Innovations and emerging trends in agricultural insurance for smallholder farmers – an update

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For more than 30 years, GIZ has been working with its partners on inclusive agricultural insurance projects around the world, from regulation and implementation to financial literacy and market development. We are proud to present this update on the state of agricultural insurance in low- and middle-income countries and current innovations and good practices shaping the future of the field.

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ABBREVIATIONS

ADBL	Agricultural Development Bank Limited (Nepal)
BMGF	Bill & Melinda Gates Foundation
CGIAR	Consultative Group for International Agricultural Research
DAP	Disaster Assistance Programme
DFID	Department for International Development of the UK (now the Foreign, Commonwealth & Development Office or FCDO)
ERVOS	Early Recovery Vouchers
FAO	Food and Agriculture Organization of the United Nations
FISP	Farm Input Subsidy Programme
FSP	Financial Services Provider
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
HSNP	Hunger Safety Net Programme (Kenya)
IBI	Index-Based Insurance
IBLI	Index-Based Livestock Insurance
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
INSURED	Insurance for Rural Resilience and Economic Development
IRI	International Research Institute for Climate and Society
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
KLIP	Kenya Livestock Insurance Programme
LAC	Latin America and the Caribbean
MFI	Microfinance Institution
MPCI	Multi-Peril Crop Insurance
NDVI	Normalized Difference Vegetation Index
NGO	Nongovernmental Organisation
PBI	Picture-Based Insurance
PPP	Public-Private Partnership
PSNP	Productive Safety Net Programme (Ethiopia)
RWBCIS	Restructured Weather Based Crop Insurance Scheme (India)
SME	Small and Medium-Sized Enterprise
SNP	Safety Net Programme
UAI	Unit Area of Insurance
USAID	United States Agency for International Development
WFP	World Food Programme

EXECUTIVE SUMMARY

From extreme weather to fluctuating commodity prices, farm households face a range of production and market risks that contribute to income volatility, food insecurity, and hesitancy to invest in technologies and farming practices. With changes in global climate, these households must increasingly cope with catastrophic weather events and natural disasters that destroy crops, livestock and other assets, and create humanitarian crises requiring large-scale disaster relief around the world.

On this background, the last two decades saw a surge in policy interventions, innovative technologies, and new institutional approaches that spurred the growth of agricultural insurance programmes in low- and middle-income countries (LMICs), where millions of smallholder farmers do not have a financial safety net. GIZ conducted a first stocktaking and analysis of this development in 2016 and repeated the exercise in 2020/2021 covering 52 national agricultural insurance programmes[1] and two regional programmes in 32 LMICs. This report provides an update of the state of agricultural insurance in these countries, and the policies, technologies, and innovations currently shaping it.

The GIZ survey found that:

- **About half of all farms in LMICs have at least some agricultural insurance.** Approximately 265 million agricultural insurance policies were sold in LMICs in 2020.
- **Insurance coverage is still limited.** Agricultural insurance is often just enough to cover the cost of seeds or repay a loan, and does little to stabilise the overall household incomes or consumption.
- **The global distribution of insurance is very unequal.** About 95 per cent of insured farms in LMICs are in China and India where 80 per cent of all farms have some insurance. Less than 10 per cent of farms in other LMICs had any agricultural insurance in 2020, and in Africa this share was even smaller.
- **Most agricultural insurance is offered by private insurers.** Overall, about 60 per cent of agricultural insurance programmes are led by the private sector and this rises to 71 per cent in Africa. The remainder were initiated by governments, donor agencies or NGOs, but private insurers were still involved in implementation through public-private partnerships (PPPs).
- **Private-sector programmes are smaller on average.** There were 370 policyholders per programme on average, compared to 680 for all other agricultural insurance programmes (China and India excluded).[2]
- **Index insurance is the most common type of agricultural insurance.** About 80 per cent of all programmes surveyed were index-based, a sign that this relatively new type of insurance has become the dominant alternative to traditional indemnity insurance.
- **More than half (56 per cent) of agricultural insurance programmes are internationally reinsured.** This is due to a high level of private sector involvement and the prevalence of index-based insurance. However, figures vary widely by region: 100 per cent in Asia, 50 per cent in Latin America and the Caribbean (LAC), and 33 per cent in Africa.
- **Insurance programmes cover a variety of risks, but drought and flood are the most common.** From our data, this can been because either they are listed as specific perils in policies or indirectly through an index highly correlated with drought and flood risks.
- **The median age of surveyed programmes is six years, ranging from 0 to 17.** However, programmes in India and China have antecedents in earlier programmes that go back much further, implying that government programmes supported by subsidies tend to be longer lived than private, small-scale schemes.
- **Most agricultural insurance programmes (about 80 per cent) are at least partially subsidised.** Since most LMICs cannot afford to heavily subsidise large-scale agricultural insurance programmes, subsidies tend to be modest and targeted at certain groups. The exception is India and China where governments subsidise premiums for farmers at an average of 80 per cent.

One of the biggest changes in agricultural insurance in recent years has been the surge in new technologies. For example:

- Advances in **remote sensing and crop modelling** are supporting data-based index insurance. This is expanding the types of risk that can be insured and enabling insurance to be offered in regions that still rely on ground-based data systems (e.g., weather stations). Even tough remote sensing takes longer than many expected to become a cornerstone of the insurance world, the progress is constant and promising.

- **Digital technologies** like smart apps, electronic banking, and blockchain are opening access to insurance for smallholder farmers and poorer households. This is helping to improve contracts, strengthen security and distribution channels, and speed up claim payments.

- Picture-based insurance (PBI) generates plot-level photo evidence of crop damage. Through the use of smartphones, remote sensing, and data digitisation, this technology may be able to overcome some of the data challenges associated with indemnity insurance, reduce moral hazard and combines the advantages of indemnity models and recent technological developments.

Technologies are rarely catch-all solutions, however. They must also be accompanied by supportive government policies and fresh, creative approaches by public and private insurance providers. For example:

- **Integrating insurance into agricultural value chains** by bundling it with credit or inputs like seed and fertilizer, or making it part of contract farming schemes makes its seem more worthwhile to smallholder farmers and leverages the strength of various actors in the farming ecosystem.

- **Organising farmers into insurance groups** lowers costs and reaches many more underserved farmers with appropriate insurance products, including women farmers and poor smallholders.

Rethinking the role of disaster assistance in managing catastrophic risk. In some instances, disaster assistance could be restructured to heavily subsidised agricultural insurance for farmers, replacing traditional ex post disaster relief with insurance contracts and fast, prearranged (ex ante) and guaranteed pay-outs.
Although there are many examples of successful innovations in agricultural insurance, they have not yet been adopted as widely as generally expected and significantly increased the number of insured smallholders worldwide. Weak delivery systems and policy environments are still holding back the development and uptake of agricultural insurance in most LMICs, which has prompted many governments, often with the support of donor agencies and other partners, to work together to ensure farmers can access and reap the benefits of agricultural insurance. Joint activities include:

- **Strengthening the legal and regulatory environment** for private insurers through sandbox innovations and capacity building with the regulators.

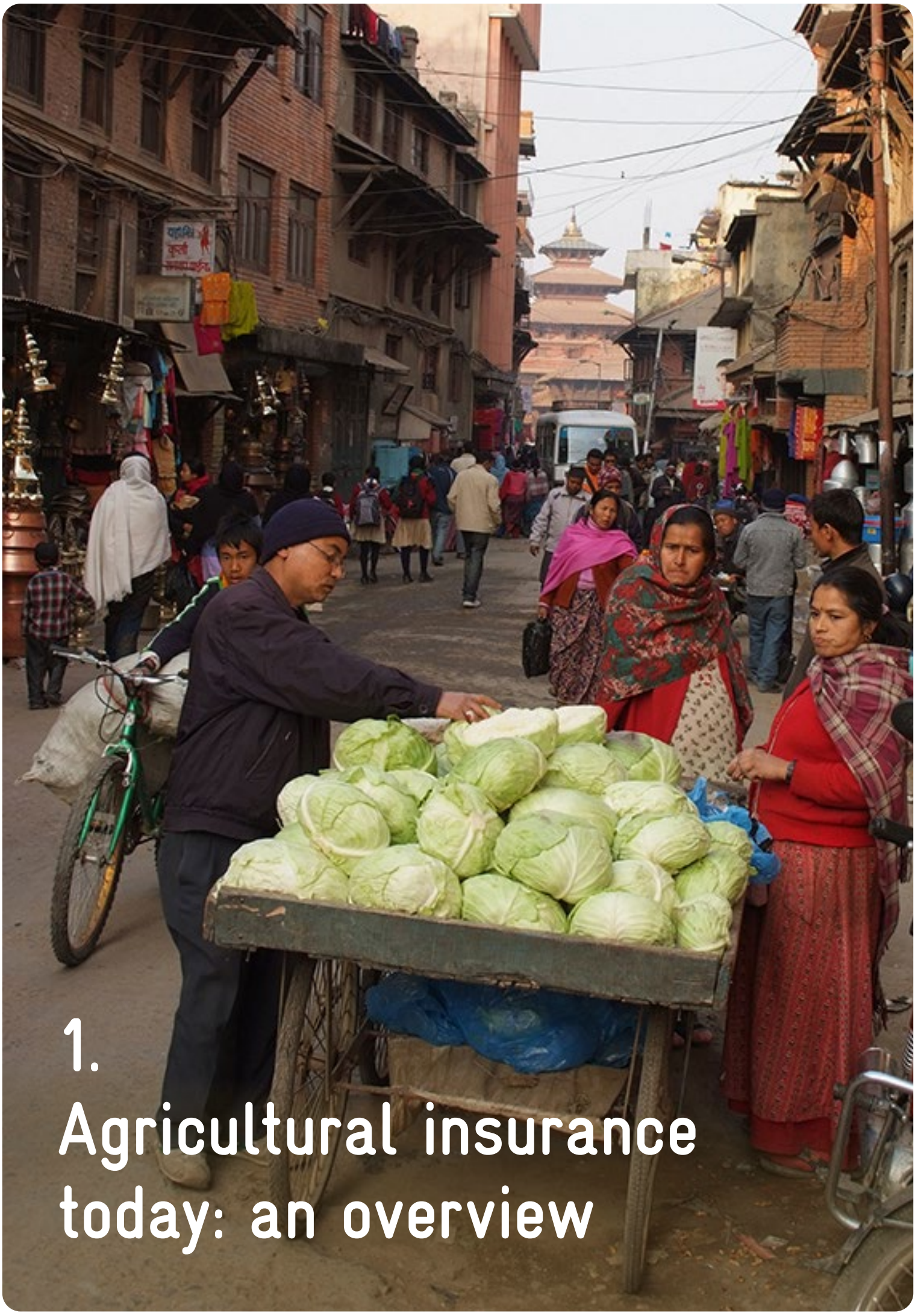
- **Investing in essential public services** that support insurance, such as weather station infrastructure, remote sensing and data systems, agrometeorological research, and farmer education.

- **Working in partnership with private insurers** to launch new agricultural insurance programmes, especially ones targeting underserved groups like poor and women farmers.

- **Subsidising insurance in various ways.** This is most evident in India and China where heavy investments have been made in agricultural insurance systems and generous subsidies are provided to farmers to encourage widespread uptake.

The success of many of the smaller country and regional programmes highlighted in this report suggests that more integrated approaches can work without large subsidies. However, these typically require strong coordination and partnerships between governments, private insurers, donor agencies, NGOs, and other external stakeholders and highly targeted business modells. This is most evident with programmes that target traditionally excluded groups like poor smallholders and women farmers.
Looking at the empirical evidence presented above for the biggest agricultural insurance programs nevertheless raises questions whether high government subsidy rates are a necessary condition for significant upscaling in insurance for smallholder farmers. And if so, what are the macro economic rationalities behind this and the comparative advantage of insurance mechanisms versus other modes of stabilizing farm incomes from the field of social security and distaster relief. The study hopes to contribute to the joint efforts of practitioners and policymakers and the ongoing discussion in this important field.

As the collected data was mainly from 2020 and 2019, effects of the Covid-19 pandemic are not yet visible in the numbers. However, it is clear that with stretched government budgets, subsidy support for insurance schemes might be getting smaller.



1. Agricultural insurance today: an overview

Farmers face a range of market and production risks that make their incomes volatile from year to year. Some of these risks can lead to serious losses, for example, when crops or livestock are destroyed by drought, fire or new pest outbreaks, or when lives and assets are lost due to extreme weather events like hurricanes and floods.

These risks can create financial challenges even for large commercial farms in high-income countries, but for vast numbers of smallholders in low- and middle-income countries (LMICs), the consequences are much more severe. Periodic shocks to farm production and income can undermine household food security and make farmers hesitant to adopt new technologies or make investments that could improve their long-term productivity and household welfare. Major shocks can lead to the loss of assets and humanitarian crises that require large-scale relief interventions. Climate change is magnifying these problems for many farmers as agricultural risks become more frequent and extreme.

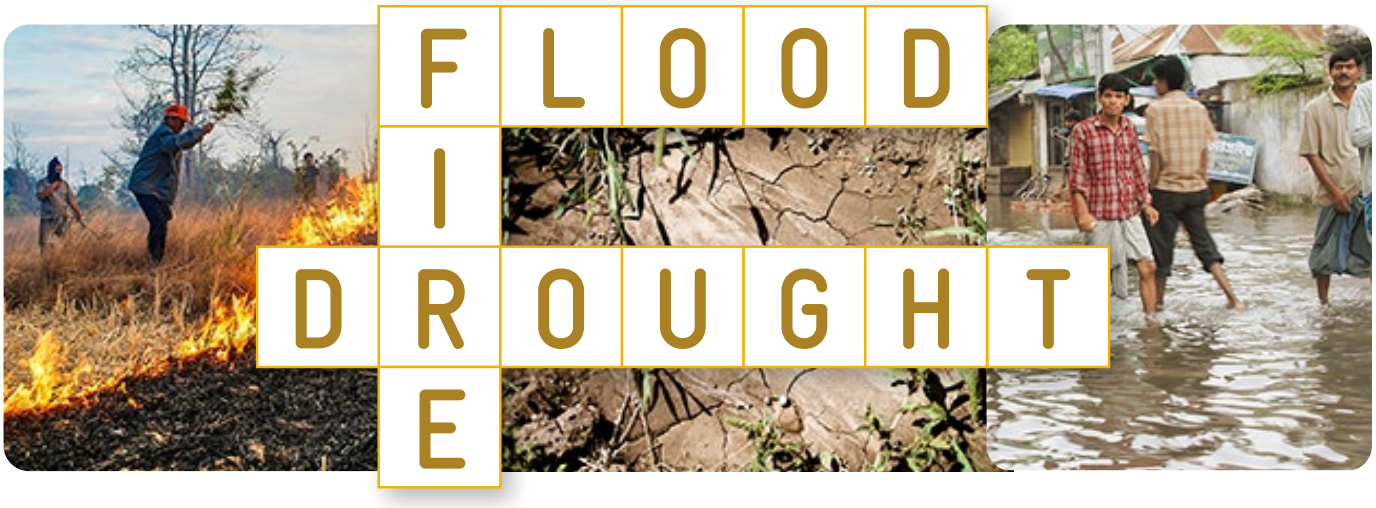
All this has prompted greater public spending on disaster assistance and interest from governments, the international development community, and the insurance industry in promoting more and more inclusive risk management tools. Although their objectives may differ, they typically share a hope that agricultural insurance will reduce the need for disaster assistance, support rural finance, and extend insurance to traditionally excluded groups like women and smallholder farmers. More broadly, they hope it will support agricultural development and climate change adaptation. This growing interest has spawned innovative technological solutions, policies, and approaches to achieve the aforementioned objectives.

Innovations and trends in agricultural insurance have been reviewed before,[3] including in a 2016 GIZ study, "Innovations and Emerging Trends in Agricultural Insurance". This was the first attempt since a 2008 World Bank study (Mahul and Stutley, 2010) to assess the state of agricultural insurance programmes in LMICs. This report updates the 2016 survey findings with a new literature review and country survey. Conducted in 2020, the survey covered 52 agricultural insurance programmes in 32 LMICs[4] and two regional insurance programmes in Africa. The report is intended primarily for those already familiar with or working in the area of agricultural insurance, especially in government, donor agencies, NGOs and the private sector, and looking for more recent information.[5]

The primary focus of the report is agricultural insurance for farmers, who are defined not only as crop and livestock producers, but also as small-scale managers of other natural resources, such as pastoralists, fishers, and foresters.

The report touches on some aspects of value chain insurance for financial services providers (FSPs) and agribusinesses, which play key roles in delivering agricultural insurance to farmers and bundling it with other products and services, including credit, improved seeds, fertilisers, and market access.

Finally, the report looks at the impact of disaster assistance on agricultural insurance and risk management in LMICs. Spending on disaster assistance has increased significantly in many countries due to climate change (IMF, 2019), and although the aim is to provide humanitarian relief for all types of households in need in affected regions, the relief it provides to farm households can affect both demand for agricultural insurance and the types of insurance that insurers are willing to offer.



2. Understanding agricultural risk and insurance

To assess the effectiveness of risk management approaches, including insurance, it is helpful to look at the different "layers" of risk farmers face (*Box 1*). This report classifies these risks into three layers: idiosyncratic, intermediate, and catastrophic.[6]

BOX 1: LAYERS OF RISK IN AGRICULTURE

From an insurer's perspective, risks can be ordered according to their position in a loss function showing the probabilities of occurrence of possible losses.

1ST LAYER

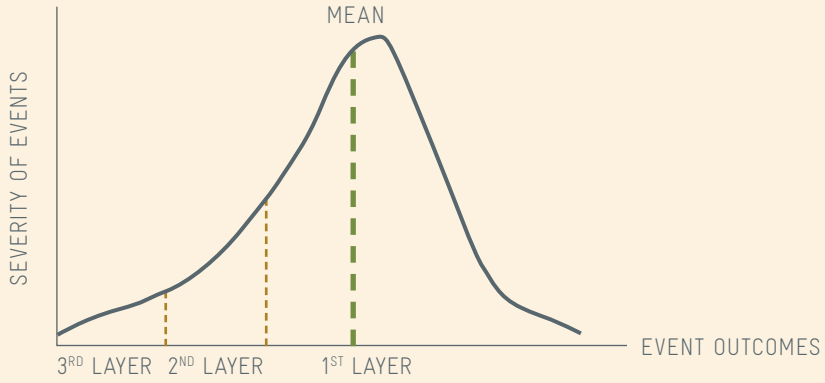
Idiosyncratic risks are frequent but typically low-impact losses, such as modest yield and production losses due to plot-specific pest and weather problems. Since losses tend to be modest and isolated, most households choose to manage these risks on their own.

2ND LAYER

Intermediate risks are less frequent but more significant losses that other nearby households may also experience, such as localised frost, hail or flood damage, or local market disruptions. Many of these risks are insurable at affordable premium rates.

3RD LAYER

Catastrophic risks are low-frequency, high-impact risks, such as severe floods or droughts that are systemic (i.e., highly correlated across households) and cause widespread losses of crops, livestock, and other assets within a region. Some of these risks are insurable through specific peril or index products, but are unaffordable for many smallholders without (government) support.



2.1 HOW FARMERS MANAGE RISK

Farmers and rural communities have developed an array of methods over generations to reduce and manage risks on their own. For example, they may make long-term investments in water conservation, irrigation and flood control, or they may grow a mix of crops and crop varieties and stagger crop planting dates. Many farm households also engage in off-farm employment or have a non-farm business to supplement their income and reduce their dependence on farm income. To cope with losses, farmers keep stocks of food, livestock, savings, and other assets that can be consumed or sold in times of need. They may also rely on credit, and local self-help groups and kin support networks provide another layer of protection.

While these methods have proven quite effective at managing many frequent and idiosyncratic risks, they provide less protection against intermediate risks and can fail completely for catastrophic risks like major droughts or hurricanes that affect many farmers, communities, and the wider economy at the same time. These systemic risks are especially difficult to manage because local credit markets and community and kin support networks cannot cope when everyone needs help at once. Those with the least assets to fall back on are also typically those least able to cope, and recurring income shocks and asset losses can keep them trapped in poverty (Carter and Barrett, 2006).

Systemic risks are also a problem for FSPs and agribusinesses that offer credit and agricultural inputs to farmers and can be faced with widespread defaults on loans and unpaid bills. Agricultural traders and processors also face losses when a disaster leads to a shortage of raw materials. To reduce these risks, FSPs and agribusinesses are less willing to serve smallholders who they perceive as too risky.

Climate change is exposing farm households and communities to even more risks, including catastrophic ones. This is not only rendering traditional risk management practices less effective, but is also creating uncertainty about the future. One consequence is that many farm households must rely on disaster assistance when catastrophic risk events occur.

2.2 THE ROLE OF AGRICULTURAL INSURANCE

In principle, agricultural insurance enables farmers to transfer some of their risk exposure to the insurance market in return for a premium payment. Agricultural insurance has many potential benefits, including:

- The ability to protect against risks they would not be able to cope with otherwise;
- A potentially more cost-effective way to manage risks than diversification or other coping strategies;[7]
- Take on more risk, such as adopting new technologies and farming practices that increase productivity;
- More timely access to cash compensation and no need to borrow or liquidate assets, which helps to protect assets and speed recovery;
- Better access to credit as a substitute for collateral, which enables farmers to purchase modern farm inputs and productive assets to improve productivity and incomes over time; and
- Less need for disaster assistance from governments or international aid by providing farmers with sufficient protection against catastrophic risks.

These benefits can help to protect farmers against income shortfalls and the loss of assets, strengthen their capacity to repay debt, and encourage them to adopt more productive farming practices and technologies. When farmers purchase insurance, FSPs and agribusinesses also face less risk of loan defaults and unpaid bills, and it may make them more willing to offer services to smallholder farmers, even those they perceive as risky.

Despite the promise of agricultural insurance, it is not a catch-all solution. Some risks are simply too difficult or expensive to insure. For example, market risks like fluctuating demand, high cost of transportation or inputs are virtually uninsurable because there are no stable or quantifiable loss functions for setting premium rates. Some risks that might otherwise be insurable, such as catastrophic risks like major droughts or floods, now occur so frequently and/or cause such large losses that premium rates are unaffordable for most farmers without substantial premium subsidies. Meanwhile, investments in risk reduction, such as soil conservation, irrigation and flood control, not only reduce risk in some cases, but also increase agricultural productivity and lead to other long-term benefits.

In practice, agricultural insurance has proven most useful for managing farm production risks, such as crop yield losses and livestock health and mortality. However, the types of risk that can be insured have expanded as new types of insurance products have entered the market, especially index-based insurance (***see Box 2***).

BOX 2: INDEX-BASED INSURANCE

Until the 21st century, agricultural insurance was mainly offered as **indemnity insurance** to cover specific crop or livestock losses. With indemnity insurance, a farmer receives compensation based on their actual losses, typically following an on-site inspection by the insurer to confirm and determine the value of the loss. Private insurers generally offer crop insurance for a limited range of specific or named perils, such as hail or frost damage, while many public sector insurance programmes offer **multi-peril crop insurance (MPCI)**, which covers a much wider range of losses. Indemnity insurance presents many challenges for the insurer, including **moral hazard** and **adverse selection**, high administration costs, delays in paying farmers' claims, and a lack of suitable historical yield data for individual farms.

Index-based insurance developed in response to the challenges of indemnity insurance. Contracts are based on events defined and recorded by a single regional index rather than those at the farm or plot level, for example, a drought recorded at a local weather station or an official low crop yield estimate for a district or county. This data is generally objective and reliable. All buyers in the same region are offered the same contract terms per unit of insurance coverage and pay the same premium rate. When an event triggers a payment, they receive the same rate of payment per unit of insurance.

Index-based insurance avoids moral hazard and eliminates the need for costly on-farm inspections and individual loss assessments. It also provides a way to insure risks that were difficult to insure in the past with indemnity products. For example, **area yield insurance** is a more viable alternative than MPCI for covering many sources of yield loss. Index-based insurance, particularly when it is based on remote-sensing data, can also avoid delays in paying claims to farmers after an insured event. The main downside to index-based insurance is that farmers are not compensated based on their actual crop losses and, since farm-level losses within an insured region vary, farmers are exposed to **basis risk**. This has led to many innovations that seek to reduce basis risk. These are reviewed in Section 4.

2.3 THE GROWTH OF AGRICULTURAL INSURANCE

Although agricultural insurance has been around for over 250 years, it is only in recent decades that it has been available in many LMICs. As a measure of the size and distribution of the global agricultural insurance market, Swiss Re (2019) has estimated that total agricultural insurance premiums collected in 2017 (including premium subsidies) were worth about USD 30 billion (*see Table 1* for regional distribution). Europe and North America accounted for 53 per cent of all premiums collected while the Asia Pacific region accounted for much of the rest (42 per cent). Africa and Latin America and the Caribbean (LAC) represented a small share, collecting one per cent and four per cent of total premiums, respectively.

The Swiss Re data shows there has been considerable growth in agricultural insurance in LMICs since a 2007 World Bank survey (Mahul and Stutley, 2010) estimated total global premiums at $20 billion ($23.6 billion in 2017 prices) – a 30 per cent increase and a real growth rate of 2.4 per cent per annum. As shown in *Table 1*, nearly all this growth was in the Asia Pacific region where premiums increased from an estimated $3.73 billion in 2007 to $12.6 billion in 2017 – an annual growth rate of nearly 13 per cent. Africa experienced similar growth, but because it started from a very low base in 2007 ($90 million), the region only accounted for $300 million in 2017. LAC was also a minor player in 2017 despite a 50 per cent increase in collected premiums between 2007 and 2017.

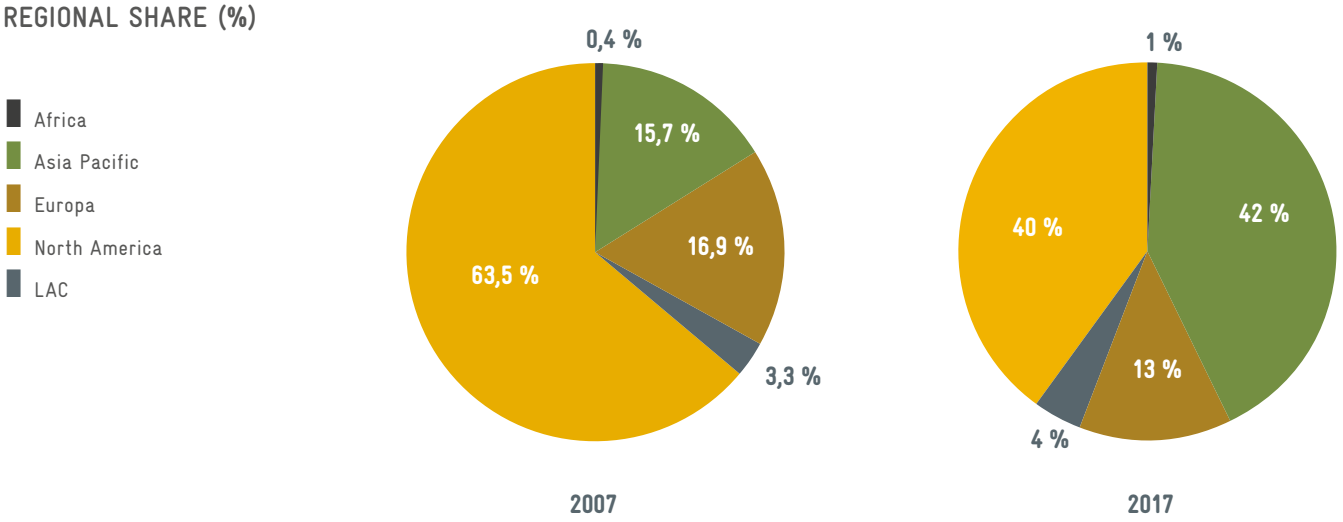
TABLE 1: ESTIMATED AGRICULTURAL INSURANCE PREMIUMS COLLECTED AND LEVEL OF COVERAGE IN 2007 AND 2017, BY REGION

REGION	AGRICULTURAL INSURANCE PREMIUMS COLLECTED (USD BILLION, 2017 PRICES)	
	2007*	2017**
Africa	0.09	0.3
Asia Pacific	3.73	12.6
Europe	4.0	3.9
LAC	0.77	1.2
North America	15.07	12.0
Total	23.6	30.0

REGION	INSURANCE PENETRATION (PREMIUM AS A PERCENTAGE OF AGRICULTURAL GDP)***	
	2007	2017
Africa	0.13	0.08
Asia Pacific	0.31	0.60
Europe	0.64	1.19
LAC	0.24	0.45
North America	5.01	5.52
Total	0.92	0.91

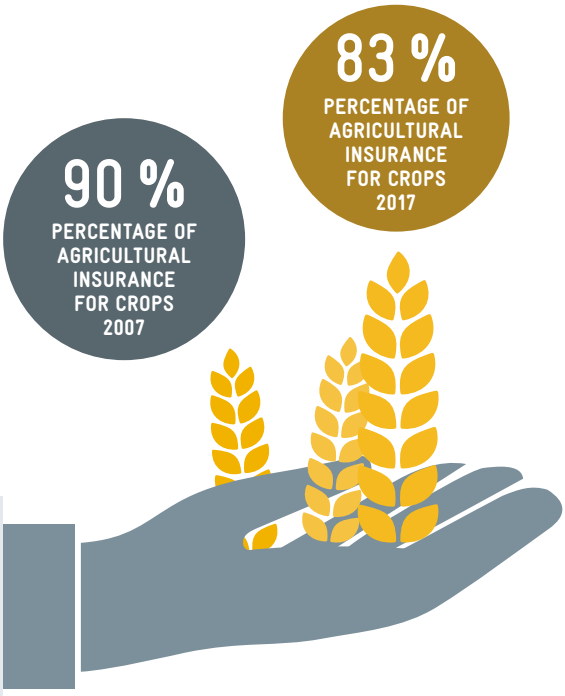
* The 2007 data only covered 65 countries, which together accounted for 75 per cent of estimated global premiums collected that year (Mahul and Stutley, 2010). The data in this column has therefore been scaled up and adjusted for inflation.
** 2017 data are taken from Swiss Re (2019).

*** Insurance penetration rates were calculated by the authors using the "FAO Statistical Yearbook: World Food and Agriculture 2020".



It is the opposite story in high-income countries. Between 2007 and 2017, total agricultural insurance premiums collected in Europe and North America actually declined.

Despite recent growth in agricultural insurance, penetration rates (as measured by the ratio of total agricultural premiums collected, an approximate measure of the value of coverage)[8] to agricultural GDP remain small in Asia, Africa and LAC compared to North America and Europe (***Table 1***). The penetration rate was only 0.08 per cent, 0.45 per cent and 0.6 per cent, respectively, in Africa, LAC and Asia Pacific in 2017, compared to 5.5 per cent and 1.2 per cent in North America and Europe (***Table 1***).[9]



Globally, about 83 per cent of agricultural insurance in 2017 was for crops (Swiss Re, 2019), down from about 90 per cent in 2007 (Mahul and Stutley, 2010), while insurance for livestock, horticulture (including greenhouses), aquaculture/fisheries, and forestry has been growing.

3.
The 2020 Country Survey of Agricultural Insurance

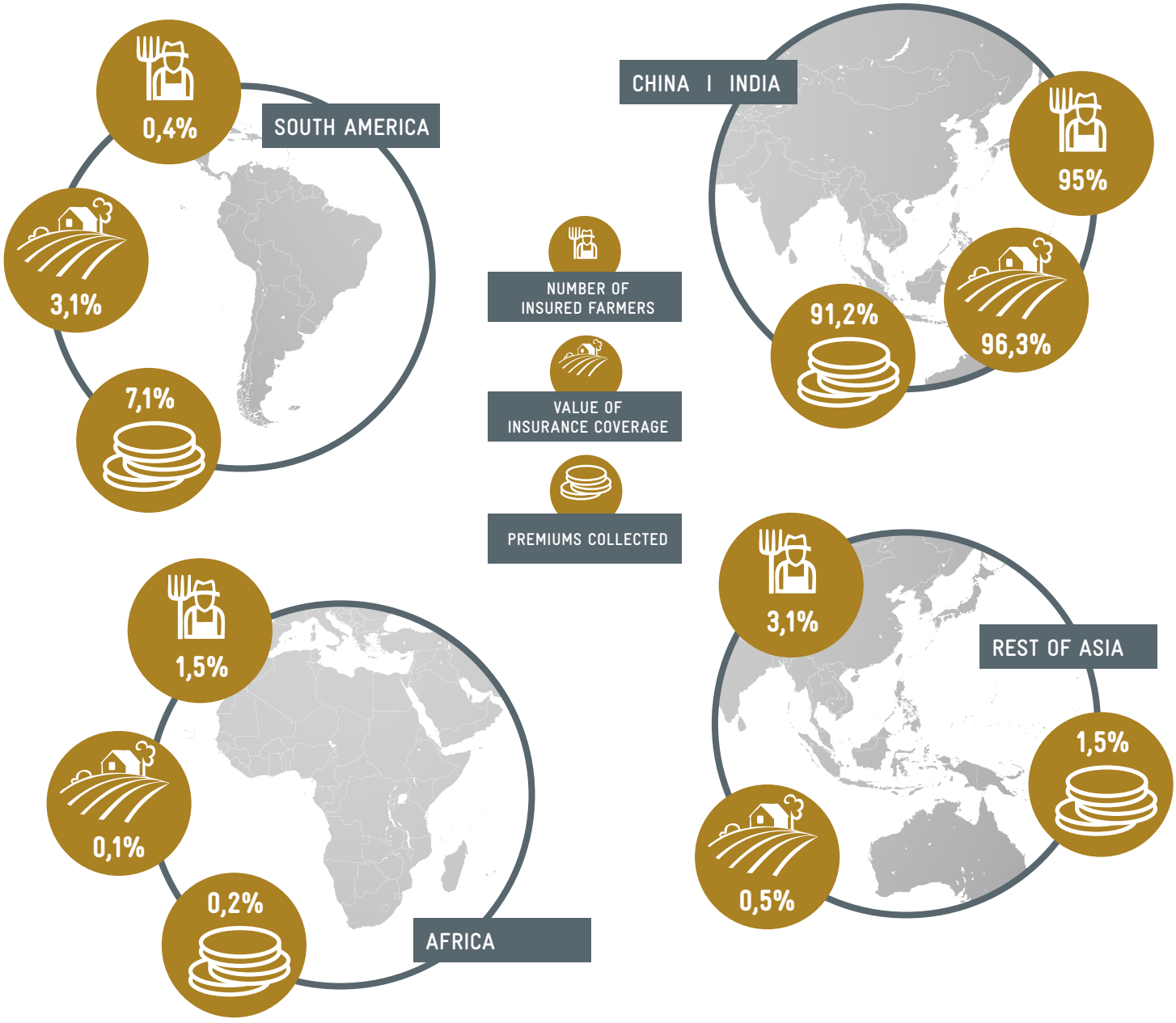
In 2020, GIZ conducted a survey of 52 agricultural insurance programmes in 32 LMICs and two regional programmes covering four additional countries. The survey focused on **microinsurance** programmes that insured farmers either directly or through intermediaries like FSPs, agrodealers, farmer cooperatives and mutuals. A detailed description of the methodology and these insurance programmes can be found in the Appendix.

The main findings of the survey are summarised in *Table 2* and *3*. Since data is missing for many of the variables, results in *Table 2* are only for programmes that reported on each variable rather than the total sample. Also, since China and India have by far the biggest agricultural insurance programmes of all the surveyed countries, results for Asia and LMICs are presented both with and without these countries.

TABLE 2: HIGHLIGHTS FROM THE GIZ 2020 COUNTRY SURVEY ON AGRICULTURAL INSURANCE (AGGREGATE RESULTS)

VARIABLE	AFRICA	LAC	ASIA		TOTAL LMICS	
			With China & India	Without China & India	With China & India	Without China & India
Number of policyholders (thousands)						
Total	3,906	1,099	260,127	8,312	265,133	13,317
Average/programme	177	100	15,302	639	5,303	290
Median	62	30	29	15	31	29
Numbers of programmes	22	11	17	13	50	46
Premiums collected (USD thousands)						
Total	$20,882.1	$978,347.9	$12.857.663	$213.990	$13.856.833,40	$1.213.159,98
Average/programme	$2.6	$122.293	$918.405	$19.454	$461.894	$44.932
Median	$599	$36,329	$5,675	$33.0	$2.626	$876,03
Numbers of programmes	8	8	14	11	30	27
Value of coverage (USD millions)						
Total	$383.6	$17,702.6	$551,760.0	$3,004.8	$569,846.2	$21,091.0
Average/programme	$42.6	$2,212.8	$42,443.0	$300.5	$18,994.9	$781.1
Median	$10.0	$344.2	$35.4	$0.6	$15.6	$5.7
Numbers of programmes	9	8	13	10	30	27
Index-based Programmes (%)						
Index-based programmes (%)	86	75	84	78	82	83
Index-based programmes that are area yield (%)	37	50	19	18	32	30
Numbers of programmes	22	4	18	13	44	39
Programmes subsidised (%)						
Index-based programmes (%)	75	83	78	69	78	50
Numbers of programmes	9	5	14	9	28	23
Programmes reinsured (%)						
Index-based programmes (%)	33	50	100	100	56	38
Numbers of programmes	21	8	12	8	41	37
Years since programme start						
Average	5.7	11.1	5.9	5.0	7.1	7.0
Median	5.0	11.0	5.0	4.5	6.0	6.5
Numbers of programmes	10	6	9	6	25	26
Privat Programmes (%)						
Private programmes (%)	71.4	60.0	52.6	64.3	62.0	66.7
Numbers of programmes	21	10	19	14	50	45
Total programmes surveyed	22	12	20	15	54	49

FIGURE 1. REGIONAL AGRICULTURAL INSURANCE COVERAGE (PERCENTAGE SHARE)



NUMBER OF INSURED FARMERS

As reported in ***Table 2***, an estimated 265 million agricultural insurance policies were issued in 2020.[10,11] Given that there were about 515 million farms in LMICs in the early 2020s (Lowder et al., 2016), approximately half had some insurance coverage in 2020. However, about 310 million of these farms were in China and India, which means that approximately 80 per cent of farms in these two countries had insurance while only about 10 per cent of farmers (13.3 million) in other LMICs were insured (***Figure 1***).

VALUE OF INSURANCE COVERAGE

Since the estimated value of insurance coverage in ***Table 2*** is based on data from only about half the sample, ***Figure 1*** focuses on regional shares. India and China accounted for 96 per cent of total insurance coverage while most of the remaining coverage was in LAC (3.1 per cent). Just 0.1 per cent was in Africa and 0.5 per cent in the rest of Asia.

PREMIUMS COLLECTED

India and China accounted for 91 per cent of total premiums collected. Most remaining premiums were collected in LAC (7.1 per cent), with just 0.2 per cent collected in Africa and 1.5 per cent in the rest of Asia. The LAC share is particularly high considering that the region only accounts for 0.4 per cent of all policyholders. This is because the value of insurance policies issued in LAC countries is higher than in other countries in the survey. The lowest value policies, in terms of premium and coverage per policyholder, are in Africa.

TYPES OF INSURANCE

The vast majority (82 per cent) of agricultural insurance programmes in the survey are index-based with little variation by region (***Table 2***). Index-based insurance is clearly prospering despite much-publicised problems with basis risk (***see Box 2***). About one-third (32 per cent) of all index-based programmes are also area yield index schemes, although this varies by region (50 per cent in LAC, 37 per cent in Africa, and 18 per cent in Asia).

MAJOR RISKS INSURED

Agricultural insurance programmes are quite diverse in terms of the types of risks they cover and some, like area yield insurance, cover a wide range of production risks. The most common risks insured in all three regions are drought and flood, either because they are listed as specific perils in policies or indirectly through an index highly correlated with drought and flood risks. Given the prevalence of index-based insurance, the types of risks insured may be those that are most easily indexed.

LONGEVITY OF INSURANCE PROGRAMMES

The median age of the surveyed programmes is six years with a mean of 7.1 years, and range from 0 to 17 years (e.g., PROAGRO in Brazil). However, programmes in India and China have antecedents in earlier programmes that go back much longer (***see Box 5***). About a quarter of the programmes are relatively new, starting between 2016 and 2020. Of all the index-based insurance programmes surveyed by GIZ in 2016, 70 per cent were still operating in 2020.[12]

PUBLIC VERSUS PRIVATE INSURANCE

Of the 54 agricultural insurance programmes surveyed, more than 60 per cent are led by private insurers, and in Africa this rises to 71 per cent (***Table 2***). Private insurers also participate in other programmes through various public-private partnerships (PPPs) with government or non-profit agencies (e.g., bilateral donors, foundations, and NGOs). One reason is that most of these organisations are not licensed to sell insurance and must partner with private insurers that provide and underwrite the insurance contracts.

One consequence of significant private sector involvement and the prevalence of index-based insurance is that 56 per cent of all agricultural insurance programmes in the survey are internationally reinsured. However, this varies by region: 100 per cent in Asia, 50 per cent in LAC, and 33 per cent in Africa (***Table 2***).

More private insurance programmes are index-based (82 per cent) than government or non-profit programmes (75 per cent) and they are also smaller on average. There is an average of 370 policyholders per programme compared to 680 for all other programmes when China and India are excluded).[13] One reason may be that they receive few, if any, premium subsidies (see next section) and therefore sell insurance primarily to commercial farmers. Some examples of successful private programmes are detailed in ***Box 3***. The largest for-profit insurance programme in the GIZ survey is ACRE Africa (Agriculture and Climate Risk Enterprise Ltd). Between 2009 and 2018, ACRE facilitated more than 1.7 million agricultural insurance contracts for farmers in Kenya, Rwanda, and Tanzania (***Box 4***).

INSURANCE SUBSIDIES

Many governments and donors support agricultural insurance, and about 80 per cent of the programmes surveyed are subsidised to some extent (***Table 2***). India and China are the two biggest spenders, channelling $3 billion and $6.9 billion, respectively, to insurance subsidies in 2018–19 (***Box 5***). The subsidies cover about 80 per cent of total premiums in both countries, not only providing insurance but also supporting farm incomes. In India during the 2016–17 and 2018–19 crop years, insurance programmes paid out $4.33 in claims for every $1 of premium paid by farmers. Comparable calculations for China between 2013 and 2018 show that farmers received $3.43 for every $1 of premium they paid. Other programmes with substantial government subsidies include the national rice insurance scheme in Thailand ($680 million per year), the PROAGRO programmes in Brazil ($250 million per year), and the PCIC programme in the Philippines ($130 million in 2019).

Most LMICs cannot afford to heavily subsidise large-scale agricultural insurance programmes and subsidies tend to be more modest and targeted. A good example of a well-subsidised programme is the One Acre Fund in Africa. Although it is operated like a private scheme, it receives a 30 per cent subsidy from donor organisations (***Box 5***).

BOX 3: EXAMPLES OF SMALL PRIVATE INSURANCE PROGRAMMES

In Peru, La Positiva Insurance Company offers crop insurance to small, commercially-oriented farms on an unsubsidised basis. The multi-peril indemnity-based insurance is available to farmers who borrow from financial institutions associated with the insurance company. The insurance covers 50 per cent of the value of a farmer's expected crop yield. Indemnity payments are used to repay loans first, with any surplus going to the farmer. Financial institutions provide the insurer with enough farm-level data to issue contracts to farmers without the need for field inspections.

The insurance programme began in 2013 and has since insured 14,600 farms a year on average, with average annual coverage of $3,800 per farm. Despite being unsubsidised, the scheme has proved financially viable, with an average loss ratio of 0.65 between 2013 and 2020. Inspired by this success, and with the hope to encourage more private insurance companies to enter the market and scale up the number of insured farmers, the Government of Peru began offering a 50 per cent premium subsidy for this and similar schemes in the 2020–21 crop season.

In Bangladesh, the Green Delta Insurance Company has offered commercial weather and yield index insurance to small farms since 2015 without any subsidies despite a five per cent government-regulated cap on premium rates. Insurance is distributed through FSPs, agribusinesses and NGOs, and typically bundled with credit and farm inputs. The average loss ratio between 2015 and 2020 was a financially viable 0.28. Still, the scheme has not scaled up, insuring just 9,000 farms a year on average (2015–2020) at an average of $1,180 of coverage per farm.

In Colombia, Nespresso has partnered with Blue Marble Microinsurance to provide weather insurance to coffee farmers. The pilot programme began in 2018 and now insures 3,275 farms. The insurance is based on a climate index called CaféSeguro, and provides coverage for excess rainfall and drought during early growing stages when coffee plants are most vulnerable.

BOX 4: ACRE AFRICA (AGRICULTURE AND CLIMATE RISK ENTERPRISE LTD.)

ACRE Africa is not an insurance company itself, but a licensed insurance intermediary that works with local insurers and stakeholders. The programme grew out of the Kilimo Salama project, established in 2009 and funded by the Syngenta Foundation and the Global Index Insurance Facility (GIIF), a World Bank Group programme. ACRE is currently operating as a registered insurance surveyor in Kenya, as an insurance agent in Rwanda and Tanzania, and it also has projects in Ghana, Malawi, Mozambique, Senegal, and Uganda. Providing climate risk management solutions in rural areas, ACRE facilitated more than 1.7 million contracts between 2014 and 2018 in Kenya, Rwanda, and Tanzania.

ACRE offers three products. The core product is weather index insurance that uses satellite-based rainfall data and enables farmers to cover certain growing phases, the entire growing season, or severity levels. Second, ACRE offers a hybrid weather index and MPCI, an innovative product that covers the germination phase and allows for more comprehensive coverage. The third product is livestock insurance, which covers dairy cows, the risks associated with pregnancy, and other losses. ACRE has also piloted a blockchain solution that enables payouts to be sent to eligible farmers' mobile money accounts within seconds. In the case of an extreme weather event, payments are triggered automatically, allowing timely and fair payouts.

THE CASE OF INDIA

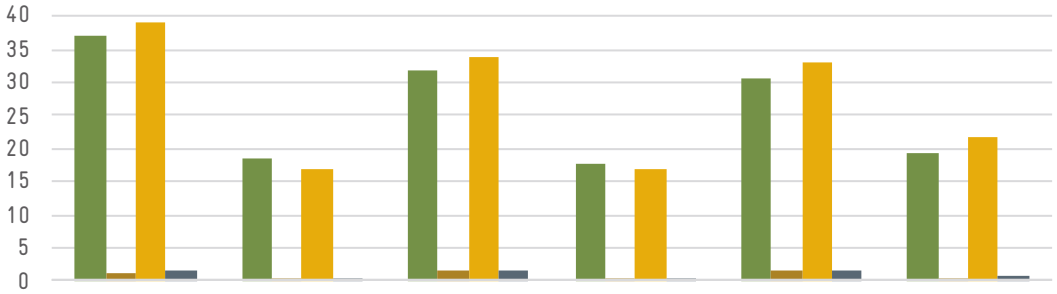
India has a long and varied experience with crop insurance, including a public MPCI programme and various area yield and weather index insurance schemes. However, in 2016, disappointing penetration rates prompted the government to launch a nationwide area yield crop insurance scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY), and to revise its weather index insurance programme, which became the Restructured Weather Based Crop Insurance Scheme (RWBCIS). Insurance is available for India's two main farming seasons – Kharif (main monsoon) and Rabi (winter season) – and is distributed by private insurers through a PPP.

The PMFBY covers the standard costs of production estimated for each crop at the district level. Average yields are determined each season for clusters of villages through state-run crop cutting experiments. The premium rates that farmers pay (before subsidies) are fixed at two per cent for Kharif crops, 1.5 per cent for Rabi crops, and five per cent for horticultural and commercial crops. The RWBCIS primarily insures crops against low or excess rainfall, mainly during the Kharif season. Weather indices are defined and tracked at 5,000 reference weather stations. Surrounding unit areas of insurance are restricted to a 10 km radius around the weather station for rainfall and wind, and 100 km for other weather parameters, such as frost, heat, and relative humidity.

Together, the two programmes insure about a third of India's farmers and 25 per cent of total crop area, with the PMFBY accounting for about 95 per cent of the insurance. Both insurance programmes have performed well in terms of average loss ratios (claims/gross premium): 0.75 for PMFBY and 0.9 for RWBCIS from 2016 to 2019 (*see Table 3*).

TABLE 3. PERFORMANCE OF PMFBY AND RWBCIS BY YEAR AND SEASON, 2016–17 AND 2018–19

AREA INSURED AND NO. OF INSURED FARMERS



	Kharif 2016	Rabi 2016–17	Kharif 2017	Rabi 2017–18	Kharif 2018	Rabi 2018–19
Area insured PMFBY (million ha)	36,93	18,44	31,95	17,52	30,44	19,49
Area insured RWBCIS (million ha)	**1,32**	**0,40**	**1,65**	**0,38**	**1,47**	**0,25**
Number of insured farmers PMFBY (in thousand)	39,203	17,068	33,907	16,867	32,930	21,756
Number of insured farmers RWBCIS (in thousand)	**1,54**	**0,55**	**1,45**	**0,57**	**1,4**	**0,73**

THE CASE OF CHINA

Like India, China has expanded coverage of national agricultural insurance programmes in recent years. Indemnity-based crop insurance is the main agricultural insurance programme in the country, which was launched as a pilot in 2007. Farmers participate through small groups (village mutuals) that purchase a single contract for all members. The insurance covers a wide range of crops, as well as forest and livestock, against named perils and is distributed by private insurers as part of a PPP. When policyholders report losses, agricultural technicians from the Ministry of Agriculture and Rural Development conduct on-site assessments, and compensation is agreed between the technicians, farmers, and the insurer. Payments are made within 10 days via bank transfers. The distribution of indemnity payments within a village mutual appears to be based on loss assessments for individual plots or livestock.

The scheme has scaled up enough to provide some insurance for nearly all farms in China (*Table 4*), and it insures more than 70 per cent of all rice, wheat, and maize sown. The amount of coverage per farmer increased from $972 in 2013 to $2,662 in 2018. Much of this increase occurred after 2017 when the insurance programme was expanded to include livestock and aquaculture.

The Chinese government has recently embarked on a series of policy reforms to make the insurance programme an integral part of a new farm income support policy, "Insurance Plus Futures". This involves moving away from a commodity procurement and price support programme, developing agricultural commodity and futures markets, and modifying the agricultural insurance programme to include both price and production risks (Kenderdine, 2018). Within this context, the insurance subsidy has become a more important part of China's farm income support policy.

The insurance programmes in India and China are heavily subsidised, with premium subsidies of about 80 per cent, on average. In 2018–19, the annual cost of the subsidy was about $3 billion for India and $6.88 billion for China. In both cases, governments made additional financial and in-kind contributions to the programmes' operating costs. At these subsidy levels, the programmes are not only providing insurance, but also supporting farm incomes. In India, total claims payments for PMFBY and RWBCIS from 2016–17 to 2018–19 amounted to $8,521 million while farmers paid only $1,966 million in premiums. This indicates that, on average, farmers received more than four times what they spent on premiums. Comparable calculations for China reveal that farmers received nearly three and a half times what they paid in premiums.[14]

TABLE 4. PERFORMANCE OF CHINA'S AGRICULTURAL INSURANCE PROGRAMME, 2013–2018

YEAR	NUMBER OF INSURED FARMERS (MILLIONS)	SUM INSURED*	GROSS PREMIUM	PREMIUM PAID BY FARMERS	CLAIMS
		IN USD MILLIONS			
2013	214	208,040	4,600	966	3,130
2014	247	244,800	4,890	978	3,220
2015	229	294,620	5,620	1,124	3,900
2016	204	324,000	6,270	1,254	4,490
2017	213	418,500	7,190	1,438	5,020
2018	195	519,000	8,590	1,718	5,900

* See Glossary for definition

Source: Tao Ye and Qingyan Mu. (2020). Fostering Rural Resilience: A Closer Look at China's Agricultural Insurance Project. GFDRR and World Bank Group. Available at: http://documents1.worldbank.org/curated/en/148591594886678703/pdf/Fostering-Rural-Resilience-A-Closer-Look-at-China-s-Agricultural-Insurance-Pilot-Learning-from-Experience-Insights-from-China-s-Progress-in-Disaster-Risk-Management.pdf.

BOX 5: THE ONE ACRE FUND IN AFRICA

The One Acre Fund is a non-profit social enterprise founded in 2006. Starting with a pilot group of 36 farmers in Kenya, it is now one of the largest purchasers of crop insurance for smallholder farmers in Africa, serving more than one million farmers in Burundi, Ethiopia, Kenya, Malawi, Nigeria, Rwanda, Tanzania, and Uganda. Crop insurance is offered as part of a standard agricultural service package that includes asset-based loans for high-quality seeds and fertilisers, input delivery, training on agricultural techniques, and crop storage solutions. If farmers experience harvest losses from extreme weather events such as droughts, they are reimbursed for a portion of their upfront investment in seeds and fertiliser. The premium collected from farmers covers about 70 per cent of total field expenses while donor funds cover the rest.

4.
Current innovations and good practices in agricultural insurance

4.1 ADDRESSING THE CHALLENGES OF AGRICULTURAL INSURANCE

Despite the promise of agricultural insurance and many successful examples, it is still not fulfilling the expectations of smallholders in LMICs. A variety of challenges have been identified in the literature (e.g., GIZ, 2016; FAO, 2020) and are summarised ***below***.

These challenges are especially acute in countries with poorly developed insurance sectors. However, recent developments and innovations in technology, institutions, and policy are helping to address these challenges and promote the development of agricultural insurance. These are reviewed in the following sections.

- Limited data and knowledge about farmers' insurance needs
- Sparse and poor-quality data for designing and pricing insurance contracts
- The high cost of insuring many frequent and high-severity risks
- Designing and pricing insurance products given the uncertainties of climate change
- Costly and underdeveloped distribution channels for providing insurance on a large scale to small, dispersed farms
- Managing moral hazard with indemnity-based insurance and basis risk with index-based insurance
- Regulatory hurdles and uncertainties about government policies that may affect the financial viability of private insurance
- Access and high costs of international reinsurance

CHALLENGES FOR INSURERS AND FARMERS

- Limited understanding of insurance
- Lack of suitable insurance products designed to meet their needs
- Accessing distribution channels for insurance
- Lack of trust in insurers
- High premium rates
- The need to pay premiums upfront at the beginning of the crop season
- Basis risk with index-based insurance

4.2 GOVERNMENT AND DONOR RESPONSES

Many governments, often with the support of donors and other partners, are addressing the challenges of agricultural insurance. These efforts range from creating more enabling legal and regulatory environments for private insurers to subsidising agricultural insurance, making agricultural insurance available to underserved groups, and spending more on safety net and disaster assistance programmes to protect rural households.

4.2.1 CREATING A MORE ENABLING ENVIRONMENT FOR PRIVATE INSURERS

Government actions include:

- Providing an enabling legal and regulatory environment for enforcing insurance contracts that buyers and sellers can trust;
- Making laws and regulations consistent with international standards to give insurers a better chance of accessing global markets for risk transfer;
- Building weather station infrastructure and data systems to provide remote-sensing and area yield data that is reliable, timely, and on a sufficient scale to reduce basis risk;
- Supporting agrometeorological research and product design in underdeveloped markets;
- Supporting insurance education programmes for farmers and training more insurance experts; and
- Establishing and enforcing quality standards for insurance products offered to farmers.

Several international organisations are working with countries to achieve these goals, such as the Access to Insurance Initiative (A2ii), the World Bank Group, GIZ, InsuResilience, IFAD, WFP and the FAO, as well as private international reinsurers and brokers, including Swiss Re, Munich Re, Allianz, Africa Re, and Willis Towers Watson.

Government efforts vary widely across countries and are not always sustained. In interviews with private international reinsurers, a recurring theme was the need to have some assurance that government policies and regulations would not change unexpectedly and undermine their business. In particular, insurers mentioned the challenge of delivering subsidised insurance through PPPs when a subsidy is suddenly withdrawn or premium rates are capped at unrealistically low levels. Government decisions about disaster relief or new forms of subsidised insurance can also crowd out private insurers and need to be anticipated. Another issue raised in the interviews was that insurance regulations in some countries restrict, and sometimes prohibit, the sale of index-based insurance products despite a lack of suitable alternatives.

4.2.2 PROVIDING INSURANCE SUBSIDIES

The 2020 country survey revealed that many governments and donors are using subsidies to promote agricultural insurance. This is not a new phenomenon. Mahul and Stutley (2010) found that, in 2007, about 85 per cent of all premiums collected from farmers globally were matched with a premium subsidy, and the estimated total global cost in 2007 was about $20 billion. Most agricultural insurance programmes are still subsidised today: 80 per cent of programmes surveyed in 2020 are at least partially subsidised (***Table 2***). Given that just four countries – Brazil, China, India, and the US – spend about $17.5 billion per year combined (not including indirect subsidies from government), the global cost of insurance subsidies has almost certainly increased since 2007.

Sometimes temporary subsidies can overcome start-up problems. For example, when farmers or insurers are uncertain about a new type of insurance product because they do not know enough about it to assess the real risks and benefits. Subsidies are also widely used to make insurance more affordable and accessible to targeted groups, such as poor smallholders and women farmers. Some countries also subsidise insurance for farmers on an ongoing basis and at levels that effectively provide income support (e.g. in India and China). However, such subsidies should be used with caution as they can be costly to the national budget, undermine efficiencies and incentives in the insurance industry, and encourage farmers to (over)invest in risky and sometimes environmentally damaging farming practices.[15]

The appropriate role of insurance subsidies is beyond the scope of this report, but any insurance subsidy should be designed and implemented cost-effectively. Recent studies have identified several good practices (e.g., Hill et al., 2014; Hazell and Varangis, 2020), which are summarised in ***Box 6***.

BOX 6: GOOD PRACTICES IN AGRICULTURAL INSURANCE SUBSIDIES

- **Develop a clearly stated and well-documented purpose for the subsidy that all relevant policymakers can agree on**. There should be an explicit understanding of the total cost of the subsidy and an exit strategy or long-term financing arrangement to prevent the subsidy from becoming an uncontrollable financial burden on the government.

- **Select capable insurance institutions**. A subsidy should only be added to a well-performing insurance programme or institution to ensure that ressources are well used.

- **Cap the amount of subsidised insurance available to each farmer** to prevent uneven distribution and larger farms from capturing a disproportionate share.

- Wherever possible, **the subsidy should crowd in private insurers and encourage competition**. For example, insurance companies should be selected for PPPs through competitive bidding.

- **To ensure the subsidy is achieving its intended purpose, establish a good monitoring and evaluation (M&E) system and conduct periodic evaluations**. If the results show that the market has changed, subsidies should be adjusted quickly.

- **Avoid using subsidies to reduce the cost of insurance below the pure risk premium**. To discourage farmers from taking on too much risk or the wrong types of risk, the premium rate (net of any subsidy) should ideally never be less than the actuarially fair (or pure risk) premium. If the pure risk cost is to be subsidised, disincentives can be avoided by insuring some of the administrative or risk-loading costs of the insurer rather than the risk premium, or by lowering taxes on insurance. Another approach is restricting the amount of subsidised insurance that farmers can purchase for each insured crop, or not offering a subsidy at all for high-risk crops, farmers, or regions where disincentives are likely to be a major challenge.

- **Subsidies for smallholder farmers should be targeted and channelled through appropriate intermediary institutions**. For many smallholders, the real value of insurance is when it is bundled with credit, modern inputs, and technologies that increase productivity. However, just as smallholder farmers are often excluded from insurance, they also face barriers to accessing inputs. Therefore, it is often better to market subsidised insurance through intermediaries that can create bundled packages, such as an FSP, farmer cooperative, or agribusiness.

4.2.3 WORKING IN PARTNERSHIP TO PROVIDE INSURANCE TO UNDERSERVED GROUPS

Many governments in LMICs collaborate with stakeholders that also promote agricultural insurance and disaster assistance. These include multilateral agencies (e.g., World Bank Group, IFAD, WFP, FAO), bilateral donor agencies (e.g., German Development Bank (KfW), GIZ, FCDO (formerly DFID), USAID), private foundations (Syngenta, BMGF), research organisations (e.g., CGIAR, IRI, ILRI), international NGOs and nonprofits (e.g., Oxfam, MicroEnsure), international reinsurers and brokers (e.g., Swiss Re, Munich Re, Allianz, Africa Re, AXA, Willis Towers Watson), and venture capitalists (e.g., WorldCover, OKO). Their contributions have included initiating and funding insurance programmes, providing technical advice and training to governments and national insurers, contributing to the design and development of insurance products, and financing feasibility studies and some of the initial start-up costs of insurance programmes.

Despite many helpful and productive contributions, coordination is often lacking. Duplication of efforts can be missed opportunities to align and sustain activities. Without strong coordination with government, many promising programmes initiated by external stakeholders and NGOs fizzle out after the pilot stage. Better coordination and partnerships are needed, and there are promising examples at both international and country levels (***Box 7***).

BOX 7: EXAMPLES OF PARTNERSHIPS BETWEEN MAJOR DONORS AND TECHNICAL ASSISTANCE AGENCIES

A variety of organisations are working to promote collaboration between international donors and organisations that provide technical assistance. One is the Insurance Development Forum (IDF), a PPP led by the insurance industry and supported by international organisations. The IDF aims to improve and expand the use of insurance and risk management to build resilience and provide better protection to people, communities, businesses, and public institutions vulnerable to disasters and the associated economic shocks.[16] Other examples include the Global Index Insurance Facility (GIIF) led by the World Bank Group, and the Platform for Agricultural Risk Management (PARM), a multi-partner venture led by IFAD, FAO, and the WFP.

The Committee for the Development and Promotion of Index Insurance (CDPAI) in Senegal is a good example of strong national coordination. The CDPAI was established in 2015 by La Compagnie National d'Assurance Agricole du Sénégal (CNAAS) and the WFP to bring together all stakeholders in the country involved in index insurance. By coordinating their activities, the CDPAI has reduced duplication and competition, improved the overall efficiency of their financial and technical resources, and helped to scale up and sustain index-based insurance programmes.

4.2.4 RETHINKING DISASTER ASSISTANCE

Insuring catastrophic risks affordably has been an elusive goal in most countries. When rural areas experience a natural disaster, governments often find it necessary to provide direct disaster assistance. Since the government agencies that manage disaster assistance programmes (DAPs) are driven by humanitarian agendas, their primary focus is on saving lives and rebuilding assets and livelihoods. Their beneficiaries therefore include all rural residents, not just farm households. Unlike insurance programmes, DAPs are fully funded by governments, bilateral donors, UN agencies and NGOs, so do not recoup any of their costs from beneficiaries.

In recent years, **macroinsurance** has been used by some DAPs to insure a portion of anticipated relief costs. This insurance is usually index-based[17] and pays out when a regional index is triggered, for example, by a hurricane, flood, or severe drought. Macroinsurance helps DAPs avoid the delays and uncertainties of funding urgent relief efforts, and evens out their annual budgets with a regular and more predictable annual premium.

By removing some important **tail-end risks** from the insurance market, disaster assistance has the potential to make private agricultural insurance more available and affordable. However, if not designed carefully, disaster assistance can disincentivise rural households from buying insurance of their own. It may also discourage farmers and rural communities from farming practices and investments that could reduce their exposure to catastrophic losses.[18]

One way to reduce these unintended outcomes is to limit disaster assistance payments to losses that are not covered by insurance. Another is to require some form of co-payment, perhaps based on household income. One approach that has been tested by DAPs in a few countries recently is providing fully or heavily subsidised insurance against catastrophic risks to individual households rather than issuing post-disaster payments (***Box 8***). In this approach, households still receive financial support when disaster strikes, but in the form of a predictable and speedy insurance payment. It also provides more incentive to adopt farming practices and make investments that reduce their exposure to risk (Hess et al., 2010).

BOX 8: EXAMPLES OF INSURANCE PROVIDED THROUGH DAPS

There are several examples of countries that have converted disaster payment schemes to insurance, including the CADENA programme in Mexico and KLIP in Kenya. Although most do this to target poorer and more vulnerable households, Hess et al. (2010) have argued there is no reason why insurance should be restricted in this way, especially if a graduated premium system were used. One way to structure it is to provide a basic amount of coverage to each household for free, as well as the option for households to buy additional coverage at progressively higher prices. When an insured event occurs, a basic payment would be made to all insured households, and those that purchased additional insurance would also receive top-up payments (Hess et al., 2010). This is essentially what KLIP provides in Kenya: fully subsidised drought insurance for up to five tropical lifestock units for vulnerable pastoralists, and index-based livestock insurance is available on a voluntary and unsubsidised basis for households that wish to top up.

4.3 TECHNOLOGICAL AND INSTITUTIONAL INNOVATIONS

One outcome of the growing interest and partnerships in agricultural insurance has been the development and testing of innovative approaches to address the challenges. Some of these innovations are technological while others, particularly ones that address delivery issues and more inclusive insurance, are institutional. These efforts are based on evidence from the 2020 country survey, as well as recent published and grey literature. The ways in which they are helping to overcome some of the major challenges of agricultural insurance are summarised in *Table 5*.

TABLE 5. HOW RECENT TECHNOLOGICAL AND INSTITUTIONAL INNOVATIONS ARE ADDRESSING THE CHALLENGES OF AGRICULTURAL INSURANCE

TYPE OF INNOVATION	CHALLENGE						
	RESOLVE DATA PROBLEMS	EXPAND THE TYPES OF RISK THAT CAN BE INSURED	REDUCE BASIS RISK	REDUCE COSTS	IMPROVE DISTRI-BUTION CHANNELS	ADD VALUE	MORE IN-CLUSIVE OF POOR AND WOMEN FARMERS
TECHNOLOGICAL INNOVATIONS							
Remote sensing and crop modelling	✔	✔	✔	✔	✖	✔	✔
Smart and connected end user applications	✔	✖	✔	✔	✔	✔	✔
Blockchain technologies	✔	✖	✖	✔	✔	✔	✖
Picture-based insurance	✔	✔	✔	✖	✖	✔	✖
INSTITUTIONAL INNOVATIONS							
Value chain insurance	✔	✖	✔	✔	✔	✔	✔
Insurance groups or mutual insurance	✔	✖	✔	✔	✔	✖	✔
Targeting insurance to underserved groups	✖	✖	✖	✖	✔	✖	✔

TECHNOLOGICAL INNOVATIONS

4.3.1. REMOTE SENSING AND CROP MODELLING

Obtaining reliable data on key risk variables with sufficient spatial coverage has long been an issue with agricultural insurance, but recent advances in remote-sensing data and crop modelling are potential game changers. Data collected by satellites cover large areas of the globe, comes with historical records, and can be highly disaggregated and accessed in near-real time, enabling faster insurance payments to farmers. Raw satellite data is also accessible, affordable and sometimes even freely available, and can be used to develop a variety of useful indices.

However, remote sensing has not solved all the data problems with agricultural insurance. While some satellite indicators can now be monitored practically at the farm level (e.g., at 100-metre scales for evapotranspiration from eLEAF) to reduce basis risk, it is still challenging to calibrate and validate this data with reliable yield or loss data for crop modelling at similar scales to identify useful indices for insurance contracts (Benami et al., 2021; IFAD, 2017). It is possible that Synthetic Aperture Radar (SAR) datasets,[19] which can be used for local crop mapping and monitoring, could help to resolve some of these lingering issues.

Data providers, such as the European Space Agency's (ESA) Copernicus programme, are increasingly offering technologies and tools for modelling (including algorithms, which could in turn be used by machine learning applications). In combination with agronomic crop growth models, these could enable insurers to estimate crop yields completely remotely (Malik and Domke, 2020). If successful, this would not only create new opportunities for micro indemnity- and index-based insurance, but also provide an alternative to crop cutting experiments for area yield insurance.

DRONES

Drones are a potentially transformative technology that can be used to estimate yields and assess crop losses. Since drones can fly at low levels, they avoid problems with cloud cover and can provide detailed images of plots and farms. This means they could be used for both indemnity- and index-based insurance. The US insurer Crop Risk Services (CRS) has used drones since 2016 to gather data to assess farmers' crop insurance claims. The unmanned aircraft gathers data on crop damage from hail, wind, flooding and drought, and automatically uploads the information to the company's claims software.[20] Drones have been proposed for use in several LMICs, such as India (Gulati et al., 2018).

4.3.2 SMART AND CONNECTED END USER APPLICATIONS

The development of smart and connected end user applications began with electronic banking, which enables faster insurance payouts and reduces the risk of fraud. As mobile phone penetration has increased, however, insurance providers have been able to extend index-based insurance services to smallholder farmers, a traditionally excluded group. Smart applications for insurance can take many forms, but the most common are smartphone apps and digital services that can be delivered and received via a mobile phone.

For example, index insurance providers, such as ACRE Africa, Pula and OKO, use mobile (non-smartphone) communication channels to register and communicate with their customers. Some services can triangulate agricultural plots using location-based services, generating information that can match them with the best locally available index insurance products to reduce basis risk. Mobile money is also used to collect premiums and pay claims digitally. For example, in Sri Lanka, local insurer Sanasa has worked with GIZ to create the iFarm app, which not only enables farmers to register claims digitally, but also provides value-added services, such as crop prices in the region and weather information.

With the COVID-19 pandemic, digital mobile services have become a part of everyday life, even in less developed financial markets. With a growing number of applications and ubiquitous and connected user technologies, electronic banking and smartphones may only be the beginning.

PICTURE-BASED INSURANCE (PBI)

PBI uses smartphones, remote sensing, and data digitisation to overcome many of the challenges associated with indemnity-based crop insurance. A farmer installs an app on their smartphone, takes a photo of the crop parcel they want to insure, and then takes the same photo throughout the growing season to document crop growth. The app uses geotags and visual aids to help the farmer ensure their photos are taken at the same location and provide an almost identical view. All photos are automatically uploaded to a server so the farmer cannot manipulate them on their phone. At the end of the season, experts examine the photos to evaluate the time lapse of the plot and estimate the percentage of crop damage. The insurance company then uses these loss assessments to verify claims, which trigger payouts to the farmer (Ceballos, Kramer and Robles, 2019). To minimise the work involved in interpreting photos, researchers are exploring the potential of using artificial intelligence (AI) and machine learning.

PBI can also help to reduce basis risk problems with index-based insurance. With a suitable payments system in place, farmers who submit photo evidence of crop damage over a season would be able to claim compensation for losses from insured risks that were not triggered by the local index product.

THE INTERNET OF THINGS (IOT)

The Internet of Things (IoT) consists of networked devices and everyday objects that are interconnected and can send and receive data. While still at an early stage of development, especially in LMICs, IoT may have considerable potential to transform agricultural insurance. Currently, IoT data streams are mainly used to simplify insurance processes, such as underwriting and claims processing, and to facilitate interactions with customers.[21] As more data is collected automatically, interconnected tools such as tractors could measure crop height/sturdiness or soil moisture and send this information to an insurance company. The company could then send specific farming recommendations to the insured farmer. This could create a "win-win" scenario in which crop losses are prevented and the cost of insurance is reduced. Using IoT for agricultural insurance is still in the exploratory phase, and wider-scale rollout would depend, among other things, on the speed of adoption of IoT-enabled devices.

4.3.3 BLOCKCHAIN TECHNOLOGY

Blockchain technology is showing promise as a way to reduce insurance costs, speed up claim settlements, improve fraud management, and increase transparency and trust (Grima et al., 2020). Blockchain can also address information asymmetries in agricultural supply chains as changes e.g. in transportation or prices can be seen in real time by all stakeholders. Over time, this could build trust, lead to better designed insurance solutions, and offer cheaper premiums. In India, GIZ worked with *WRMS* to launch the smart farming tool, *SecuFarm*. Based on an analysis of storage temperature, rainfall, ground moisture, air humidity and soil type data, the software provides smallholders with sustainable land management plans. If participating smallholders adhere to these practices they are automatically insured and receive an insurance payout in the event of crop failure, ensuring a guaranteed minimum income. In the current test phase, the blockchain already holds data on about 50 cotton farmers in the states of Punjab and Haryana.[22]

SMART CONTRACTS

Smart contracts are not a new idea – the principle has been around since the beginning of the 1990s. However, the introduction of new digital storage mechanisms are creating more possibilities for the future. Smart contracts are based on the blockchain principle of storing information in several places so that it cannot be manipulated. This allows contracts to be processed more quickly and verified much more easily if changes are made. An agreement can be written into code and the blockchain can be configured to require participants to sign off on the transaction using their own identifier, a private cryptographic key. The key verifies the identities of the contractual partners, which can be helpful if a dispute arises later, and it creates a record of transactions that increases transparency and encourages trust.

Smart blockchain-based contracts for agricultural insurance are especially useful in "if-then" scenarios, such as index insurance payouts. They can simplify the contracting process and shorten the payout period. In the case of weather indices, triggers can be written into the contract and the algorithm can trace the index (e.g. rainfall levels) automatically, instantly executing payouts if the defined trigger is reached.

Having information stored digitally can also be helpful for farmers who make a claim. If they cannot show proof of insurance, claims are usually denied. However, information that is stored digitally cannot be lost and the terms can be accessed by all parties (the insurer, the insured party, and possibly the regulator).

In July 2019, Aon plc, Oxfam in Sri Lanka, and Etherisc enrolled about 200 smallholder paddy farmers in Sri Lanka in a blockchain-based platform that insures against weather risks.[23] Etherisc is now working with Sprout Insure and ACRE Africa on a similar pilot programme in Kenya that will operate over two to four years and aims to insure 1.2 million farmers.[24] In both cases, crop insurance policies are plugged into smart contracts on a blockchain and indexed to local weather.

For more examples of smart contracts, see section 4.3.5 Mutual and peer-to-peer insurance.

4.3.4 VALUE CHAIN INSURANCE

Many insurers are working successfully with intermediaries like FSPs and agrodealers to provide agricultural insurance. Intermediaries often have a local presence and established relationships with farmers, which can be helpful when farmers have little knowledge or trust in insurance. Intermediaries can also bundle insurance with credit and other value-added services that make insurance more valuable for farmers. For example, if insurance is attached to credit and the credit gives borrowers access to an innovative technology or marketing package that can boost their farm income, this can increase demand for insurance (GIZ, 2016; Carter et al., 2017). There is substantial literature on linking agricultural insurance with credit (e.g., see review by Meyer et al., 2017), and there are many examples of bundling insurance and credit with agricultural inputs (***Box 9***).

BOX 9: EXAMPLES OF BUNDLING INSURANCE FOR FARMERS

The One Acre Fund insurance programme in Kenya links seed and fertiliser sales with index-based insurance. When an insured event occurs, local farmers are reimbursed for the cost of their input purchases. The premium is five per cent over the seed price. When a farmer buys seed and fertiliser, their insurance is registered using a mobile phone camera that scans the barcode on the bag label. An additional benefit is that the barcode provides assurance of the seeds' authenticity.

In Zambia, the government bundles input insurance with its farm input subsidy programme (FISP). The insurance was introduced in the 2018–19 season and insures input costs against poor seed germination due to drought or excessive rainfall. In 2019–20, around 874,000 farmers received insurance payments due to low rainfall in the first month of the growing season, enabling them to quickly purchase new inputs and replant their crops. Policymakers can also be assured that the input subsidy is not wasted in poor crop years, which is politically important for the government. The insurance premium is prefinanced by the FISP, but is paid by the farmer as part of a mandatory cash contribution to access the input package. The Government of Malawi is contemplating a similar insurance bundle tied to its own FISP (Baulch and Kramer, 2020).

Agricultural insurance can also be bundled with other types of insurance to provide more comprehensive risk coverage. For example, the One Acre Fund has partnered with MicroEnsure (now RiskShield) to provide farmers in Rwanda with a package of inputs and services that includes credit, agricultural insurance, a credit life insurance benefit that waives clients' outstanding debts if they or their spouse dies, as well as a benefit that compensates farmers for poor-quality inputs. Training and market facilitation services are also provided. The programme reached more than 275,000 farmers in the main agricultural season of 2018.

Bundling has also been used to encourage climate-smart farming practices. For example, one recent study found that index-based insurance bundled with credit can help promote uptake of drought-tolerant seed varieties.[25] They were found to be complementary as the drought tolerance of the seeds lowered the cost of insurance, and the insurance, which provided replacement seed in the event of severe drought, reduced the financial risk for farmers. Another study in India found that insurance bundled with seasonal weather forecasts is helping farmers select appropriate seed varieties (Kumbhat, 2020).

CONTRACT FARMING

Contract farming is another form of bundling that has 'long been used to combine insurance with inputs, extension services, credit and market together with privileged access to a market, especially for industrial crops and high-value agricultural products. For example, in Zambia, NWK Agri-Services has been offering insurance for inputs as part of a cotton farming contract since 2013. In Colombia, Nespresso includes insurance for growers participating in its Blue Marble coffee scheme (***Box 3***).

MESO-LEVEL INSURANCE FOR INTERMEDIARIES

Bundling insurance with credit and other services removes some of the risk for intermediary organisations that serve farmers, such as FSPs. However, when insurance is index-based, the intermediary still has significant exposure to basis risk. When an intermediary purchases **meso-level insurance**, they manage basis risk by covering their remaining portfolio risk. When basis risk is sufficiently high, it may even be better for an FSP and borrowers if, instead of selling them insurance, the FSP buys meso-level insurance to protect its lending portfolio and uses any indemnity payments (along with its normal lending and loan collection processes) to help individual farmers manage its own losses (Miranda and Gonzalez-Vega, 2010). One still innovative example of meso-level insurance is in Peru where historical data on the El Niño–Southern Oscillation (ENSO) was used to design an index to insure a microfinance institution (Caja Nuestra Gente) against extreme floods (Abedalrazq et al., 2007).[26]

4.3.5 MUTUAL AND PEER-TO-PEER INSURANCE

Another established way to improve access to insurance and reduce costs is organising farmers into groups that purchase a single policy on behalf of its members. Examples include farmer cooperatives, village savings and loans associations (VSLAs), or even entire villages (e.g., in China). An advantage of insuring groups is that it gives them some discretion in how they distribute indemnity payments among their members, which helps to resolve basis risk issues within the group. Research by Clarke and Dercon (2015) suggests that in communities where informal risk-sharing arrangements are already in place, leaving them to sort out compensatory payments on their own might strengthen rather than undermine risk sharing.

However, lack of trust can sometimes be a problem with group **risk pooling**, as was found in a study of coffee farmer cooperatives in Guatemala, as farmers have to rely on the group to conduct a fair loss adjustment (McIntosh, 2016). One way to build trust is to make the group's payment system more objective and transparent. PBI is one way to structure compensatory payments for individual farmers based on plot-level photos of crop damage. In Nepal, self-organised insurance groups of up to 100 farmers share agricultural risks in an arrangement similar to a savings group. Under this model, established more than 20 years ago by the national agricultural development bank ABDL, premiums are collected by the groups and deposited in an ADBL group account together with government subsidies for agricultural insurance (75 per cent of the premium payment). In the event of a disaster, insurance payments are determined by a group sub-committee with advice from technical experts at ADBL, and payments are deposited into farmers' personal bank accounts. Currently, 147,789 farmers are served by 380 insurance groups through 75 ADBL branches in 43 districts.

A newer and more technical interpretation of mutual insurance is the peer-to-peer (P2P) insurance model in which individuals or organisations pool their resources to share risk. The characteristic feature of the model is that it allows a business to be created without the need for a centralised risk carrier, and it provides an automated and trustworthy transaction environment (blockchain technology is often a part of newer P2P models[27]). To prevent or reduce fraud, P2P insurance creates groups of individuals or organisations with mutual trust and interests. It reduces the administrative costs typically associated with a classic insurer's policy, and policyholders can pay themselves back with residual funds after claims are paid.

The main difference between P2P and mutual insurance models is that P2P models select and group individuals or organisations to minimise risks, while in a mutual insurance scheme, risk reduction comes mainly from having large pools of individuals insured. As with smart contracts, claims can be processed automatically when certain conditions are met. Both claims and claim payments can be enabled, executed, and recorded automatically via blockchain, eliminating the need for an intermediary insurance company.[28]

P2P insurance has advantages for both the insured and the insurer. First, insurance premiums are usually lower than with traditional insurance and the insured person can benefit from the repayments. Second, repayments reduce the incentive for insurance fraud and ultimately lower processing costs for the insurance company. Some start-ups are already operating based on P2P insurance principles,[29] and with the growing penetration of smartphones in LMICs, the business case to expand can be made easily.

4.3.6 TARGETING INSURANCE TO UNDERSERVED GROUPS

The most challenging types of insurance to design and deliver are for poorer and more vulnerable farm households. For-profit insurers have little incentive to serve these groups, and while safety net programmes (SNPs) that provide regular cash transfers have been effective at helping some of the chronically poor, they do not provide adequate protection against catastrophic losses. In response to this challenge, SNPs in some countries have increased cash transfer payments in catastrophic crop years. Some have also extended their reach to assist vulnerable households that do not normally qualify for regular cash transfers. In effect, SNPs are providing a form of insurance against catastrophic risks fully funded by government.

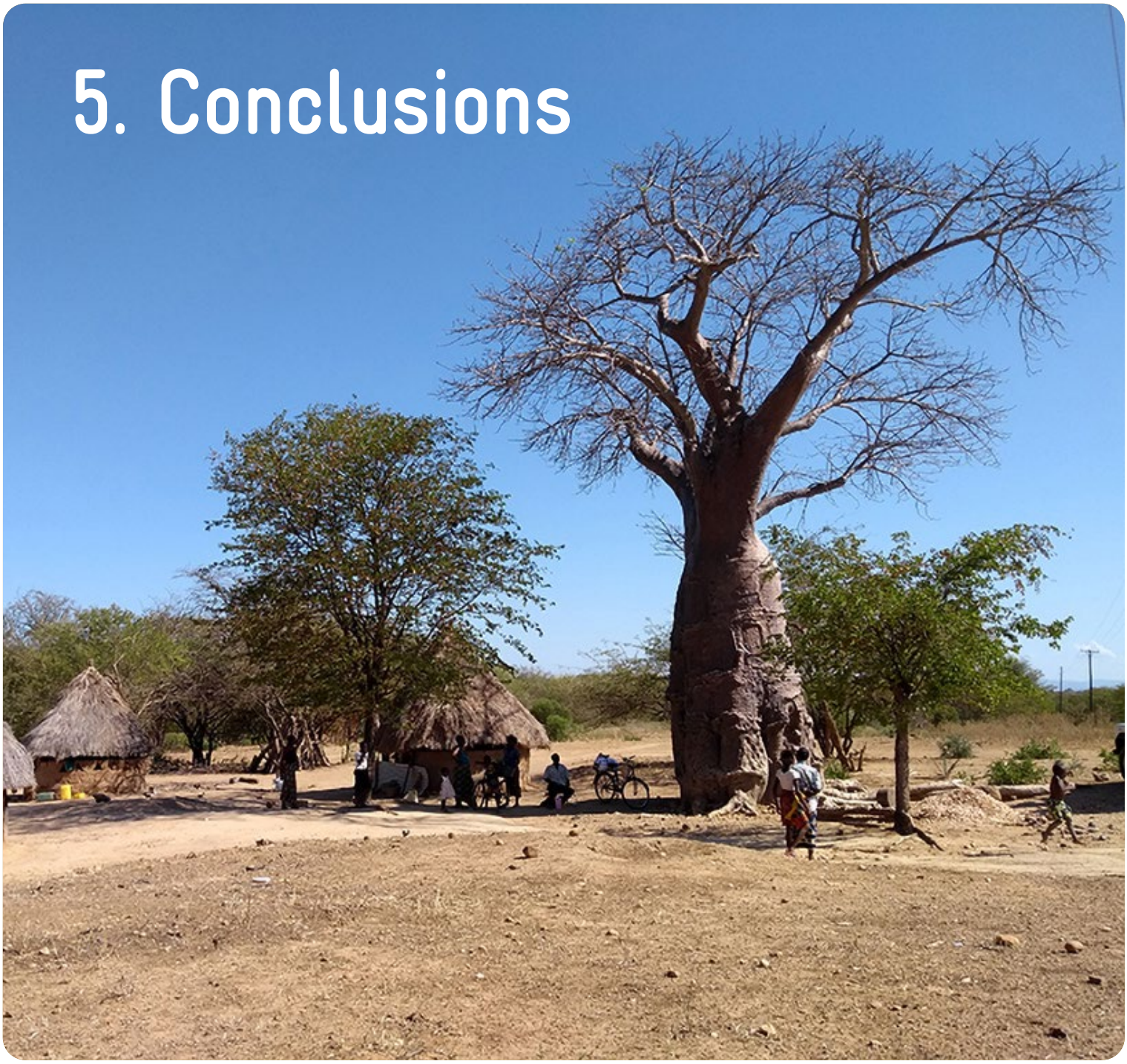
One example is the Hunger Safety Net Programme (HSNP) in Kenya which, since 2015, has expanded payments in drought years to households in arid and semi-arid pastoral lands (Farhat et al., 2017). Like index-based insurance, payments are determined by local drought indices. One advantage of using SNPs in this way is that they usually have robust data on rural households in a region, which can be used both to target insurance and provide regular cash transfers and disaster assistance payments.

Another innovative way of targeting insurance to the poor is by linking formal insurance to informal risk-sharing groups, such as social funds or VSLAs. While these groups can be effective at managing idiosyncratic risks that affect only a few members at a time (e.g., deaths or illness), they are not well suited to more serious and systemic catastrophic losses that affect all members at once (see Section 2.1). Here, formal insurance can play an important role.

Informal groups have also proven to be a useful way to target women farmers (IFAD, 2020), who tend to be more active in social networks than men and have access to other groups or associations that could be target beneficiaries of insurance products. For example, since 2012, GIIF, through its partners MicroEnsure and ACRE, has been aggregating women farmers and enrolling them in insurance programmes – a commercially feasible option for the insurer and a way for women farmers to receive coverage collectively for weather-related risks.

Another positive example is an index-based insurance arrangement in Kenya. During recent droughts, a payout from ACRE, initiated by GIIF and supported by Swiss Re, kept thousands of women farmers in business, providing funds to buy seeds and fertiliser for the next growing season. The InsuResilience Global Partnership also provided insights on how to create gender-inclusive insurance schemes.[30]

5. Conclusions



Across LMICs, interest in agricultural insurance is growing, and innovative new technologies and policy approaches are allowing farm households to protect themselves from risk for the first time. Uptake and coverage are uneven, however. While India and China have high rates of coverage, data from the GIZ country survey implies that less than a tenth of farms in the observed countries had agricultural insurance in 2020. Governments, the international development community, and the private insurance sector are still facing a number of challenges in their effort to scale up comprehensive agricultural insurance coverage that enables farmers to manage risk and cope with climate change.

A key challenge is that many **technological innovations** have not lived up to widespread expectations and are still "blue sky" prospects that lie beyond the capacities of many LMICs. For example, despite advances in remote sensing and crop modelling, most of the index-based programmes in the GIZ 2020 survey are still using indices based on ground data from crop-cutting experiments or local weather stations. Also, notwithstanding the spread of smartphones and the promise of digital technologies, many insurance programmes do not have even a basic capacity to digitise data to process contracts and claims. A recent study found that around half of index-based insurance providers still rely on non-digital channels for service delivery (Raithatha and Priebe, 2020). For now, these technological solutions are more likely to take off in transitioning countries with more developed infrastructure, human capital, and private sector capacities.

Another challenge is that the business models of **institutional innovations** are often not sufficiently integrated in local agricultural value chains or the everyday environment of farming communities, and may not leverage the interests and contributions of the various parties involved. Often, successful private schemes have found very specific solutions for a target group of farmers, and although these can be difficult to reproduce or scale, they are extremely beneficial for those involved. The greatest progress in terms of numbers, however, has been achieved when technological innovations have been complemented with enabling institutional arrangements and supporting government policies. This is most clearly the case in countries like India and China but also Zambia, Thailand or Peru.

These cases also highlight the challenge of **high premium costs** in the absence of government subsidies. The fact that most of the insurance programmes in the 2020 country survey are heavily subsidised suggests that many farmers still perceive insurance as too expensive. Some of the risks farmers need to insure against most are catastrophic in nature, which may be too costly without substantial subsidies. It is possible that purely private insurance will never be a complete substitute for this type of risk and that governments will always need to provide some form of disaster assistance. This is even the case in high-income countries like the US, France or Japan that have large-scale and publicly supported agricultural programmes.

Yet another challenge may be a lack of **effective coordination** between the many public and private, international and national players in agricultural insurance. Better and efficient coordination on concrete solutions through partnerships and exchange platforms could lead to more value-added and scaled up insurance programmes.

These challenges can be overcome, and there are many reasons to be optimistic. The highest numbers of farmers are reached when **technological innovations** are accompanied by, or bundled with, enabling institutional arrangements and supportive government policies. This is clearly the case in India and China, which have invested heavily in the development of agricultural insurance systems and provided generous subsidies to encourage widespread uptake. It has also been evident in Zambia, Thailand, and Peru.

On the **institutional front**, insurance is being successfully bundled with credit and modern farm inputs to make insurance more valuable for smallholders. Innovative programmes are also targeting poorer farmers and women farmers with appropriate insurance products delivered through local groups or social safety net programmes. The agencies that manage disaster assistance programmes will need to ensure that farmers and rural communities are not discouraged from improving and making investments in their risk management practices, including those that reduce their exposure to catastrophic losses and purchase insurance when it is affordable. This is especially important to create appropriate, in-demand products and delivery channels. There are also innovative ways to ensure insurance and disaster assistance play complementary roles, such as converting some ad hoc relief payments to subsidised insurance to provide farmers with more assured and speedy insurance payments.

The success of many of the smaller country and regional programmes highlighted in this report suggests that more integrated approaches can work even without subsidies. However, these typically require **strong coordination and partnerships** between governments, private insurers, donors, NGOs, and other external stakeholders. Government and PPPs may help to sustain and scale up agricultural insurance programmes. This has been most evident with programmes that target traditionally excluded groups and require some level of subsidy, but PPPs also have important roles to play in developing insurance solutions for commercial farmers.

In the midth of persistent challenges and innovative ways to approach them still lay many open questions. One of the key ones being if – in face of the empirical evidence e.g. from China and India – high government subsidy rates are a necessary condition for significant upscaling in insurance for smallholder farmers. On a macro level, this question opens up to thinking about the objectives and economic politics behind agricultural insurance. This includes other ways of stabilizing farm incomes such as of social security and distaster relief and begs the question of their comparative efficiency and impacts with agricultural insurance. While the study at hand does not answer this and many other important questions, it hopes to contribute to the joint efforts of practitioners and policymakers and the ongoing developments and discussions in the field of agricultural insurance and hopes to reflect the continued commitment of GIZ to this important area.

References

Abedalrazq, F.K., Hyun-Han, K., Upmanu, L., Mario, J.M. and Skees, J. (2007). El Ninõ–Southern Oscillation-based index insurance for floods: Statistical risk analyses and application to Peru. Water Resources Research 43, W10416. Available at: *https://doi.org/10.1029/2006WR005281*.

Baulch, R. and Kramer, B. (2020). Insuring the AIP: The Devil is in the Details. IFPRI, Washington, DC. Available at: *https://massp.ifpri.info/2020/10/09/insuring-the-aip-the-devil-is-in-the-details/*.

Benami, E., Jin, Z., Carter, M.R. et al. (2021). Uniting remote sensing, crop modelling and economics for agricultural risk management. Nature Reviews Earth & Environment 2:140–159. Available at: *https://doi.org/10.1038/s43017-020-00122-y*.

Carter, M.R. and Barrett, C.B. (2006). The economics of poverty traps and persistent poverty: An asset-based approach. Journal of Development Studies 42(2):178–199.

Carter, M. (2013). Sharing the risk and the uncertainty: public-private reinsurance partnerships for viable agricultural insurance markets. Policy Brief 78. Fondation pour les Études et Recherches sur le Développement International (FERDI), Clermont-Ferrand, France.

Carter, M., de Janvry, A., Sadoulet, E. and Sarris, A. (2017). Index insurance for developing country agriculture: A reassessment. Annual Review of Resource Economics 9:421–38.

Ceballos, F., Kramer, B. and Robles, M. (2019). The feasibility of picture-based insurance (PBI): Smartphone pictures for affordable crop insurance. Development Engineering 4, 100042. Available at: *https://www.sciencedirect.com/science/article/pii/S2352728518300812*.

Ceballos, F. and Kramer, B. (2019). From Index to Indemnity Insurance using Digital Technology Demand for Picture-Based Crop Insurance. IFPRI Discussion Paper 01890. IFPRI, Washington, DC. Available at: *https://www.ifpri.org/publication/index-indemnity-insurance-using-digital-technology-demand-picture-based-crop-insurance*.

Clark, D.J. and Dercon, S. (2015). Insurance, credit and safety nets for the poor in a world of risk. In Nazrul, I. and Vos, R. (Eds.), Financing for Overcoming Economic Insecurity, 85–110. Bloomsbury Academic, London.

Cole, S., Bastian, G.G., Vyas, S., Wendel, C. and Stein, D. (2012). The Effectiveness of Index-Based Micro-insurance in Helping Smallholders Manage Weather-Related Risks. EPPI Centre, Social Science Research Unit, Institute of Education, University of London, London.

Dercon, S. and Christiaensen, L. (2007). Consumption risk, technology adoption and poverty traps: evidence from Ethiopia. Policy Research Working Paper 4257. World Bank, Washington, DC.

FAO. (2020). Protecting Livelihoods: Linking Disaster Risk Insurance and Social Protection in Agriculture. FAO, Rome. Farhat et al. (2017). Evaluation of the Kenya Hunger Safety Net Programme Phase 2: Emergency payments deep dive study. Oxford Policy Management, Oxford, United Kingdom.

Gautam, M., Hazell, P. and Alderman, H. (1994). Rural demand for drought insurance. Policy Research Working Paper 1383. World Bank, Washington, DC.

GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit). (2016). Innovations and Emerging Trends in Agricultural Insurance. GIZ GmbH, Bonn and Eschborn, Germany. Available at: *http://star-www.giz.de/pub?r=42623*.

Goodwin, B.K. and Smith, V.H. (2013). What harm is done by subsidizing crop insurance? American Journal of Agricultural Economics 95(2):489–497.

Greatrex, H., Hansen, J., Garvin, S., Diro, R., Blakeley, S., Le Guen, M., Rao, K. and Osgood, D. (2015). Scaling Up Index Insurance For Smallholder Farmers: Recent Evidence And Insights. CCAFS Report No. 14. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Copenhagen. Available at: *https://ccafs.cgiar.org/resources/publications/scaling-index-insurance-smallholder-farmers-recent-evidence-and*.

Grima, S., Spiteri, J. and Romanova, I. (2020). A STEEP framework analysis of the key factors impacting the use of blockchain technology in the insurance industry. The Geneva Papers on Risk and Insurance – Issues and Practice 45(3):-398–425.

Gulati, A., Terway, P. and Hussain, S. (2018). Crop Insurance in India: Key Issues and Way Forward. ICRIER, Delhi. Available at: *https://icrier.org/pdf/Working_Paper_352.pdf*.

Hazell, P., Oram, P. and Chaherli, N. (2003). Managing livestock in drought-prone areas of the Middle East and North Africa: Policy Issues. In Löfgren, H. (Ed.), Food, Agriculture, and Economic Policy in the Middle East and North Africa 5:70–104. Elsevier Science, Ltd., New York.

Hazell, P., Anderson, J., Balzer, N., Hastrup Clemmensen, A., Hess, U. and Rispoli, F. (2010). Potential for scale and sustainability in weather index insurance for agriculture and rural livelihoods. International Fund for Agricultural Development (IFAD) and World Food Programme (WFP), Rome.

Hazell, P. and Varangis, P. (2020). Best practices for subsidizing agricultural insurance. Global Food Security 25, June.

Hellmuth, M.E., Osgood, D. E., Hess, U., Moorhead, A. and Bhojwani, H. (Eds). (2009). Index insurance and climate risk: Prospects for development and disaster management. Climate and Society No. 2. International Research Institute for Climate and Society (IRI), Columbia University, New York.

Hess, U., Balzer, N., Calmanti, S. and Portegies-Zwart, M. (2010). CERVCO: Community Early Recovery Voucher Scheme for Catastrophic Weather Disaster Hedging. In Weather Risk Management: A Guide for Corporations, Hedge Funds and Investors. K. Tang, P. (Ed.), 215–30. London: Risk Books.

Hill, R.V., Gajate-Garrido, G., Phily, C. and Dalal, A. (2014). Using subsidies for inclusive insurance: lessons from agriculture and health. Microinsurance Paper 29, ILO, Geneva.

IFAD. (2017). Remote sensing for index insurance: Findings and lessons learned for smallholder agriculture. IFAD, Rome.

IFAD. (2020). Making agricultural and climate risk insurance gender inclusive: How to improve access to insurance for rural women. IFAD, Rome. Available at: *https://www.ifad.org/en/web/knowledge/publication/asset/41761818*.

IMF. (2019). Building Resilience in Developing Countries Vulnerable to Large Natural Disasters. IMF Policy Paper 19/020. Available at: *https://www.imf.org/en/Publications/Policy-Papers/Issues/2019/06/24/Building-Resilience-in-Developing-Countries-Vulnerable-to-Large-Natural-Disasters-47020*.

ISF. (2018). Protecting Growing Prosperity: Agricultural Insurance in the Developing World. ISF Advisors, Washington, DC and New York. Available at: *https://isfadvisors.org/wp-content/uploads/2020/06/sep_2018_isf_syngneta_insurance_report_final.pdf*.

Jensen, N. and Barrett, C. (2016). Agricultural Index Insurance for Development. Applied Economic Perspectives and Policy 39(2).

Kenderdine, T. (2018). Insurance Plus Futures: Agricultural commodity price reform in China. Asia & the Pacific Policy Studies 5(2):331–346.

Kramer, B. and Ceballos, F. (2018). Enhancing adaptive capacity through climate-smart insurance: Theory and evidence from India. Presented at the 2018 International Conference of Agricultural Economists, Vancouver, British Columbia, July 28–August 2, 2018. Available at: *http://ageconsearch.umn.edu/record/275926*.

Kumbhat, A. (2020). Bundling Seeds, Weather Forecasts and Insurance. Agriculture World 6(11):36–37.

Lowder, S.K., Skoet, J. and Raney, T. (2016). The number, size, and distribution of farms, smallholder farms, and family farms worldwide. World Development 87:16–29.

Mahul, O. and Stutley, C.J. (2010). Government support to agricultural insurance: Challenges and options for developing countries. World Bank. Washington, DC.

Malik, W. and Domke, B. (2020). Agricultural insurance for smallholders in Africa: Considerations under the practitioner's lens. Draft report, November, GIZ.

McIntosh, C., Povel, F. and Sadoulet, E. (2016). Utility, risk, and demand for incomplete insurance: lab experiments with Guatemalan cooperatives. Working Paper, University of California, San Diego.

Meyer, R.L., Hazell, P. and Varangis, P. (2017). Unlocking Smallholder Credit: Does Credit-Linked Agricultural Insurance Work? Global Index Insurance Facility, World Bank and ILO. Available at: *http://documents.worldbank.org/curated/en/515371511848930976/Unlocking-Smallholder-Credit-Does-Credit-Linked-Agricultural-Insurance-Work*.

Miranda, M. and Gonzalez-Vega, C. (2010). Systemic risk, index insurance, and optimal management of agricultural loan portfolios in developing countries. American Journal of Agricultural Economics 93(2):399–406.

OECD. (April 2016). Agricultural Risk Management: A Holistic Approach. OECD Meeting of Agriculture Ministers, Background Note, OECD, Paris.

Raithatha, R. and Priebe, J. (2020). Agricultural insurance for smallholder farmers: Digital innovations for scale. GSMA AgriTech Programme. Available at: *https://www.gsma.com/mobilefordevelopment/resources/agricultural-insurance-for-smallholder-farmers-digital-innovations-for-scale/*.

Robles, M. (2021). Agricultural Insurance for Development: Past, Present, and Future. In Otsuka, K. and Fan, S. (Eds.), Agricultural Development: New Perspectives in a Changing World. IFPRI, Washington, DC.

Rosenzweig, M.R. and Binswanger, H.P. (1993). Wealth, weather risk and the profitability of agricultural investment. Economic Journal 103:56–78.

Sakurai, T. and Reardon, T. (1997). Potential Demand for Drought Insurance in Burkina Faso and its Determinants. American Journal of Agricultural Economics 79(4):1193–1207, November.

Sandmark, T., Debar, Jean-Christophe and Tatin-Jeleran, C. (2013). The Emergence and Development of Agriculture Microinsurance: A Discussion Paper.

Siamwalla, A. and Valdés, V. (1986). Should crop insurance be subsidized? In Hazell, P.B.R., Pomareda, C. and Valdés, A. (Eds.). Crop Insurance for Agricultural Development: Issues and Experience. Baltimore: Johns Hopkins University Press.

Swiss Re. (2019). Agricultural Insurance: A Growth Story. Swiss Re, Zurich.

Tao Ye and Qingyan Mu. (2020). Fostering Rural Resilience: A Closer Look at China's Agricultural Insurance Pilot. The Global Facility for Disaster Reduction and Recovery (GFDRR) and World Bank Group.

World Bank Group. (2015). Kenya: Toward a National Crop and Livestock Insurance Program.

GLOSSARY OF TERMS

Actuarially fair cost of insurance: The part of a premium that, based on actuarial calculations, the insurer estimates will equate to the average indemnity to be paid out over time.

Adverse selection: Situations in which an insurance company extends insurance coverage to an applicant whose actual risk is substantially higher than the risk known by the insurance company. If the insurance company charges an average price for its product, it will attract high-risk buyers who, over time, will cause the insurer to lose money. If the insurer responds by raising the average premium, it will lose more of its lower risk buyers, eventually ending up with an unviable portfolio of high-risk farmers.

Area yield insurance: A type of index-based insurance in which the index is linked to the average crop yield for a region, usually measured through randomised crop-cutting experiments.

Basis risk: Basis risk arises with index products when there is a mismatch between the index measure that assesses losses for the insured region and the loss experienced by individuals. This happens if an individual farmer experiences crop losses that are too localised to trigger a regionally based insurance payment. The opposite can also occur, and farmers may sometimes receive insurance payments triggered at a regional level even when they have not suffered a serious loss themselves.

Indemnity-based insurance: Insurance that compensates an insured farmer based on the assessed loss or damage sustained. This type of insurance requires individual loss assessments and, in many cases, some monitoring to avoid moral hazard problems. The most common forms are multiple peril crop insurance (MPCI) and specific or named peril insurance. Personal insurance like life, health, and accident insurance are also examples of indemnity insurance.

Index-based insurance: Insurance that compensates for losses measured by an index defined at a regional level, sometimes called a unit area of insurance (UAI), rather than for the losses of individual clients. A UAI might be a district, community, or GIS-defined area. When an insured event occurs (e.g., rainfall at a weather station or the average yield for the UAI falls below a defined level), all insured clients in the area receive the same payment per unit of insurance.

Loss function: The statistical relationship between the possible outcomes of an insured event and their probability of occurrence, which is used to establish the appropriate premium rate to cover the actuarially fair cost of the insurance.

Macroinsurance: Macroinsurance is sold to public entities like disaster assistance programmes (DAPs) and government departments to transfer some of their aggregate risk exposure to the international market rather than to the government's budget.

Meso-level insurance: Meso-level insurance is sold to intermediaries like agribusinesses, FSPs, and NGOs (i.e., the insurance contract holders), which use the insurance to cover risks in their own aggregate portfolios.

Microinsurance: With microinsurance, the policyholder is an individual, household, smallholder or micro/small enterprise. They may be insured under an individual policy or a group policy. This is the most common approach in agricultural and climate risk insurance. Examples include individuals who purchase insurance to cover their production risks or farmer groups that insure their members directly under a group policy. In the development community, microinsurance has increasingly come to mean the development of microproducts to insure the most vulnerable individu-als in low-income countries, similar to the concept of microfinance. This type of insurance is a subset of the more general concept of microinsurance used in this report.

Moral hazard: The problem that arises if the behaviour of an insured party can affect whether an insured event occurs and/or the amount of damage it causes. For example, a farmer with an MPCI contract may be less diligent in managing their crop if they know they will be compensated by insurance for yield loss.

Multi-peril crop insurance (MPCI): A type of indemnity insurance that provides coverage against a wide range of natural hazards that affect crop yields. MPCI is particularly prone to moral hazard.

Premium: The amount of money that an individual or business pays for an insurance policy. It typically consists of the actuarially fair cost of insurance plus administration costs plus risk loading, less any subsidy amount provided by the government or other stakeholder.

Reinsurance: When the total exposure of a risk or group of risks presents a hazard beyond the limit that is prudent for an insurance company to carry, the insurer may purchase reinsurance, i.e., insurance for the insurance. Reinsurance has many advantages, including (i) levelling out the financial outcomes of the insurance company over time; (ii) limiting the exposure of individual risks and restricting losses paid out by the insurance company; (iii) potentially increasing an insurance company's solvency margin (percentage of capital and reserves to net premium income), hence the company's financial strength; and (iv) the reinsurer shares the profits of the insurance company, but also contributing to the losses, with the net result being a more stable loss ratio over the insurance period.

Risk loading: An addition to an insurance premium that an insurer charges to help compensate for limited information or uncertainty about the relevant loss function, for example, one that arises with a new type of insurance or because of climate change.

Risk pooling: One of the basic functions of a financial system in which the risk of providing financial services to one customer is pooled or intermingled with those of other customers. The objective is to reduce the overall risk to the institutions offering the services.

Sum insured: The amount of money that an insurance company is obligated to cover in the event of an insured loss. The sum insured amount is dependent upon the premium price being paid for the insurance coverage.

Tail-end risk: The chance of a significant loss occurring due to a low-probability event, as predicted by a probability distribution.

Appendix

SURVEY METHODOLOGY

OVERVIEW

The GIZ 2020 Country Survey was supplemented with a literature review of recent developments in the area of agricultural insurance, including technological and institutional innovations designed to overcome key challenges. Interviews were also conducted with several international reinsurers and brokers to assess their views of the current situation and future challenges and opportunities

The median age of the surveyed programmes was six years with a mean of 7.1 years, but ranged from 0 to 17 years (PROAGRO in Brazil). The current programmes in India and China have antecedents in earlier programmes that go back much longer. Of all the index insurance programmes surveyed in 2016 by GIZ, 70 per cent were still operating in 2020.

SURVEY METHODS

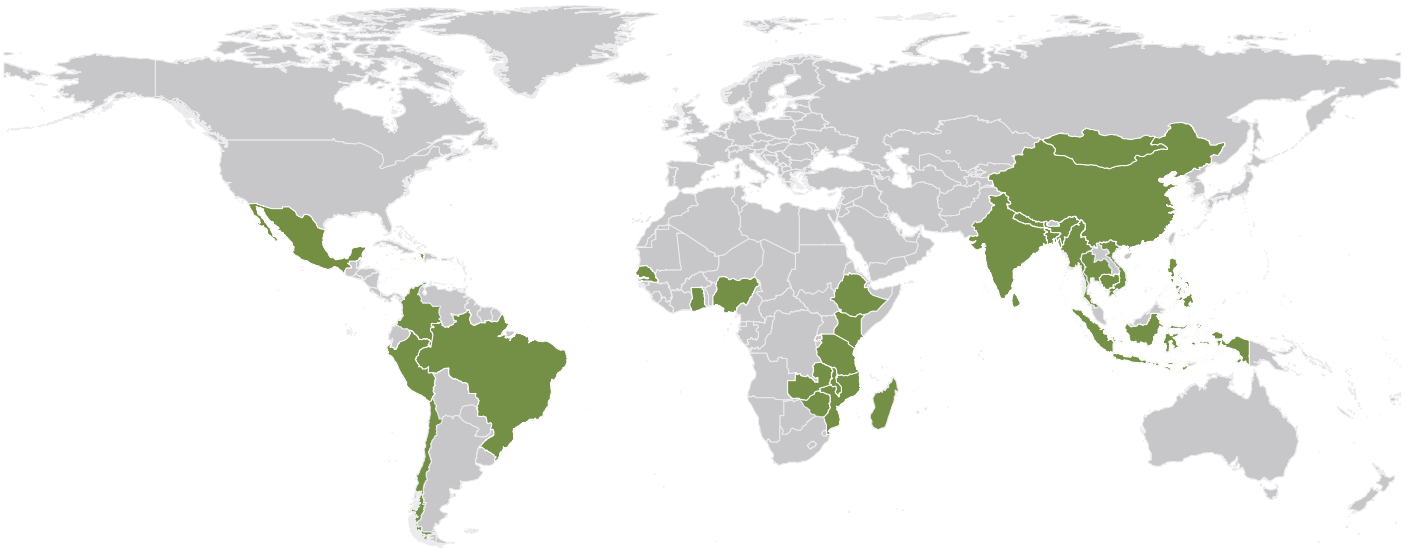
The country survey was conducted between July 2020 and January 2021. Countries were selected in a purposeful manner rather than at random. All the countries included in an earlier GIZ survey (GIZ, 2016) were included and other countries were added based on analysis of the size of agricultural markets and interviews with experts from the insurance and international reinsurance sectors.[31] In total, 52 national agricultural insurance programmes in 32 countries and two regional programmes covering four additional countries were surveyed. The survey focused on microinsurance programmes that insured farmers either directly or through intermediaries like FSPs, agrodealers, and farmer cooperatives and mutuals. The survey did not include macroinsurance programmes that insure farmers indirectly on a fully subsidised basis through social safety net or disaster assistance agencies (e.g., CADENA in Mexico).

Within the selected countries, detailed overviews of the agricultural insurance landscapes were compiled with the help of consultants, interviews with insurers, and publicly available data. Data was collected for the latest year available, typically 2019 or 2020, but occasionally 2018. Interviews were also conducted with several international reinsurers and brokers.

LIMITATIONS OF THE SURVEY

The survey was conducted during the COVID-19 pandemic, which precluded in-country visits by the authors, but created opportunities for local consultants to assist with data collection and GIZ country-based staff to follow up with insurance programmes that did not adequately respond to requests for information. The survey primarily captured the larger agricultural insurance programmes in each country, and the statistical analysis focused on variables with sufficient observations to provide credible representation.

Agricultural insurance programmes in selected LMICs



COUNTRY NAME & PROGRAMME	SCALE (IN OR AROUND 2019–2020)	MAIN FEATURES	START
AFRICA			
Weather index insurance: Burundi	96	Crop insurance (maize, beans and rice), index-based (rainfall)	2017
Weather index insurance pilots: Ethiopia	3,950	10 pilots from 2006 to 2009, standardised crop index insurance products from at least three insurance companies, two live agricultural microinsurance products (WFP R4 and SIIPE)	2019
Rural Resilience Initiative: Ethiopia, Senegal, Malawi, Zambia, Kenya, Zimbabwe, Mozambique, Bangladesh, Madagascar	194,303	Weather index risk insurance product for farmers and vulnerable groups	2020 (index insurance component)
World Cover Pilot: Ghana	27,000	MPCI and poultry insurance	2018
Kenya Agriculture Insurance Programme (KAIP): Kenya	420,000	Maize and wheat insurance	2016
Kenya Crop Insurance Programme (KCIP): Kenya	81,800	Crop insurance for maize, wheat, and potatoes in the event of production shocks like drought and disease	2015
One Acre Fund: Kenya, Rwanda, Burundi, Tanzania, Uganda, Malawi, Zambia	1,047,700	Multi-peril insurance for crops and legumes	operations started in 2006, insurance pilot dates vary from country to country
Weather index insurance products: Malawi	17,143	Weather index insurance via various private sector aggregators and development agencies; mostly satellite-based	2005
Weather index insurance products: Mozambique	8,797	Weather index insurance products implemented by Hollard and EMOSE. Supported by the IFC Global Index Insurance Facility (GIIF); integration with contract farming operations	2012
Nigerian Agricultural Insurance Corporation (NAIC): Nigeria	50,000	Subsidised crop and livestock insurance for fire, lightning, storm, flood, and drought	2014
NIRSAL Area Yield Index Insurance: Nigeria	12,333	Crop and livestock insurance, area yield and index-based	2017
NIRSAL Comprehensive Index Insurance: Nigeria	9,676	Crop and livestock insurance, combination of yields and price index	2018

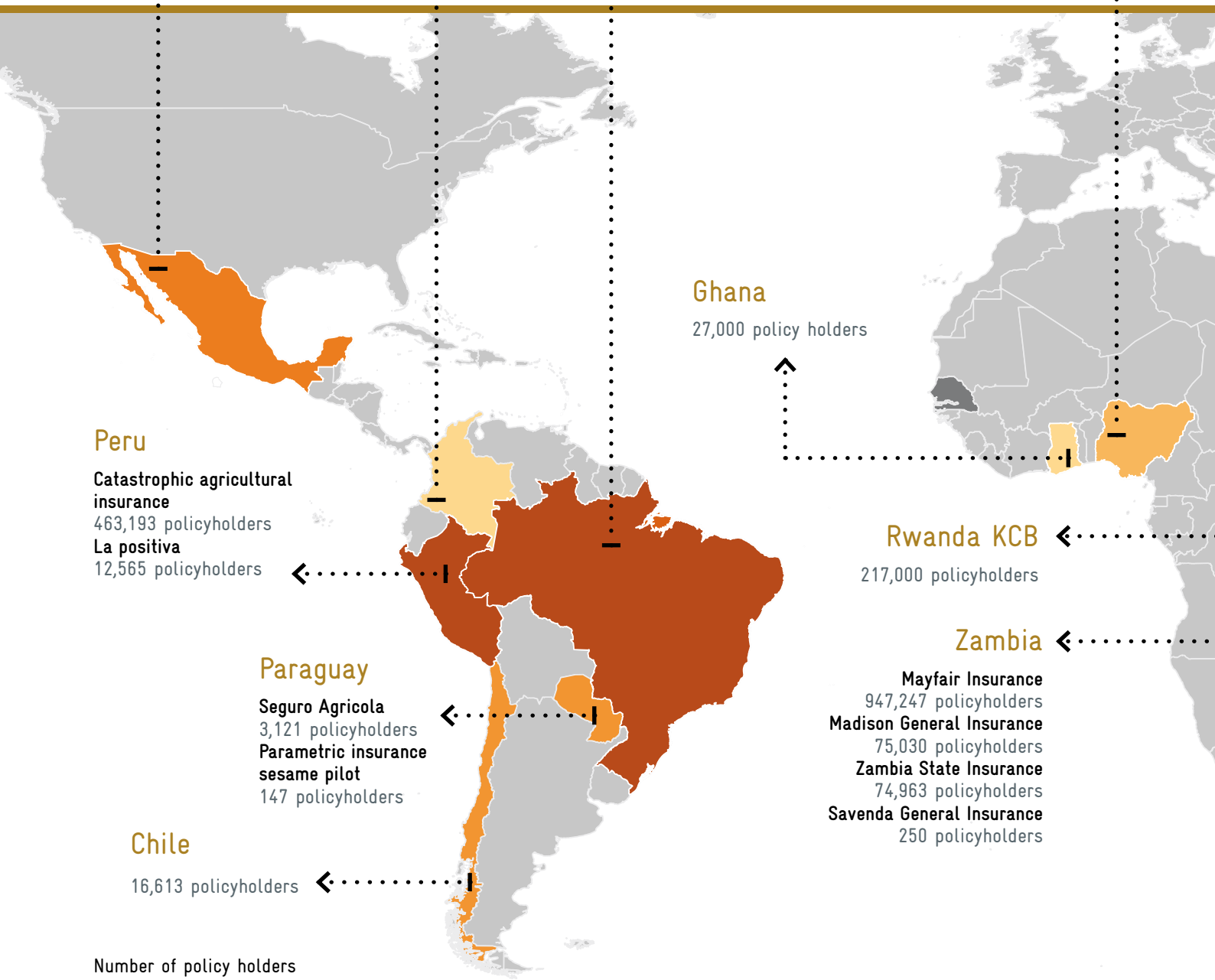
COUNTRY NAME & PROGRAMME	SCALE (IN OR AROUND 2019–2020)	MAIN FEATURES	START
AFRICA			
PULA (CBN Programme): Nigeria	543,000	Yield Index Insurance for rice, maize and cotton	2016
National Agriculture Insurance Scheme (NAIS), Rwanda	217,000	Primarily yield index crop insurance, also some livestock insurance coverage on an indemnity basis	Since 2014 for private-sector aggregators, since 2019 for NAIS
Uganda Agriculture Insurance Scheme (UAIS): Uganda	97,000	Weather index insurance for smallholders and MPCI for medium- and large-scale farmers	2017
Mayfair Insurance Zambia: Zambia	947,247	Weather index insurance	
Professional Insurance Company Zambia: Zambia	78,874	Area yield index insurance; area yield and weather index insurance (hybrid), perils covered: drought, excessive moisture, hail, frost, wind	
Madison General Insurance Company: Zambia	30	Indemnity insurance distributed through dairy cooperatives	
Madison General Insurance Company: Zambia	75,000	Area yield and weather index insurance (hybrid)	
Zambia State Insurance Company: Zambia	74,957	Area yield and weather index insurance (hybrid)	
Zambia State Insurance Company: Zambia	5	Indemnity insurance for smallholder farmers	
Savenda General Insurance: Zambia	250	Indemnity insurance for smallholder farmers	
Madison General Insurance Company: Zambia	30	Indemnity insurance distributed through dairy cooperatives	
TOTAL AFRICA	3,906,160		

COUNTRY NAME & PROGRAMME	SCALE (IN OR AROUND 2019–2020)	MAIN FEATURES	START
ASIA			
Agricultural insurance products offered by Green Delta Insurance Company (GDIC): Bangladesh	7.314	Weather index (mostly based on weather stations, gridded data set, satellite-based); yield index insurance, flood index insurance	2015
Agricultural insurance by Green Delta Insurance company (GDIC), Bangladesh	226,2	Livestock indemnity-based insurance for smallholders (linked to loans)	2015
Cambodia	219	Index insurance for rice, cassava, vegetables/fruits, maize and rubber	
National Agricultural insurance Scheme: China	195,000,000	Crop insurance covering more than 200 kinds of crops, including corn, rice and wheat; aquaculture insurance	2007
Pradhan Mantri Fasal Bima Yojana (PMFBY): India	54,685,103	Crop insurance covers yield losses due to unpreventable risks, e.g., natural fire and storm, flood, etc.	2016
Revised Weather Based Crop Insurance Scheme (RWBCIS): India	2,126,449	Insurance covers major weather perils considered to cause "adverse weather incidence" and lead to crop loss, e.g., low rainfall, excess rainfall, high temperature (heat), low temperature	2016
State-level crop insurance scheme, West Bengal (Bengla Shashya Bima, BSB): India		Insurance is paid in four stages for any losses suffered during planting, cultivation, post-harvest when crops are lying in the field, and for adverse weather situations; area yield index approach	2019
Index-Based Flood Insurance (IBFI): India	3,300	Insurance covers crop losses from flood (pilot 1) and flood and drought (pilot 2, Bundled Insurance with Climate Information and Seed Systems for Agricultural Resilience (BICSA)); based on satellite images and flood modelling tools	Pilot 1: 2015–2018 Pilot 2: 2018–2019
Rice Crop Insurance: Indonesia	1,447,038	Rice crop insurance	2012
Index-Based Livestock Insurance (IBLI): Mongolia	28,527	Index-based livestock insurance based on livestock mortality rate; payments made once mortality rate exceeds a threshold (5% or 6%) for each species	2006
Yield index-based project in collaboration with Global World Insurance (GWI): Myanmar	334		
Several types of insurance: Nepal	129,001	Includes livestock insurance and vegetable insurance; covers multiple perils (fire, lightning, earthquake, flood, drought, disease); index insurance based on cumulative rainfall	2013
Punjab Agriculture and Rural Transformation P4R Programme: Pakistan	254,484	Crop insurance (Kharif rice, maize, cotton, sugarcane, Rabi wheat) plus tree fruit insurance for mango and citrus; area yield index; links two crop credit/seasonal loan schemes	2018

COUNTRY NAME & PROGRAMME	SCALE (IN OR AROUND 2019–2020)	MAIN FEATURES	START
ASIA			
Philippine Crop Insurance Corporation (PCIC): Philippines	4,404,557	Crop insurance covers (e.g. rice, maize, high-value commercial crops); insurance cover for livestock, fishery, non-crop agricultural assets, credit and life insurance; indemnity-based	first pilot in 1981
GIZ-SANASA Agri-Insurance Scheme: Sri Lanka	580	Index-based agricultural crop insurance, e.g., for flood, drought, excess rain, wild animal attack, disease	2020
GIZ-SANASA Livestock Insurance Scheme, Sri Lanka	50	Index-based livestock Insurance, covers peril due to snake bite, earthquake, poisoned feed etc.	2020
SANASA Insurance: Sri Lanka	15,000	Weather Index Insurance	2011
National Rice Insurance Scheme, Thailand	2,024,727	Indemnity-based agriculture insurance	2014
TOTAL ASIA	260,126,909		

COUNTRY NAME & PROGRAMME	SCALE (IN OR AROUND 2019–2020)	MAIN FEATURES	START
LATIN AMERICA & CARIBBEAN			
Agricultural Guarantee Program (ProAgro): Brazil	193,470	Proagro guarantees the exoneration of financial obligations related to rural credit operation, whose settlement is hindered by the occurrence of natural phenomena, plagues, and diseases that affect herds and plantations	2006
Agricultural Guarantee Program (ProAgro Mais): Brazil	31,713	public insurance serving small producers	2004
Government Premium Subsidies Program for Agricultural Insurance (PSR): Brazil	262,291	Insurance coverage for crops, livestock, forests, aquaculture	2006
Agroseguros crop insurance: Chile	8,307	Crop insurance for annual crops, cut flowers, fruits	2013
Agroseguros insurance for animal husbandry: Chile	8,306	Livestock insurance that covers the death of cows, sheep and bees, forest fire, disease, natural disasters, and theft	2012
Blue Marble/Nespresso: Colombia	3,275	Weather index insurance program for smallholder coffee farmers	2018
Mexico	86,085	Agricultural insurance	
Seguro Agricola: Paraguay	30,121	Area yield index insurance, covers weather-related risks/ drought, excessive rain, hail, flooding, etc.	2019
Microseguro Paramétrico Agrícola para Pequeños Productores en Paraguay: Paraguay	147	Sesame insurance	2019
Seguro Agrícola Catastrófico (Catastrophic Agricultural Insurance): Peru	463,193	Area yield index insurance, covers weather-related risks/ drought, excessive rain, hail, flooding etc.	2009/2010
Seguro Agrícola Comercial (Commercial Agricultural Insurance), La Positiva: Peru	12,565	Multi-peril indemnity insurance	2013/2014
TOTAL LATIN AMERICA & CARIBBEAN	**1,099,473**		

World Map of Agricultural Insurance Schemes



Mexico

86,085 policyholders

Colombia

16,613 policyholders

Brazil

ProAgro
31,713 policyholders
ProAgro Mais
262,291 policyholders
PSR
193,470 policyholders

Nigeria

NAIC
50,000 policyholders
Nirsal AYII
12,333 policyholders
Nirsal CII
9,676 policyholders
PULA
543,000 policyholders

Ghana

27,000 policy holders

Peru

Catastrophic agricultural insurance
463,193 policyholders
La positiva
12,565 policyholders

Rwanda KCB

217,000 policyholders

Zambia

Mayfair Insurance
947,247 policyholders
Madison General Insurance
75,030 policyholders
Zambia State Insurance
74,963 policyholders
Savenda General Insurance
250 policyholders

Paraguay

Seguro Agricola
3,121 policyholders
Parametric insurance sesame pilot
147 policyholders

Chile

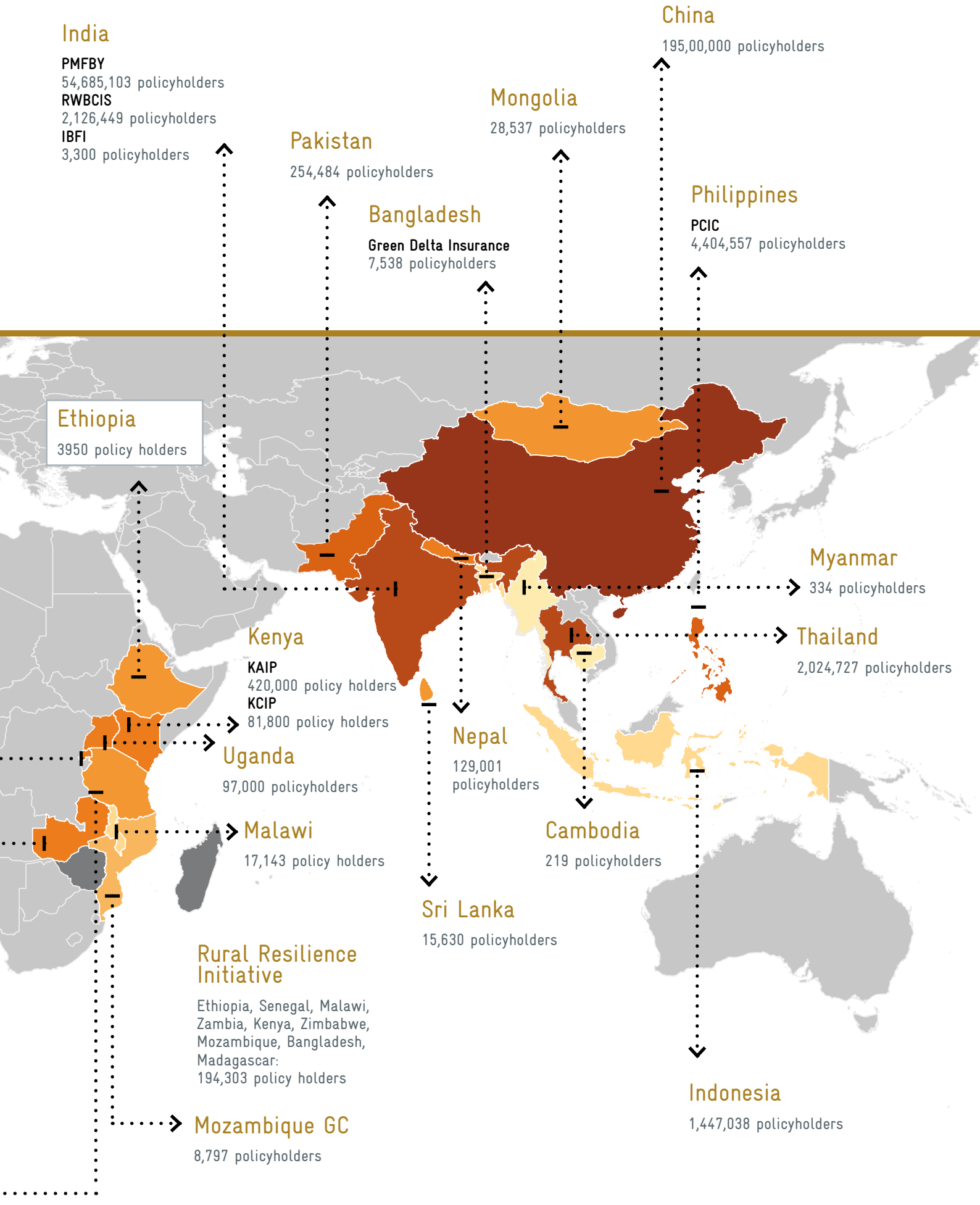
16,613 policyholders

Number of policy holders

- 0.0 - 0.0
- 0 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 - 50,000
- 50,001 - 250,000
- 250,001 - 1,000,000
- 1,000,001 - 50,000,000
- 50,000,000.001 - 160,000,000.0

One Acre Fund

Kenya, Rwanda, Burundi, Tanzania, Uganda, Malawi, Zambia: 1,047,700 policyholders


India
PMFBY
54,685,103 policyholders
RWBCIS
2,126,449 policyholders
IBFI
3,300 policyholders
Pakistan
254,484 policyholders
Bangladesh
Green Delta Insurance
7,538 policyholders
Mongolia
28,537 policyholders
China
195,00,000 policyholders
Philippines
PCIC
4,404,557 policyholders
Ethiopia
3950 policy holders
Myanmar
334 policyholders
Thailand
2,024,727 policyholders
Kenya
KAIP
420,000 policy holders
KCIP
81,800 policy holders
Uganda
97,000 policyholders
Nepal
129,001
policyholders
Malawi
17,143 policy holders
Cambodia
219 policyholders
Sri Lanka
15,630 policyholders
Rural Resilience Initiative
Ethiopia, Senegal, Malawi, Zambia, Kenya, Zimbabwe, Mozambique, Bangladesh, Madagascar:
194,303 policy holders
Mozambique GC
8,797 policyholders
Indonesia
1,447,038 policyholders

Endnotes

1
In this paper, "programmes" refer to both donor projects and private sector insurance schemes.

2
There were 15,333 policyholders on average when China and India are included.

3
For example, Hellmuth et al. (2009), Hazell et al. (2010), Greatrex et al. (2015), Jensen and Barrett (2016), Carter et al. (2017), Robles (2021), Swiss Re (2019), and ISF (2018).

4
The latest UN classification of countries is used in this report.

5
For readers looking for more introductory material on agricultural insurance, please see the various working papers available at the Platform for Agricultural Risk Management (PARM): *https://p4arm.org*

6
See Sandmark et al. (2013) and OECD (2016).

7
For example, some earlier studies of drought-prone areas in India and Burkina Faso found that the diversification strategies farmers use to manage their risk exposure reduce their expected income by 12 to 27 per cent (Gautam, Hazell and Alderman, 1994; Sakurai and Reardon, 1997; Rosenzweig and Binswanger, 1993). A well-designed insurance product might be a less costly alternative.

8
The gross premium collected by the insurer would be exactly equal to the coverage if the premium charged were equal to the pure risk cost of the insurance, but it is greater than the coverage when the premium includes administration and **risk loading** costs.

9
Another way to view the low coverage rate is by comparing the premium paid to the cost of modern agricultural inputs. For example, total insurance premiums collected in 2017 in Africa, Asia, and LAC were sufficient to cover, at most, 40 per cent of the total value of synthetic fertiliser used that year. This does not include insuring other costs like improved seeds, pesticides, hired labor, and credit charges. This is the authors' calculation based on FAO estimates of total fertiliser use in LMICs in 2017 and World Bank data on world fertiliser prices.

10
This is very close to an ISF estimate of 257 to 269 million for 2017 and 33 per cent higher than the GIZ (2016) estimate of 198 million in 2015. ISF (2018) estimated that there were between 44 and 56 million insured farmers in LMICs in 2017, excluding China. When China is included, the estimate becomes 257 to 269 million, which includes the GIZ 2020 estimate of 265 million.

11
Since most countries in the survey reported the total number of insurance policies issued, the total number of farms insured is also an estimate since some farms may have been counted twice. The number of agricultural insurance policies sold can significantly overstate the number of farms insured in some countries. Farm households with multiple plots or crops may purchase more than one insurance policy in a season under some insurance schemes and, in countries with more than one agricultural season, farmers may buy insurance in more than one season. In India, for example, there are two cropping seasons: the main monsoon or Kharif season and the winter or Rabi season. During the 2018–2019 agricultural year, 56.18 million policies were sold, 34.33 million of which were sold in the Kharif season and 22.48 million in the Rabi season. Many farmers purchase insurance in both seasons and have been double counted in the annual data in Figure 1.

12
By design, the GIZ 2016 survey only included index-based insurance programmes.

13
There were 15,333 policyholders on average when China and India are included.

14
see 'Insurance subsidies' on p. 15

15
For example, if premium subsidies reduce the cost of insurance below its actuarially fair cost, this may encourage farmers to take on too much risk, such as growing unsuitable crops in risky environments, or growing more of them, adding to the future costs of the insurance to government (Siamwallaand Valdes, 1986; Goodwin and Smith, 2013; Hazell and Varangis, 2020).

16
See: *https://www.internationalinsurance.org/about*

17
Index insurance has two advantages when ensuring a government agency like a DAP. One is that indices can be defined at aggregate regional levels because the agency is typically large enough to overcome any basis risk among its beneficiaries. This also simplifies the data needs of the insurance. The other advantage is that an index can be monitored remotely with satellite data by the reinsurer. This avoids potential moral hazard problems if other government agencies were responsible for collecting data for an index, and which could be influenced to manipulate the data to ensure insurance payments.

18
Some studies have shown that poorly designed disaster assistance can actually lead people to make investments that increase their risk exposure. For example, government policies to provide subsidised barley for feeding livestock during droughts successfully reduced livestock losses in the Middle East and North Africa, but also led to longer term increases in herd sizes that a) made herders more dependent on feed subsidies, and b) increased stocking rates on rangeland to unsustainable levels (Hazell, Oram and Chaherli, 2003).

19
Synthetic Aperture Radar: creates three-dimensional "reconstructions" of landscapes (down to centimetres/millimetres) that are superior to optical imagery since radar penetrates clouds or "sees" at night. This is very useful for monitoring crops in areas with frequent cloud covered and adverse weather events at any time of day.

20
Plume, K. (22 April 2015). ADM could use drones from 2016 to get crop insurance claims data. Reuters. Available at: *https://www.reuters.com/article/ctech-us-archer-daniels-insurance-drones-idCAKBN0ND2RR20150422*.

21
Behm, S. et al. (4 February 2019). Digital ecosystems for insurers: Opportunities through the Internet of Things. McKinsey & Company. Available at: *https://www.mckinsey.com/industries/financial-services/our-insights/digital-ecosystems-for-insurers-opportunities-through-the-internet-of-things*.

22
Initiative for Sustainable Agricultural Supply Chains (INA). (n.d.). Securing incomes through smart farming and traceability. Available at: *https://www.nachhaltige-agrarlieferketten.org/en/news-events/securing-incomes-through-smart-farming-and-traceability/*.

23
Aon. (1 July 2019). Press Release: Aon, Oxfam, and Etherisc launch first blockchain-based agricultural insurance policies for smallholder farmers in Sri Lanka. Aon Investor News. Available at: *https://ir.aon.com/about-aon/investor-relations/investor-news/news-release-details/2019/Aon-Oxfam-and-Etherisc-launch-first-blockchain-based-agricultural-insurance-policies-for-smallholder-farmers-in-Sri-Lanka/default.aspx*.

24
Climate Finance Lab. (n.d.). Blockchain Climate Risk Crop Insurance. Available at: *https://www.climatefinancelab.org/project/climate-risk-crop-insurance/*.

25
See the Feed the Future project, "Bundling Innovative Risk Management Technologies to Improve Nutritional Outcomes of Vulnerable Agricultural Households". Available at: *https://basis.ucdavis.edu/project/bundling-innovative-risk-management-technologies-improve-nutritional-outcomes-africa*.

26
Global Ag Risk Inc. "Peru". Available at: *http://globalagrisk.com/globalagrisk-projects/peru/*

27
McKinsey & Company. (July 2016). Blockchain in insurance: opportunity or threat? Available at: *https://www.mckinsey.com/~/media/McKinsey/Industries/Financial Services/Our Insights/Blockchain in insurance opportunity or threat/Blockchain-in-insurance-opportunity-or-threat.ashx*.

28
Society of Actuaries. (March 2021). Peer-to-Peer Insurance: Blockchain Implications. Available at: *https://www.soa.org/globalassets/assets/files/resources/research-report/2021/p2p-insurance-blockchain.pdf*.

29
For example, Teambrella. See: *https://www.the-digital-insurer.com/dia/teambrella-bitcoin-enabled-p2p-insurance/*

30
Miles, K. and Wiedmaier-Pfister, M. (November 2018). Applying a Gender Lens to Climate Risk Finance and Insurance. InsuResilience Global Partnership. Available at: *https://www.insuresilience.org/wp-content/uploads/2018/11/insuresilience_applygender_181128_web.pdf*.

31
Since the 2016 GIZ survey was limited to index-based insurance programmes, it was less representative than the 2020 survey.

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