed to successfully pilot and scale up agricultural insurance. Farmers, banks, regulatory authorities and public agencies shared technical knowledge under the leadership of the insurer. The results demonstrated the importance of the early working partnership that had developed between insurers, agricultural universities, weather institutes, banks and the reinsurance market. The pilot also showed that an external development agency could have a catalytic effect in establishing the necessary public/private partnerships, particularly in providing technical assistance to coordinate public agencies in the early stages, when confidence-building is very important. Without local leadership for these activities, it would have been very difficult to build the capacity of various local stakeholders (Arce 2009).

China. The weather infrastructure is strong and highly developed in China, and insurers are active, but there is still a need to build capacity within the industry. Most insurers are not prepared to develop an index insurance product, despite their strong interest in the sector. At this time, they still need significant capacity- and skills-building support, as well as the transfer of individual 'know-how', to develop, successfully pilot and scale up index insurance products. In addition, MPCI poses a serious challenge to their capacity, especially with regard to the complex, time-consuming loss-adjustment procedures (Case Study 4).

Other examples. Outside champions were critical to success in many of the case studies. Sometimes the role of champion is played by a multilateral agency, such as the World Bank's CRMG (e.g. India, Malawi, Mexico), WFP (e.g. Ethiopia), IFAD/WFP (e.g. China), an NGO (e.g. Oxfam in Ethiopia), or a broker (e.g. WRMS in India, MicroEnsure in the United Republic of Tanzania) (Case Studies 1, 3, 4 and 5).

Increase client awareness of index insurance products

Index insurance programmes that include initial training and an overall, continuous approach to capacity development have a clear advantage in effective implementation compared to those that do not. When farmers are trained in the use of index insurance as a risk-reducing investment, and in general financial literacy, they are better positioned to understand when and how to make a claim, and they have more realistic expectations regarding payments. Similarly, they can make well-informed decisions about their overall risk-reduction strategy, whether index insurance could complement it, and what products best suit their needs.

Ethiopia – NISCO. Farmer awareness of insurance, let alone of weather index insurance, is very low in Ethiopia. Nyala Insurance Company (NISCO) needed initial support to sensitize the market and cover its start-up costs. NISCO sells index insurance products for agriculture in close cooperation with the Lume Adama Farmers' Cooperative Union (LAFCU). In addition to serving as an efficient delivery channel, LAFCU works with NISCO to educate farmers on coverage, including how the rainfall deficit computation panel (a tool to settle claims) works and when payouts will be triggered. This is a useful model for easy communication that could be replicated elsewhere (Case Study 3).

India – PepsiCo. A big part of the success of PepsiCo's programme is due to its contract farming arrangement with farmers, a package of production information and support that includes an index insurance pilot. Product education was provided systematically, with training and educational meetings conducted with each programme participant. WRMS sent a weather data advisory message to each farmer via mobile phone to promote corrective measures in advance of bad weather, so that farmers knew what measures to take in the field to prevent avoidable losses. This service was sent in a timely and regular manner and charged separately to participating farmers. Training sessions on index insurance were also organized at various warehouse facilities, a natural gathering point for farmers (Case Study 2).

Brazil. AgroBrasil led an extensive marketing campaign to promote an area-yield index insurance product in the State of Rio Grande do Sul. It dedicated about 45 people to marketing activities, placing ground teams close to distribution points, and investing in promotion of the programme via radio, local offices of the State's Department of Agriculture and Supply (SAA), city halls and other distribution sites. AgroBrasil also prepared educational materials to help interested farmers understand the product. In a cartoon booklet, *Mr Chico and Agricultural Insurance* (AgroBrasil Seguros 2008), a character named Segurito® simplified insurance terms and explained how the insurance product works (Case Study 9).

Nicaragua – INISER. The Nicaraguan Insurance Institute (INISER), a public insurance company, began selling index-based insurance contracts in 2007 with support from CRMG. The initiative was part of a pilot programme to insure groundnut farmers against drought risk. But already in 2005, INISER and CRMG had begun to lay the groundwork for the pilot through efforts to transfer technical capacity in contract design to local insurers and to begin the business processes needed to carry out the work. This effort required a significant time commitment from the insurer and other stakeholders involved in the pilot. Training these various stakeholders under the leadership of the local insurer was possible because of the long-term commitment by CRMG, which required a three- to four-year preparation before targeted farmers could start buying index insurance.

Lack of client awareness can hamper a product's success:

Ukraine. In the Ukraine, there is a lack of understanding of insurance providers in the market, and only a minority of farmers insure their crops. Insurance is still a foreign concept to most. Producers did not realize that the pilot product was being offered by the local insurance company; instead, they mistakenly believed it to be an initiative by IFC and CRMG, which they were reluctant to trust. An inadequate effort to educate clients on the importance and relevance of index insurance was one of the factors that contributed to the very limited achievements of the pilot programme (Case Study 8).

Graft onto existing, efficient delivery channels, engaging the private sector from the beginning

While it is technically feasible to develop index insurance products, the operational challenges of reaching end-users can be enormous. Insurers rarely have their own rural distribution networks, but successful pilots have used existing channels that already reach the target group. Through farmers' organizations and other aggregators, it is possible to reach large numbers of clients more cost-effectively than reaching out to them individually. Of course, to integrate index insurance into a supply chain successfully, the chain itself must be working, efficient, and must involve strong commercial partners.

Insurers also rarely have their own rural agents; they must typically rely on intermediaries to sell and manage the insurance with farmers. These intermediaries need to be efficient providers, trusted institutions, and available and responsive to farmers' needs. Typically, farmers lack both the capital to pay premiums and an incentive to spend scarce resources on forward-looking risk-management tools. One way around this problem is to bundle access to index insurance with other products and services, which may help reduce costs and align incentives. When insurance is tied to credit or farm inputs, the credibility of the supply system affects the perception of the entire package. Partners should be selected carefully – with confirmation that they have the commitment and capacity to follow through on their agreements.

It is also important to involve private-sector players from the beginning to contribute to product research and design, build local ownership and enhance sustainability. Finding a local insurer motivated to open a new line of business in agriculture is essential to the success and sustainability of index insurance.

Peru – area-based yield insurance. In 2008, La Positiva joined with Caja Señor de Luren (Caja) to develop an area-yield index-based insurance programme for cotton farmers in the Pisco Valley. Caja had the leading agricultural microfinance credit portfolio in the region, and, through this partnership, La Positiva gained access to well-established distribution channels. Caja also benefited from the arrangement, as those who signed onto the index insurance programme became more lucrative customers. Caja was able to increase its credit portfolio and offer loans to more cotton growers.

Malawi – AllianceOne Tobacco. AllianceOne is a leaf tobacco merchant with a well-functioning supply chain. It leverages this chain to offer index insurance to its farmers. AllianceOne provides a wealth of products and client services, including training, short-term cash advances, quality control, arranging financing and guaranteeing loans; and it helps small-scale farmers break into the tobacco value chain. In order to participate, smallholders must open individual bank accounts with Opportunity International Bank of Malawi (OIBM). In the AllianceOne weather insurance pilot, 425 hectares were insured, with payout at the end to OIBM.

Ethiopia. NISCO works with two of the main farmer unions that together reach approximately 60,000 clients. The unions provide farmers with inputs and pay the farmers' premiums up front. The union can sell the produce, deduct the premium and input costs from the revenue, and then pay farmers the balance. Though this sounds like a straightforward approach that could be appealing to farmers, only about 10 per cent of union members sell through the union (Case Study 3).

Other examples. One groundbreaking initiative in India was possible because BASIX, the microfinance and livelihood support institution, was already a trusted partner of farmers' groups. In another Indian example, Tokyo Marine, a Japanese insurer, took the unusual step of establishing a joint venture with IFFCO to gain access to farmers. In Brazil, two input suppliers, Syngenta and Monsanto, and the Brazilian AgroBrasil programme cross-sell inputs and index insurance coverage. Many other examples – including the Bank for Agriculture and Agricultural Cooperatives (BAAC) in Thailand, INISER in Nicaragua, AIC in India and NASFAM in Malawi – link, or at least cross-sell, insurance with credit, and hence distribute their insurance through existing networks (Case Studies 5 and 9).

Programmes that do not utilize existing delivery channels face an uphill battle:

Malawi – NASFAM. An index insurance programme was initiated by CRMG to cover groundnut producers in 2005, and then maize growers in 2006. Though the weather insurance product provided protection against weather risk, side-selling, done in part to avoid loan repayment, was a problem, exacerbated by gaps and inefficiencies within the supply chain. Although the insurance scheme offered effective risk management and increased farmers' access to formal credit, the inefficient delivery channel eventually stalled the programme.

Access international risk-transfer markets

Reinsurance support is critical for any meaningful index insurance development, and it is a crucial condition for scaling up. Eighteen of the 36 total index insurance programmes reviewed have been reinsured, representing 2.5 million cumulative policies, whereas products without reinsurance have sold a mere 9,500 cumulative policies.

Reinsurance itself can be a business driver, because reinsurers are ready to take on a significant amount of the risk. This practice allows insurers to earn commissions without tying up capital – unlike in typical insurance where reinsurers require retention levels of at least 15 per cent of the risk to avoid moral hazard. The objective, third-party nature of weather index insurance makes very high levels of reinsurance possible.

The Caribbean – CCRIF. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) was developed at the request of the Caribbean Community (CARICOM) to facilitate a risk model for hurricane and earthquake hazards. The CCRIF makes payouts to a country in a policy year, limited by the exhaustion point of the coverage selected by each country. The CCRIF retains the bottom US$10 million, with US$110 million reinsured by various reinsurers. US$20 million of the top layer of risk was placed in the capital markets through a risk swap between the CCRIF and the World Bank treasury, which is the first time such an instrument has been used to transfer risk.

Jamaica – Storm Tracker insurance coverage. Jamaica Producers (JP) is a diversified group of companies engaged in agriculture, with origins in banana production. JP is highly vulnerable to hurricanes, particularly in Jamaica. After a number of losses due to storms, JP's insurance broker, Assurance Brokers Jamaica, approached the ACE Group international reinsurer for a customized parametric insurance product (i.e. an insurance product in which payouts are triggered by an event, such as a catastrophic storm), using the ACE Storm Tracker product. Reinsurance provided the foundation of the product, as traditional insurance had become prohibitively expensive.

Ethiopia – NISCO. This programme aims to protect the livelihoods of small-scale farmers vulnerable to severe and catastrophic weather risks, particularly drought. For NISCO, reinsurance is a major challenge to effective scaling up. It is currently negotiating a reinsurance arrangement that it hopes will ease this constraint (Case Study 3).

Other examples. In India in 2003, ICICI Lombard began engaging seriously with index insurance products only when the reinsurance manager of the company personally met with five different reinsurers and bankers that expressed interest in underwriting this type of risk (Case Study 5). In Nicaragua, INISER entered into a long-term agreement with a reinsurer.

Improve the infrastructure and quality of weather data

Accurate and timely weather data are key to successful index insurance products. Serious mass market players in financial markets will not engage in product development and support unless they can be sure that good risk data are available for pricing contracts and that data providers can provide reliable and timely data on index values to settle claims quickly. The relatively high cost of private weather data services constrains the potential for scaling up insurance in many remote, rural areas with low levels of agricultural productivity, sparse populations and difficult terrain. Reliable weather stations with automatic transmission capabilities are becoming less and less expensive, although the capacity and cost of maintaining such stations must be factored into the calculation.

One way to reduce infrastructure costs is to use stations for multiple services. Some data providers sell weather information to farmers, newspapers and media companies, input suppliers and agricultural processors.

Satellites can be an alternative to or supplement data collected on the ground. Data from remote sensing have two advantages: they are more difficult to tamper with and are available across large areas of the globe in real time via the Internet. However, data from satellites can be of limited quality, and the satellites with the highest resolution often do not have global coverage. New technology such as the Normalized Difference Vegetation Index (NDVI) comes from satellite measures of vegetative 'greenness', which should correspond to the level of photosynthesis on the ground (and thus help calculate the healthiness and abundance of crops). In India in 2005, AIC introduced an index insurance product in Haryana and Punjab States to cover wheat using NDVI, though this faced problems because of cloud cover during critical growth periods. This example illustrates why remotely sensed data may be most useful when they complement other types of information.

India. Since most weather stations here are new, the biggest constraint is the lack of historical weather information. Historical data (other than for rainfall) are only available from approximately 550 India Meteorological Department (IMD) weather stations. These are far too few to adequately cover the 150 million hectares of arable land, and they are rarely located in poor rural areas. It has been suggested that an additional 10,000-15,000 weather stations would be needed to offer meaningful insurance services for farmers. Of these, at least 5,000 should be automatic, each at a distance of approximately 10-20 km from insured land; and these would need to be supplemented with 20,000 automatic rain gauges (Case Study 5).

India – WRMS. Since India does not have an adequate public weather data service, private weather data providers such as WRMS help fill this gap on a for-profit basis. Some 1,000 private weather stations have been installed and are producing real-time data. Though the cost of some WRMS weather stations is not covered by revenues from index insurance products alone, WRMS breaks even by selling data to a variety of clients (e.g. newspapers, farmers, agricultural processors, input suppliers) (Case Study 5).

India – PepsiCo. The dissemination of data via mobile phone SMS communications has become more and more important in helping farmers minimize crop losses and understand the exact nature and magnitude of weather risks. In Punjab, for example, timely forecasts via SMS messages gave farmers the information they needed to prevent major frost losses and save on irrigation costs (Case Study 2).

Malawi – Macro. Designed by the World Bank, this insurance programme aims to strengthen maize markets in Malawi by using index insurance at the macro level. The programme depends on a rainfall index constructed using data from

23 weather stations throughout the country. The presence of the stations was essential in launching this product and enabling a sophisticated, market-based risk transfer, despite the generally poor conditions of the country's weather data services (Hess and Syroka 2005).

Nicaragua. Nicaragua has introduced index insurance faster than other countries in Central America, owing largely to the availability of reliable, accessible weather data. The weather service, Instituto Nicaragüense de Estudios Territoriales (INETER), has played a key role in supporting market development of agricultural insurance, in turn providing confidence to the local industry, reinsurers and regulatory authorities. Much greater investment is needed to increase the density of historical weather data in agricultural areas and ensure the availability of data for contract monitoring.

China – WRMF. Though the weather infrastructure in China is sound, access to data is problematical. Some 160 weather stations exchange data globally through the World Meteorological Organization (WMO), but access to both historical daily weather data and real-time daily data is considered confidential and is thus very difficult. Increasing awareness and building capacity among the various partners could mitigate this constraint. In addition, effective roll-out of the waterlogging product in Huaiyuan would require a more robust infrastructure: waterlogging is not easy to record, in that a single, highly localized event may drive the bulk of the loss (Case Study 4).

United States – rainfall and vegetation index insurance. The use of new technologies offers promising solutions for the lack of weather infrastructure or quality data. Under the Pasture, Rangeland, Forage Vegetation Index (PRF-VI) Pilot Programme, payments are based on a vegetative 'greenness' index examined in grids of 4.8 square miles, using satellite image data from the U.S. Geological Survey's Earth Resources Observation and Science Center (EROS), and the National Oceanic and Atmospheric Administration (NOAA) (Case Study 7).

Mexico. Though Mexico's disaster relief programme has grown significantly in terms of the surface area insured, its expansion has been constrained by a lack of weather stations to guarantee efficient data flow and an optimum risk valuation process. Mexico has approximately 1,200 conventional weather stations that report in semi-real time, managed by the National Water Commission (CONAGUA), but only half are located in regions where insurance is offered. A possible solution would be to incorporate the new network of 764 automated weather stations constructed by Fundación PRODUCE, the private rural producers' association, into the insurance programme, but these have only three years of weather data. In response, AGROASEMEX has developed a methodology using reanalysis techniques to obtain a simulated series of weather variables, thus compensating for the lack of historical weather data (Case Study 1).

Brazil. To improve sales of an area-yield index insurance product, AgroBrasil and SAA developed a software application called AgroNet®. Installed at seed distribution points, it cross-checked information on farmers' seed requests with municipal insurance data, such as the sum insured and area-yield index of that municipality. The AgroNet® system allows AgroBrasil to exchange information with SAA at the time of purchase. SAA then centralizes information on each municipality and submits a daily, validated electronic report back to AgroBrasil. It also shares this report via the Internet with technical partners such as the ground sales team, and the insurers and reinsurers that use the report to issue policies and financial guarantees to reinsure the risk (Case Study 9).

Other examples. In Ethiopia, NISCO sells index insurance through farmer cooperatives, taking advantage of low-cost automatic weather stations owned by the National Meteorological Agency (NMA). With support from WFP, NMA is testing the stations (Case Study 3). Similar ones are in use in index insurance in Kenya, where the Syngenta Foundation installed two low-cost automatic stations to support index-based insurance as a way to promote the use of high-cost, high-yield seed.

Promote enabling legal and regulatory frameworks

Since public-sector programmes and policies have an impact on commercial incentives, developing pilot projects alone is, of course, not enough to ensure market sustainability. Public-sector interventions are important to ensure that the conditions exist for private insurers to go beyond conducting pilot projects and start scaling up the business to reach massive numbers of smallholders. From the early stages, the public sector should support and invest in information, such as weather data and agricultural statistics, and ensure a proper formal regulatory environment. Donors and other stakeholders can play an important role in promoting such an enabling legal and regulatory framework for index insurance products (e.g. promoting enforceability of contracts within the supply chain).

China – WRMF. In launching the first index insurance product in China, the experience of the WRMF reinforced the importance of involving the relevant government agencies in index insurance pilots – Ministries of Finance and Agriculture and the Chinese Insurance Regulatory Commission (CIRC) – in order to increase their understanding of the product and inform sound policy in agricultural insurance. Doing so has been particularly important in China, where as of 2009 there was no comprehensive law on agricultural insurance. As a result, decision-making can seem somewhat arbitrary – for example, there are no clear regulations on loss adjustment; CIRC has a general requirement, but the processes and procedures vary from company to company. In the WRMF pilot, regulators were very supportive of efforts to develop weather index-based insurance and clearly recognized its potential social benefits. As a result, the drought and heatwave pilot product got swift approval from CIRC. To scale up, government agencies should be more actively involved in assuring that the sale and management of products are fair to both buyers and sellers (Case Study 4).

India. Private insurance companies are at a disadvantage in scaling up index insurance programmes in rural areas. Government-run rural banking and cooperative institutions already reach some 50 per cent of the rural population, while private institutions will take a number of years before reaching close to the same level. Moreover, banks are obligated to offer the publicly subsidized area-yield scheme. Thus it is difficult for them to collaborate with insurers for any other kind of crop insurance product, be it the Weather Based Crop Insurance Scheme (WBCIS) offered by the public insurer AIC, or any private insurers' weather insurance products (Case Study 5).

Monitor and evaluate products to promote continuous improvement

Thorough monitoring and evaluation (M&E) exercises need to be undertaken on a systematic basis. Although programmes need to be of a certain size and longevity for a systematic approach to be worthwhile, effective M&E excercises are needed to ensure effective learning and adaptation. Although assessments will be preliminary, they can be used to attract and maintain the support of donors and governments.

All products require ongoing review and development to continuously adapt to new risks posed by climate change, advances in technology, the availability of better data or information, and methods for keeping the product simple and easily understood by consumers. In addition, to ensure both effective learning and the continued support of donors, it is important that pilots demonstrate significant, positive impact on the intended beneficiaries through impact studies. Over time, the insurance must prove its worth to farmers, insurers and other stakeholders.

Canada. In 2000 the Ontario provincial government initiated the Forage Rainfall Plan, which protects forage producers from the financial consequences of production decreases due to drought. Under the plan designed and delivered by AgriCorp, an agency of the provincial government, forage producers choose the amount of insurance, a coverage option and a rainfall collection station. Over the years, the programme has undergone reassessment and adjustment to increase its flexibility and better suit the needs of forage producers. For example, three additional coverage options were introduced, and the daily rainfall cap was adjusted to meet actual conditions (Case Study 6).

China. In terms of scalability, index insurance must be adapted to each new area, which requires upfront technical inputs. To overcome this limitation, standard policies could be introduced. This is a particular issue in China, where there is a range of environmental conditions, including desert, rangeland, typhoon-exposed regions, and microclimates within each province. These varied climates and weather exposures require completely different approaches to insurance and product design. M&E exercises and impact studies that detail information about implementation and results could help demonstrate the feasibility and success of index insurance programmes and contribute to scaling up (Case Study 4).

CCRIF. The board of directors and staff at the CCRIF felt that Hurricane Dean provided an excellent opportunity to review its mission and response. To that end, and following widespread consultation and analysis, several changes in the contract, coverage and price were implemented. The changes, effective at the renewal of the annual policies in June 2008, included a lower deductible option for CCRIF members for hurricane coverage only. Members could reduce their attachment point (i.e. deductible) from a 1-in-20 year event to a 1-in-15 year event. In addition, the maximum coverage limit available to each country for each peril was increased from US$50 million to US$100 million, and the policy premium rate was reduced by 10 per cent. A minimum payout equal to the annual premium paid by the participant for that peril was also implemented, should a policy reach the attachment point. The finalization of the parametric calculations, and thus the claims settlement time frames, were also reduced from 28 to 14 days.

Chapter 4
Roles for governments and donors in promoting the scaling up of index insurance

Although private insurers play a central role in the case studies reviewed in this paper, it is noticeable that in nearly all cases the programmes were initiated by the public sector, multilateral agencies (such as the World Bank and WFP) or NGOs, not by private insurers. This suggests that there are important public goods and roles that need to be in place, without which private insurers may be unwilling or unable to enter the market.

There is a first-mover problem: the high initial investment in research and development of index insurance products might not be recouped, given the ease with which competitors could copy products if they prove profitable. This discourages many companies from making initial investments in new product development, especially in underdeveloped markets. Private insurers may be particularly wary of this issue: unlike public insurers, they are not subsidized and may miss the opportunities that public insurers have as early movers.

Subsidies might be warranted as part of a well-designed, focused strategy to kick-start insurance markets. Targeted government and donor support could counteract the high start-up costs of developing these products by investing in public goods, such as the purchase and installation of weather stations, improved access to historical and real-time weather data, and key investments in client education, as well as capacity-building and technical support for local insurers to develop, launch and evaluate products. This kind of support would offset some of the initially high set-up, administrative and reinsurance costs, though there should also be an explicit exit strategy.

That said, governments and donors should intervene carefully to promote development-oriented index insurance. In particular, subsidies should be used cautiously. The evidence suggests that few farmers are willing to pay the full cost of unsubsidized insurance simply as an alternative way of managing risk. Index insurance is much more likely to sell on an unsubsidized basis if it is linked to a wider package of goods and services that enables farmers to access new productivity-enhancing technologies or high-value markets that could significantly increase their income.

There may be good arguments for subsidizing development-oriented insurance for the very poor, especially if it displaces more costly types of safety nets. But such subsidies should be carefully targeted and monitored, and the insurance may need to be sold through a separate distribution channel. However, once farmers are accustomed to paying highly subsidized premiums, it may be difficult for a government to reverse its policy later and, in the perception of farmers, raise the cost of these risk-management tools for smallholders.

While the private sector plays a key role, governments and donors can support:

Ongoing technical assistance, training and product development, both in the start-up phase and as programmes continue. Insurers, for example, will need technical support in designing the initial contracts, and then ongoing technical assistance to review, revise and expand index insurance products. This kind of assistance could include specific product design support, help in setting up a company development plan, and convening networks of and information-sharing with other agricultural insurers. Along these lines, donors and governments could support and promote international exchanges and study tours to help nascent initiatives learn from each other and avoid costly delays and mistakes. This is particularly important as local capacity for product design and management is currently limited. It must be cultivated to build the skills and experience of local insurers and financial service providers to effectively identify client needs, estimate

Box 4. Pros and cons of subsidies

Pro:

- Can make insurance products affordable to the very poor;
- Can provide incentives to uptake;
- Can jump-start the market;
- Can be structured to decrease as uptake increases;
- Subsidized services can decrease the need for other types of social safety nets.

Con:

- Are often provided indiscriminately for all clients, when some clients have the resources to pay full (or higher) premiums. Clients should be classified according to ability to pay before issuing subsidies;
- Can promote dependency on future subsidies or be a disincentive to the purchase of non-subsidized products;
- Can depress the market;
- Can crowd out private insurers that do not receive subsidies on their products; governments should ensure a level playing field for all insurers.

demand, design products and deliver effective risk-management services. Other actors in the supply chain (farmers' associations, input suppliers, financial service providers and others) could also benefit from capacity-building.

Client education on insurance. Marketing and client education strategies are necessary to introduce smallholders to insurance products, differentiate them from weak public-sector insurance programmes that they may already know, and clearly communicate the costs and potential benefits of index insurance. Without sufficient targeted training to raise the awareness of potential clients in the market, insurers that are accustomed to traditional insurance products may consider index insurance too difficult to communicate to agents and these clients. Other private insurers may invest in marketing, but only for their specific products, and not at more socially optimum levels that would educate farmers more generally about the appropriate role of insurance. Donors can play a key role in supporting the design and dissemination of these public education efforts.

Innovation. Donors can also push the frontiers of index insurance by funding innovations that may open new directions in the market. The use of new technologies in alternative indices and remote sensing applications such as NDVI, for example, offer great untapped potential. Certain applications of technology might lower the entry barrier for reinsurers developing an appetite for index insurance products, but looking for products that are ready to be priced and of sufficient size. Remote sensing techniques could provide additional information that makes reinsurers less hesitant about index insurance contracts.

Facilitate access to reinsurance. In the initial phases of the market, reinsurers are not interested in the small, risky deals characteristic of index insurance start-ups. Donors could play a catalytic role in index insurance markets by aggregating deals, so as to arrive at a volume that would be of interest to reinsurers, and more generally, by facilitating linkages between local insurers and reinsurers. Some larger donors could also take a more proactive role and initially underwrite extreme losses for the insurance pool, perhaps through contingent loans, until a sufficient volume of business has been established to attract global reinsurers. The IFC-led Global Index Insurance Facility, for example, is providing capacity-building support and underwriting index insurance contracts. As another example, the World Bank has provided a contingent loan arrangement for the livestock insurance scheme in Mongolia. Donors could also support innovative mechanisms and look for ways to graft onto existing delivery channels to bring index insurance to the local level.

National weather services, infrastructure, data systems and research. The complexities of contract design and basis risk are significant constraints on index insurance. Scaling up can only be achieved if there is systematic coverage of the territory, with weather stations sufficiently close to the insured parties (maximum 20 km). Beyond the physical presence of weather stations, there is a need to collect, maintain and archive data and to make them available on a timely basis in relation to insured events. This requires longer-term investments in the coordination of national meteorological authorities and in training in the operation and maintenance of weather stations. WMO, private players, donors and governments – working closely with national meteorological services – can play a key role in improving and expanding the network of weather stations and the quality of data produced and available. Similarly, these actors can explore opportunities related to satellite-based indices that use remote sensing tools. Given the increasing unpredictability of weather patterns due to the changing climate, the benefits of investment in weather infrastructure will also extend beyond the development of index insurance products.

An enabling legal and regulatory environment and sound national rural risk-management strategies. In many countries, the laws and regulations necessary to accommodate the development and use of weather insurance products are simply not in place, and they would need to be consistent with international standards to improve insurers' chances of gaining access to global markets for risk transfer. Human capacity-building and technical assistance are also essential in preparing the legal and regulatory environment to govern index insurance programmes. For example, establishing such an environment for enforceable contracts that buyers and sellers can trust is a fundamental prerequisite for index insurance. Donors can play an important role in supporting the development of sound national rural risk-management strategies. Index insurance is but one instrument for managing risks in rural areas, and it has greatest relevance in regions where farmers are exposed to covariate and catastrophic losses due to weather risks or other natural events. There is a need to develop national risk-management strategies to identify priority areas in which these investments should be made, to analyse how index insurance blends with existing risk-management policies, and to determine how these policies impact incentives for index insurance.

Impact studies. Though many agree that index insurance has the potential to smooth household incomes and mitigate the force of weather shocks on poor farming families, it would be important to define its specific effects on households. None of the programmes examined in the case studies were subjected to a rigorous study to examine their impact on the level of poverty and the asset base of clients who purchased the products; nor were they examined to determine what, if any, influence they may have had on farmers' decisions to plant certain crops, use different agricultural practices or enter particular markets. There have been a few studies of farmers' uptake of index insurance when linked to credit and technology packages and of the socio-economic determinants of that demand (e.g. Giné, Townsend and Vickey 2008; Giné and Yang 2008), but there are no ex post impact studies showing how the insurance has changed farmers' livelihood strategies and incomes, or how protecting lives and assets has enabled people to avoid or escape poverty. With disaster-relief index insurance, the product would need to show that it is protecting farm assets and incomes during catastrophic events. Impact pathways would need to extend well beyond demonstrating a demand for insurance to also show how the insurance has impacted risk-management behaviour, the choice of land use and technologies, and ultimately how it has affected incomes, poverty and vulnerability.

Conclusion

While not a panacea, index insurance holds great promise for improving the lives of people for whom weather incidents can mean the difference between survival and catastrophe. It will take work and, as this paper has indicated, careful thought and management to be successful. With government and donor help, infrastructure can be developed to create stable data and a rational market for index insurance. Once the framework is in place, private insurers can step in to extend the market along existing delivery channels, and to stabilize the risk through objective standards and reinsurance. Ultimately, index insurance can not only be a profitable industry, it can aid governments to make better choices about poverty and disaster management.

Interested governments and donors should begin by training and educating key players in the idea of index insurance; and private insurers should begin developing relationships with existing delivery channels. These steps will lay the groundwork for a functioning market.

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Glossary

adverse selection: This occurs when potential borrowers or insurees have hidden information about their risk exposure that is not available to the lender or insurer, which then becomes more likely to erroneously assess the risk of the borrower or insuree.

aggregator: An organization that reaches a large number of potential clients through its natural mandate or business activities, such as a farmers' organization, financial service provider, input supplier or community development organization.

basis risk: The potential mismatch between the index-triggered payouts and the actual losses suffered by the policy holder.

covariate risk: Risk that can affect large numbers of people at one time (e.g. widespread drought, flooding, earthquake).

index insurance: An insurance product linked to an index highly correlated to local yields. Contracts are written against specific perils or events monitored at regional levels; payouts are triggered by pre-specified patterns of the index.

moral hazard: This occurs when individuals engage in hidden activities that increase their exposure to risk as a result of borrowing or purchasing insurance. These hidden activities can leave the lender or insurer exposed to higher levels of risk than had been anticipated when interest or premium rates were established.

parametric insurance product: An insurance product in which payouts are triggered by an event, such as a catastrophic storm.

transhumance: Seasonal migration of livestock to suitable grazing grounds.

waterlogging: Oversaturation of the soil that can starve plants of the required oxygen.

winterkill: Crop losses due to very cold winter weather.

zero/one contract: A contract structured so that once a threshold has been crossed, the total possible payout is made.

Case Study 1
AGROASEMEX in Mexico

Context

Mexico is highly vulnerable to catastrophic weather events that cause excess rainfall and drought. These are further aggravated by the El Niño phenomenon (El Niño Southern Oscillation – ENSO) and cyclones. Over the last 30 years, Mexico has faced more than 119 natural disasters, the most in Latin America and the Caribbean, and the trend is upwards.[11]

Although agriculture accounts for just 3.8 per cent of the country's GNP, the sector employs 21 per cent of the workforce. This disparity exists because subsistence farming is the most widespread form of agriculture, and small-scale farmers generally have non-irrigated plots of less than two hectares. Weather shocks are thus most likely to have an adverse affect on the poorest farmers.

The majority of arable land is sown with basic grains such as maize (the most widespread), beans, sorghum and barley. Over three quarters of these grains are sown in the spring/summer cycle from May to November, which coincides with the rainy season. Consequently, it is these crops that are most vulnerable to fluctuations in rainfall.

Traditionally, small-scale farmers have relied on informal mechanisms to manage their risks (e.g. crop diversification and rotation, or emergency borrowing from friends and family), trapping them in a vicious circle of poverty and limiting sustainable growth.

Prior to 2003, the majority of the poor rural population had no access to agricultural insurance. In the event of a natural disaster, they received funds from the Ministry of Agriculture's Programa de Atención a Contingencias Climatológicas (PACC) [Climate Contingencies Programme], a subsidiary of the National Disaster Fund.

PACC's former disaster assistance programme, funded exclusively from federal and state tax revenues, was a costly and unsustainable ex post attempt to manage risk. In order to improve the use of federal funds and their distribution to farmers, in 2002 an insurance programme for catastrophic risk based on weather indices was piloted. In 2003 the federal Government incorporated this programme into PACC, offering it on a much larger scale than in the pilot. It sought to offer the Government efficient risk-management solutions for agricultural activities and to provide for more-timely distribution of federal funds to marginal farmers.

[11] Center for Research on the Epidemiology of Disaster, Université catholique de Louvain, Louvain-la-Neuve, Belgium.

The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 1: Guanajuato, Michoacan, and Puebla States in Mexico

History

The first small-scale pilot was carried out in 2002 in various regions of Guanajuato State and insured 75,000 hectares (ha) of maize and sorghum against drought. It was based on a rainfall index and used five weather stations.

The government-owned AGROASEMEX designed and implemented this index insurance product in order to transfer Mexico's catastrophic agricultural risks to the financial market.[12] AGROASEMEX still manages the programme, is responsible for commercialization of the product, and transfers the risk to the international reinsurance market.

Insurance Programme

Table 1: Programme basics

Programme	AGROASEMEX in Mexico
Project leads	AGROASEMEX
Client	Federal and state governments in Mexico purchase the insurance; benefits are distributed to low-income rural producers
Insurer	AGROASEMEX
Weather data provider	National Water Commission (CONAGUA)
Regulatory body	National Insurance Commission (CNSF)
Crops	Corn, beans, sorghum and barley
Risks	Drought and excess moisture
Premium rate	Varies by the degree of marginalization of the municipality
Farmers insured	650,000 in 2007 and 800,000 in 2008

Regulation

A second pilot took place in the spring/summer cycle of 2003, incorporating lessons learned from the technical and operational results of the 2002 pilot. At this time, the product was registered with the National Insurance Commission [Comisión Nacional de Seguros y Fianzas] (CNSF), which vets the legality of contracts and contributes to the actuarial methodology for evaluating risk. Having CNSF on board verified the efficiency of the product and the strength of the triggers established in the contract. In this pilot, the State Government of Guanajuato contracted insurance for approximately 107,600 ha of corn and sorghum, distributed over six weather stations in the regions. The total sum insured in 2003 was US$3.5 million, with gross premiums totalling US$338,000 (see Table 4).

[12] AGROASEMEX is a national insurance institution of the federal Government of Mexico that provides reinsurance to economic agents operating in the market of agricultural insurance. It also designs and manages mitigation and risk-transfer instruments, http://201.158.1.169/agroasemex/.

Weather data provider

Prior to the launch of the second pilot, the National Water Commission (CONAGUA), which is the public entity responsible for managing the weather stations, granted access to the historical weather database and began producing a weekly electronic report with rain value updates.

2004-2008 scale-up

Scaling up of the weather insurance programme continued in the following years. In 2004, some regions from Puebla State were incorporated, crop coverage was extended to barley, and the insured area, number of weather stations and sum insured increased.

Since 2004, AGROASEMEX has continued to work to extend coverage. It offers protection against drought and excess moisture for all four of the most important grains in Mexican agricultural production: corn, beans, sorghum and barley. By 2008, 1.9 million ha were protected under the programme, distributed over 251 weather stations, with a total sum insured of US$132.5 million and premiums of US$22 million, benefiting approximately 800,000 low-income farmers.

Target group

The insurance is sold exclusively to the federal and state governments. The federal Government purchases the product through its PACC programme. It decides which states to cover and also responds to formal requests for assistance from state governments.

The target group consists of low-income rural producers, mainly with non-irrigated crops. Of those who receive aid, 57 per cent have an income of less than US$74 per month, while the remainder have monthly incomes fluctuating from US$75 to US$222.

Public policies state that, in the event of disaster, aid should go mainly to the most marginalized regions (i.e. those with the lowest combined development in socio-demographic variables, such as access to education, suitable housing and income). In the period 2006-2007, 41 per cent of the regions supported were considered highly marginalized.

Product information

Premium rates and subsidies

The premium rate depends on the degree of marginalization of the municipalities included in the portfolio. The federal Government subsidizes 90 per cent of the premiums for those municipalities with high marginalization, and 70 per cent for municipalities with low-to-medium marginalization. The remaining percentage of both is funded by the relevant state government.

Triggers

Every year AGROASEMEX evaluates and adjusts the trigger levels and/or the period covered to improve payouts for the upcoming season. There are two triggers: drought and excess rainfall. Trigger levels differ according to the crop, region and crop growth stages (i.e. sowing, flowering and harvesting).

Payouts

Before paying any indemnities, CONAGUA is required to certify the weather data, which are sent to the international reinsurers. PACC operational guidelines state that the minimum payout is US$82 per hectare, equivalent to the aid granted by the Government in the case of extreme contingencies, for up to 5 ha of land per farmer (Table 3). This results in a maximum payout of US$410 for farmers growing annual and perennial crops and US$2,275 for small-scale farmers growing high-value crops.

Payouts are fixed at this rate, and the Government retains any extra indemnities received. The state governments have a list of low-income farmers eligible to receive a payout from PACC, and they distribute the indemnities directly to farmers. These governments aim to deliver payouts within three months. On average, farmers reinvest 70 per cent of the payout received to restart or improve their production by purchasing agricultural supplies or making improvements to their production units.

Table 2: Minimum and maximum triggers for all states for drought and excess rainfall (2008)

	Sowing	Flowering	Harvest
Drought triggers (rainfall in mm)			
Corn	29-66	49-239	26-180
Bean	26-58	45-107	24-128
Barley	35	97-140	39-52
Sorghum	36-37	54-97	29-34
Excess rainfall triggers (rainfall in mm)			
Corn	n/a	280-1514	189-1095
Sorghum	n/a	351-924	272-738

Note: rainfall amounts outside of these ranges trigger the payout.

Table 3: Support given to farmers for disasters through PACC

Type of crop/ type of farmer	Amount of support	Surface area subject to support
Annual: Farmers with less than 20 ha	US$82/ha	Up to 5 ha per producer
Perennial: Farmers with less than 5 ha		
Fruit, coffee, nopal: Farmers with less than 5 ha	US$455/ha	

Source: PACC operational guidelines.

Table 4: Index insurance evolution in Mexico (2003-2008)

Annual crops	2003	2004	2005	2006	2007	2008
Policy terms (amounts in US$; area in ha)						
Premium rate	10%	12%	15%	12%	13%	16%
Sum insured	32.8	68.2	51.8	56.1	54.3	70.2
Portfolio						
Total number of policies sold	12	40	259	393	295	407
Total number of farmers covered	47 000	108 000	478 000	600 000	650 000	800 000
Total surface area	108 000	248 000	1 160 000	1 418 000	1 519 000	1 903 000
Weather stations	6	25	185	198	170	251
Total gross premiums	338 000	2 082 000	9 142 000	9 367 000	10 497 000	21 779 000
Total net premiums earned	338 700	1 630 000	5 602,000	7 026 000	4 380 000	13 104 000
Total sum insured	3 532 000	16 942 000	60 115 000	79 577 000	82 522 000	132 562 000
Reincurance						
Reinsurance premiums paid	-	451 000	3 540 000	2 341 000	6 118 000	8 676 000
Total proportional reinsurance (sum insured)	-	4 210 000	23 280 000	19 886 000	47 857 000	52 805 000
Performance						
Claims (payouts)	-	-	9 553 000	1 957 000	3 675 000	7 653 000
Loss ratio (claims/ gross premiums)	0%	0%	104%	21%	35%	35%
Agency costs	46 000	220 000	781 000	1 035 000	1 073 000	1 723 000

Source: AGROASEMEX.

Assessment

Performance

Basis risk

AGROASEMEX and its government clientele have been satisfied with the relatively minimal level of basis risk present in the programme. Nevertheless, when it has occurred, lessons have been learned and action has been taken to correct it. In 2006 there were two cases. An indemnity was paid on a reading from a weather station in Neutla, Guanajuato Province, although no damage occurred in the field. As a result, this weather station, which was no longer reporting on a daily basis, was discontinued. In Michoacán State, the index trigger was not reached, but damages were present in the field. As was feared, in this case the state government was dissatisfied, lost trust in the scheme, and discontinued paying its share of the premium.

In order to decrease basis risk, the ideal solution would be to reduce the distance from weather stations to 10-20 km. However, doing so would require installation and maintenance of new weather stations, for which the federal Government does not have the resources.

Profitability

In quantitative terms, the programme's financial sustainability is feasible. It has been cheaper for governments to purchase and operate index insurance than to pay disaster assistance funds directly to farmers. The average operational costs from 2003 to 2008 are in the range of 1.3 per cent of the sum insured; and by 2008, purchase of risk-transfer instruments represented 61 per cent of the PACC budget, less than the costs prior to insurance when tax revenues were used directly.

Reception and adoption

Index insurance in Mexico has, on average, shown consistent growth since its 2003 launch (Table 4). Qualitatively, AGROASEMEX considers the insurance product an efficient instrument for risk management and risk transfer of federal assistance funds. It has a direct impact on the previously uninsured low-income rural population by significantly reducing the delivery time of aid and quickly kick-starting agricultural production. Despite this, farmers themselves are often unaware that the aid they now receive comes from index insurance as opposed to tax revenues.

Lessons learned

Weather data

Despite the programme's growth, it only covered 17 per cent of the sowed surface in the spring/summer cycle. This is attributable mainly to the lack of weather stations able to guarantee efficient data flow and an optimum risk valuation process.

Though the country has approximately 1,200 conventional weather stations managed by CONAGUA, only half of those are located in regions where insurance is offered. A possible solution would be to use the national network of approximately 764 automated weather stations constructed by Fundación PRODUCE, the private rural producers' association. Thus far, these new, private weather stations have not been incorporated into the insurance programme, but they would also present problems, as they have only three years of weather data. To overcome this limitation and make use of the improved weather station network, AGROASEMEX developed a methodology using reanalysis techniques to obtain a simulated series of weather variables. This reanalysis has made it possible to simulate the current random data into regular patterns or 'meshes' for temperature or rain, thus compensating for the lack of historical weather data.

The feasibility of this methodology received preliminary testing in 2007 with satisfactory results; and in 2008 it was used for 75 weather stations, insuring an additional 250,000 ha. It is estimated that by 2009 approximately 161 government stations and 100 Fundación PRODUCE stations may be included because of AGROASEMEX's data simulation, which would potentially further increase coverage by 2 million ha.

Another opportunity to improve data collection would be to use satellite imagery. An insurance product for pasture land began in 2007 using a Normalized Difference Vegetation Index (NDVI), which is derived from satellite measures of 'greenness' corresponding to the level of photosynthesis on the ground.

Diversifying payout options

AGROASEMEX has suggested that in the future it might include a partial payout modality to accommodate smaller payouts in the event of smaller crop losses.

Expanding risk coverage

The positive reception of index insurance programmes in Mexico is opening doors for its expansion and growth in the short- and mid-term. Efforts have been initiated to include new risks such as flooding and frost.

Financial intermediaries

AGROASEMEX is also investigating the potential of selling index insurance products directly to farmers instead of solely to governments. The objective is to drive the growth of index insurance by attending to the needs of the low-income rural population more efficiently and sustainably.

Since poor rural smallholders are generally excluded from financial services, the idea is to link this risk-transfer scheme under a collective or group insurance approach, using rural producers' organizations to perform microinsurance intermediation. AGROASEMEX has calculated that by outsourcing to large intermediaries that have a stronger presence in rural areas, operational costs and the risk of moral hazard could be reduced.

The possibility of operating and managing insurance under a partner/agent model is under study. In this approach, the risk is assumed by an insurance company and the microfinance institution performs sales and customer service functions, restricted exclusively to its partners, under a collective insurance contract that can be linked or not to credit. AGROASEMEX estimates that this operational model creates institutional synergies: each party (microfinance institution and insurance company) provides the service(s) in which it has expertise, creating advantages for the microfinance institution, the insurance company and the insured party. Feasibility studies are being completed, and AGROASEMEX has initiated a series of meetings with several microfinance institutions interested in future projects.

Case Study 2
PepsiCo contract farming in India

Context

As the third largest producer of potatoes in the world, India grows approximately 25 million tons of potatoes annually, or about 8 per cent of total worldwide production. To secure its supply of processing potatoes, used for potato chips, PepsiCo started a contract farming programme for potatoes in India in 1995. In 2008, it contracted with approximately 10,000 potato farmers across the country in Punjab, Uttar Pradesh, Bihar, West Bengal, Himachal Pradesh, Maharashtra, Tamil Nadu and Karnataka. PepsiCo planned to increase the total number of potato contract farmers to 12,000-15,000 by the end of 2009. The volume of potatoes sourced in this programme has increased sharply, from 2,920 tons in 2002 to 57,000 tons in 2007, accounting for approximately 60 per cent of PepsiCo's total demand.

In its contract farming arrangement, PepsiCo offers an extensive package of services. It distributes fertilizer, provides access to pesticides, and requires contracted potato farmers to use a specific variety of high-quality potato seed, which it sells to farmers at cost. PepsiCo offers farmers technical advice on production practices through a network of agronomists, extension workers and local facilitators. Contracted farmers have the opportunity to manage the many risks associated with potato-growing through an index insurance product, which is sold through ICICI Lombard General Insurance Company and managed by Weather Risk Management Services (WRMS).[13] PepsiCo has systematically educated farmers about this product, conducting numerous training sessions and meetings for the various actors involved.

An integral part of the PepsiCo contract farming programme, WRMS is a private consultancy firm that designed the product, installed weather stations and manages the insurance aspect of the programme, charging PepsiCo a commission of 5 per cent of the premiums. WRMS has installed 250 weather stations in India to date, and aims to have 400 installed by year-end 2009. As a point of reference, the India Meteorological Department (IMD) operates 600 weather stations. The data generated by WRMS weather stations have been a key input into index insurance policies; they are also sold to newspapers, the Reuters service and television programmes. WRMS sent weather data advisory messages to each farmer via mobile phone, along with information on how to prevent avoidable crop loss. This weather service was sent in a timely, regular manner and charged separately to participating farmers.

[13] www.weather-risk.com.

The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 2: States in India where PepsiCo engages in contract farming for potatoes

Insurance Programme

Table 5: Programme basics

Programme	PepsiCo contract farming programme in India
Project leads	PepsiCo, WRMS, ICICI Lombard
Client	Potato farmers participating in PepsiCo contract farming programme
Insurer	ICICI Lombard (insurer) and WRMS (technical and infrastructure support)
Weather data provider	WRMS
Crops	Potatoes
Risks	Late blight disease
Index	Humidity and temperature
Premium	US$30/acre (1 acre = 0.405 ha) PepsiCo offers an incentive in the buy-back price of Rs 0.15/kg (US$0.002/kg) with purchase of index insurance
Farmers insured	4,250 in 2007 and 4,575 in 2008

Product Information

In India, the upfront costs of producing processing potatoes for PepsiCo are relatively significant: 45,000-60,000 Indian rupees (Rs)/acre (US$890-1,900/acre).[14] In comparison, table potatoes are approximately Rs 30,000/acre, and wheat is only Rs 10,000-15,000/acre. Among the costs of potato-growing, inputs total Rs 30,000-35,000/acre, including the processing-potato seeds (Rs 16,000/acre), fertilizer (Rs 4,000-5,000/acre), pesticides (Rs 5,000-6,000/acre) and irrigation (electric- or diesel-powered) (Rs 5,000-6,000/acre). In addition, larger farmers may lease land (Rs 15,000-20,000/acre) and hire labour (Rs 8,000-10,000/acre). The index insurance presents an additional optional cost of Rs 1,500/acre.

Many of the larger-scale farmers in the PepsiCo programme, particularly in Punjab, have sufficient working capital to not need financing of their production costs. For those who do, PepsiCo has an agreement with the State Bank of India (SBI) that allows its contract farmers to borrow up to Rs 30,000/acre at 7 per cent interest. In addition to SBI, smaller- to medium-scale farmers can access loans from cold-storage facilities, where they will often store their potatoes after harvest. Interest rates from these loans range from zero to 24 per cent, and repayment is often quite poor.

PepsiCo offers contract farmers a base buy-back price and incremental per kilogram price incentives for low or zero sugar levels (+Rs 0.30/kg),[15] high dry-matter content, the use of fertilizers and pesticides (+Rs 0.25/kg) and the purchase of insurance (+Rs 0.15/kg). The price incentive for purchasing index insurance is offered for the first three years of the programme in a given state and is still in place in West Bengal, Punjab and Uttar Pradesh. The base buy-back price changes from area to area, and the total price, including

[14] In March 2009, US$1 = Rs 50.56.

[15] The sugar content of potatoes depends on the weather: cold weather leads to an increase in plant sugars, which is undesirable for processing potatoes (sugars make the potato chips burn and turn brown when cooking).

Table 6: Approximate gross margins of PepsiCo processing potatoes versus table potatoes

	Processing potatoes		Table potatoes	
Budget items	**Rs**	**US$**	**Rs**	**US$**
Approximate cost of production (per acre)				
Seed	16 000	320	12 000	238
Fertilizer	4 000	80	3 500	69
Pesticides	5 000	100	3 500	69
Irrigation	5 000	100	5 000	99
Labour costs	7 000	140	7 000	138
Index insurance	1 500	30		
Total	38 500	770	31 000	613
Approximate yield and revenue per acre				
Average yield (ton)	12.5		11.0	
Yield after quality control (ton)	11.0			
PepsiCo base buy-back price (Rs/kg)	6.50	0.130		
Use of recommended chemicals (Rs/kg)	0.25	0.005		
Index insurance(Rs/kg)	0.15	0.003		
Low or zero sugar content (Rs/kg)	0.30	0.006		
PepsiCo buy-back price with incentives (Rs/kg)	7.20	0.140		
Market price quality potatoes (Rs/kg)			5.00	0.10
Profit (Rs/acre)	79 200	1 571	55 000	1 088
Gross margin (Rs/acre)	40 700	808	24 000	474

the incentives, can range from Rs 7 to Rs 10/kg. As farmers are required to pay all upfront costs of production, side-selling is not a significant concern to PepsiCo, as it does not have costs to recoup. Its priority is sourcing inputs for processing. The average yield for processing potatoes in India is 8-10 tons/acre; PepsiCo farmers produce 11-14 tons/acre.

History

PepsiCo was motivated to add index insurance to its contract farming package both to limit the risk to farmers and to limit the risk in its supply chain, as part of a larger effort to establish long-term relationships with farmers. Index insurance was appealing to the company because the national area-yield insurance was not considered sufficiently transparent and its record in India has been very poor. Nevertheless, PepsiCo did express some concern that since index insurance is not well-known in India, it may be hard to market; farmers may also not consider it to be a good value, as it covers only their production costs and not lost sales.

Coverage

In India, farmers who take an agricultural loan from a state bank ('loanee farmers') are required to purchase insurance. Most loans are provided by government banks, which are required to provide the traditional yield insurance for a given list of crops. When the list in a state *does not* include potatoes, farmers are free to choose index insurance. When the list of crops in a particular state *does* include potatoes, then the bank mandates the purchase of the National Agricultural Insurance Scheme (NAIS), which is the government agricultural insurance programme. In some cases, farmers may refuse to pay for the traditional insurance or bankers may not want to bother with it, and they can demand an exception to choose index insurance instead. Farmers seemed quite displeased with NAIS, saying that it is not transparent and that there are 'never' payouts.

Among PepsiCo contract farmers, roughly 95 per cent elect to purchase index insurance, a high proportion that is driven at least in part by price incentives and the requirement that loanee farmers buy insurance. PepsiCo also encourages the purchase of index insurance through client education, as it finds index insurance simpler, more transparent and faster to settle than conventional insurance.

Approximately 50 per cent of those insured by the index insurance programme were smallholders, owning less than 5 acres (2.025 ha) of land. In Punjab, where relatively few farmers need to take out loans for production costs and have no requirement to purchase insurance, about 75 per cent of farmers still choose to buy it. In Maharashtra, where index insurance is compulsory for loanee farmers, 1,500 farmers have purchased it. Of the 1,500 PepsiCo farmers in Karnataka, about 75 per cent chose to purchase the insurance in 2008. The payout in Karnataka in 2007 was up to 90 per cent of the sum insured, equivalent to Rs 22,500/acre, which may have led to the increased number of subscriptions in 2008.

Target issue

WRMS designed this product to cover severe potato crop losses caused by late blight disease, as minor losses could be avoided through better farming practices. Late blight disease can spread easily under certain conditions, especially those involving high moisture caused by rain, dew, irrigation or high humidity (greater than 85 per cent) and moderate temperatures (night temperatures of 10-15°C and day temperatures of 15-21°C). Consequently, the insurance programme is based on a disease index, incorporating both humidity and temperature levels.

Product information

Weather data and infrastructure

Index insurance was first offered through the contract farming programme in Karnataka and Maharashtra in the *kharif* season (June through October) in 2007, West Bengal and Punjab in the *rabi* season (December through March) in 2007, and then in Uttar Pradesh in *rabi* in 2008. During implementation of the product, weather stations were installed, with their locations carefully chosen to minimize basis risk. WRMS bore the costs of installing the new infrastructure, recovering this investment through the revenue generated by the insurance programme and the sale of services to other companies and commercial farmers. For example, it offered private clients subsidized weather stations that it would install and maintain at half the cost (US$512 instead of US$1,023) in exchange for access to the station's data. In Karnataka, Maharashtra and Punjab, each weather station is now 20 kilometres from a participating farmer; that is, the stations occupy the four corners of the grid with the farmer in the middle.

Premium rate and subsidies

The premium for index insurance in the PepsiCo programme is Rs 1,500/acre (US$30/acre), approximately 3-5 per cent of the sum insured (Rs 25,000-30,000 or US$500-600/acre). The product is structured to cover losses above 40 per cent of yield, with farmers covering losses up to this point through various risk coping mechanisms. The maximum payout is designed to be equal to the cost of production plus a bit more to include family farm wages and opportunity costs.

Triggers

Payouts for late blight disease are triggered if crops experience consecutive days of average relative humidity greater than 90 per cent and average temperature of 10-20°C. In subsequent years, a frost index was also added to the coverage, which triggers payout when the temperature falls below 1-2°C.

Payouts

The programme has been effective in timely settlement of claims, lowering the settlement time from an average of six to eight months to a maximum of two months from the end of the covered period. Efforts are still being made, however, to ensure settlement within 30 days of the end of the covered period.

Table 7: Analysis of the programme through four seasons of implementation (2007-2008)

Season/year	*Kharif* 2007	*Kharif* 2008	*Rabi* 2007	*Rabi* 2008 (estimate)
Number of farmers insured	3 750	4 100	500	475
Number of farmers insured as a proportion of the total number of farmers in the contract farming programme	80%	85%	50%	60%
Average premium per farmer (US$/acre)	30/acre	30-37/acre	32/acre	25-30/acre
Total premium (US$)	139 025	153 704	28 691	32 790
Average area insured per farmer (acres)	1.85	1.85	4.2	4.4
Total area insured (acres)	5 560	6 487	1 050	1 112
Average sum insured per farmer (US$)	922	922	2 049	2 049
Total sum insured (US$)	2 766 676	3 258 530	522 594	553 335
Total claims (US$)	130 208	71 728	43 037	n/a
Incurred claim (%)	94%	45%	150%	n/a

Assessment

Performance

The results for the first season (*kharif* 2007) of index insurance through PepsiCo showed a significant difference between the level of basis risk and actual risk. The weather index of some locations showed 85 per cent loss when actual losses were roughly 50 per cent; and some locations received payouts without suffering any loss. In other regions, however, the loss recorded (45 per cent) was less than the actual damage (50-60 per cent). In response, more weather stations were installed near farm locations for the following season.

Basis risk results in *rabi* 2007 were slightly better, but they were still not optimal. Payouts matched two damaged locations, but recorded less than actual losses for another two.

Reception and adoption

In Punjab, only 145 out of 282 potato farmers under contract farming with PepsiCo bought index insurance coverage. This result stems from two important conditions. First, since Punjab had suffered relatively less damage than other regions, fewer farmers were inclined to purchase the insurance. Second, some farmers who did not purchase insurance were new to the contract farming programme and, as such, were still testing the credibility of the PepsiCo programme. Once they became acquainted with it, more farmers bought the insurance.

The *kharif* season of 2008 showed satisfactory results, primarily due to a further increase in the number of weather stations. The product was also adjusted to trigger payout for losses only beyond the break-even level. Small losses would not receive any indemnification, an aspect that was hard to explain to farmers, but necessary to reduce the premium. Additionally, the estimated loss of yield (33 per cent) matched the expected payout.

Despite the challenges in its implementation, surveys conducted by WRMS indicated that farmers trusted the programme for its capacity to reflect actual losses and provide for timely claim settlement. Farmers seemed to have a good grasp of the quantitative impact of weather on yields. In many locations, farmers had calculated claims and expected the forthcoming indemnification, which allowed them to plan future investments accordingly.

Lessons learned

Barriers to scaling up

Currently, IMD has 500 weather stations in India, of which only 25 per cent have good historical data, and hail, cyclone and wind data are almost non-existent. In addition, the recording frequency in most stations varies from once every three hours to once per day, making consistent daily data collection and consolidation nearly impossible. Moreover, weather stations are rarely located in poor rural areas. Similarly, the distance between farmers and weather stations needs to be reduced. WRMS plans to install new stations to cover the regions in PepsiCo's contract farming programme, though significant levels of investment in infrastructure would also be required to offer index insurance in regions where PepsiCo does not operate. WRMS estimates that an additional 10,000 weather stations are required in India, which would imply an investment of US$5-6 million.

The limited participation of reinsurers is another constraint on scalability. Reinsurance companies are reluctant to enter the market due to the difficulty of estimating its size and their risk exposure. Since coverage is voluntary, the number of enrolled farmers may vary significantly from one season to the next and may represent a small share of total premium in the insurance market. As a consequence, reinsurers that do enter the market load the premium, owing to a lack of reliable data on a real-time basis. In addition, options for reinsurance are limited for deals under US$1 million in ceded premium (only one reinsurer has accepted a deal for US$100,000). While most reinsurers require the sales process to end 10 days prior to the risk inception date, index insurance cannot work with policies older than 30 days. The lack of pricing and underwriting skills further impedes the development of the local reinsurance market and limits the retention capacity of the insurer.

Key lessons

Contract farming has been an extremely effective tool in reducing the vulnerability of smallholders. *The main drivers of smallholder participation in contract farming programmes* appear to be:

- Links to a market and buyers;
- Fixed prices, which are typically above market prices;
- Better access to inputs through PepsiCo, which purchases fertilizer in bulk and can sell it more inexpensively to its contract farmers (who can then produce higher yields);
- Technical assistance, including agricultural production and weather forecasts; and
- Access to financial services, including loans and index insurance.

The main challenges for smallholders in contract farming programmes have been:

- High quality standards of buyers (e.g. size, shape, sugar levels and dry-matter content);
- Required upfront financing; and
- The need to strictly follow specific agronomic practices to produce the required quality and yield (i.e. farmers cannot skip prescribed applications of fertilizers, chemicals and pesticides).

The demand for index insurance is difficult to determine, though the product seems to be appreciated by the farmers who did buy it and who received payouts. *The main drivers that influence a farmer to purchase index insurance* include:

- Incentives offered (e.g. higher buy-back price from PepsiCo);
- The ability to finance the premium and other production costs through a loan;
- Trust in the actors involved (e.g. corporation, processor, insurer, local representatives);
- Demonstration of timely payouts in previous seasons;
- A perceived need to mitigate the risk of losing the significant upfront costs of production, in part to cover the production costs for the following season; and
- Dissatisfaction with the government area-yield insurance programme.

A number of *key challenges remain* for index insurance, including:

- Designing products that balance meaningful coverage with an affordable premium;
- Minimizing basis risk;
- Securing delivery channels for product distribution;
- Expanding the limited target market (agricultural borrowers at state banks are required to buy national insurance);
- Creating new indices that blend the quick payouts of index insurance with the more accurate payouts and lower basis risk of area-based insurance; and
- Using technology that more accurately captures weather events and trends, such as the Normalized Deviation Vegetation Index (NDVI), which is derived from satellite measures of 'greenness' corresponding to the level of photosynthesis on the ground.

In terms of replicability and scalability, the potential to apply the contract farming model to other crops and value chains, linked to an index insurance product, seems great. Farmers integrated into a value chain have a greater potential for sustained income growth and increases in their quality of life. This can also better position them to take on higher-risk income-generating opportunities that require greater upfront investment: the insurance can play a key role in hedging these investments against weather shocks.

Case Study 3
Index insurance in Ethiopia – three pilots

Context

Some 44 per cent of Ethiopia's population lives below the poverty line. Agriculture is the dominant economic activity, accounting for roughly 47 per cent of GDP.[16] Almost four fifths of the people live in rural areas, and the majority work in the agriculture sector.

Grains are the most important field crops – and the chief element in the diet of most Ethiopians. The principal grains are teff, wheat, barley, corn, sorghum and millet. Other widespread crops include pulses and oilseeds such as niger seed (*neug*) and sesame.

Agricultural activities in Ethiopia generally have low productivity. The sector is affected by a high level of poverty, underdeveloped infrastructure and poor entrepreneurial development. Natural resource degradation, shortage of capital and poor savings habits trigger severe seasonal income fluctuations.

Ethiopia is one of the few countries in the world that has been ravaged by two extreme hydrological phenomena: extreme drought and extreme flooding, both of which compound the land degradation problem. The direct results are a dramatic decrease in economic development and an increase in poverty. In order to cope, some farmers have diversified crops in the case of drought or have sold cattle to repay loans or buy food.

The Government of Ethiopia's agriculture policy aims to achieve rapid economic growth through the development of a free market economy, with the intention of liberating Ethiopia from aid dependency.[17] Within the Government Food Security Program, proposed development alternatives include the use of index insurance products. Index insurance was first piloted in the country in 2006.

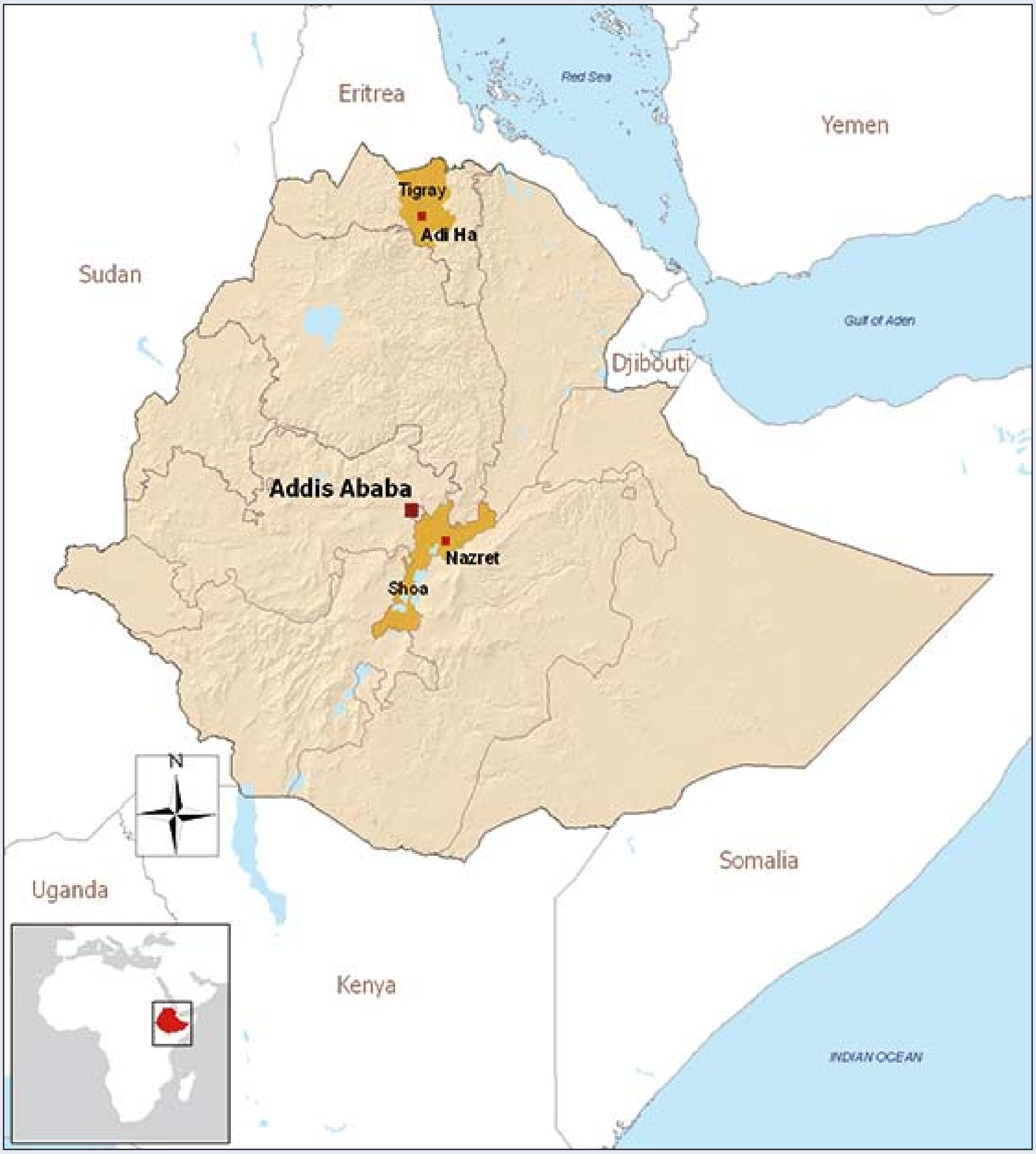
Insurance programmes

Pilot overview I: Macro pilot project – disaster insurance in Ethiopia, 2006

Ethiopia's first index insurance pilot was implemented in 2006 through a partnership between the World Food Programme (WFP) and the Government. The main objective was to insure against the risk of national drought catastrophe on the international financial

[16] IFAD. 2008. Ethiopia: Recent macroeconomic agriculture-sector performance and trends in rural poverty, August 2008. Internal document. Rome.

[17] www.eap.gov.et/About-MoARD/Vission.asp and www.eap.gov.et/content/files/Documents/Rural_Development_Policies.pdf.



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 3: Ethiopia and the Central Tigray and East Shoa districts

market. The insurance targeted a group of 5 million transiently food-insecure people who are directly affected in the case of drought.[18]

The Ethiopian Drought Index (EDI) was developed using historical data provided by the National Meteorological Agency (NMA), together with a crop water-balance model. Rainfall was monitored at 26 weather stations installed across the country. The index had an 80 per cent correlation with the number of food aid recipients from 1994 to 2004, which demonstrated that it could act as a good indicator of human need when drought strikes. Extension officers in the field reported that the index effectively tracked rain. Axa Re reinsured the contract, with a premium set at US$0.93 million and a maximum payout of US$7.1 million in the event of severe drought.

At the end of the coverage period in October 2006, the EDI was well below the US$55 million trigger level, as rainfall was above normal that year; thus no payout was made. Despite this fact, the pilot demonstrated the feasibility of index insurance. It showed good capacity-building between the Government and local partners, including NMA, which was able to deliver quality data.

The policy was not renewed in 2007 due to lack of donor support. However, other index-insurance pilots did follow this initiative.[19]

Box 1: LEAP software

Following the first index insurance pilot in Ethiopia, under the guidance of agronomist and weather expert Peter Hoefsloot, WFP and the World Bank developed the Livelihoods, Early Assessment and Protection (LEAP) software application. Based on the Water Requirement Satisfaction Index (WRSI) of the Food and Agriculture Organization of the United Nations (FAO), the software allows users to quantify and index the drought and excessive rainfall risk in a particular administrative unit. The software monitors this risk and guides disbursements for the scaling up of the Ethiopian Productive Safety Net Programme (PSNP), a Government programme that targets the poorest people facing food insecurity in any type of weather.

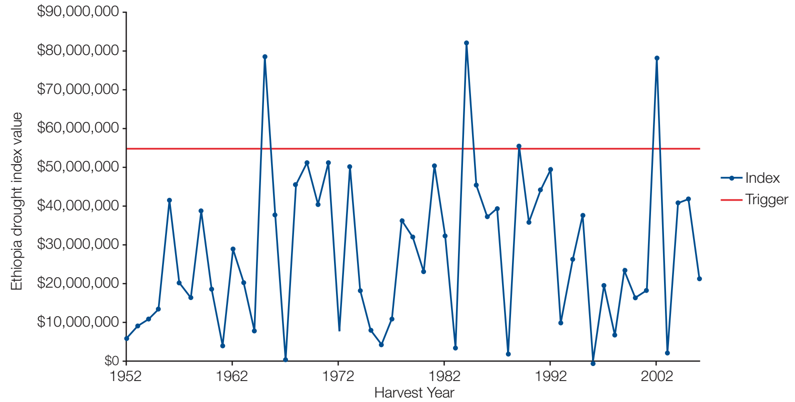
LEAP runs localized models to convert rainfall data into crop or rangeland production estimates and subsequently into livelihood stress indicators for vulnerable populations. It uses ground and satellite rainfall data to map the whole of Ethiopia, and it is able to cover areas without weather stations, so that all administrative units in the country can be included. LEAP then estimates the financial magnitude of the livelihood-saving interventions needed in the event of a weather shock. It thus provides a good estimate of the funding needed to protect transiently food-insecure people's livelihoods at a time of shock – and it does so through an independent, objective, verifiable and replicable index of livelihood stress.

18 'Transiently food-insecure' describes people that are usually not food insecure (i.e. in favourable weather conditions). However, they are likely to become food insecure in the case of drought or floods. They are not part of the Productive Safety Net Programme (PSNP) 'regular' or chronic beneficiary caseload. The idea is to *prevent* them from becoming chronically food insecure.

19 Ulrich Hess and Laura Verlangieri, Disaster insurance in Ethiopia, in *Index insurance and climate risk: Prospects for development and disaster management*, ed. M.E. Hellmuth, D.E. Osgood, U. Hess, A. Moorhead and H. Bhojwani. Climate and Society No. 2 (New York: International Research Institute for Climate and Society (IRI), Columbia University, 2009).

The following graph illustrates an example of the use of LEAP software in calculating drought-index value flow against a trigger level.[20]

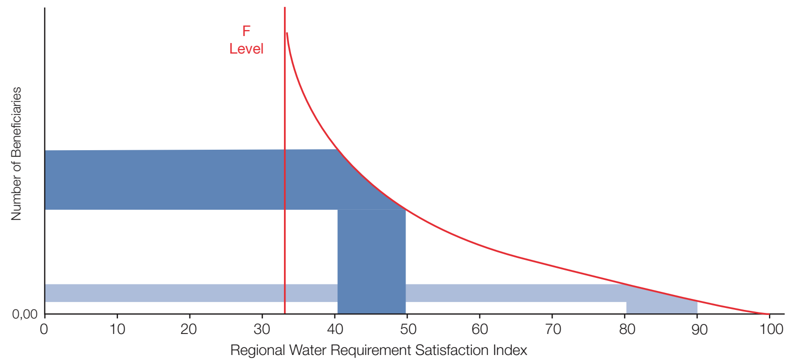
Ethiopia drought index value 1952-2002



Source: Hess and Verlangieri (2009).

Once the data are collected and the index is defined, it is necessary to identify the number of beneficiaries in the regional drought index. The Regional Water Requirement Satisfaction Index (RWSI) model was developed to elaborate such a correlation by using historical beneficiary numbers. The model is a weighted average of the WRSI computed by LEAP. In this model, the number of beneficiaries (N) increases when the drought index decreases. As a result, when the drought index is large (meaning that drought is not severe), the increase in beneficiaries is small, and when the drought index is small (meaning that drought is severe), the increase in beneficiaries is large. However, in the relationship between the number of beneficiaries and the RWSI, a failure level exists. This 'F level' shows the catastrophic conditions at which maximum livelihood protection assistance effort would be required (when the index reaches the F level, the entire population is at risk).[21]

Regional Water Requirement Satisfaction



[20] Ibid; and Peter Hoefsloot presentation during a meeting of the Ministry of Agriculture and Rural Development in December 2009.

[21] Sandro Calmanti, Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA). Presentation during a meeting of the Ministry of Agriculture and Rural Development in December 2009.

Pilot overview II: Micro prospective – haricot bean index insurance, 1 July - 30 September 2009 (*meher* season)

The overall objective of this index insurance pilot is to contribute to an ex ante risk-management system to protect the livelihoods of Ethiopian smallholders vulnerable to severe and catastrophic weather risks. The pilot uses a weather index to demonstrate the feasibility of establishing contingency funding. In the event of severe and catastrophic shortfalls in precipitation, the index is able to indicate the number of beneficiaries, and helps give an effective aid response.

In 2009, WFP gave technical support to this pilot by providing a framework for the design of the insurance contracts.[22] Nyala Insurance Company (NISCO), with guidance from WFP, designed the contracts for smallholders in the area of Bofat/Sodore near Nazareth. It insured farmers growing haricot beans in the *meher* season, and a rainfall deficit index was used to protect against drought.[23]

The contract was based on a simplified version of WRSI (which actually measures crop performance), measuring the balance between water supply and demand during the growing season. The water balance is updated every 10 days. WRSI is computed as the ratio between actual evapotranspiration (AET) and the seasonal crop water requirement (WR).[24]

So, if

Water soil content + cumulative rainfall level > plant water requirement

there is no deficit; but if

Water soil content + cumulative rainfall level < plant water requirement

there is a deficit; or put more simply,

AET < WR = deficit

The scheme proposed for this pilot is based on a simplified version of the full WRSI model. The simplified model assumes a zero soil water-holding capacity. In this case, the water deficit is determined by the difference between the water requirement and the observed rainfall during a particular 10-day period. During each 10-day period of the crop cycle, the water deficit is computed as follows:

Deficit = required rainfall – actual rainfall[25]

When actual rainfall exceeds required rainfall, the deficit is considered zero.

Contract coverage targeted three cultivation phases:

- Initial phase: germination and vegetative phase (1 July-20 August);
- Mid-phase: flowering (20 August-10 September); and
- Final phase: seed formation and ripening (11-30 September).

[22] WFP Disaster Risk Reduction Department. Ethiopia mission report and direct project involvement.

[23] *Meher* is the rainy season in Ethiopia, from early July through the end of September.

[24] WRSI = 100*AET/WR, where AET is actual evapotranspiration, which depends on water availability in the soil, and WR is the water requirement, which depends on atmospheric conditions and on the growth phase of the plant. The underlying conceptual model is that of a bucket replenished by rainfall and depleted by plant evapotranspiration. If the soil water content is less than the water requirement, there is a water deficit. In this case, AET would be less than WR and WRSI would be less than 100 per cent.

[25] There is no water deficit if the accumulated rainfall during a 10-day period is more than the water requirement. For example, if the water requirement is 40 mm and rainfall is 55 mm, then the deficit is zero. If the water requirement is 40 mm and rainfall is 30 mm, then the deficit is: 40 mm – 30 mm = 10 mm.

At the end of each phase, the total deficit for a phase is equal to the sum of all the deficits in each 10-day period within the phase.

Also at the end of each phase, payout is computed according to the value of the corresponding rainfall deficit and is related to a Rainfall Deficit Index (RDI). This index increases when rainfall decreases.

The contract was structured from a micro prospective. NISCO promoted and sold the product through the Lume Adama Farmers' Cooperative Union (LAFCU). LAFCU was essential in securing farmer participation, as it is a trusted delivery channel for farmers that already buy seed and fertilizer through the union. LAFCU bought drought insurance for the rainy season (i.e. all three cultivation phases), covering a total of 137 farmers (seven of whom were women).

When drought occurred in 2009, the growth of haricot beans was impeded and payouts were triggered. The indemnities were paid within 60 days and totalled US$24,300 (309,000 Ethiopian birr [Br]), or approximately half the maximum payout. This amount was paid to LAFCU, which then distributed it to the 137 insured farmers.

A preliminary evaluation of the pilot indicates that the insured farmers understood the insurance policy well and were aware of its potential benefits.[26] In addition, other farmers in the region have approached NISCO and its partners, asking to be included in the next phase of the pilot and expressing interest in a product that would cover crops such as maize and teff. NISCO signalled interest in this type of expansion, but it would only consider it feasible given significant capacity-building efforts and Government support.

The Government considered the NISCO pilot a good learning experience in providing crop insurance in rural areas, and it supports continuing the programme. It believes that index insurance has the potential to increase production by sharing risks and assisting farmers in adopting new technologies. It is particularly interested in replicating the experience in other regions, so that they might see similar benefits (e.g. reduced effects of natural hazards on susceptible crops). Together with international organizations, the Government would be willing to provide financial support to insurers and farmers' unions to sustain the programme. Priorities include creating incentives, providing access to credit, and improving farmers' understanding of the nature of insurance through organizing training workshops, identifying potential stakeholders and creating awareness.

Although generally favourable to the development of weather insurance, the Government sees some areas in need of improvement. Adequate training for farmers, unions and insurers (as well as its extension workers and NMA staff) would be essential to future success. Improvements in the timing of payouts would also be needed. In addition, some changes in the process of insurance development should occur. In particular, a major effort should be made to provide more access to credit for farmers. In this regard, farmers' cooperative unions have a central role in providing credit to farmers to pay premiums and possibly in marketing beneficiaries' products.

[26] Report of the evaluation of the Ethiopian haricot beans pilot project, forthcoming in the spring of 2010.

Although the payout amount did not fully compensate the loss incurred, all beneficiaries estimated that the amount of payout was adequate. Most of the beneficiaries bought household basic necessities (e.g. food, clothing), paid school fees and/or settled debts with the payout monies. However, payout timing and distribution were issues. Farmers did not anticipate that it would take two months after the end of the contract to receive the payout. In addition, they had to travel to a nearby town to collect the payout, which reduced the actual payout value by US$7.85 per person (Br 100). Looking ahead, farmers suggested establishing an insurance committee within LAFCU with a view to making the process more transparent and efficient.[27]

In the future, beneficiaries would like to see the insurance combined with other services such as improved seed, fertilizer, herbicides, potable water and the provision of marketing services. Many mentioned that additional, more-detailed training on index insurance would be useful.

Pilot overview III: Horn of Africa Risk Transfer for Adaptation (HARITA), late 2007 – ongoing

Oxfam America and Swiss Re, in collaboration with IRI, the Relief Society of Tigray (REST) and others, have developed an ongoing index insurance pilot. The project focuses directly on farmers, and it has worked to integrate index insurance with risk-reduction activities, such as improved agricultural practices, conservation measures, and seasonal and weather forecasting. Innovative aspects of the project include the extension of weather insurance to communities that lack typical delivery channels, as well as methods to allow cash-constrained farmers to pay for premiums through their labour.

Swiss Re reviewed, assessed and structured index insurance contracts for commercial viability and conformity to market standards. Oxfam America convened various local and international stakeholders and helped facilitate holistic risk-management models.

The project was initially aimed at farmers growing teff in the village of Adi Ha in the Central Tigray District. Expansion to additional villages and crops was envisioned after 2009. With farmers' backing, in the spring of 2008 Oxfam America contracted IRI to draft a prototype index insurance contract. NMA is collecting meteorological data in Adi Ha, aided by a new HOBO® Weather Logger station, purchased by Oxfam America and installed by NMA in August 2008.

Financial institutions involved in the pilot will employ a partner/agent model for insurance product delivery. Dedebit Credit and Savings Institution (DECSI), the second largest microfinance institution in Ethiopia, will act as the insurance agent. DECSI has extensive operations throughout Tigray, and it will leverage its strong community relationships and reputation to market and deliver insurance on behalf of NISCO.

With the help of a team of five community members, who were recruited to join the HARITA project management team, the project conducted workshops with farmers in Adi Ha to build their financial literacy. It carried out experimental economic risk simulations ('games') with the farmers to better understand their preferences for key parts of the insurance contract, such as coverage and frequency of payout.

[27] Ibid.

The project also worked on ways to overcome limited weather data for the region. IRI led the exploration of new techniques to enhance sparse local datasets through a combination of satellite data, rainfall simulators and statistical tools for incorporating information from stations nearby. Satellite data will also be used to better understand the correlation between rain gauges and losses on specific farms. With this information, the project may be able to reduce basis risk by determining the maximum distance between farm and rain gauge at which precipitation measurement is still valid.

An advantage of this project is that it builds on established relationships. Oxfam has had a presence in Ethiopia since the 1960s and thus has long-standing networks of trust and knowledge of the country. These relationships, along with Oxfam's history of high-profile successes in other development projects, have paved the way for resilient partnerships and for local partners' willingness to experiment with the 'radical' solution of index insurance. Other partners are also highly respected. REST has an outstanding track record in high-impact development, and communities place an unusually high degree of trust in it following the crucial assistance it provided to Tigray during and after the Ethiopian civil war.

The HARITA project ties in with Ethiopia's PSNP social protection programme. At the federal level, PSNP reaches approximately 8 million vulnerable people. It provides payments to participating households in exchange for labour to build community assets such as water-harvesting structures. Such households tend to be chronically food- and resource-insecure, and they are likely to be unable or unwilling to pay cash for insurance premiums. However, they are interested in managing the risk within their livelihood strategies.

HARITA is exploring ways to build on the PSNP model by enabling farmers to pay insurance premiums in kind, rather than in cash. Under the programme, liquidity-constrained farmers would have the option of working a few additional days in exchange for an insurance voucher that protects them against deficit rainfall. Oxfam America's focus group interviews with farmers in communities across the country suggest that many more people would be willing to purchase insurance if the premiums could be paid for through their labour.[28]

Overall characteristics of the sector in Ethiopia

Weather data and infrastructure

There are approximately 600 weather stations in Ethiopia, many with as much as 30 years of historical data. However, inconsistencies in data collection, storage and management have left major gaps.

NMA provides data through its weather bulletins, which are accessible directly from the agency.[29] Only 17 weather stations are 24-hour stations, reporting every three hours to the Global Telecommunication System of the World Meteorological Organization (WMO), communications permitting. An additional 50-60 stations report daily to the Addis Ababa office. These are Class 1 stations: fully equipped, meteorological observing stations, recording pressure, temperature, relative humidity, wind speed and direction, rainfall,

[28] Victor, M., and S. de Messieres. 2009. A farmer-centric approach in Ethiopia. In Hellmuth et al. (2009).

[29] www.ethiomet.gov.et.

evaporation and soil temperature every three hours from 06.00 to 18.00. The remaining 430 weather stations are mainly Class 3 stations: they collect data on rainfall and temperature only. There have been a few trials with other types of automatic weather stations, but these have not yet been scaled up, let alone mainstreamed.

Other weather stations that are not part of the NMA network are also available, since NMA is not the only governmental agency managing weather stations. However, there is no comprehensive overview of all the stations in terms of number, models and quality.

NMA records are open to the public. However, according to the agency's data policy, users do not have the right to give meteorological data to a third party. All routine and daily weather forecasts may be requested by telephone. Data quality is also a concern. Most weather station records have major gaps, sometimes exceeding several months. Insurance premiums need to take into account the uncertainty that missing data create – and for stations missing 20 per cent or more data from the last 30 years, the necessary adjustment to premiums would be cost-prohibitive. Given this criterion, only about 64 stations can be used to develop weather insurance products.

The HARITA pilot worked on ways to overcome limited weather data for the region. As mentioned previously, IRI has led the exploration of new techniques to enhance sparse local datasets through a combination of satellite data, rainfall simulators and statistical tools for incorporating information from stations nearby. Satellite data will also be used to better understand the correlation between rain gauges and losses on specific farms.

Another initiative seeks to purchase 20 Class 1 weather stations for pastoralist areas, either to replace outdated models or introduce all new ones. These new, low-cost high-quality stations will replace old or malfunctioning ones (or they will be installed in pastoralist areas, since one of the aims is to improve the early warning system for these areas, which have been neglected). The Ethiopian Insurance Company is also keen to expand the network of weather stations in the country and has already held talks with the World Bank to this end.

Regulation

A general, internationally-recognized regulation for index insurance products does not exist in Ethiopia. Nevertheless, index insurance is growing. However, continuing such product development without appropriate regulation would be a risk for its future scalability and sustainability. Consumers should be informed of the products and of how they can reduce their risks. Building the weather risk-management product without regulatory support would develop either risk of product incomprehension or reduced product appreciation. Appropriate support and commitment, enhanced by the regulator, will encourage the partnership of high-level counterparts in this sphere, hopefully leading to an official risk-management environment, as well as to market growth.[30]

[30] United Nations. 2007. *Developing index-based insurance for agriculture in developing countries*, by E. Bryla and J. Syroka. Sustainable Development Innovation Briefs No. 2, March. New York: Policy Integration and Analysis Branch, Division for Sustainable Development, Department of Economic and Social Affairs, www.un.org/esa/sustdev/publications/innovationbriefs/no2.pdf.

Assessment

As a result of the pilots, there is now increasing awareness among both farmers and financial institutions of the role of index insurance. This has had a number of positive effects, including opening access for smallholders to loans (as farmers are using credit to finance premium payments) and connecting agricultural insurance in Ethiopia to international financial markets.

Strong local stakeholders and delivery channels

A local insurance champion is essential to the scalability and sustainability of an index insurance product. Experience in pilots has led WFP to conclude that sustainability and scalability will not be achieved unless product development is locally owned and managed. In each of the three pilot programmes detailed here, one of the main pioneers has been the local company NISCO.

The Ethiopian Insurance Company has realized that one key to scaling up and sustaining index insurance is to focus on intermediaries and unions in the development and roll-out of the product, especially since the existing national insurance association is not considered particularly active (members are often too competitive to work together effectively). To this end, the company has already initiated discussions with farmers' associations.

Client education

Farmers will only be interested in something that is objective, timely and shown to have real benefits. According to the managing director of NISCO, the biggest obstacle to achieving scale is the low level of awareness of insurance and education among smallholders. During the dry season, says the director, farmers are only interested in price, and during the wet season, they are busy tending their crops. One option is to bring farmers together and pay them a per diem to learn about index-based insurance.

NISCO has its own agronomists and it trains extension agents and farmers. It realized early on that it was important to train these extension agents in insurance, as farmers trust them. Farmers receive training and certificates, so they are aware that they have insurance. It is important to choose farmers with a good credit history and who use good inputs and practices. NISCO checks all model farms at crop emergence to confirm that crops have been planted, and the policy only becomes effective at that point.

The haricot bean pilot involved ongoing communication with farmer cooperatives. They were considered a good starting point for reaching farmers directly and, more importantly, for communicating with them clearly and effectively, without misunderstandings.

Subsidies

In Ethiopia, insurance is less than US$1 per capita. It is thus unlikely that programmes would break even within the first 10 years, as administrative costs are very high (e.g. for logistics and awareness-building). Farmers living on so little find it difficult to pay the premiums, so subsidies – as well as in-kind labour – could help in adoption. One idea is to introduce subsidies in the earlier stages, but then slowly phase them out (for example, in the first year the farmer might pay 10 per cent of the premium, 25 per cent in the second year, 50 per cent in the third year, and so on).

Next steps

Index insurance can enhance existing agricultural supply chains and businesses. However, it would not be the most appropriate tool everywhere in the country – some crops are more weather-resistant than others – and is best suited to drought-prone areas. It can help support expansion in rural finance and agriculture, but must go hand-in-hand with investments in related areas such as extension services and irrigation.

According to NISCO, there is scope for capacity-building of insurers on the use of information technology systems and software such as LEAP in administering index insurance.[31]

[31] Nyala Insurance Company, interview December 2009.

Case Study 4
Index insurance in China

Context

Just over 10 per cent of China's land is cultivated. Rice, wheat, corn and soybeans are the main subsistence crops, representing 64 per cent of the total sown area, while cash crops include peanuts, rapeseed, cotton, sugar, vegetables and fruit. Agriculture accounts for 11 per cent of GDP, and the sector engages 41 per cent of the total labour force. Over half of China's total population is based in rural areas, and almost a fifth of these live on less than US$157 per year. Farming is mostly small-scale.

China's agricultural production is highly exposed to natural disasters and the potential impact of climate change. Drought, flooding, hail and frost are the main weather risks. Traditionally, Chinese farmers turn to a variety of ad hoc coping strategies, from diversifying their crops to, more commonly, borrowing money from friends and relatives or relying on remittances.

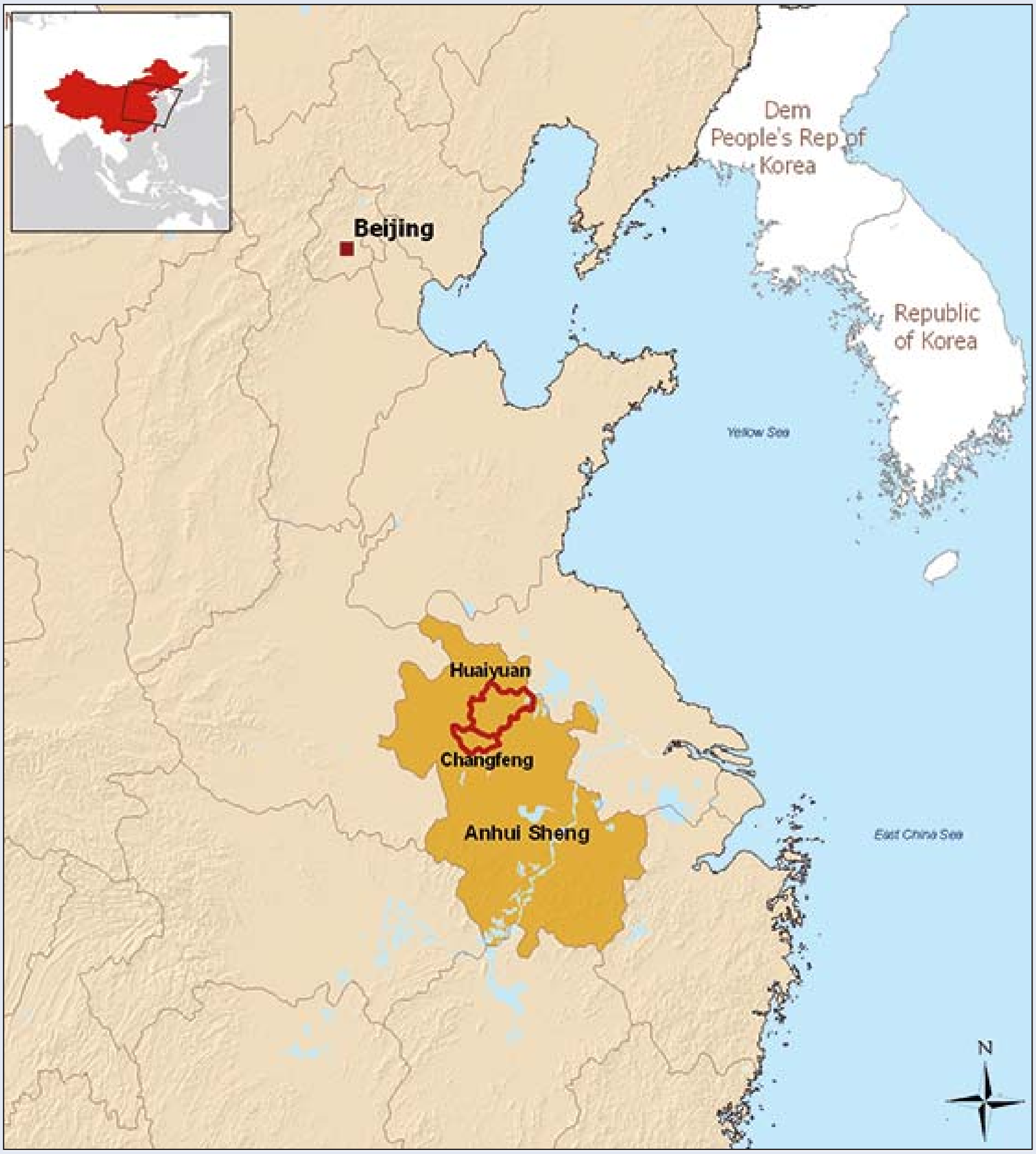
Insurance Programme

Table 8: Programme basics

Programme	WRMF index insurance pilot in China
Project leads	IFAD-WFP Weather Risk Management Facility (WRMF), Ministry of Agriculture
Client	Rice farmers in Changfeng County, Anhui Province
Insurer	Guoyuan Agricultural Insurance Company (GAIC)
Weather data provider	Anhui Meteorological Service
Regulatory body	Chinese Insurance Regulatory Commission (CIRC)
Crops	Rice
Risks	Drought and high temperature
Index	Drought and heat wave
Premium	US$0.17 per 0.07 ha
Farmers insured	482 farmers in 2009

History

Agricultural insurance was first introduced in China in 1982. By 2007 it had grown three-fold, making China the second largest market after the United States. This expansion occurred after the Government announced that it was placing a high priority on insurance. The State Council called for development of a risk protection mechanism, including the promotion of agricultural insurance, and for expansion of the coverage of pilot programmes through premium subsidies and the diversification of catastrophic risk with government financial support.



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 4: Changfeng and Huaiyuan Counties in Anhui Province, China

Since then, the central and provincial governments have supported farmers through premium subsidies for a national multi-peril crop insurance (MPCI) programme, which has been scaled up rapidly. The programme covers a variety of crops for risks including rainstorms, flooding, waterlogging (oversaturation), strong winds, hail, frost, disease, pests and rodents.

Despite these encouraging developments, MPCI has already generated some challenges. Time-consuming and potentially inaccurate loss adjustment procedures have led insurers (and the Government to some extent) to express their interest in investigating alternative solutions.

Index insurance pilot

A joint index insurance pilot was launched in 2008 by WFP, IFAD and the Ministry of Agriculture. It was the first time index insurance had been piloted in China, and the programme aimed to test its viability as a supplement or alternative to MPCI.

Geographical coverage

Anhui Province was chosen as the pilot area. Located in the centre of China, Anhui is one of the primary grain production provinces of the country, with the principal crop being rice. The Ministry initially chose the counties of Changfeng for drought and heatwave and Huaiyuan for waterlogging. Both have higher-than-average levels of rural poverty. In the end, however, the Huaiyuan pilot was only simulated owing to time constraints.[32]

Target group and crops

The policy covered the entire rice crop of the 482 households in Yanhu village in Chengfeng, protecting 85 ha of rice with a total insured value of US$56,000 and with a premium of US$2,000. Under the group insurance policy, each individual household is insured according to its actual plot size, at 300 Chinese yuan (RMB) (US$50) per 0.07 ha, which roughly equals input costs. Plot sizes vary from 0.04 to 0.5 ha.

Principal stakeholders and delivery channels

The pilot programme took place thanks to the involvement and commitment of stakeholders at all levels and across diverse, relevant sectors. IFAD, WFP and the Ministry of Agriculture were the principal project management partners. IFAD and WFP implemented the training of Chinese stakeholders. Their consultants led development of the index and design of the contracts, in consultation with local stakeholders and the WFP country office. The Research Institute of Meteorological Science, Anhui, undertook the task of index calculation and reporting.

The Institute of Environmental and Sustainable Development in Agriculture (IEDA), within the Chinese Academy of Agricultural Sciences (CAAS), was appointed by the Ministry to

[32] Changfeng and Huaiyuan had higher-than-average levels of rural poverty relative to the rest of the country and to Anhui Province. Changfeng was one of the 592 national poverty counties, i.e. the poorest counties in China, and Huaiyuan's per capita income in rural areas was RMB 3,200 (US$544) in 2007, while the average for Anhui was RMB 3,500 (US$595) and the national average was RMB 4,140 (US$704).

facilitate the provision of weather data by the Anhui Meteorological Service, the broader organization that includes the Research Institute, the Provincial Meteorological Bureau and the county-level weather service.

Guoyuan Agricultural Insurance Company (GAIC) was selected to join the project. Apart from underwriting the risk and subsidizing the pilot product, it participated in the product design and has responsibility for marketing. Funded by 12 state-owned enterprises, GAIC is the only specialized agricultural insurer in Anhui Province. It was also invaluable in local coordination, communicating with township and village leaders, and organizing training courses to enhance awareness.

Product information

A feasibility and demand study with all key stakeholders – including government agencies, insurers and farmers – concluded that the major weather risks for paddy rice in Changfeng are drought and high temperatures, while the major risk in Huaiyuan is waterlogging.[33]

Thus the pilot product in Changfeng covered heatwave (temperatures above 35°C) and drought. The indices had diverse triggers and a varying maximum payout amount (see Table 9).

After the approval of drought and heatwave index insurance by the Chinese Insurance Regulatory Commission (CIRC), the insurer, GAIC, sold a group insurance policy to Yanhu village, which bought it as a complement to MPCI, as the latter does not cover drought risk.

Weather data and infrastructure

There are more than 2,200 provincial weather stations and 700 national stations in China, which have 40-50 years of good quality historical weather data. Of these, 160 stations share their data internationally through WMO. The pilot location was just a few kilometres away from the main weather station.

Moreover, several decades of rain gauge data were available in the pilot area, so the IFAD/WFP and Chinese experts used 'historical burn analysis', further supplemented by farmer and local agricultural expert interviews, to calculate the index and the appropriate premium price.[34]

Table 9: Triggers for drought and heatwave pilot in Changfeng

Index type	Time period	Trigger
Cumulative rainfall index I for drought	15 May - 31 August	cumulative rainfall < 230 mm
Cumulative rainfall index II for drought	1 September - 15 October	cumulative rainfall < 15 mm
Heatwave index for high temperatures	30 July - 15 August	cumulative high temperature differentiation > 8°C

33 As mentioned, the waterlogging index insurance pilot in the end was only simulated, owing to time constraints.

34 'Burn analysis' is a methodology for testing an index against historical data and determining when payouts would have been made and what they would have been. The disadvantage of this analysis is that it may not capture the possible extremes, and it may be too influenced by individual years in that historical period.

Source: Weijing Wang

Figure 5: A GAIC representative marketing insurance to farmers

Note: Pink sheets list 'frequently asked questions'.

Premium rates and subsidies

The premium was RMB 12 (US$2) per 0.07 ha. The premium rate is 4 per cent of the sum insured. Farmers paid 8.3 per cent of this premium cost or RMB 1 (US$0.17). The other 91.7 per cent was subsidized by the insurer, in line with the national MPCI subsidy rules, which also subsidize premiums at this level.

The sum insured only covered production costs (excluding labour), and farmers reported that it was too low to be of interest. For the same sum insured, the pilot product was slightly cheaper than MPCI, but it covered far fewer risks.

For the next generation of product, an alternative route could be to offer different coverage options and allow farmers to choose. Additionally, it is expected that scaling up of index insurance can open up access to larger pools of capital and reduce prices. From the risk-carrier's viewpoint, errors may cancel out, while aggregating and pooling risks can reduce variability for reinsurers, thereby reducing their need for a safety margin in pricing.

Assessment

Performance

2009 was the first year of the drought product pilot. A total of 482 farmers purchased policies. There were no payouts, but this was considered consistent with the weather and loss data.

Despite its early stages, the pilot has garnered some significant results in that the product was developed, piloted and evaluated in a relatively short span of time. The strong commitment and collaboration by the Chinese Government and the insurer has been encouraging for the future of index insurance in China.

Client understanding and trust

The majority of farmers interviewed either do not understand or lack awareness of the product, and most have little trust in insurance companies. To improve on this, GAIC should enhance trust by settling claims in a timely manner and identifying partner organizations that farmers already trust. Using existing networks and programmes for rural development – such as the farmer credit access programmes, contract farming and professional cooperatives or associations – would also help reduce transaction costs and improve cost-effectiveness by facilitating marketing and promoting local ownership.

Sustainability of financial subsidies

Currently the Government only subsidizes the national MPCI programme, so GAIC matched this percentage of subsidy for the index insurance pilot. Although subsidies can help expand the market and encourage farmers to learn about and use the product, private subsidies are unsustainable in the long term, and they may make weather insurance at full cost less attractive to farmers in the future. However, it is equally questionable how long the Government can continue heavily subsidizing MPCI.

Weather data structure and possibility of basis risk

While China's weather data structure is relatively well developed, new weather stations are needed for scaling up. Moreover, stations need ongoing maintenance, as well as skilled staff to operate them.

In terms of this pilot, there are only 81 standard meteorological stations in Anhui Province to cover its area of 139,000 km^2. Historical burn analysis was used, but it has its limitations: one or two major events can distort the probabilities, while any event that has not happened in the historical record is not considered. In the future, analysis should be complemented by rainfall modelling and simulation in order to improve the index design.

In addition, to help fill data gaps and enhance data availability, technologies should be encouraged, including: remote sensing (of rainfall and vegetation), rainfall modelling and simulation, seasonal forecasting, techniques for modelling risk over time and space, modelling of long-term processes and trends, systematic communication tools, agricultural systems modelling and water resource techniques.

For the potential waterlogging product in Huaiyuan, a better weather data structure is needed to record rainfall. Waterlogging is often difficult to record, because a single highly localized event may drive the bulk of the loss.

Weather data availability

The accessibility of data is one of the most challenging issues in China. Aside from the 160 weather stations that exchange their data globally through WMO, access to both historical and real time data is considered confidential.[35] Awareness enhancement and capacity-building could help solve this bottleneck for the future development of indices.

[35] To develop accurate indices for this pilot, partners coordinated closely with the relevant Chinese offices and, for monitoring data, had access to web reports.

Capacity-building of local stakeholders

During index design, international experts worked alongside national and local stakeholders, which has greatly enhanced the specialized design skills of local partners. For scaling up, however, there is still a need to further develop specialized index design skills, especially given the complexity of China's vast geographical area and diverse weather environments.

Innovative marketing, client education and sales skills also require investment at the local level, especially since insurers often rely on village leaders to explain the product, and insurers are currently stretched thin due to the rapid development of MPCI.

Next steps

GAIC has been keen to assimilate the experiences of the pilot. It plans to actively seek the support of the Government in fostering future sales of index insurance and possibly in replacing China's current agricultural insurance products. The largest insurer, the People's Insurance Company of China (PICC), also has a strong interest in entering this market. It hopes to develop weather insurance products for rubber, oranges and watermelon.

Explore index insurance for disaster management of governments

Disaster risk reduction emphasizes preparedness ahead of disasters, in order to limit the loss of assets. The Government usually bears the costs of responding to large-scale disasters directly, but if it took up insurance policies linked to weather indices, it would ensure rapid response and ex-ante risk planning in the event of a disaster.

Develop a strong legal and regulatory system

China still lacks a comprehensive insurance regulatory environment. The pilot showed that regulators recognize its potential social benefits and are very supportive of efforts to develop index insurance. The drought and heat-wave pilot product obtained swift approval from CIRC. In the future, however, regulators should be more actively involved to ensure that products are fair to both buyers and sellers.

Case Study 5
Private and public index insurance in India

Context

In India, more people earn their livelihood from the agriculture sector than from all other economic sectors combined. About 75 per cent of poor rural people are members of households dependent on agriculture, mostly for subsistence. Most are landless labourers, who depend on healthy crops to earn an income. While cultures are varied, the majority of farmers grow oilseeds or food crops such as cereals and pulses.

Agriculture in India is vulnerable to excess and deficit rainfall, which is especially harmful to production during specific planting and growing phases, but can affect production across the entire crop cycle. The absence of irrigation and water management facilities compounds the problem, especially given that about 40 per cent of total arable land is not irrigated. However, irrigated land itself is not without risks.

Sowing seasons are divided into the *kharif* and *rabi* seasons. *Kharif* yields are considered summer crops, sown just before the wet season from April to June, and harvested from October to December. Those sown in *rabi* are considered winter crops, planted from October to December immediately after the wet season, and harvested in April and May.

India began debating the feasibility of crop insurance programmes in the 1940s, but it made the first concrete attempt in 1972. Since the late 1980s, farmers taking crop loans from government credit bodies were required to buy the government-subsidized National Agricultural Insurance Scheme (NAIS), which compensates farmers if the area yield for a region falls below a particular threshold. This insurance programme is the first recourse for farmers when there are crop losses due to weather; however, there have been widespread criticisms of the programme. The Government commissioned a review that found a number of weaknesses, particularly the lengthy loss-adjustment procedures (and thus delays in claims settlements) and inadequate coverage, with an extremely high coverage cost. All of these factors render the scheme unattractive to the reinsurance market.

Only 15 per cent of farmers in the country buy NAIS, indicating that the majority do not have access to a credible crop insurance product. Farmers who take out loans do not have the option of choosing the best insurance programme for their crops. Moreover, long delays in claims settlements often force farmers to default on loan repayments owing to the unavailability of capital after extensive crop losses. This becomes a vicious circle: once farmers have defaulted on a loan, they become ineligible for future crop loans, and they are thus less likely to benefit from insurance initiatives.

The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 6: States in India home to initiatives in index insurance

Insurance Programmes – Private

Weather insurance in India was first launched in 2003 as a private initiative. Two of the main private insurers offering index insurance are ICICI Lombard General Insurance Company and IFFCO Tokio General Insurance Company (ITGI).[36] These weather products have been distributed to farmers through multiple channels, such as direct selling through rural cooperative banks, or through input suppliers or contract farming companies.

ICICI Lombard and BASIX

ICICI Lombard, with support from the World Bank, International Finance Corporation (IFC) and BASIX, piloted a rainfall insurance product in the Mahabubnagar district of Andhra Pradesh in the *kharif* season 2003. During the pilot year, the insurance policy was linked to crop loans that BASIX had provided to 154 groundnut farmers and 76 castor farmers in the district. In subsequent years the programme was expanded to cover eight states for both *kharif* and *rabi* seasons, for a cumulative total of 34,186 farmers. Premium rates are 3-8 per cent of the sum insured.

Table 10: BASIX index insurance programme

Year	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
States covered	1	1	6	7	7	8
Seasons covered	*kharif*	*kharif*	*kharif*	*kharif*	*kharif*	*kharif & rabi*
Weather stations	1	5	36	50	45	40
No. of customers	230	402	6 689	11 716	4 545	10 604
Claims settled	154	319	864	2379	537	793 (due)
Premium collected (Rs)[a]	88 685	824 681	1 703 098	1 430 171	1 539 175	2 098 638
Claim amount paid (Rs)[a]	41 860	471 485	950 000	2 063 160	298 922	470 671
Loss ratio	47%	57%	56%	144%	20%	22%

[a] In March 2009, US$1 = 50.56 Indian rupees (Rs).

Table 11: ITGI index insurance programme (2005-2009)

Season	Year	Crop	State
Rabi	2005/06	Wheat and mustard	Haryana
	2006/07	Wheat and mustard	Haryana, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh
	2007/08	Wheat, mustard, potato, paddy	Andhra Pradesh, Chattisgarh, Gujarat, Haryana, Maharashtra, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, West Bengal
	2008/09	Wheat, mustard, potato, paddy, salt	Andhra Pradesh, Chattisgarh, Gujarat, Haryana, Maharashtra, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, West Bengal
Kharif	2006/07	Generic product for paddy, groundnut, soybean, cotton	Andhra Pradesh, Haryana, Madhya Pradesh, Punjab, Uttar Pradesh, Rajasthan
	2007/08	Paddy, groundnut, cotton, maize, bajra	Andhra Pradesh, Chattisgarh, Gujarat, Haryana, Maharashtra, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, West Bengal
	2008/09	Paddy, maize, bajra, groundnut, cotton	Andhra Pradesh, Chattisgarh, Gujarat, Haryana, Maharashtra, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, West Bengal

[36] This case study does not address the PepsiCo programme (see Case Study 2), however, some cumulative numbers for the private sector include PepsiCo's contribution.

As of *kharif* 2008, the Government changed the policy to allow private insurance companies to take advantage of the same premium subsidy offered to the public sector (in certain regions). Thus BASIX has started selling subsidized insurance products in Rajasthan (with a premium subsidy of 40-50 per cent). Demographically, most of the BASIX farmers are smallholders for whom other formal credit channels are not easily accessible. Crops covered include maize, groundnut, cotton, soybean, paddy, wheat, sunflower, coriander, cumin and mustard.

IFFCO Tokio General Insurance Company

ITGI is a joint venture of the Indian Farmers Fertiliser Cooperative (IFFCO) and its associate Tokio Marine and Nichido Fire Group, the largest listed insurance group in Japan. ITGI has been offering index insurance since 2004. The company incorporated the product into IFFCO's fertilizer programme and has used the programme's rural network of fertilizer cooperatives for distribution.

ITGI provides technical advice, product education, training and marketing skills to secretaries and staff of member cooperatives to enable them to sell insurance products. In each state, 1,000-1,500 farmer cooperatives became agents of ITGI and have sold 163,945 policies since the programme's inception. Premium rates have been 3-8 per cent of the sum insured.

Assessment

Performance

In the first five years since its entry into the weather insurance market in India, the private sector has cumulatively covered over 400,000 farmers. In coming years, private stakeholders plan to expand their programmes to additional states and to at least double the number of insured farmers.

All index insurance programmes experienced a gradual growth until 2006/07. The number of farmers insured decreased during the crop season 2007/08. ITGI experienced a minor decline (about 3 per cent) from one year to the next, while ICICI Lombard incurred a 50 per cent loss in uptake in 2007.

These losses are attributable to a variety of reasons. In 2006, a seed company offering a contract farming programme similar to that of PepsiCo and ITGI purchased index insurance coverage from ICICI and increased the total number of farmers insured for that year. However, the company discontinued coverage in the following year due to the lack of sufficient profit margins. The drop in the number of insured farmers may also be due to farmers' optimistic perceptions of risk for the year and the increase in premium rates in 2007/08.

Despite decreasing levels of uptake, the total sum and hectares insured more than doubled from 2006/07 to 2007/08. Of course, this might suggest that the companies under ICICI's index insurance programme changed focus from smallholders to larger-scale farmers in order to decrease administrative costs during the latter year. For the 2008/09 crop season, Weather Risk Management Services (WRMS) estimates that uptake might have increased, but it does not have final figures yet. Other seed companies sought ICICI's index insurance programme in 2008/09 to insure participant farmers in their contract farming programmes.

Table 12: Total outcomes for index insurance offered by ICICI and ITGI (2003-2008)

Year	2003/04	2004/05	2005/06	2006/07	2007/08
ICICI: Total outcomes for all index insurance programmes[a] (Currency in US$; area in ha)					
Number of farmers insured	1 000	8 000	87 000	108 000	43 278
Gross premium	410	96 579	329 724	533 136	1 332 841
Sum insured	6 151	1 448 695	4 945 866	7 997 047	19 992 618
Area insured	1 700	7 850	26 800	45 000	108 500
Claims	615	65 821	60 490	349 819	1 271 325
Incurred claim (%)	0.000006	0.15	0.47	4.43	40.3
Loss ratio (claims/gross premium earned)	150%	68%	18%	66%	95%
Agency costs	15%	15%	15%	15%	15%
Reinsurance premiums paid	411	95 786	327 285	529 085	1 322 713
Total proportional reinsurance – sum insured	99%	99%	99%	99%	99%
ITGI: Outcomes for the index insurance programme linked to the fertilizer programme					
Number of farmers insured	NA	NA	18 595	73 950	71 400
Gross premium	NA	NA	505 652	535 187	1 189 304
Sum insured	NA	NA	9 188 078	9 739 993	21 633 038
Area insured	NA	NA	51250	54 375	120 850
Claims	NA	NA	41 110	265 543	2 132 546
Incurred claim (%)	NA	NA	0.05	3.37	60.32
Loss ratio (claims/ gross premium earned)	NA	NA	8%	50%	179%
Agency costs	NA	NA	12-15%	12-15%	12-15%
Reinsurance premiums paid	NA	NA	355 601	376 156	834 532
Total proportional reinsurance – sum insured	NA	NA	70%	70%	70%
ICICI Lombard and ITGI combined outputs					
Total number of farmers insured	1 000	8 000	105 600	181 600	114 678
Total gross premium	410	96 579	835 376	1 068 323	2 522 145
Total sum insured	6 151	1 448 695	14 133 944	17 737 040	41 625 656
Total area insured	1 700	7 850	78 050	99 375	301 350

[a] These totals include the BASIX and PepsiCo index insurance programmes.

Subsidies and government financial support

Since *rabi* 2007, the Government has allowed public and private index insurance programmes to take advantage of subsidies, pending the approval of respective state governments. As a temporary measure, expected to last for five years, it is hoped the subsidy will promote adoption of index insurance and create a long-lasting insurance culture among farmers.

Currently, as with all other commercial insurance products, the Government is charging service tax on weather insurance.[37] An additional step to make the premiums more affordable to farmers could be that the Government would exempt index insurance from service tax, due to the nature of the product.

[37] In the 2008/09 season, the tax was 12.36% of the premium.

Strong institutional network and delivery channels

A strong institutional network of insurers, reinsurers and data service providers, along with effective delivery channels, can be crucial to the scalability and sustainability of a programme. However, the Insurance Regulatory and Development Authority (IRDA) stipulates that a maximum commission of 17.5 per cent of the gross premium amount can be paid to an agent or channel partner, which appears to be a constraint on the profitable, sustainable growth of the sector.

Diversify the portfolio

Marginal farmers have traditionally been neglected by the insurance market in India. Private insurance companies and microfinance institutions have been found to target their insurance programmes at large-scale farmers, owing to the potential for higher returns. However, the ICICI Lombard and BASIX initiatives have been able to sustain operations targeting lower-income farmers over the last five years, largely due to the diversity of their portfolio: their operations are spread throughout the country and integrated with other extension services provided by BASIX. Their healthy portfolio has also attracted insurers and reinsurers to the programme. That said, the size of the programme is still not large enough for BASIX to recover its marketing and operational costs.

Plans for scaling up

Index insurance programmes are expected to expand in the next few years. Companies plan to expand coverage to other regions and to serve a higher number of marginal farmers.

Restrictive regulations on distribution of insurance products

Private insurance companies in India are at a disadvantage when it comes to scaling up index insurance programmes in rural areas. Government-run rural banking and cooperative institutions already reach some 50 per cent of the rural population, while private institutions will require a number of years before reaching close to the same level. Moreover, banks are obligated to offer the publicly-subsidized NAIS, thus it is difficult for them to collaborate with insurers for any other kind of crop insurance product, be it public or private insurers. As a way forward, to aid the scalability and sustainability of index insurance, the Government should allow banks to collaborate with any public or private insurance company. For this to be feasible, however, the Government would have to amend its notification on agricultural insurance schemes.

Reinsurance capacity

Only two major reinsurers operate in the Indian market. With limited participation by reinsurance companies, the reinsurance rates at times have been found to be high. Reinsurance companies cite lack of data, complexity of product structures and the relatively low economic value of coverage as reasons for the high rates. They mainly concentrate on substantial Indian programmes (with a total premium value of more than US$1 million); only one reinsurer has accepted a US$100,000 deal. With Indian insurance companies keeping a very small portion of the risk on their books and depending on reinsurance companies to validate pricing, the ability to insure small deals is severely restricted. This instigates a vicious circle in which the programmes cannot be expanded without reinsurance support and, in turn, there is no reinsurance support because the programmes are not sizable. Weather insurance programmes in the country are small to begin with, and they expand gradually, with farmers testing the concept and gradually endorsing it over time. In addition, most reinsurers require the sales process to end 10 days prior to the risk inception date. However, index insurance cannot work with policies older than 30 days.

The lack of pricing and underwriting skills further deters development of the local reinsurance market and limits the retention capacity of the insurer. Since coverage is voluntary, the number of enrolled farmers may vary significantly from one season to the next and may represent a small value of total premium in the insurance market. As a consequence, those reinsurance companies that enter the market load the premium, owing to lack of reliable data on a real-time basis.

In answer to these current restrictions, better designed products and a larger number of index insurance participants would encourage more reinsurance companies to join the market, promoting lower rates. Public and private insurers in the country could join a common platform in which they pool spare underwriting capacity, as has happened in some other countries. However, a neutral and credible institution is needed to bring all the insurers together in agreement. The Ministry of Agriculture could play this role with technical support from a multilateral institution. In the meantime, there is a proposal that a contingency fund be created by pooling resources from the Government and other agencies. This contingency fund could support programmes for marginal farmers in a community mutual insurance format. WRMS, which is a stakeholder in the ICICI-PepsiCo programme, estimates that one million more small farmers could be served with a contingency fund of US$3-4 million (expected to last 8-10 years before reserves allow the programme to reach self-sufficiency). This fund could be used to target farmers in areas with inadequate historical data availability.

Adaptability of index insurance

Once the proposed improvements to NAIS are introduced and prove to be effective, it is possible that it could seem a more comprehensive and farmer-friendly product. Thus index insurance may have to consider ways to become more competitive with NAIS.

Insurance Programmes – Public

History

The Agriculture Insurance Company of India (AIC) is a government-founded, public insurance company set up in 2003 with the responsibility of designing appropriate crop insurance products to meet the diverse needs of the farming sector.[38] Its first role was to take over implementation of NAIS. Although a new body in name, it had almost 30 years of experience in crop insurance, as it was created out of the Crop Insurance Department of General Insurance Corporation of India (GIC), the sole entity administering crop insurance since 1973.

[38] www.aicofindia.org.

AIC branched into index insurance in 2004 for a number of reasons: perceived shortcomings of NAIS; demand for weather-specific coverage from farmers and private agricultural companies; and a business desire to expand into new opportunities. By 2008, AIC had offered nine different index products across diverse districts, including the Varsha Bima, Rainfall Index, Coffee Rainfall Insurance and Wheat Weather Insurance products, an overview of which is given in the following section.

The federal Government offered subsidies for farmers buying weather insurance products for the first time in its 2007-2008 union budget. The subsidies are shared equally by participating state governments.

AIC's weather insurance products have been well supported by national and international reinsurers, with an average of 50 per cent of the total coverage placed in the international market. The reinsurance contracts are based on a quota share/proportional treaty basis. In addition to the national reinsurer GIC Re, foreign reinsurers such as Paris Re, SCOR Re, Endurance Re and Swiss Re participate in the programmes.

Principal stakeholders

In developing its portfolio of crop insurance products, AIC partnered with various public, private, national and international stakeholders, receiving the benefit of expertise in weather data, product design, financial support and reinsurance.

To support the development and operation of its products, AIC also partnered with public and private weather data providers:

- **India Meteorological Department (IMD)** and its National Data Centre provided historical weather data to interested researchers from all weather observatories/ hydrology centres. For its weather-based crop insurance programmes, AIC accessed 25-30 years of historical daily weather data for about 300 locations in the country. It also uses data from the IMD weather observatories network to service its weather insurance products in some locations.
- **National Collateral Management Services Limited (NCMSL)**. A subsidiary of National Commodity Derivates Exchange (NCDEX), NCMSL was launched in September 2004. It is promoted by 10 public and private entities and provides services to the agriculture and industry sectors. For agriculture, NCMSL provides quality testing and warehousing services to farmers. As part of its crop and weather intelligence, it presently has a network of over 400 automatic weather stations spread across 17 states, of which nearly 250 are servicing AIC's weather insurance products on a fee basis.
- **Karnataka State Natural Disaster Monitoring Centre (KSNDMC)**. An autonomous body affiliated with the Department of Science and Technology, Government of Karnataka, KSNDMC has recently set up a telemetric rain gauge network. Nearly 150 out of 600 rain gauges are servicing AIC's rainfall-based insurance products on a fee basis.
- **Risk Management Solutions India (RMSI)**. Working in geospatial and information technology, RMSI develops innovative solutions that integrate geographical information with niche business applications. RMSI's success hinges on its unparalleled expertise, specifically in natural-disaster and climate-change risk modelling, and in its unique application of geospatial technologies. AIC has used RMSI services for weather data cleaning and data simulation.

AIC only started using the services of insurance intermediaries in 2006, two years after the launch of its first product, Varsha Bima. Prior to this, products were either sold by AIC directly to farmers or with more informal arrangements through primary agricultural cooperative societies (PACs) and NGOs. For direct selling, AIC recruited temporary staff called 'agri-preneurs' (agriculture graduates trained in entrepreneurship), who visited locations and talked with stakeholders such as village leaders, farmers' associations and NGOs. The main purpose was to explain the product, distribute product literature and enrol interested farmers.

With only one underwriting office in each state, however, AIC found that direct selling was inefficient, expensive and ultimately hampered scaling up. Thus, from 2006, AIC began enrolling insurance intermediaries, starting with insurance brokers, followed by corporate agents, and finally in 2008 microinsurance agents. AIC mainly uses pamphlets, posters and radio jingles to create insurance awareness.

Product information

AIC offers a variety of index insurance products.

Varsha Bima rainfall insurance

Varsha Bima was designed in consultancy with the National Insurance Academy and conceived and marketed by AIC. It is a weather insurance product intended to provide payouts for crop losses suffered due to deficit or inadequate rainfall. The programme focuses mainly on field crops during the *kharif* season.

Varsha Bima is based on precipitation outputs and offers three types of risk coverage:

- **Seasonal rainfall cover**. Primarily involves determination of the sensitivity of various crops in diverse regions to levels below normal rainfall for the whole season. Triggered by 20 per cent negative deviation of normal rainfall levels.
- **Agronomic index cover**. Based on the normal amount of rainfall needed at each crop growth stage, from planting through harvesting. Accordingly, the entire length of the crop cycle was divided into weeks, and each week received a specific rainfall weight to reflect the importance of that week's rainfall in achieving an optimum final output. Triggered by 20 per cent negative deviation in the index.
- **Sowing failure cover**. Coverage for deficit rainfall during the sowing season, usually from 15 June to 15 August. The sum insured includes the total costs incurred through the sowing period. Triggered by 40 per cent negative deviation in rainfall.

Varsha Bima is unsubsidized and is offered for voluntary purchase to non-borrowing farmers at an average of 2.8 per cent premium rates during the first year and 5.5 per cent in the following years.

The 2004 pilot was offered to about 20 subdistricts in Andhra Pradesh, Karnataka, Rajasthan and Uttar Pradesh to cover rice, sorghum, maize and pearl millet. In 2004 alone, 1,050 policies were sold (more than 0.5 per cent of the farming community in the four regions) and 2,200 ha insured (less than 0.5 per cent of total cropped area in those regions). In 2005, Varsha Bima was extended to more than 125 locations across

10 states. It rapidly extended its coverage to 125,000 farmers, covering 98,000 ha with a premium income of 31.7 million Indian rupees (Rs) (US$697,000) against a sum insured of Rs 558.6 million (US$12.3 million). About 90 per cent of the coverage was reported from the State of Maharashtra alone. The majority of the clients were marginal farmers (owning an average of 0.75 ha), who grew short-duration pulses (e.g. black and green gram), sorghum and soy. Since the 2006-2007 season, however, uptake numbers have been dwindling.

Sookha Suraksha Kavach

AIC designed Sookha Suraksha Kavach with WRMS.[39] It was a deficit rainfall insurance product for the State of Rajasthan during the 2005 *kharif* season. Payouts were both fixed and variable, based on aggregate rainfall between July and October, and were triggered when rainfall levels fell below 331 mm. As a stand-alone product, it did not sell well, and it was merged with Varsha Bima during the 2006 *kharif* season.

Rainfall Insurance

The Rainfall Insurance product was developed for *kharif* 2006 on a customized basis, following a request from the agribusiness arm of ITC Limited, the third-largest grossing private-sector company in India.[40] ITC wanted a product that it could retail to its farmers. Rainfall Insurance is a demand-based product designed with separate contracts for soybean and for paddy rice. The contracts are stage-specific and focused on the key growing periods of the crops. To determine the total sum insured, the products are offered on a per unit basis rather than by other factors (e.g. cost of production). Marketing is carried out through a web portal (called e-Choupal) that is available to farmers and ITC's field agents.[41]

AIC has also designed customized excess and deficit rainfall insurance coverage for other clients, including seed companies such as Pioneer Seeds and JK Seeds and member organizations of Friends of Women World Banking (FWWB).

Rabi Weather Insurance

In 2006 AIC introduced a multicrop weather insurance product to protect against excess rainfall and frost during *rabi*, subject to a maximum payout cap. It covers potato, mustard, gram, barley and wheat. Contracts are sold through the ITC e-Choupal network in the states of Madhya Pradesh, Uttar Pradesh, Rajasthan and Maharashtra.

The contract's two options for excess rainfall and frost operate from 16 December to 31 January. The excess rainfall contract is based on a combination of fixed and variable payouts, triggered once the daily rainfall exceeds 25 mm, with maximum payout set at Rs 8,000 (US$176) and maximum premium at Rs 906 (US$20). Frost coverage is based on the accumulated units of daily night temperature below 5°C during the coverage period. Triggers are set at a cumulative deviation in temperature of 15-40°C deviation below the norm. The maximum payout possible is Rs 12,000 (US$267) and the maximum premium is Rs 553 (US$12).

[39] www.weather-risk.com.

[40] www.itcportal.com.

[41] www.itcportal.com/rural-development/echoupal.htm.

Rainfall Insurance Scheme for Coffee Growers (RISC)

AIC introduced Coffee Rainfall and Yield Insurance in 2005, designed through a consultancy with WRMS. Payouts were based on a combination of aggregate rainfall using information from IMD stations at district headquarters and average coffee yields based on estimates from the Coffee Board. The product was modified in 2006 after inputs from the Coffee Board and Central Coffee Research Institute, and it was renamed the Rainfall Insurance Scheme for Coffee Growers (RISC). It is designed to give a payout in the event of inadequate rainfall during the rain phases of 'blossom showers' and 'backing showers', and in the event of excess rainfall during 'monsoon showers'. Since 2007, the Coffee Board has offered a 50 per cent subsidy on the premium for small/marginal growers, who own an average of 0.75 ha.

Wheat Weather and Crop Health insurance

AIC designed an insurance product for wheat in Haryana and Punjab that had two triggers: weather and crop health. Weather was based on rise in temperature in 2005, expanded in 2006 to include excess/unseasonal rainfall. Crop health was based on a Normalized Difference Vegetation Index (NDVI), using average values over the preceding eight years for which satellite imagery was available. The NDVI value was estimated from the average crop health of images generated during the third week of January and second week of February each year. The product was offered in 2007 and 2008, but satellite images for the specified weeks of January and February could not be analysed due to cloud cover.

Mango Weather Insurance

During 2005, AIC began piloting a multi-peril, index insurance product for mango crops in locations within Andhra Pradesh, Maharashtra and Uttar Pradesh. The weather parameters were excess rainfall, frost, temperature fluctuations and high wind speeds. The pilot is continuing with minor modifications in wind speed coverage, because while historical data for wind speed were based on average recordings, the insurance contract is based on maximum wind speed. To overcome this problem, AIC generated the maximum wind speed from the average historical record, using ratios between the two based on 15-30 minute cycles of data generated by automatic weather stations.

Apple Weather Insurance

During the 2007/08 season, AIC designed customized weather-based crop insurance for apple crops in Uttaranchal, following a request from the state government. The product used parameters such as chilling units (temperature in a specific low range to break dormancy), temperature fluctuations, precipitation based on a rainfall index, and hailstorm based on each individual orchard. A major challenge was that historical weather data were not available for many locations where the product was marketed. Thus the product used an 'implementing agency' model, which establishes a flat premium paid by growers, and the aggregate payouts that exceed the premium collected are reimbursed by the state government.

Weather Based Crop Insurance Scheme (WBCIS)

In 2007 the federal Government requested that AIC design the Weather Based Crop Insurance Scheme (WBCIS) as a pilot to be implemented with government financial and policy support. The pilot was the first of its kind and was developed in collaboration with high-level scientific and technical experts in India.

WBCIS has two different types of coverage, one for *kharif* (June-October) and one for *rabi* (December-March). *Kharif* coverage is based on rainfall outputs, while in *rabi* it uses composite index insurance as a substitute for area-yield insurance. Triggers vary depending on the day of the month and crop development stage. What is more, it is also location-specific (based on subdistricts) and crop-specific.

The insurance product was designed using an innovative 'tripod' for capturing data:

- Cleaning of historical weather data, and extending them to 100 years through simulation;
- A crop-growth simulation model to capture the yield/weather relationship and establish triggers and payout rates; and
- A dense network of automatic stations to measure current weather.

The price of the premium was established with the capacity-building support of the Technical Assistance Project (TAP), made available to AIC by the World Bank. The components of pricing included the expected loss; loadings for data uncertainty; return on risk (RoR), calculated using 1-in-100 years probable maximum loss (PML); and administrative and business expenses.

During *kharif*, WBCIS covers rice, sorghum, pearl millet, groundnut, soy, sunflower, cotton and other crops against both deficit and excess rainfall. During *rabi*, it covers wheat, mustard, chickpea, potato, cumin, coriander and other crops against frost, high temperatures, humidity, excess rainfall and other risks.

The average premium was 8 per cent, depending on the type of crop and region insured – of which an average of 2.8 per cent was paid by farmers after subsidy adjustments. The premium was subsidized equally by federal and state governments, ranging from 25 to 80 per cent depending on the crop, and averaging 63 per cent. As an example, commercial premium rates for soy and groundnut are 8 per cent of the sum insured; farmers pay a premium of 3.5 per cent, and the remaining balance is equally shared by federal and state governments. The 2007/08 pilot was offered to approximately 200 subdistricts (out of about 5,000 subdistricts in the country) for more than 20 crops. In recognition of its work on this pilot, AIC was awarded the Innovation of the Year 2008 award at the Asian Insurance Industry competition.

Assessment

Performance

A summary of the performance of AIC's weather insurance products can be seen in Table 13. Varsha Bima is the longest-running index insurance product in AIC's portfolio, but despite a promising pilot and 2005/06 uptake, the number of farmers insured has been decreasing since the 2006/07 season. However, the launch of the two WBCIS products in 2007/08 has seen a massive increase in the number of farmers insured.

Table 13: Performance of AIC's index insurance products (2004-2008)

Product	No. of farmers insured	Area insured (ha)	Total sum insured (Rs[a])	Premium (Rs[a])	Claims (Rs[a])
2004-05					
Varsha Bima	1 050	2 200	2 620 406	611 656	562 639
2005-06					
Varsha Bima	125 453	97 690	558 582 520	31 704 876	1 996 106
Coffee Rainfall Insurance	58	514	16 943 000	366 039	192 500
Sookha Suraksha Kavach	327	295	844 595	83 752	55 454
Wheat Weather Insurance	121	248	1 712 000	84 072	54 550
Mango Weather Insurance	16	-	655 440	35 292	83 039
Total	**125 975**	**98 747**	**578 737 555**	**32 274 031**	**2 381 648**
2006-07					
Varsha Bima	12 328	15 873	109 230 588	6 443 885	3 699 995
Wheat Weather Insurance	2 502	11 291	39 091 200	2 186 408	1 046 953
Mango Weather Insurance	126	225	5 280 370	295 692	421 342
Rainfall Insurance	10 885	10 256	71 432 483	4 170 195	2 462 596
Rabi Weather Insurance	5 612	19 398	125 462 457	5 951 298	6 405 764
Total	**31 453**	**57 044**	**350 497 098**	**19 047 478**	**14 036 650**
2007-08					
Varsha Bima	8 125	18 120	102 945 362	5 941 415	5 758 651
Coffee Rainfall Insurance	16 355	30 488	1 914 003 988	29 737 668	86 431 100
Wheat Weather Insurance	1 821	23 411	79 506 000	4 548 098	946 500
Mango Weather Insurance	60	90	3 706 570	183 958	56 540
Rainfall Insurance	6 703	15 626	55 332 785	3 728 344	8 553 490
Rabi Weather Insurance	5 585	11 703	111 965 380	5 808 291	5 314 613
Apple Weather Insurance	1 406	1 120	62 695 725	1 567 394	1 567 394
WBCIS – *Kharif*	43 790	50 075	530 118 846	70 307 563	52 411 718
WBCIS – *Rabi*	627 167	984 553	17 049 511 084	1 384 512 875	1 006 981 789
Total	**711 012**	**1 135 186**	**19 909 785 740**	**1 506 335 606**	**1 168 021 795**

[a] In March 2009, US$1 = Rs 50.56.

Lessons learned

Real-time weather data

AIC found that the lack of real-time weather data presents one of the most significant challenges to settling claims accurately and on time. It frequently takes 30-75 days for insurers to receive data from public weather stations, delaying the timely settlement of farmers' payouts and discouraging the participation of reinsurers in the market. In addition, current weather data are not adequately captured. In many regions, the provision of data for every day of the season (which is required for accurate estimation of a crop's water uptake) is not guaranteed, since most stations are manually operated.

To address this issue, both the public and private sectors have started to automate manual weather stations. Though private companies have already installed a network of approximately 500 stations, access to private weather data is expensive, ranging from

US$40-100 per month per station, which may prohibit the public sector from using this infrastructure. There is also some controversy over data from private stations, since many are set up close to residential areas (due to security reasons and the required telephone line) and thus record slightly higher temperatures than the public stations. The Government has suggested that insurers use public weather stations where they are available.

Public providers, IMD and the Indian Space Research Organization (ISRO) planned to install 1,550 automatic weather stations and 1,350 automatic rain gauges by the end of 2009. In addition, provincial governments have recently shown interest in installing more automatic stations. The State of Karnataka has already set up about 650 telemetric rain gauges and the State of Tamil Nadu is in the process of establishing about 225 automatic weather stations.

Until this additional infrastructure is installed, data gaps can be filled using WMO-prescribed methodologies under the supervision of a qualified national meteorologist. Moreover, it is important to incorporate accurate local historical weather data in the pricing models, as weather parameters tend to vary spatially. Better data information systems can make the product more affordable when product prices are based on a region's specific weather risk.

Stakeholder trust and understanding

AIC recognized that weather insurance should present the right balance between technology and simplicity in order to have a product that is easily accessed by the various stakeholders involved. It found that even after four years of marketing its products, understanding was still low among farmers, provincial governments and programme managers.

In some cases, farmers expected to receive a payout every time they experienced a small loss, and they were reluctant to repurchase coverage for the coming seasons in the absence of a payout. A consumer court recently upheld the plea of a complainant who asked for a payout on the basis of a government-owned weather station, disregarding the fact that it was not the reference weather station, which incidentally did not record a condition requiring payout. Additionally, provincial governments wrongly accused insurers of pocketing federal subsidies when payouts were not triggered, as any government subsidies for index insurance are paid ex ante, instead of ex post as with NAIS. Thus some provincial governments have not supported the premium subsidy for index insurance due to their belief that the subsidy would actually benefit insurers.

Subsidies and government financial support

During the pilot year of AIC's WBCIS in 2007/08, 200 locations were served to insure 670,957 farmers. This positive response could be attributed to the subsidized premium, which averaged 65 per cent depending on the type of crop. At the same time, there is a concern that these subsidies might undermine farmers' willingness to pay the full cost of coverage in the future.

Strong institutional network and delivery channels

AIC's Sookha Suraksha Kavach product of 2005/06 failed primarily because AIC did not have a distribution channel at the grass-roots level. Recognizing this deficiency, in 2006 AIC began enrolling insurance intermediaries, starting with insurance brokers, followed by corporate agents, and finally in 2008 microinsurance agents.

On the other hand, AIC saw a massive expansion of its Varsha Bima programme in its second year, which has been largely attributed to the involvement of PACs in distributing the product. As cooperative lending institutions, PACs have a strong network of some 100,000 distribution centres across the country. Their extensive outreach aided in marketing and selling the product to farmers. The well-established distribution centres also proved to be important in that farmers trust them as reliable, credible institutions.

AIC has also considered incorporating its products into NAIS.

Case Study 6
Forage Rainfall Plan in Ontario, Canada

Context

Primary agriculture (crop and animal production) accounts for some 8.7 per cent of Ontario's GDP. Nearly half the province's agricultural activity is related to forage, with 753,681 ha of pasture and 1,037,062 ha of hay land, which together account for 33 per cent of total farm land. Forage production is the foundation of Ontario's beef and dairy industries. The value of forage for agriculture in Ontario was estimated at 746 million Canadian dollars (C$) (US$697 million) in 2007, making it the second largest crop produced in Ontario after corn.[42]

The average annual yield of forage crop is about 2.70 tons/acre in Canada.[43] Seasonal forage yields vary across Ontario and over time, depending on rainfall. One half to two thirds of the total yield is typically from the first cut. Yield variability in the first cut ranges from 25 per cent below to 20 per cent above the average first-cut yield. In years of drought, second- and third-cut yields are more valuable than the first cut, but in extremely dry areas, there may not be enough growth to have a second cut. Dry weather during the pasture 'summer slump' can quickly force farmers to use up their stored forage supplies.

In 1998, Ontario experienced lower than average precipitation and low water levels. During the spring and summer of 1999, south-western and eastern Ontario experienced an extended period of low rainfall. Traditionally, Ontario farmers cope with forage losses by rotational grazing, supplementing pastures with hay, restricting livestock to a paddock with full feed, and the use of corn silage. However, in 2000 the Ontario provincial government initiated a Forage Pilot programme to protect producers from the financial consequences of forage production decreases due to drought.

[42] In February 2010, US$1 = C$1.07.

[43] 1 acre = 0.405 ha.

The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 7: Ontario, Canada

Insurance Programme

Table 14: Programme basics

Programme	Forage Rainfall Plan in Ontario, Canada
Project leads	Agriculture and Agri-Food Canada
Client	Producers of forage in Ontario
Insurer	AgriCorp
Weather data provider	Environment Canada
Crops	Forage
Risks	Drought
Index	Rainfall
Premium	Varies according to plan and subsidy
Farmers insured	1,945 in 2008

History

In 2003 the Forage Pilot was renamed the Forage Rainfall Plan and became a formal part of the Government's Production Insurance (PI) programme.[44] PI protects farmers against yield reductions and crop losses due to adverse weather and other insured perils. In addition to PI, in 2003 the Agricultural Policy Framework (APF) established the Canadian Agricultural Income Stabilization (CAIS) programme to protect farm operators from declines in income by combining stabilization assistance with disaster assistance. In 2008, APF was replaced by the new five-year Growing Forward policy framework, which established AgriInvest and AgriStability. These programmes replaced CAIS, and PI continued under the new framework.

Participating in both AgriStability and the Forage Rainfall Plan maximizes the benefits of government risk-management programmes. Depending on weather and/or market conditions, in a given year clients could receive an AgriStability benefit, a Forage Rainfall Plan claim, or both.

Geographical coverage

The pilot programme started with five counties in Ontario. By 2003 coverage was extended to seven counties and two districts.

Target group and crops

The target population for this programme is the Ontario farmers, landlords and sharecroppers who grow forage. The insurable crop is forage that consists of grass and legume plant species in either pure or mixed stands that were seeded in a previous calendar year. This includes hay land and intensively managed, improved and unimproved pasture land.

[44] Production Insurance is a nationwide federal/provincial/producer cost-shared crop insurance programme. It protects farmers against yield reductions and crop losses due to adverse weather and other insured perils. In Ontario, PI is delivered by AgriCorp and is available for 90 crops, including forage. More than 16,000 Ontario producers with more than 5 million acres of farmland are covered by PI.

Table 15: Forage Rainfall Plan: Product particulars (2009)

Land type:	Value:
Rough land pasture	C$25/acre
Improved pasture	C$25-100/acre
Intensely-managed pasture (or hay land)	C$100-300/acre
Coverage amount	C$2,000 up to a maximum equal to total value of crop (based on land type values)
Coverage plan options:	**Particulars:**
Base plan	Places equal weight on rainfall May to August
Monthly weighting	Rainfall is weighted as follows (based on deficit/surplus): May: 130%; June: 120%; July: 80%; August: 70%
Three-month plan	Equal weighting May to July (August not used)
Bimonthly plan	May and June rainfall are added together, and July and August rainfall are added together. Separate claim amounts are calculated for the May-June period and the July-August period. The claim amount that is paid to a forage producer equals 60% of the May-June claim plus 40% of the July-August claim
Incentives	Provides collateral required to secure loans

Principal stakeholders and delivery channels

AgriCorp is responsible for the design and delivery of the Forage Rainfall Plan. As an agent of the Ontario government, its objectives are to administer crop insurance plans, including PI, and other programmes related to the agriculture and food industries. AgriCorp is responsible for collecting and processing all rainfall data. It fulfils this responsibility by contracting Environment Canada, a professional weather service. AgriCorp's employees serve as insurance agents, with 125 field staff who are responsible for selling PI in Ontario.

Product information

The Forage Rainfall plan is available to all forage producers in the province. Producers choose the amount of insurance, a coverage option, and a rainfall collection station that best suits their risk-management needs. The value of the producer's crop is determined by land type and acreage. The producer selects a coverage amount from a set minimum up to the total value of his crop, and he selects a coverage plan based on his particular farm type and management practices. Premium rates differ for each option, as they are based on different weighting schemes (Table 15).

Weather data and infrastructure

A network of 350 rainfall collection stations across Ontario generates rainfall indices. Stations are located at 15-km intervals throughout participating areas, approximately one per township. An appropriate local station is used as the standard for the producer. Contemporary and historical data are used to determine the difference between contemporary conditions and historical averages. Data from stations within and adjacent to the areas were evaluated and verified for accuracy. These data were used to determine a long-term average monthly rainfall. Long-term averages are reviewed on maps to determine any abnormal weather patterns or significant differences within an area. A historical rainfall average is available online for decision reference. Maximum daily and monthly rainfall caps are applied to the rainfall data, recognizing that the benefit of increased rainfall has a limit. The daily cap is 50 mm of rainfall, and the monthly cap is 125 per cent of the monthly historical average rainfall.

Premium rates and subsidies

The entire administrative cost and about 60 per cent of the premium (depending on the coverage option) are paid by government. Administrative costs of the Forage Rainfall Plan are split between the federal and Ontario governments on a 60/40 basis. In 2008, the producers' share of the premium for the base plan, monthly weighting and three-month options was 40 per cent. The producers' share of the bimonthly option was 40 per cent of the portion of the premium equal to the base option, and 67 per cent of the remaining portion. Forage Rainfall Plan premiums are tax-deductible. Table 16 shows basic premium rates charged to producers (net of subsidy). These premium rates are constant across rainfall-reporting stations.

Payouts

Insurance payments are made whenever rainfall is less than 80 per cent of the long-term average for the area. The payment is determined by the following formula:

Claim payment = (80% – % rainfall) x coverage amount x value option factor

The value option factor is always 2, because AgriCorp doubles the claim amount to account for the cost of transporting purchased replacement forage. Per cent rainfall equals the ratio of the sum of capped actual rainfall[45] to the sum of historical average rainfall multiplied by 100. Claims are paid approximately one month after the end of the rainfall collection period.

Table 16: Premium rates (2007-2009)

Year	Base plan	Monthly weighting	Bimonthly	Three-month
2007	3.23%	3.87%	10.08%	4.76%
2008	2.87%	3.62%	10.10%	4.72%
2009	2.61%	3.31%	9.18%	4.32%

Source: AgriCorp.

[45] For the monthly weighting coverage option, it is the sum of capped weighted rainfall.

Assessment

Performance

Payouts

The programme can make significant payouts to forage producers, as the large variation in the loss ratio shown in Table 17 demonstrates. In two of the past nine years, the programme had loss ratios greater than 3.0, paying out more than C$1.9 million in 2001 and C$8.7 million in 2005. In 2008, the Forage Rainfall Plan paid C$64,000 on 34 claims, compared with C$5.9 million on 909 claims in 2007, when 52 per cent of the programme participants across the province received an indemnity.

Reception and adoption

On the whole, the Forage Rainfall Plan provides producers with an affordable means of insuring forage crop losses against drought. It has been well received by Ontario producers because of its:

- **Convenience**. Producers do not need to provide damage measures to make claims.
- **Predictability**. Clients can monitor rainfall measures online throughout the season and calculate possible indemnities themselves.
- **Timely indemnity payments**. Growers who use their own forage can purchase replacement forage quickly in the event of a loss and thus resume normal business.

Programme participation has increased every year. The number of acres insured has increased from a mere 37,576 acres in 2000 to 448,794 acres in 2008. The number of contracts sold doubled in 2004 after the Forage Rainfall Plan became a permanent insurance programme in 2003. In 2008, the programme had almost 2,000 contracts, generating a total premium of C$4 million. About a quarter of Ontario's pasture and hay lands were insured under the programme (Table 17).

Table 17: Forage Rainfall Plan summary (2000-2008)

Year	Number of contracts	Acres insured	Liability (C$)	Total premiums (C$)	Total claims (C$)	Claim rate Total claims/ liability	Loss ratio Total claims/ total premiums
2000	151	37 576	4 051 455	287 653	18 022	0.44%	0.06
2001	235	52 824	5 806 151	412 237	1 965 670	33.85%	4.77
2002	545	131 675	12 317 760	985 421	1 293 857	10.50%	1.31
2003	730	186 485	16 614 263	1 462 055	395 441	2.38%	0.27
2004	1 504	314 735	29 788 866	2 650 764	62 834	0.21%	0.02
2005	1 648	376 344	32 679 512	2 647 041	8 766 055	26.82%	3.31
2006	1 727	400 572	37 818 488	3 661 694	2 447 931	6.47%	0.67
2007	1 751	418 749	40 023 984	3 693 971	5 910 193	14.77%	1.60
2008	1 945	448 794	47 685 454	4 178 968	64 084	0.13%	0.02

Source: AgriCorp.

Impact on poverty

Despite these encouraging reports, the impact of these programmes on Ontario's poor rural people is limited. About 80 per cent of Ontario's low-income farm families live on small farms, most of which experience negative on-farm income. The level of off-farm income explains most of the difference between low-income farm families and farm families who have higher incomes. Because current government programmes are not targeted at off-farm income, they do little to differentially help poor rural people.

Lessons learned

Continuing product review and development

Over the years, the Forage Rainfall Plan has undergone reassessment and adjustment to increase its responsiveness to environmental conditions and to better suit the needs of forage producers. Three additional coverage options were introduced to complement the base plan, recognizing the importance of early season rainfall in single-cut forage and rainfall prior to each cut in multi-cut forage. The daily rainfall cap was reduced from 70 mm to 50 mm to reflect the fact that too much rain can also negatively affect forage yields.

Possibilities for scaling up

The Forage Rainfall Plan is a single-peril index insurance that is relatively easy to implement. The rainfall index is simply a weighted average of growing-season monthly precipitation readings collected in the local weather station. It is replicable to regions that have adequate rainfall collection stations with a long record history. The programme is expected to continue its growth in Canada in the future.

Case Study 7
Rainfall and vegetation index insurance pilots in the United States

Context

There are about 588 million acres of pasture and rangeland in the United States and 61.5 million acres of hay land.[46] These are lands grazed by more than 60 million cattle and 8 million sheep, or grasslands harvested for hay, and they support a livestock industry contributing over US$80 billion in farm sales annually. In 2008, cash receipts for cattle and calves were US$48 billion, about 15 per cent of total cash receipts in the farm sector. The estimated value of hay production alone is some US$13 billion.

When too little rain falls in the growing season, plant growth slows and forage yields decline. Other risks include flooding, insects and disease. Historically, forage producers who own livestock have coped with lost forage by purchasing supplemental forage, moving their herds to new grazing lands, or herd liquidation. Specialized hay producers mitigate risk through off-farm jobs and through diversification of farming operations.

The United States agriculture sector enjoys the benefits of multiple government programmes addressing farm risk management. These include yield and revenue insurance, disaster payments, emergency loans, marketing loans, loan deficiency payments, counter-cyclical payments and average crop revenue election (ACRE), among others. Programmes closely related to pasture, hay production and livestock production include the Livestock Indemnity Programme, Livestock Forage Disaster Programme and Non-insured Crop Disaster Assistance Programme (NAP).[47] The current set of farm safety-net programmes generally benefits farmers producing only a subset of commodities, and the primary beneficiaries are larger farms.

[46] 1 acre = 0.405 ha.

[47] Acres insured in Pasture, Rangeland, Forage (PRF) programmes are not eligible for payments from NAP.

Insurance Programme

Table 18: Programme basics

Programme	Pasture, Rangeland, Forage Rainfall Index (PRF-RI) Pilot Programme and Pasture, Rangeland, Forage Vegetation Index (PRF-VI) Pilot Programme
Project leads	United States Department of Agriculture, Risk Management Agency (USDA-RMA)
Client	Producers of forage and hay crops
Insurer	USDA-RMA, Federal Crop Insurance Corporation (FCIC), along with private insurers
Weather data provider	PRF-RI: National Oceanic and Atmospheric Administration, Climate Prediction Center (NOAA-CPC) PRF-VI: Earth Resources Observation and Science (EROS) Center – Normalized Difference Vegetation Index (NDVI)
Crops	Forage and hay crops
Risks	Late blight disease
Index	PRF-RI: Rainfall amount PRF-VI: Greenness of vegetation
Premium	Varies according to the number of insured acres, a productivity factor and the coverage level
Farmers insured	PRF-RI: 12,685 in 2009 PRF-VI: 3,015 in 2009

History

The federal Agricultural Risk Protection Act of 2000 mandated the development of insurance coverage for loss of forage on United States pasture and rangeland, which together account for more than half the country's agricultural land. The provisions of the act established the development of a pasture, rangeland and forage programme as one of the highest research and development priorities of the Risk Management Agency of the United States Department of Agriculture (USDA-RMA). Traditional multi-peril crop insurance is not suitable for providing forage coverage because of a lack of historical production data and publicly announced prices, and large variations in management practices and forage species.

As a result, the RMA developed two pilot programmes to meet the legislative mandate: the Pasture, Rangeland, Forage Rainfall Index (PRF-RI) Pilot Programme and the Pasture, Rangeland, Forage Vegetation Index (PRF-VI) Pilot Programme. Both began in 2007 and are designed to cover the financial consequences of a lower-than-expected production of forage crops.

PRF-VI is based on data of the Normalized Difference Vegetation Index (NDVI) from the U.S. Geological Survey's Earth Resources Observation and Science (EROS) Center,[48] and it uses grids of about 4.8 square miles. Producers can select one or more three-month time periods (or index intervals) in which NDVI data are important to the growth and production of their forage. Insurance payments to farmers are then calculated based on deviation from the normal NDVI within the grid during the selected index interval(s).[49]

48 http://eros.usgs.gov/.

49 See www.rma.usda.gov/policies/pasturerangeforage/faq-vi.html for more information.

Producers can choose to cover their crops with one or both index products, and both programmes allow producers to select the grids and index interval that are most relevant to their individual production situations. Producers can use more than one grid index. Each interval stands alone when determining indemnities and premiums. Thus the total premium and total indemnity paid is equal to the sum of premiums and indemnity across all selected intervals. Insurance coverage is based on the experience of the entire grid, not of individual farms.

Coverage

PRF-RI covers the crop year from 1 February and is divided into two-month index intervals. Producers must select at least two intervals. A farmer chooses the appropriate grid for his land, and the number of acres to insure in that grid for each crop type and index interval. The insurance coverage is measured in units for calculation purposes.

Target group

The two programmes are targeted at producers of forage and hay crops that have production levels correlated with the average precipitation or vegetation patterns in a grid. The forage can be either on grazing land or on grasslands harvested for hay. The forage producers who can buy these products are extremely heterogeneous in almost all attributes. Producers range in size from small (less than 10 ha of land) to extremely large (more than 10,000 ha).

Geographical area

In 2009, 33.7 million acres were covered by PRF-RI, and 7.2 million by PRF-VI. The programmes were made available in widely diverse geographical and weather regions, such as the warm and humid south-east, the cool and humid north-east, the northern Great Plains, the southern Great Plains, the semi-arid south-west, and the intermountain region of the north-west. PRF-RI was initially available in select counties in six states, and then expanded to three more states in 2009. PRF-VI was available in six states in 2007 and then six more in 2009. Figure 8 shows county availability in 2009.

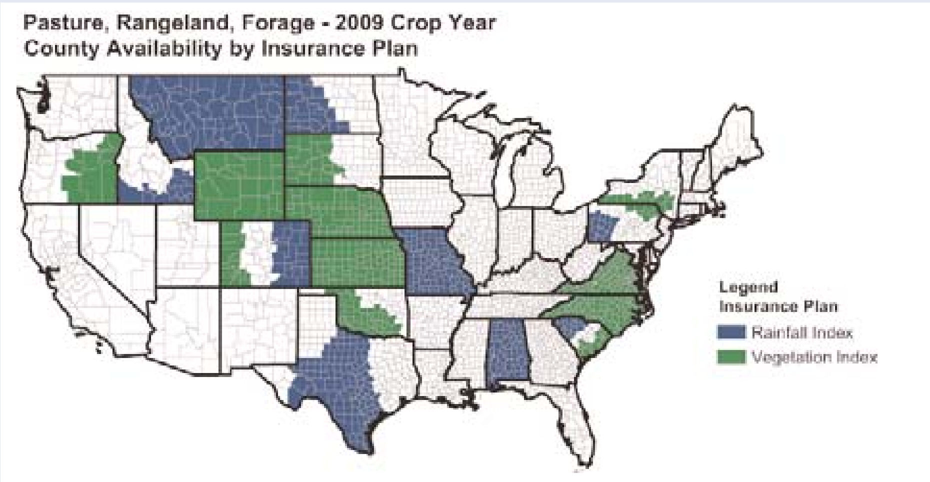


Figure 8: PRF-RI and PRF-VI county availability (2009)

Principal stakeholders

The RMA[50] designed and owns the policies, sets premium rates, and administers the subsidies of premium and delivery expenses. Private insurance companies[51] sell and service the policies through agents. The Federal Crop Insurance Corporation (FCIC), which is operated and managed by RMA, provides reinsurance to the insurance companies.

Delivery channels

For marketing purposes, and to make PRF-RI and PRF-VI more accessible to producers, they were first introduced as part of the existing Group Risk Plan (GRP), but have now been separated from it.[52]

PRF-RI and PRF-VI insurance policies are sold to producers by crop insurance agents. The vast majority of agents own their own company or work with a large multi-state crop insurance agency. Agents are generally independent of the insurance companies that bear the risk and that are authorized to issue policies. These companies sell all crop insurance to farmers, not only GRP insurance. They bid for the insurance business of agents through the commission rates they offer.

The crop insurance companies receive subsidies based on the amount of insurance they sell, and they receive subsidized reinsurance. Crop insurance companies routinely purchase private reinsurance for their entire crop insurance book of business, which includes all index insurance policies.

Product information

Weather data and infrastructure

The rainfall index used by PRF-RI is based on weather data collected and maintained by the National Oceanic and Atmospheric Administration's Climate Prediction Center (NOAA-CPC).[53] The rainfall index reflects a spatially smoothed prediction based on a grid that reflects nearby weather station estimates.

As mentioned previously, the PRF-RI crop year begins on 1 February and operates on a two-month index interval. The PRF-VI crop year begins on 1 April and operates on a three-month index interval, with producers choosing at least one three-month interval. The intervals represent mini-insurance periods.

50 www.rma.usda.gov/.

51 List of private insurance companies, www3.rma.usda.gov/tools/agents/companies/.

52 Group Risk Plan insurance is a risk-management tool to insure against widespread loss of production. This plan is based on expected yield in the county, rather than on individual farm yield. The GRP was developed on the assumption that when an entire county's crop yield is low, most farmers in that county will also have low yields. GRP coverage is available for many primary crops in major production areas throughout the country. Producers choose one coverage level for each crop and county combination. They then select the dollar amount of protection per acre and one of the five coverage levels (70, 75, 80, 85 or 90 per cent) of the FCIC expected county yield. Indemnities are paid when yield for the county, determined by the National Agricultural Statistics Service, falls below the 'trigger' yield. The expected county yield is multiplied by the selected coverage level. Indemnity payments are made about six months after harvest of the crop, www.rma.usda.gov/policies/.

53 www.cpc.noaa.gov/index.php.

Table 19: Overview of PRF-RI and PRF-VI pilot programmes

	PRF-RI	PRF-VI
Crop year	1 Feb to x	1 April to x
Index interval	2-month	3-month
Producers select	At least 2 intervals	At least 1 interval
Index	Rainfall amount	Vegetative greenness

PRF-VI uses a measure of vegetative greenness called the Normalized Difference Vegetation Index (NDVI). NDVI is derived from satellites observing long-term changes in the greenness of the earth's vegetation. The satellites are maintained by the EROS Center. The greenness of vegetation implies overall crop health on the ground (i.e. forage conditions and productive capacity) in relation to the average at that time of year – in general, healthier plants are given the higher index values.

Premium rates and subsidies

Premium rates for the policy depend on the number of insured acres, a productivity factor and the coverage level. Producers are allowed to insure any proportion of their land. The productivity factor ranges from 60 to 150 per cent, and the coverage level ranges from 70 to 90 per cent in 5 per cent intervals. The dollar amount of protection per acre of land is the product of the county base value (which is the established production value for each crop type in a county), the productivity factor and a producer's share (if less than 100 per cent).

\$(protection/acre) = county base value x productivity factor x producer's share

\$(protection/unit) = \$(protection/acre) x no. of acres insured

The premium is individually rated, and claim payments are independently calculated in each unit.

Producer premiums are subsidized. Producers pay 49 per cent of the premium at the 90 per cent coverage level, 45 per cent at the 80 and 85 per cent coverage levels, and 41 per cent at the 70 and 75 per cent coverage levels.

Triggers

Indemnities are paid out whenever the actual rainfall index (PRF-RI) or vegetative greenness index (PRF-VI) falls below the trigger grid index (coverage level multiplied by the long-term expected value of the index) in the grid and index interval chosen.

Payouts

The indemnity is calculated for each unit as the product of the payment calculation factor and policy protection per unit. The payment calculation factor is computed similarly to other group risk insurance programmes:

$$\text{Payment calculation factor} = \frac{(\text{trigger grid index} - \text{final grid index})}{\text{trigger grid index}}$$

If an indemnity is due, it will be issued no later than 60 days after the determination of the final grid index. Premium rates vary by each grid cell, index interval and type of land (Table 20).

Table 20: Summary for PRF-RI and PRF-VI insurance [a]

Product/ year	No. of policies	Total premium	Premium subsidy	Liability	Acres insured	Indem-nities	Loss ratio
		US$ million/million acres					
PRF-RI							
2007	8 024	64	37	326	25	40	0.64
2008	7 623	60	35	309	23	79	1.32
2009	12 685	87	47	456	34	23	0.27
PRF-VI							
2007	1 687	7	4	62	4	3	0.49
2008	1 510	9	5	68	6	1	0.15
2009	3 015	8	4	79	7	n/a	n/a

[a] As of 31 August 2009. RMA periodically releases updates, www3.rma.usda.gov/apps/sob/state.cfm?CFID=10806774&CFTOKEN=88838102&jsessionid=b630a71989de4565687a.

Assessment

As indicated in Table 20, the programmes have been fairly successful. Both programmes have been well received, with special recognition given to elimination of the need to measure actual production and to the timely payment of indemnities. Both programmes are expected to continue in the foreseeable future.

Performance

In 2009 approximately 40 million acres were insured; PRF-RI sold 12,685 policies and PRF-VI 3,015. The total volume of premiums from both programmes was US$95.7 million.

This success is likely due to significant premium subsidies, the frequent and severe droughts that had affected producers earlier in the 2000s, and the commissions that provide incentives for agents to learn about and market the programmes.

Reception and adoption

The Internet is an integral part of the implementation of PRF-VI and PRF-RI.[54] Agents and producers can access mapping tools to identify insurance grids. A web-based, interactive decision tool allows evaluation of the premium and provides access to how the programmes would have paid out in the past. For producers with limited access to the Internet, the system allows screen printing. Access to detailed explanations of the programmes, published rates and indices contributes to transparency. Publicly available information allows the evaluation and monitoring of effectiveness and efficiency. Educational programmes, lectures and meetings held by local agricultural institutions and associations help agents and producers become familiar with the web interface and the insurance programmes.

[54] http://agforceusa.com/rma/ri/prf/maps.

Impact on poverty

On the whole, it is difficult to identify any community impact of the insurance programmes, because grazing represents a relatively low value per unit of land and the proportion of land that is insured is relatively small. The average value of pasture land is about US$1,230 per acre, which is only about half the average value of farmland (US$2,350 per acre). Less than 10 per cent of the 650 million acres of grazing and hay lands in the United States are currently insured in either of the pilot programmes. Moreover, most producers of forage have income and wealth levels that are above average, so the programme cannot be expected to have an impact on poverty reduction.

Lessons learned

Basis risk needs correction

Farmers in Texas and Oregon who purchased PRF-RI and PRF-VI, and who suffered through major droughts, feel strongly (as do their agents) that the programmes failed to adequately compensate them for actual losses suffered in the field. An effort is thus underway to modify the programme to increase the correlation between indemnities and actual losses.

Producers have complained about the design of the intervals and insurance coverage amounts, which some feel do not trigger a payment even after a severe drought. The leader of sales for the Silveus Insurance Group argues that recent experience has demonstrated that the cumulative impact of drought that spans intervals is much greater than the sum of the estimated impacts in those intervals. Thus farmers receive compensation that is much less than their actual losses.

Payout disparity between the two programmes

Agents have also criticized the fact that the two programmes are designed to cover the same risk, but they work quite differently. Although the two programmes are not available on the same land, the comparison of payoffs in adjacent tracts of land reveals significant differences in indemnities from the two programmes.

Next steps

After development, the incremental cost of delivering the programmes is quite low. Thus the programmes could be replicated in additional areas of the United States, as well in other regions of the world with access to historical satellite imagery data or adequate rainfall data. However, areas that lack such data could not easily benefit from the model. In addition, the high level of government subsidies raises serious questions about the programme's sustainability, particularly if looked at in the context of developing countries.

Case Study 8
Index insurance pilot in Ukraine

Context

Agriculture accounts for just over 9 per cent of Ukraine's GDP,[55] with the annual production of agricultural commodities estimated at 80 billion Ukrainian hryvnias (Hrv) (US$10 billion).[56] Agricultural land constitutes 42 million ha or 70 per cent of the total area of the country, of which approximately 32 million ha are allocated for field crops such as cereals and oil crops. There are about 40,000 private farms and 16,000 commercial farms.

The most common agricultural risks in Ukraine are drought, spring frosts, strong winds, hail and 'winterkill' (crop deaths following exposure to cold winter weather). Severe winterkill was registered in 2003, when 70 per cent of the winter crops perished from low temperatures and ice crust. Ukraine experienced drought in 2003, 2005 and 2007. In an attempt to mitigate these risks, producers cultivate drought-resistant varieties and crops that conserve moisture. Though important, these techniques have had limited effect in the years in which rainfall was inadequate, especially if little soil moisture had been stored over the winter. Thus, while demand for an insurance product with drought coverage was high, it had never been met.

Crop insurance has been implemented poorly in the Ukraine. Index insurance was introduced in 2001, and the first programme was launched in 2003. It was a hybrid of multi-peril crop insurance (MPCI) and an area-based yield index for all major field crops. Indemnities were paid based on regional statistical records (not an official statistical report) and a farm-level inspection of actual yield; that is, the farmer had to provide proof that the crop yield reduction was caused by the risks insured. Complicated and unclear loss adjustment procedures meant that payouts were usually delayed for up to six months. Recently, producers have lost interest in the area-based yield index, and insurers have been looking for effective new ways to insure crops.

55 CIA World Fact Book/Ukraine, https://www.cia.gov/library/publications/the-world-factbook/geos/up.html.

56 In August 2009, 1 US$ = 8,34 Hrv.

The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 9: Khersons Oblast,[57] Ukraine

[57] An 'oblast' is a province or administrative region.

Insurance Programme

Table 21: Programme basics

Programme	Index insurance pilot in Ukraine
Project leads	International Finance Corporation (IFC) Agribusiness Development project and World Bank Commodity Risk Management Group (CRMG)
Client	Producers of winter wheat in Kherson Oblast
Insurer	Insurance Company Credo-Classic
Weather data provider	Ukrainian Hydrometeorological Institute (UHMI)
Regulatory body	State Commission for Regulation of Non-banking Finance Sector
Crops	Winter wheat
Risks	Drought and high temperatures
Index	Rainfall and temperature
Farmers insured	2 in 2005

History

An index insurance pilot implemented in Ukraine during 2003-2005 aimed to address the disparity between the traditional insurance coverage offered and the production risks faced by farmers. The purpose of the pilot programme was to provide an innovative instrument to mitigate weather risks in southern Ukraine, especially the risk of drought.

The pilot was initiated by the International Finance Corporation (IFC) Agribusiness Development project, and jointly implemented by Insurance Company Credo-Classic and the Commodity Risk Management Group (CRMG) of the World Bank. The team identified considerable need in Kherson Oblast. This region is a key producer of agricultural commodities for the country, and producers here have regularly suffered from both winter and summer risks.

The pilot development team understood that three technical steps were essential in developing a successful index insurance programme:

- Identification of the weather exposure of crops and farmers;
- Quantification of the financial impact of adverse weather conditions on farmers' revenues and their input and production costs; and
- Development of an insurance contract structure that pays out when adverse weather conditions occur and that can be reinsured in international markets.

The pilot was launched in partnership with Credo-Classic, the only insurance company willing to undertake the complexities of designing and launching an index insurance product. A traditional risk insurance company with good standing in the market, Credo-Classic has a diverse portfolio, including motor, health, property, liability and agricultural insurance. In 2005 the company had offices in 13 oblasts.

The project team conducted consultations with farmers, local officials and scientists. The selection of reference weather stations was based on the regional risk profile and the interest displayed by the farmers interviewed. The efforts concentrated on index structures for winter wheat, the most important crop in the region. This crop occupied the largest area, represented considerable value at risk and was mostly cultivated without irrigation. The critical factor for high yields of winter wheat in Kherson Oblast was moisture, so index structures designed for the region captured drought risk from mid-April to mid-June.

Product information

Weather data and infrastructure

To develop the indices for the pilot contracts, the team used weather data and an analytical report on agriculture from the Ukrainian Hydrometeorological Institute (UHMI), a government agency. The agency maintained a weather database on 187 weather stations in Ukraine and could provide weather data for over 30 years, but only in hard copy. UHMI also provided vegetation and risk-sensitivity reports for grain crops (wheat, rye and barley). These explained and clarified the vegetation cycle of winter wheat, exposed major risks during each phase, and determined the critical weather parameters for which existing computer simulation models were applied to decipher the optimum parameters for coverage.

Weather indices

Initially, the project team designed several trial index structures, although in the end, only moisture (lack of rainfall) and temperature stress structures were offered. Contracts covered the period from 15 April to 15 June to capture low rainfall (less than 70 per cent of the normal 80 mm) and the impact of high temperatures (over 30°C or excessive accumulated temperatures). This coverage was consistent with producers' concerns: they wanted coverage for the period from 1 May to mid-June, when winter wheat was at significant risk due to high temperatures and/or lack of rainfall.

Premium rates and subsidies

For the pilot, the insurance sum was established by taking into account production costs and the revenue per crop hectare. Ukrainian farmers can be divided into three groups of producers with minimum, medium and higher technological levels. During interviews it was established that farmers were interested in insuring sums in the range of US$100-$300 per hectare. Insurers could establish higher insured amounts, provided this amount did not supersede the average selling price of the yield per hectare.

Regulation

The State Commission for Regulation of the Non-banking Finance Sector was trained by the IFC Agribusiness Development project in the basics of index insurance. By 2005 Ukrainian companies had already registered insurance regulations that included provisions for index insurance.

Assessment

Performance

In the end, only two 'cumulative rainfall index' contracts were sold in 2005, both for deficit rainfall coverage. However, to put this in perspective, it should also be noted that the company managed to sell only six MPCI contracts in the 2005 spring season. This poor performance had multiple causes.

Regulator restrictions

The insurance regulator only allowed use of index insurance by primary producers of agricultural commodities. Input suppliers, processors and loan providers could not participate in index insurance transactions to insure their agriculture portfolios, which limited the market for the possible sale of policies.

Competition

The index pilot was launched at the same time as a subsidized MPCI programme. Expecting that producers would favour subsidized products, many insurance companies preferred to concentrate on the MPCI programme.

Lack of technical knowledge and commitment by insurance companies

The general professional level of insurance specialists in Ukraine was low at the time. There were no agricultural actuaries, and the premium rates were predominantly directed by the reinsurers or identified by comparing premium rates offered by other insurers. The insurance companies did not need to apply actuarial methods to calculate premium rates, owing to the fact that they could adjust losses as they wished and control their loss ratio in this way. In addition, there were no standard products in the market, and standards for underwriting, survey and loss adjustment, for example, simply did not exist.

Ukrainian insurance companies also appeared to be unprepared to introduce new agricultural insurance products, though the partners invested considerable funds and time in the project. In addition, at the time they appeared to have other priorities. Operating in a rapidly expanding market, the managers seemed more preoccupied with establishing more regional offices than with the introduction of new insurance products.

Poor marketing

Credo-Classic only registered the regulations for index insurance in March 2005, which severely limited the reasonable time to conduct a thorough marketing campaign. The company placed information about the index pilot in regional and national mass media and tried to promote weather insurance through the oblast agricultural administration, but the informational campaign was too short to provide good results.

Credo-Classic had only one agricultural insurance specialist on its staff. Although it established an office in Kherson in the second half of 2004, the regional staff were unable to sell agricultural insurance products. The office did not have contact with farmers; the regional staff did not have agricultural insurance experience; and the branch only started active operations in the beginning of 2005.

Lack of understanding and trust

Only a minority of farmers in the Ukraine insure their crops. Insurance is still a foreign concept to most. In addition, the producers perceived the pilot as an IFC/CRMG initiative and did not associate it with the local insurance company, which may have increased their reluctance to purchase the product.

Reception and adoption

Reception of the pilot programme was also strained because Credo-Classic decided to change the coverage period, extending it by two weeks without any recalculation of the product and without notice to the pilot team. This affected the reading of the index and meant that farmers received no payouts. As a result, they were dissatisfied with the contract. This was especially significant in that year, as heavy rainfall, not covered in the original contract, brought the total rainfall amount during the protection period close to the 30-year average. Analysis of the amount of rainfall in the original coverage period would have brought this total down considerably, qualifying the farmers for a payout. That is, the index showed sufficient rainfall, but it did not occur at a time when the farmers needed it.[58]

Farmers concluded that the piloted index structure was not beneficial, because the protection period was too long. They argued that the index should be structured in a way that would have provided payouts for the conditions in 2005.

Lessons learned

Lack of weather infrastructure

One of the most significant obstacles to index insurance in Ukraine is the lack of weather stations. Although there are 5-11 official stations per oblast, the distance between them is over 50 km. This lack of coverage leads to basis risk, given that most producers regard drought (rainfall level) as their main risk. The insurance companies might consider insuring clients with the help of automatic weather stations, though this cost would have to be borne by the insurer or the client.

Prohibitive cost of weather data

Ukraine has good quality weather and crop yield data – sufficient for the design of weather indices. It also has good scientific and practical expertise in designing and supporting development and operation. However, weather data are extremely costly – prohibitive for the development of index insurance. Insurers are not prepared to invest US$6,500 for 30 years of weather data per station, particularly to develop new insurance products.

Lack of subsidies for weather insurance

Five of the six companies consulted about selling weather insurance lacked funds for the development of new products; they concentrated their efforts on the subsidized MPCI and area-yield index crop insurance programme. While the Government subsidizes 50 per cent of the premium on MPCI and area-yield index products, there are no subsidies offered for weather insurance.

[58] The original contract index ran from 15 April to 15 June 2005. Then the index was extended to 30 June 2005. This increased the amount of rain to 81.8 mm, which was near the 30-year average of 87 mm. As most of the rainfall (51.9 mm) occurred in those additional 15 days (with 27 mm falling on 27 June), this change in the index window meant that no payouts were made, although farmers suffered losses.

Poorly developed agricultural insurance system

All in all, the level of agricultural-insurance system development is currently low. Farmers do not typically insure their crops, and financial institutions prefer to use more collateral than is necessary for credit products, rather than to use insurance. The reputation of the insurance sector is poor, although it is gradually improving.

The concept of index insurance is still new, and the country lacks agricultural actuaries. The premium rates are mostly directed by the reinsurers or identified by comparing premium rates offered by other insurers (market-based).

Insurance companies prefer to experiment with traditional modes of insurance such as named and multi-peril insurance. Most insurers do not have procedures in place to qualitatively analyse agricultural insurance programmes, although future quantitative evaluations of the cost of administering traditional insurance programmes could lead them to begin looking for alternative solutions.

Next steps

Gap in the market

The agriculture sector is developing rapidly in Ukraine. Farmers are beginning to produce more high-value crops, including vegetables, oil crops, fruits and grapes. Although these commodities have the potential to produce good revenues for producers, they are susceptible to the negative impact of adverse weather conditions.

The current MPCI and yield index products do not meet the needs of producers. They suffer from the classic problems of traditional insurance, including asymmetry of information (anti-selection, moral hazard), and they are costly to administer.

Moreover, insurance companies have an opportunity to diversify their portfolio of agricultural risks when selling contracts in different regions, given the country's natural geographical diversification of agricultural risks. While farms in southern Ukraine may suffer from hail, drought and frost, producers in the centre and west might experience losses due to excessive rainfall and storms.

New interest from insurance companies sparked by pilot

While the 2005 pilot project had limited benefits, as a result of this experience, several Ukrainian insurance companies may consider introducing index products in the future. Insurance companies are currently looking for solutions to insure specific crops: winter onion, orchards and vineyards against low temperatures in winter; vegetables, peaches and apricots against late frosts in April-May; and non-irrigated field crops against lack of rainfall in May-June.

Such products could be offered with optional coverage against hail and storm in the spring-summer periods. By bundling these products, insurers could provide protection from major weather risks that farmers are willing to insure.

Government use of index insurance

National legislation allows the use of weather instruments for agricultural applications. The Government and insurers are discussing weather instruments to substitute the current practice of ad hoc (and subjective) payouts following a catastrophe.

Case Study 9
Index insurance for farm families in Rio Grande do Sul, Brazil

Context

The State of Rio Grande do Sul is located in southern Brazil, bordering Argentina and Uruguay. It is the fourth largest state in Brazil in both area and GDP.

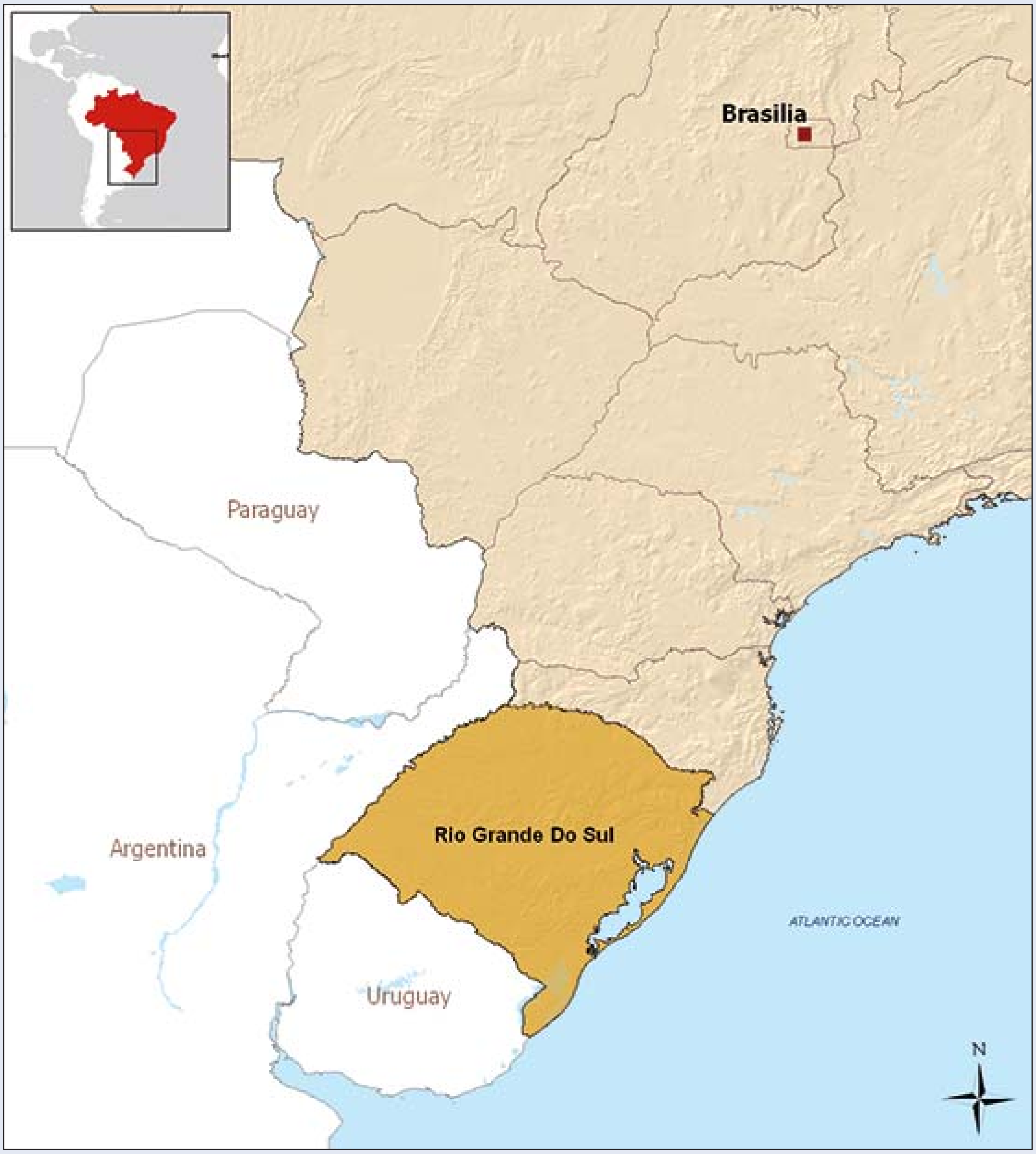
Rio Grande do Sul suffers from weather risks such as drought, flooding and hail, and these are exacerbated by the El Niño phenomenon and its sister effect, La Niña. In South America, El Niño's higher volume and intensity of precipitation cause flooding; La Niña is characterized by deficit rainfall, extensive dry spells and drought. Both events can cause extensive erosion and loss of soil moisture. Farming is vulnerable to these risks, especially as almost one fifth of Brazil's population lives in rural areas.[59]

Since 1973 smallholders in the state have been able to participate in the national, subsidized Programme to Guarantee Agricultural Activities [Programa de Guarantia da Atividade Agropecuária] (PROAGRO). PROAGRO is offered by Banco do Brasil and administered the Central Bank of Brazil. It is a compulsory, all-risk subsidized insurance that exclusively covers the loan amount contracted by farmers. In addition to federal agricultural programmes, poor rural smallholders can take advantage of state-funded insurance. Since 1989, the state government has implemented a risk-management Seed-Swapping Programme [Programa Troca-Troca de Sementes] (PTTS). It is aimed at small, low-income family farms (less than 80 ha) that rely on earning at least 70 per cent of total family income from agriculture. The programme is subsidized by the state government, and it supplies farmers with certified maize seed, which is the main crop in the state. Payment for seed is collected at the end of the harvest, and a minimum price is guaranteed by the federal Government at the beginning of the season.[60] From 2001 until the 2007/08 season, this programme covered a total of 194,000 families.

Because extreme weather events threatened continuation of PTTS, the state government opted to implement an area-yield index insurance programme that would protect its investment in PTTS. The Municipalized Risk Group [Grupo de Risco Municipalizado] (GRM®) was developed and incorporated into the PTTS programme in 2001.

59 Brazilian Institute of Geography and Statistics (IBGE). 2000. *Demographic Census 2000*. Rio de Janeiro.

60 The federal Government annually publishes the minimum price guaranteed to farmers for each crop by the National Supply Company *[Companhia Nacional de Abastecimento].*



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof. Map compiled by IFAD.

Figure 10: State of Rio Grande do Sul, Brazil

Insurance Programme

Table 22: Programme basics

Programme	Municipalized Risk Group (GRM®) in Rio Grande do Sul, Brazil
Project leads	Department of Agriculture and Supply (SAA), State Bank of Rio Grande do Sul (Banrisul), State Data-Processing Company (PROCERGS) and AgroBrasil Seguros
Client	Small, low-income family farms (less than 80 ha) that earn at least 70% of total family income from agriculture
Insurer	PROAGRO
Data provider	Brazilian Institute of Geography and Statistics
Crops	Maize
Risks	Drought, flooding and hail
Index	Area-yield, with payouts triggered by a 20% deviation from average regional yield
Premium	11.09-17.10% of the sum insured
Farmers insured	26,071 in 2007 and 14,893 in 2008

Launched by the state government – and under the coordination of AgroBrasil Seguros[61] – a partnership was formed with the state's Department of Agriculture and Supply [Secretaria de Agricultura e Abastecimento] (SAA), the State Bank of Rio Grande do Sul (Banrisul), and the State Data-Processing Company [Companhia de Processamento de Dados do Estado] (PROCERGS). The partnership's objective was to develop an insurance programme that would protect family growers in southern Brazil.

Target group

GRM® coverage is offered exclusively to PTTS farmers. More than 80 per cent of the families insured under GRM® live in small rural municipalities (with fewer than 13,000 residents). Established in small properties, these families must subsist through the raising of poultry, swine and cattle with maize from the PTTS programme.

Delivery channels/intermediaries

AgroBrasil used the already established PTTS distribution channels to distribute its GRM® insurance product to farmers. Without incurring additional costs, AgroBrasil had access to approximately 600 distribution points throughout the state, including rural workers' trade unions, farmers' associations and city halls.

The PTTS farmer portfolio is not regularly updated; thus the current data on low-income farmers who may need government subsidy are likely to differ from the actual population profile.

[61] AgroBrasil is a private risk-management agency providing support to the insurance and reinsurance markets in the development and implementation of agro-rural risk-management solutions in Brazil.

Product information

GRM® is an area-yield index insurance product (based on an objective index) that protects the insured farmer against any risk that decreases the average municipal yield, as compared with the productive history of the crop within the municipality.

Premium rates and subsidies

The premium charged varied from 11.09 to 17.10 per cent of the sum insured, averaging 15.1 per cent per year from 2001 to 2008. The state government established that the amount of the subsidy should be set at approximately 90 per cent of the premium. The premium is paid directly to the insurers by the government, and then farmers pay the remaining premium after harvest.

Triggers

Triggers were established at 10 per cent deviation of the average regional yield for the first year of the programme's operation in 2001, and were thereafter adjusted to a 20 per cent deviation.

Payouts

Dependence on the national Government results in slow payouts. Though the Brazilian Institute of Geography and Statistics [Instituto Brasileiro de Geografia e Estatística] is responsible for delivering official data, there is a delay of an entire crop season (August to October) before farmers receive their indemnities, which could be a major constraint on further sales to farmers.

Insurance agents

Independent insurers and reinsurers can apply to participate in the programme and to offer subsidized area-yield index insurance products providing they meet specific requirements set by the state:

- **Simplicity**. The smallholder should understand the coverage offered.
- **Comprehensiveness**. All farmers, in spite of the geo-climatic diversity of the state, should have the same protection.
- **Low cost**. It should be possible for all farmers to take part in the programme, respecting income limitations.

GRM® has used AgroBrasil as the operator for seven crop years and has partnered with four insurers: Porto Seguro Seguros (2001/02), UBF Garantias y Seguros (2002/03 and 2003/04), Mapfre Seguros Brazil (2004/05 and 2005/06) and Nobre Seguradora do Brasil (2006/07 and 2007/08). During these years, three reinsurers have participated in the programme: PartnerRe (2001-2004), GE FrankonaRe (2004-2006) and ScorRe (2006-2008).

Sum insured

The state government established maximum individual insured amounts, which could vary from R$200 (US$100) to R$1,000 (US$500), based on the type of seed collected from farmers (variety or hybrid maize seed) and the size of the cultivated area.

Client education and marketing

AgroBrasil prepared educational materials to help interested farmers understand the product. In a cartoon booklet, *Mr Chico and Agricultural Insurance*,[62] AgroBrasil used a character named Segurito®[63] to simplify insurance terms and explain how the insurance product works. A total of 60,000 booklets were distributed during the first year of the programme alone.

Since product purchase is voluntary, AgroBrasil dedicated about 45 people to marketing activities, placing ground teams close to distribution points and investing in promotion of the programme through radio, local SAA offices, city halls and other distribution sites.

Source: AgroBrasil

Figure 11: AgroBrasil's marketing and educational booklet

Use of new technology

To improve sales, AgroBrasil and the SAA developed the AgroNet® software program. Installed at all seed distribution points, the application cross-checked information on farmers' seed requests against insurance data on the municipality, such as the sum insured and the area-yield index of that municipality.

Through the AgroNet® system, AgroBrasil exchanges information with the SAA at the time of purchase. The SAA then centralizes information on each municipality and submits a validated electronic report back to AgroBrasil. This report is issued daily and made available on the Internet. It is accessed by technical partners such as the ground sales team, and the insurers and reinsurers that use the report to issue policies and financial guarantees to reinsure the risk, respectively.

62 AgroBrasil Seguros. 2008. *Seu chico e o seguro agrícola.* Porto Alegre/RS, Brazil.

63 'Segurito' is a registered trademark of AgroBrasil Seguros.

Table 23: Overview of performance (2001-2008)

Crop year	Families insured	Sum insured (R$)	Premium (R$)	Claims	Indemnities paid (R$)
2001/02	25 068	17 834 385	1 978 154	17 590	4 247 742
2002/03	38 620	28 445 320	4 174 436	59	5 550
2003/04	20 122	14 993 630	2 278 775	4 254	1 063 611
2004/05	24 151	19 320 800	2 749 323	23 248	10 364 084
2005/06	46 175	36 940 000	6 139 370	9 547	1 914 202
2006/07	25 071	20 056 800	3 343 580	129	30 461
2007/08	14 893	11 914 400	2 037 171	2 951	593 551
Total	**194 100**	**149 505 335**	**22 700 810**	**57 778**	**18 219 201**

Source: AgroBrasil Seguros (2008) Porto Alegre, Brazil, www.seguroagricola.com.br/novo/produtos/indice.

Assessment

Performance

In seven years (2001-2008), a total of 194,100 families growing maize were insured (27.8 per cent of the PTTS families). More than R$18.2 million (US$9.1 million) in indemnities was paid to 57,778 families, or 1.1 per cent of the state's total value of maize production. The average insured area represented 4.1 per cent of the sowed maize area (with a high point of 6.8 per cent in 2005/06), and the total area insured was 390,095 ha.[64] The number of families insured has tended to grow after a year with heavy claims.

During the seven years of operations, GRM® has covered an average of 27,728 farmers per year (16.3 per cent of the PTTS families) on an average of 55,727 ha per year.

Reception and adoption

Despite the generally positive reaction, the programme did experience fluctuations in uptake. The number of farmers insured almost doubled from 2004/05 to 2005/06, from 24,151 to 46,175 farmers insured, yet it declined to 25,071 and later to 14,893 in the following crop seasons (Table 23). AgroBrasil attributed these differences to the variations in yields and thus indemnities paid – increased uptake followed bad crop years with large sums paid out, while decreased uptake followed good crop years when fewer payouts were made.

The variation and disproportion in uptake across the whole state has also been attributed to the non-mandatory nature of the programme. Assessment of geographical client distribution shows that the greatest number of insured families are in the northern portion of the state and in municipalities where the weather risk is greater. In future scaling up, capacities should be built for educating farmers and promoting better understanding of how the insurance product works.

[64] AgroNet® database.

Lessons learned

Index insurance was an unprecedented approach in Brazil. The size of the state, and consequently the differences in weather conditions, meant that assessment of municipalities by indices ensured greater precision in determining the main natural risk for each location.

The area-yield index insurance programme was considered a successful public-private partnership. Four elements made this programme successful, and they are elements that are replicable in other programmes:

- No need for upfront payment of the premium;
- Strong marketing strategy;
- Successful use of technology; and
- Wider approach to rural and agricultural development.

Involvement in this programme was commercially attractive, as private insurers could offer coverage to low-income farmers with the help of an approximately 90 per cent government subsidy of premium costs. It should be noted, however, that this level of financial support could be difficult to sustain in the long term.

Farmer reaction to the programme was also encouraging. Out of the 195 surveys answered by participant farmers, 90 per cent were satisfied with AgroBrasil's product and the cartoon booklet. Moreover, 73 per cent believed that the programme benefited from introduction of the AgroNet® system, and that it provided speed, safety and a transparent process. This feedback, while encouraging, would be better supplemented by more rigorous monitoring, and an evaluation of a wider proportion of the client base could benefit development of the programme.

Next steps

As GRM® is under the PTTS programme, it is subject to the state government's financial and operational availability to perform technical evaluations and necessary changes to client profiles. The product's future efficiency will require regular technical assessment of the population's financial capacity, relative to the programme's outcomes, and regular adaptation of the PTTS client portfolio.

The expansion and sustainability of the programme will depend on the state's financial capacity and political willingness to cover other regions, farmers and crops. AgroBrasil has indicated its interest in participating in other regions, and it has proposed inclusion of the insurance in other states' programmes.

Alternatively, the participation of other private companies in the initiative could provide additional distribution channels, making rates more affordable and leading to further scalability of the programme.

Photographs
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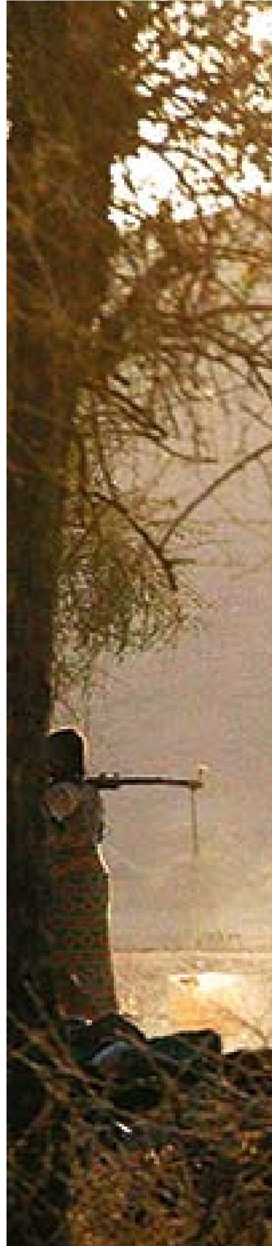

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