



# sigma

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## Partnering for food security in emerging markets

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# Executive summary

Food security is a pressing issue, requiring a massive investment in agriculture.

People have always had to overcome impediments to secure food. Although technology has generally managed to increase food supply sufficiently, food security, especially in emerging markets, has not improved significantly despite the tremendous efforts taken by national governments and supranational organisations. Indeed, food security is set to become an even greater challenge given the rapidly increasing world population. It is estimated that global agricultural production will have to increase as much as 60% by 2050 if it is to meet people's growing need for food. Rising global food prices (+74% since 2005)<sup>1</sup> and the 2012 drought in the United States, deemed the worst since the 1950s<sup>2</sup>, have sounded the alarm that food supplies, especially to emerging markets, have become increasingly inadequate. To meet the growing food needs of an increasing population, a massive investment in agriculture – albeit in the midst of an economic crisis – is the first crucial step on the road to food security.

Food insecurity in the modern sense affects emerging markets the most.

The modern concept of global food security emerged in the 1970s during a widespread food crisis. Once defined narrowly as the adequate supply of basic foodstuffs, food security now goes beyond subsistence and takes nutritional content and individual food preferences into consideration. Food security is a pressing issue today for both advanced and emerging markets<sup>3</sup>, but especially for the latter, where one in eight individuals suffers from hunger and malnutrition<sup>4</sup>, in the Asia-Pacific and Sub-Saharan Africa regions in particular.

A multi-stakeholder response where insurers are one part of the puzzle is required to improve the agricultural sector and increase food security.

Achieving food security requires multi-stakeholder collaboration to improve productivity, farming investment, storage and transportation, as well as distribution and risk management in the agricultural sector. Close cooperation is needed between the agribusiness sector (upstream as well as downstream in the production process), governments, the insurance/reinsurance (re/insurance) industry, supranational organisations, NGOs and local communities. Part of ensuring sustainable agricultural production involves risk mitigation strategies, risk control and risk financing. Although an integral piece of the puzzle, insurance is not the only driving force.

Agricultural insurance can help to manage agricultural risks, stabilise farm income, invest in infrastructure and facilitate access to credit.

Agricultural insurance helps to manage risks in the agricultural food value chain, stabilise farming income and promote investment in agriculture. It is one of the means via which farmers in emerging markets can make the jump from subsistence farming to sustainable farming. In addition to insuring agricultural risks, insurance can also act as collateral for credit, making funding available to small-holder farmers. In many emerging markets where infrastructure is still underdeveloped, it can also be leveraged to encourage investment in storage and transportation, distribution and other logistics services.

Agricultural insurance in emerging markets has grown rapidly over the last decade...

Agricultural insurance is growing. Global agricultural insurance premiums were estimated at USD 23.5 billion in 2011, with emerging markets generating around USD 5 billion of the premiums. Between 2005 and 2011, agricultural insurance premiums from emerging markets registered strong annual growth of around 30% (versus 20% globally). This growth came mainly from China and India, which together accounted for some 62% of emerging market agricultural insurance premiums in 2011. Proactive government policies and higher crop values/commodity prices have been some of the strongest contributors to this fast-paced growth in emerging markets. New products, distribution channels, and technologies have also been key to the solutions devised for the risk landscape particular to emerging markets.

...but insurance penetration is still low, implying strong growth potential.

However, insurance penetration in emerging markets remains very low, and agricultural insurance is far from reaching its full growth potential, estimated at three to four times the current market size. Although insurance alone cannot provide food security, it can play a big part in aligning production incentives, raising awareness of the importance of risk mitigation and encouraging investment in agricultural efficiency.

<sup>1</sup> FAO Food Price Index, <http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/>.

<sup>2</sup> As of 24 July 2012, USDA's Economic Research Service showed that almost 40% of the US's agricultural land was suffering from severe or worse drought, making the 2012 drought more extensive than any since the 1950s. See: [https://nes.ncdc.noaa.gov/pls/prod/f?p=100:1::::P1\\_ARTICLE\\_SEARCH:356](https://nes.ncdc.noaa.gov/pls/prod/f?p=100:1::::P1_ARTICLE_SEARCH:356)

<sup>3</sup> The economies defined in this *sigma* as "advanced" or "emerging" are generally in keeping with the conventions of the International Monetary Fund (IMF). For further information on the *sigma* definition, see *sigma* 3/2012, "World insurance in 2011: non-life ready for take-off". Individual organisations quoted in this report may adopt slightly different groupings and definitions of emerging markets.

<sup>4</sup> Calculated based on the number of people suffering from hunger and malnourishment as published by the Food and Agricultural Organisation of the United Nations (FAO, 2012) at <http://www.fao.org/hunger/en/>.

# What is food security?

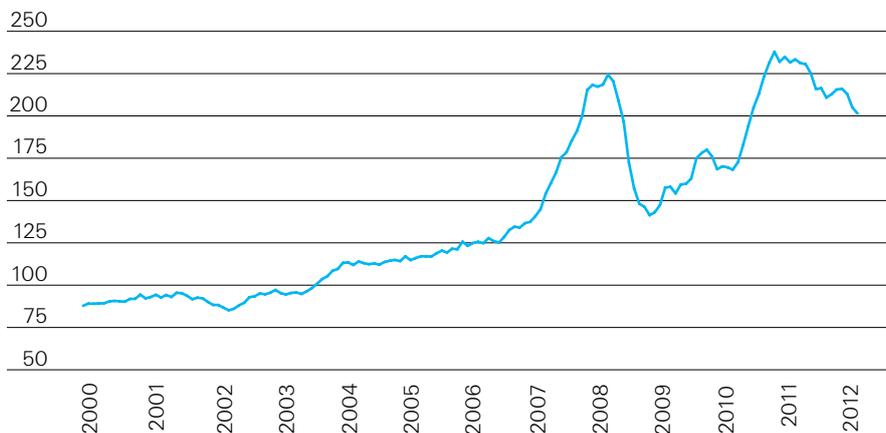
Food insecurity is on the rise...

Feeling hungry? Perhaps not now, but with the world's population estimated to reach 9.1 billion by 2050, massive efforts are needed to ensure there will be enough food to go around for everybody. In recent decades, population pressure, poor farming management, socio-economic instability and adverse weather events have already contributed to incidences of food insecurity. Unfortunately, this led to soaring food prices in 2007 and 2008 and to food riots in many emerging markets. After a brief respite, food prices went up again in 2010 partly as a result of droughts in grain-producing regions and higher oil prices. This served to push food security to centre stage, especially in emerging markets.

... partly driven by accelerated increases in global food prices.

Volatile food prices are one of the greatest causes for concern. Between 1990 and 2005, prices remained largely stable, moving only within a narrow +/-30% range of trend level (See Figure 1). In late 2005, however, price increases began to accelerate and price volatility heightened. Although the global financial crisis brought a temporary respite, by December 2011 food prices had increased by almost 50% from their post-crisis lows. Looking at food prices in real terms – ie stripping them of the effects of inflation – the price increase from 2005 to December 2011 nonetheless amounted to 33.3%, compared to an increase of only 2.3% between 1990 and 2005.

Figure 1  
**Food price index**  
(2002 to 2004=100)



Source: Nominal monthly food price index, the Food and Agriculture Organisation of the United Nations (FAO).

## Defining food security

The concept of food security has evolved over the years.

The concept of food security has changed over the years. After starting out simply as meaning the availability of an adequate global supply of basic foodstuffs, it was subsequently expanded to encompass safe and nutritious food that meets people's dietary needs and food preferences for an active and healthy life (see Box: How the concept of food security has evolved). Throughout its evolution, the core of the concept has always been about availability, accessibility, stability, and sustainability of foodstuffs.

## How the concept of food security has evolved

The concept of food security was first based on having an adequate and stable supply of basic foodstuffs.

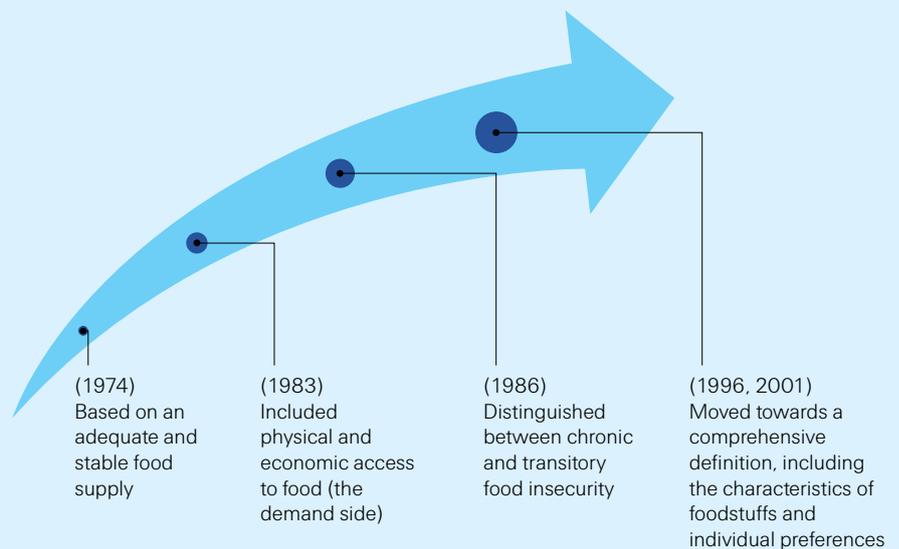
In 1974, in the midst of a global food crisis, the World Food Summit (WFS) first articulated the concept of food security. At the time, food security meant having an adequate and stable supply of food and was defined at the summit as the “availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices.”<sup>5</sup>

Later on, the definition was expanded to include securing the demand side of the equation, especially for vulnerable populations. In 1983, the Food and Agriculture Organisation (FAO) specified the importance of “ensuring that all people at all times have both physical and economic access to the basic food that they need.”

It was then revised to distinguish between chronic and transitory food insecurity,...

In 1986, wanting to distinguish between chronic food insecurity (associated with continuing or structural poverty and low income) and transitory food insecurity (involving periods of intense pressure caused by natural disasters, economic crises, or geo-political conflicts), the World Bank broadened the definition to include “access for all people at all times to enough food for an active, healthy life.”<sup>6</sup>

Figure 2  
**The evolving and expanding concept of food security**



Source: Swiss Re Economic Research & Consulting.

...and then to include both demand and supply side factors, nutrition, and individual food preferences.

The concept consequently became increasingly specific in order to ensure that the core aspects of food security were agreed upon internationally. The 1996 World Food Summit adopted a holistic and even more complete definition of food security as “when all people, at all times”...“at the individual, household, national, regional and global levels”... “have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.”<sup>7</sup> A slightly different version, published in a 2001 FAO publication, has been accepted globally as the current definition: “Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.”<sup>8</sup>

<sup>5</sup> “Trade Reforms and Food Security: Conceptualizing the linkages”, FAO (Rome, 2003), p.27.

<sup>6</sup> “Poverty and Hunger: Issues and Options for Food Security in Developing Countries”, World Bank (Washington DC, 1986), p.1.

<sup>7</sup> “Rome Declaration on World Food Security and The World Food Summit Plan of Action”, FAO, Report of the World Food Summit, Rome, 13–17 November 1996, <http://www.fao.org/docrep/003/w3613e/w3613e00.htm>.

<sup>8</sup> “The State of Food Insecurity in the World 2001”, FAO (Rome, 2002), p.49.

What is food security?

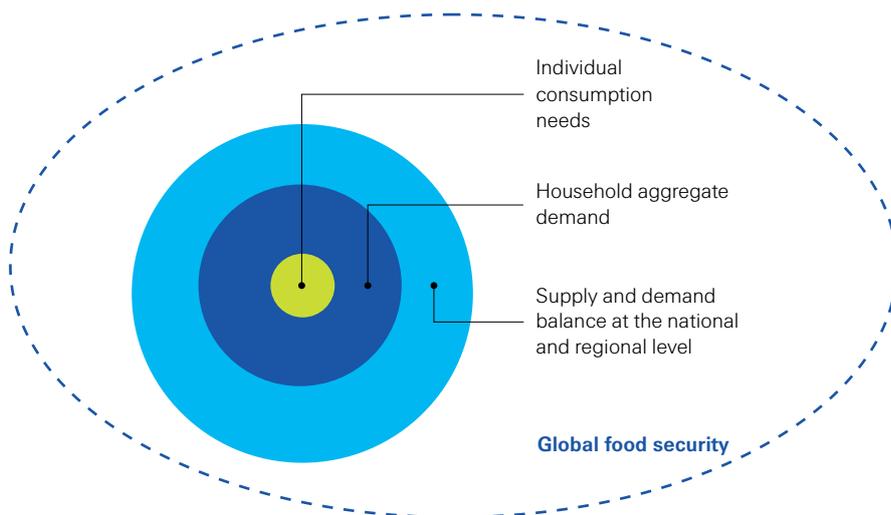
The contemporary concept of food security is largely based on the 1996 and 2001 FAO definitions.

An integral part of ensuring food security is the decisions made at the individual, household and national/regional levels.

Today's concept of food security reflects a growing recognition of the technical and cultural complexities involved in public and private action, taking into consideration, for example, the important role played by social networks in providing vulnerable populations with access to food.<sup>9</sup> Looking at the system as a whole, food security can be described as a phenomenon linking individuals to their household network, which in turn depends on the community and, finally, the country/regional and global network. Not being properly linked to the network at any particular level can seriously impact an individual's access to sufficient, safe and nutritious food.

National and regional policies on food production and distribution (eg food trade policies) affect a household's access to foodstuffs (see Figure 3). Such policies can affect where and how food is available as well as the balance between food supply and demand. Households make consumption decisions based on factors such as income level, job security, household demographic structure, and food preferences. At the individual level, the modern concept of food security means that people's food consumption is always greater than their individual, basic, physiological survival needs. Achieving global food security therefore requires taking the appropriate decisions and action at all levels and involves a massive coordination effort on the part of national and regional governments as well as international organisations. In pursuit of reaching this goal, in 2000, 189 nations developed the eight Millennium Development Goals (MDG), whose first objective (MDG1) was to "eradicate extreme poverty and hunger".<sup>10</sup>

Figure 3  
**Achieving global food security depends on three interconnected levels.**



Source: based on Chapter 1 in "Implications of Economic Policy for Food Security: A Training Manual", FAO (Rome, 1999), <http://www.fao.org/docrep/004/X3936E/X3936E03.htm>, Swiss Re Economic Research & Consulting

### Trends in food insecurity

Poverty is frequently used as a proxy for the extent of food insecurity.

While there is no readily available and comprehensive way of measuring food insecurity, poverty, and food insecurity are usually viewed as being closely interrelated, making poverty a pragmatic measure of the extent of food insecurity. To facilitate international comparison, poverty indicators are generally defined as the proportion of a population whose income falls below a particular threshold (the present internationally accepted poverty line is USD 1.25 per person per day<sup>11</sup>). Based on this measurement, over 20% of the population in emerging markets lives below the poverty line and thus faces food insecurity (see Table 1). The most affected regions are Sub-Saharan Africa and South Asia.

<sup>9</sup> For example, whether those suffering from hunger can easily ask their neighbours for food or whether they are well integrated into a social network and thus in a position to receive social aid over the long term.

<sup>10</sup> <http://www.undp.org/content/undp/en/home/mdgoverview.html>

<sup>11</sup> Based on constant 2005 purchasing power.

Table 1  
**Poverty headcount by region and selected country (2008)**

Region	Population (in millions)	Millions of people living on less than USD 1.25 a day	Poverty headcount ratio (%)
<b>East Asia and Pacific</b>	<b>1 983</b>	<b>284</b>	<b>14.3</b>
Indonesia	235	53	22.6
China, rural	754	168	22.3
<b>Europe and Central Asia</b>	<b>474</b>	<b>2</b>	<b>0.5</b>
Georgia	4	0.6	15.3
Tajikistan	7	0.8	10.7
<b>Latin America and the Caribbean</b>	<b>570</b>	<b>37</b>	<b>6.5</b>
Haiti	10	6	63.4
Colombia	45	5	11.3
<b>Middle East and North Africa</b>	<b>320</b>	<b>9</b>	<b>2.7</b>
Yemen	23	4	17.1
Egypt	78	1	1.7
<b>South Asia</b>	<b>1 587</b>	<b>571</b>	<b>36.0</b>
Bangladesh	145	68	46.6
India, rural	839	333	39.7
<b>Sub-Saharan Africa</b>	<b>813</b>	<b>386</b>	<b>47.5</b>
Congo	62	54	86.2
Nigeria	151	100	66.5
<b>Total</b>	<b>5 746</b>	<b>1 289</b>	<b>22.4</b>

Source: Replicate of the World Bank's Regional Aggregation, The World Bank Group PovcalNet research database, 18 May 2012 <http://iresearch.worldbank.org/PovcalNet/povDuplic.html>.

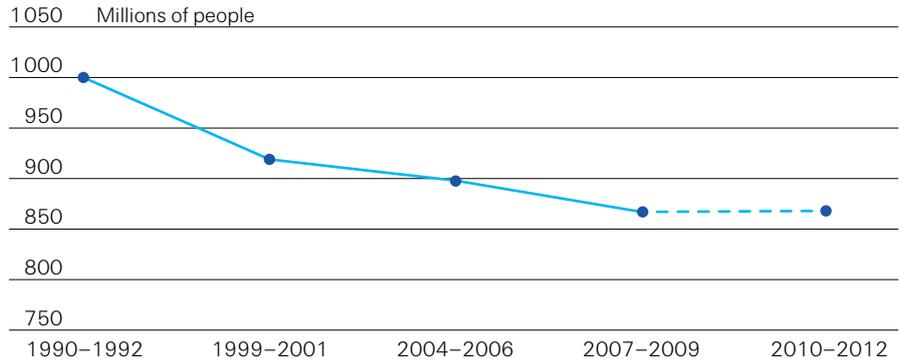
An alternative measure of food insecurity is the number of people suffering from hunger or malnutrition.

An alternative gauge of food insecurity is the number of people suffering from hunger or malnutrition. While undernourishment or malnutrition is not directly a measure of food insecurity, it is nonetheless an important manifestation of it. For instance, the 1996 World Food Summit (WFS) spearheaded food security policy direction by making its primary objective bringing about a 50% reduction in the number of people suffering from hunger or undernourishment by 2015.

A sustained decline in the number of people suffering from hunger was interrupted from 2007–2009.

The number of people suffering from hunger, as the measure is commonly called, has been an important benchmark in driving global efforts to reduce food insecurity. According to FAO figures, the number of people suffering from hunger dropped by more than 100 million between the 1990–1992 and 2004–2006 periods. However, the number has not changed tangibly since then. This is mainly attributable to soaring food prices in 2007 and early 2008 and to the subsequent global financial and economic crisis. The partial neglect of the importance of agriculture on the part of governments and international agencies has also been considered a significant contributing factor. The latest estimates show that there is still a high number of people suffering from hunger across the globe: 868 million in the 2010–2012 period.

Figure 4  
**Number of people suffering from hunger, 1990–1992 until 2010–2012**



Note: The figure for 2010–2012 is a provisional FAO estimate.

Source: "The State of Food Insecurity in the World 2012", Food and Agriculture Organisation (FAO), (Rome, 2012), p.9.

Food insecurity is high in emerging markets, with one in eight people suffering from hunger.

Out of these 868 million people suffering from hunger worldwide, 98% are located in emerging market regions (see Figure 5). The Asia-Pacific region has the greatest number (61% of people suffering from hunger worldwide in 2010 to 2012), followed by Sub-Saharan Africa (27%), Latin America and the Caribbean (5%), and the Middle East and North Africa (5%). Based on current population estimates, one in eight people in emerging markets suffers from food insecurity. Food insecurity can also be observed in advanced markets, albeit on a much smaller scale (see Box: Food insecurity – also in advanced markets?).

Figure 5  
**Regional distribution of those suffering from hunger in 2010–2012 (millions of people; world share of people suffering from hunger)**



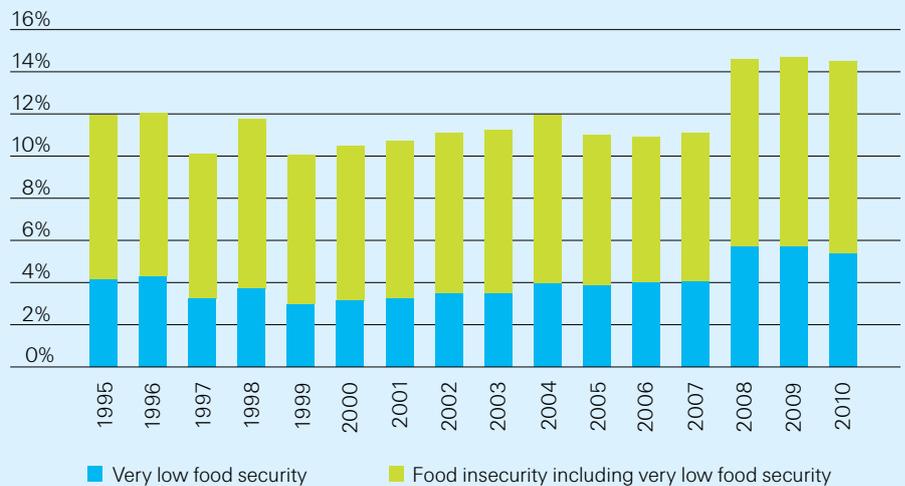
Source: "The State of Food Insecurity in the World 2012", Food and Agriculture Organisation (FAO), (Rome, 2012), p.10.

Almost 15% of US households suffered from food insecurity at least some time during 2010.

### Food insecurity – also in advanced markets?

Food security is a problem not only in emerging markets, but also one that is evident in advanced markets such as the US. For example, the Economic Research Service (ERS) of the United States Department of Agriculture reports that although 85.5% of US households were considered “food secure” in 2010, some 14.5% suffered from food insecurity for at least some time during the year (14.7% in 2009).<sup>12</sup> This included 5.4% of households (5.7% in 2009) that had very low food security (see Figure 6).<sup>13</sup> ERS research shows that food insecurity remained stable from 1995 until the onset of the global financial crisis, when the number of households suffering from food insecurity suddenly jumped. Although the impact of the global financial crisis on food security in advanced markets was relatively mild when compared with emerging markets, food insecurity can also affect the well-being of vulnerable people in advanced markets during difficult times.

Figure 6  
Food insecurity in US households, %



Note: The prevalence rates of “food insecurity” and “very low food security” for 1996 and 1997 are adjusted for the estimated differences in data collection processes used in those years.

Source: Coleman-Jensen, Alisha, Mark Nord, Margaret Andrews, and Steven Carlson. “Household Food Security in the United States in 2010”. ERR-125, U.S. Department of Agriculture, Economic Research Service (ERS), September 2011, p. 10.

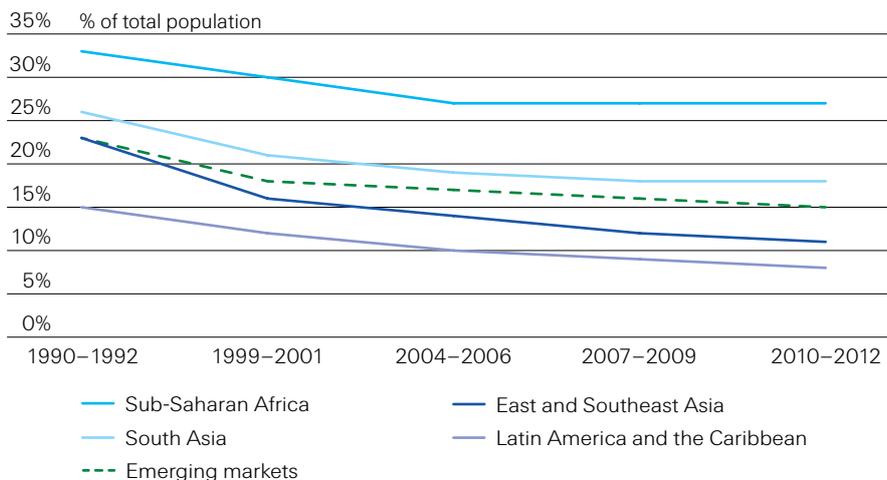
Poverty alleviation in Asia over the past few decades has improved food security.

Historical patterns in food insecurity in emerging markets show there has been a significant improvement in East and Southeast Asia, where the share of people suffering from hunger dropped from 43% in the late 1960s to 10% in the early 2000s. This improvement in food security most likely reflects China’s rapid industrialisation and economic growth over that period of time. Sustained improvement was also observed in South Asia, and Latin America and the Caribbean – with the latter consistently showing the lowest incidence of hunger among emerging regions. Although Sub-Saharan Africa saw progress too, close to 30% of its population still suffers from hunger or malnutrition.

<sup>12</sup> <http://www.ers.usda.gov/Briefing/FoodSecurity/readings.htm#statistical> (2010)

<sup>13</sup> The ERS has its own definition and calculation methodology for food insecurity. As such, the share of food insecure households is not directly comparable to other sources.

Figure 7  
**Share of those suffering from hunger in emerging markets**



Source: "The State of Food Insecurity in the World 2012", Food and Agriculture Organisation (FAO), (Rome, 2012), p.46-49.

### The role of livestock in food security for poor populations

Livestock is important for food security. It is not only an important source of food in emerging countries ...

Most discussions around food security focus on the availability and accessibility of grains and crops. However, the role of livestock in ensuring food security for poor populations is on the increase. Livestock is an important source of food for people in emerging countries, not only in alleviating seasonal food variability, but also in contributing to people's nutritional needs and food preferences. Meat preserved by drying, salting, curing and smoking can be used when other food sources are scarce. In fact, studies have found that in emerging markets, livestock not only forms an integral part of mixed farming systems to help raise whole-farm productivity, but also generally contributes significantly to the income stream of poor households.

... but also contributes significantly to the income stream of poor households.

For example, in the event of crop failure or for family celebrations such as marriage, farmers often raise livestock to slaughter or sell for cash as needed. In about 40% of districts in Kenya, livestock represents over a quarter of total household income.<sup>14</sup> While for people in isolated mountain communities in Nepal, livestock can easily constitute nearly half of total farm cash income, which includes revenue from agricultural production, rent from agricultural land, crops, and livestock.<sup>15</sup> Data from the FAO Rural Income Generating Activities (RIGA) database,<sup>16</sup> which lists information from national household surveys from 14 countries, indicates that the average rural household derives around 10% of its income from livestock (see Figure 8).

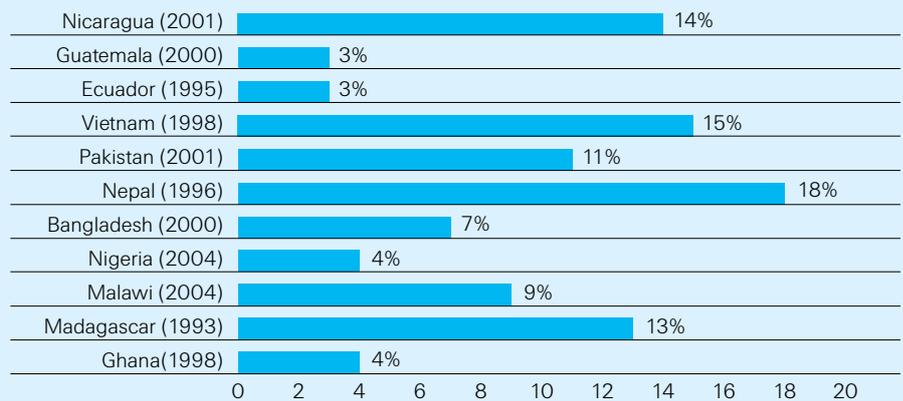
<sup>14</sup> Thornton, P.K., Kruska, R.L., Henninger, N., Kristjanson, P.M., Reid, R.S., Atieno, F., Odera, A., Ndegwa, T., "Mapping Poverty and Livestock in the Developing World", International Livestock Research Institute, (Nairobi, Kenya, 2002), p.77.

<sup>15</sup> Irini Maltsooglou and Kiyoshi Taniguchi, "Poverty, Livestock and Household Typologies in Nepal", ESA Working Paper No. 04-15, FAO (Rome, 2004), p.25.

<sup>16</sup> "The State of Food and Agriculture 2009: Livestock in balance", FAO, (Rome, 2009), p.33.

Figure 8

**Share of income from livestock for selected countries**



Note: The years in parentheses stand for the year when the nationally representative household surveys were conducted. The original data in the FAO report comes from the Rural Income Generating Activities database (available at [www.fao.org/es/ESA/riga/english/index\\_en.htm](http://www.fao.org/es/ESA/riga/english/index_en.htm)). The number of households included all rural households in the samples, whether they had livestock or not. Hence, the ratio underestimates the impact of livestock for the feeders (the farmers who feed the livestock).

Sources: "The State of Food and Agriculture 2009: Livestock in balance", FAO, (Rome, 2009), p.34; Swiss Re Economic Research & Consulting.

**What drives food insecurity?**

Many factors can create food insecurity. Looking more closely at demand- and supply-side drivers provides further insights.

The sharp rise in global food prices since 2007 has resulted in a significant increase in the number of people suffering from hunger. Economic crises, population growth, crop failure and the increasing production of biofuel can all contribute to food insecurity. The recent global financial crisis has increased unemployment in many countries, aggravating food insecurity. Food insecurity is also closely linked with energy and water supply. On the demand side, the world urgently needs to ensure sufficient production of foodstuffs to meet the growing demand for food.

Population growth is a key driver of food insecurity in emerging markets.

**Some important demand-side drivers of food consumption:**

- **Population growth:** Since 1970, population growth in emerging markets has averaged 1.7% per annum, tangibly higher than the corresponding 0.7% growth in advanced markets. The total population in emerging markets has doubled from around 3 billion in 1970 to close to 6 billion in 2011, thereby putting significant pressure on governments to ensure adequate food supply. Luckily, sustained high economic growth averaging 4.5% in emerging markets has helped lower food insecurity. However, the current number of people suffering from hunger still remains large. The UN projects that the world's population will reach 9.1 billion by 2050, a one-third increase over today, with most of this increase taking place in currently emerging markets. A significant hike in farming output and productivity will be required to meet their dietary requirements.
- **Changing food preferences:** There is a strong positive relationship between household income and food consumption and preferences, especially for animal protein from meat, milk and eggs. A combination of population growth, rising incomes and urbanisation in emerging markets has been the driving force behind the enormous surge in the world's livestock sector, which is growing at a rapid rate. The rising demand for meat is accompanied by the demand for grain and protein feeds used to produce the meat.

As income levels increase, so too does demand for food with high protein content, putting pressure on the world's food supply.

## What is food security?

Government policies can increase the demand for food.

- **Government policies:** Many emerging market governments now provide food subsidies or impose price controls on basic foodstuffs in an effort to reduce food insecurity and keep food affordable. These types of government policies push up the demand for food by making it more affordable to a larger share of the population. This is particularly common in times of economic down cycles, where income growth stalls and unemployment rises. Trade policies can have the same effect. During times of food shortages, many emerging markets reduce their import tariffs or increase their import quotas in order to mitigate the impact of rising food prices. For example:
  - Since 2006, India has reduced various import tariffs, including those of two of its biggest food import categories: pulses and edible oils.
  - In 2007, Vietnam cut tariffs on a range of food products, including milk powder and wheat.
  - In 2008, Indonesia temporarily removed tariffs on soybeans and wheat flour.

Global food production will need to increase 60% by 2050 in order to meet rising food demand.

As already mentioned, in order to feed the world's larger, richer and more urban population, food production (excluding crops used for biofuel) needs to increase 60% by 2050.<sup>17</sup> Much of the required agricultural production growth will need to be achieved despite dwindling natural resources and climate change. To reach these highly ambitious goals, proper policy intervention and appropriate social action are needed to improve agricultural production and regulate agricultural yields.

The world has so far managed to match food production with population growth, but supplies are becoming constrained.

A series of research, development and technology transfer initiatives that took place between the 1940s and the late 1970s (known as the "Green Revolution") managed to increase global food production fast enough to match population growth. However, there are numerous signs that pushing up production further will become increasingly challenging.

Natural resources are under increasing strain.

### **Some key supply-side factors that affect food production and consumption:**

- **Natural resource constraints:** Competition for limited water resources between agriculture and high valued domestic and industrial water users is rapidly increasing and will likely require the transfer of water out of agriculture.

Waste is significant.

- **Loss and waste of food:** A significant portion of agricultural output goes to waste due to factors such as poor infrastructure, insufficient or sub-standard storage facilities or market distortions (eg over-production of certain crops due to subsidies). Some estimates suggest that close to one-third of the world's food production is lost or wasted each year.<sup>18</sup> While such large-scale losses are bound to have a major impact on the global food supply, they represent a significant opportunity to increase the global effective supply as most losses are avoidable and waste can be eliminated. To reduce food loss in emerging markets, governments need to spend more on infrastructure and transportation, while better communication is needed between all parties in the supply chain. Also, consumer behaviour in the advanced markets needs to change in order to reduce food wastage.

<sup>17</sup> See "Data portal aims to help unlock food production bottlenecks: FAO and IIASA launch online Global Agro-ecological Zones Interactive Data Portal", 25 May 2012, Rome, <http://www.fao.org/news/story/en/item/143817/icode/>

<sup>18</sup> "Global food losses and food waste", FAO, 2011.

Urbanisation is taking a toll on agricultural land and the available labour force.

■ **Urbanisation:** Urbanisation is progressing rapidly in emerging markets. However, the expansion of urban areas tends to be at the expense of farm land because many cities and towns are located in former agricultural green belts. For example, the total area of arable land in China and India fell by 11% and 3%, respectively, between 1990 and 2009.<sup>19</sup> At the same time, urbanisation reduces the labour force available for food production. In 2011, around 47% of people in emerging markets lived in urban areas. Urbanisation has been rapid. For instance, in 1990 only 26.4% of Chinese lived in urban cities, but following two decades of robust economic growth, the percentage jumped to over 50% by 2011.<sup>20</sup> It is estimated that at some time between 2020 and 2025, the absolute number of people living in rural areas will peak and then start to decline. In emerging markets, more people will live in cities than in rural areas, with the result that a greater number of people will be consuming more than they produce. In Latin America and the Caribbean, and in East and Southeast Asia, the rural population is already on the decline while growth elsewhere is slowing.

Natural disasters can be costly in terms of output losses.

■ **Natural disasters:** In 2011, 325 catastrophic events cost society over USD 370 billion. Of these events, 175 were natural catastrophes.<sup>21</sup> Farm production will continue to be affected by natural disasters, with the recent severe drought in the US serving as yet another example of reduced food output resulting from extreme weather. The global repercussions will be huge, given that the US is one of the world's major food exporting countries.

The conversion of arable land for foodstuffs into land for biofuel crops is contributing to food insecurity.

■ **Demand for biofuel:** With the recent rise in world oil prices, and with European Union and US subsidies and mandates for biofuel production, farmers have shifted their cultivation to biofuel crops. The production of food crops will fall as a result of the decrease in arable land available for the growth of foodstuffs. For example, biofuel, mostly from corn, constitutes a prominent factor in recent US government renewable energy targets. Because the US is by far the largest global producer of corn, with around 40% of total output in 2011, this shift in crop output is having a major impact on global food and feedstock production.

Trade policies need to be aligned ...

■ **Trade policies:** Cases abound of governments shutting down food and grain exports because of insufficient domestic supply or expectations thereof. This places a disproportionate burden on consumers in other emerging markets and pushes up international food prices. A recent example was Russia's ban on grain exports, after Russian wheat production fell by more than 30% following a severe drought and wildfires in summer 2010. The Russian government's ban on grain exports lasted until July 2011, when the weather stabilised and production returned to normal levels.

... to encourage production and fair distribution.

Many emerging countries will continue to depend on international trade for their food security. It is projected that by 2050, emerging markets' net imports of cereals will more than double to 300 million metric tonnes, thereby underlining the need to move towards a fair and competitive global trading system. Emerging market farmers also need support and greater market access to enable them to compete on a more equal footing.

Government action plays a big role in food supply in emerging markets.

■ **Other government action:** The importance of food security is often evidenced in the intensity of a government's intervention in food production and distribution. Countries respond to food security concerns in a variety of ways, ranging from the regulation of food trade, subsidising farm production and imposing tariffs on food imports to protect local farmers, or lowering retail prices to mitigate the impact of high and volatile prices on their populations. All these types of action can restrict food supply if not administered properly. Some governments have formally incorporated food security in their policy agendas (See Box: Ensuring food security in India).

<sup>19</sup> Source: Land Use Database, Statistics Division, FAO. According to the FAO, agricultural land is suitable for both crops and livestock, and consists of arable land, orchards, vineyards, meadows and pastures.

<sup>20</sup> China Statistical Yearbook, 2012.

<sup>21</sup> See Swiss Re *sigma* 2/2012, "Natural catastrophes and man-made disasters in 2011: historic losses surface from record earthquakes and floods".

### Ensuring food security in India

There has been only slow progress in improving food security in India over the past decades, ...

According to the Global Hunger Index<sup>22</sup>, India ranked 67th among the 81 countries most vulnerable to food insecurity in 2011. Approximately 250 million people suffer from hunger in India today. What is even worse is the fact that India has undergone the least improvement of all the countries in the Global Hunger Index in recent decades. From 2001 to 2011, 73 countries met with more success than India in reducing their hunger levels, indicating India's relative lack of social development and the extent of its food insecurity.

... prompting the central government to pass a bill to proactively combat food insecurity.

In late 2011, to address food insecurity, the Indian government proposed the National Food Security Bill (NFSB), which aims to increase food security by providing subsidised food grains to around two-thirds of the population – significantly more than today – via a targeted public distribution system. The bill provides food and nutritional security by ensuring the populations' access to an adequate quantity of quality food at affordable prices. Up to 75% of India's rural population and 50% of its urban population will benefit from the bill. In addition to providing nutritional support to women and children, it ensures meals for special groups such as the destitute and homeless, those affected by emergencies and disasters and those who are starving.

The bill also examines how to increase investment in agriculture and expand the reach of financial services.

The bill also looks into other vital aspects of increasing the sustainability of food security in the agricultural sector, such as increasing investment in the sector (including R&D) and expanding the reach of financial services (credit and insurance). It also aims to provide incentives for decentralised procurement, develop modern storage and transportation and leverage technology such as the introduction of a unique identification system to improve distribution.

This marks a change in government policies towards food security – from welfare to rights-based.

The bill is likely to have a major economic and fiscal impact. Once the programme has been rolled out in full, it is estimated that subsidising foods will cost India in the range of 0.3% to 0.6% of its gross domestic product. In order to meet the NFSB's assured food requirements, the government will also need to increase direct procurement and invest heavily in production and productivity enhancement. Increasing the government's procurement efforts may have a negative impact on the open market as it will push food prices up not only for the remainder of the Indian population but also in the global market. In 2008, for instance, the mere announcement of the NFSB significantly pushed up the global price of rice on expectations that India's contribution to world rice trade would fall significantly.<sup>23</sup> Nevertheless, the bill is an important milestone for the Indian government in addressing food security in India. It is currently under review and is expected to be passed and implemented by 2014.

<sup>22</sup> 2011 Global Hunger Index, International Food Policy Research Institute, Oct 2011.

<sup>23</sup> GameChanger: Food Security Bill, Kotak Institutional Equities, Dec 2011.

Improving agriculture output and productivity is one of the key factors in managing food security, especially for agricultural-dependent emerging economies.

### Food security depends heavily on improving the agricultural sector

Much of the battle for food security involves improving the agricultural sector. In fact, many of the drivers of food security depend on developing agricultural sector productivity. With at least 70% of the world's extreme poor living in rural areas,<sup>24</sup> raising agricultural production is expected to improve their income and their access to sufficient food. As Table 2 shows, many emerging markets suffering from a high incidence of food insecurity also rely heavily on agriculture as their main source of income. Improving agricultural output and productivity can go a long way to helping to reduce the number of people suffering from hunger, thereby making a sustainable agricultural system vital for global food security in today's world.

Table 2  
**The importance of the agricultural sector in emerging markets, by prevalence of undernourishment**

Year	Number of countries	Prevalence of undernourishment for the country group* (% of population)	Agricultural value-added (as a % of GDP)**	Rural population*** (as a % of total population)
1992	114	<b>Low</b> (5% to 19%)	13.0	42.1
	32	<b>Medium</b> (20% to 34%)	29.9	63.2
	25	<b>High</b> (over 35%)	33.4	69.1
1997	117	<b>Low</b>	12.1	40.8
	30	<b>Medium</b>	27.2	62.0
	24	<b>High</b>	33.8	68.4
2001	123	<b>Low</b>	11.1	40.6
	29	<b>Medium</b>	24.5	62.2
	19	<b>High</b>	32.3	67.0
2008	129	<b>Low</b>	8.7	39.5
	30	<b>Medium</b>	21.2	60.1
	12	<b>High</b>	31.1	65.2

Note:

- \* The indicator shows the percentage of the population whose food intake is insufficient to meet dietary energy requirements continuously. 169 countries from the World Bank's country listing by prevalence of undernourishment are classified into three groups by degree of prevalence: low (5% to 19%), medium (20% to 34%) and high (>35%).
- \*\* Agriculture corresponds to ISIC divisions 1–5 and includes cultivation of crops, livestock, forestry, hunting and fishing.
- \*\*\* Rural population refers to people living in rural areas as defined by national statistical offices.

Source: Open data at the World Bank website (<http://data.worldbank.org/>), Swiss Re Economic Research & Consulting.

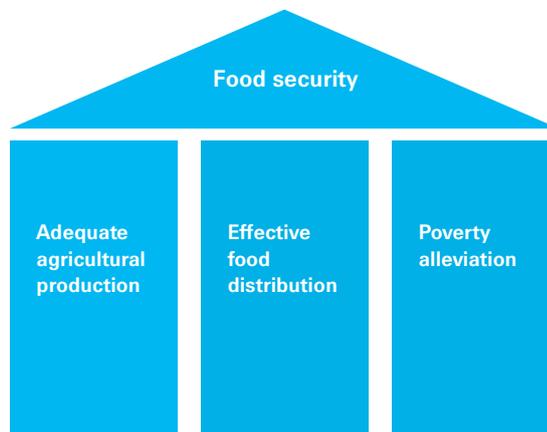
<sup>24</sup> "Rural Poverty Report 2011", International Fund for Agricultural Development (IFAD, Rome, 2011), p.9.

# Food security and agricultural insurance

Food security depends on agricultural production, effective food distribution, and poverty alleviation.

While it is acknowledged that food security is a multifaceted issue, three key underlying pillars nonetheless stand out as having a crucial impact on the strength of global food security: adequate agricultural production, effective food distribution and poverty alleviation.

Figure 9  
**The three pillars of food security**



Source: Swiss Re Economic Research & Consulting

Ensuring adequate agricultural production is arguably the most important pillar of food security.

Adequate agricultural production is arguably the most weight-bearing pillar in determining the strength of global food security. Strengthening food security requires balancing food demand and supply at affordable prices. However, the supply side in particular will remain vulnerable due to challenges such as climate change, weather events, natural disasters, water scarcity, the degradation of natural resources and insufficient infrastructure. At the same time, the world's population, which is expected to grow another 34% by 2050, will require a sustained increase in future agricultural output. For the emerging markets and their agricultural sectors characterised by small farm holdings, limited use of technology, and insufficient agricultural investment, sustaining high supply growth will require major investment, improvements in productivity and innovation on the part of all stakeholders.

More effective food distribution would also support global food security.

Effective food distribution is another important pillar of food security. Since approximately one third of the food produced globally for human consumption is lost or wasted each year<sup>25</sup>, there is ample room to raise the food supply. Improved government policies, better transportation networks and warehouse availability are needed to enhance food distribution and allocation in emerging markets. In fact, a key reason behind the high amount of food wastage in emerging markets is poor infrastructure, including insufficient refrigeration facilities and a lack of processing and packaging plants. Going forward, a more effective supply chain system will be required to ensure everyone has physical access to foodstuffs.

Strengthening food security requires a third pillar, poverty alleviation.

The alleviation of poverty is also critical for strengthening food security because increased earnings will allow lower-income households to afford their basic food needs. Around 40% of the population, or close to one billion people, in South Asia and sub-Saharan Africa live in extreme poverty (see Table 1) and lack the financial means to ensure that they have adequate access to food. Moreover, the livelihood of many small-holder farmers is vulnerable to agricultural uncertainties since many of them depend fully on agricultural production not only for income, but also to meet their basic food needs.

<sup>25</sup> "Global food losses and food waste", Food and Agriculture Organization of the United Nations, (Rome, 2011), p. 4.

Insurance is fundamental to agricultural risk management, supports food distribution and helps reduce poverty vulnerability.

Ensuring adequate agricultural production requires a solid understanding of the agricultural risk landscape and how insurance can help manage risks across the entire agricultural food value chain. Insurance can help fuel investment in the agricultural sector and provide incentives for farmers and corporations to increase food production. Insurance can also strengthen the second pillar, making food distribution more effective by acting as an enabler for the further development of transportation networks, distribution channels, warehouses and other logistics. This enabling function is essential for many emerging markets where infrastructure remains underdeveloped. Finally and equally important, insurers can provide life and health protection to low-income farmers and households via microinsurance, thereby reducing their vulnerability to poverty due to accident, sickness or death.

Insurance helps lessen food insecurity.

Insurance is not the only driving force in solving the global food insecurity issue, but is an important measure in meeting food security objectives. The global insurance industry can be an enabling partner in providing risk protection and improving the agricultural sector's output and productivity, thereby helping to reduce global food insecurity.

### Understanding the food value chain risk landscape

A first step is to better understand the food value chain risk landscape.

Just as the economic, social and demographic demand side of food security has its risks, so too does the production and nutritional supply side. Risk management is an integral part of increasing agricultural output. Strategies need to be developed at the global, national, institutional and household/individual levels in order to address growing needs and expand production to meet them. It is thus imperative to have a better understanding of agricultural risks and of the different risks involved in the food value chain so as to be able to develop appropriate risk management strategies.

Food security depends on more than agricultural production. Farmers need inputs such as seeds, fertilisers, and equipment, which, in turn, require a distribution system to support the flow of goods and services. The food processing industry is another essential component of the food value chain. Finally, food must reach consumers through the retail network. The key risks in the food value chain are summarised in Figure 10 and explained in more detail below.

Figure 10  
Key risks in the food value chain



\* Consists of weather risk that affect farmers and natural catastrophe risks that affect the region/country  
Level of risk: High (✓✓✓), Medium (✓✓), Low (✓)

Source: Swiss Re Economic Research & Consulting

There are many risks involved in farming.

Farming can be a risky business. The production cycle is usually long – up to one year or even longer – and poses a major challenge to producers, who attempt to adjust production levels quickly to meet changing market dynamics. Farming as an outdoor business is susceptible to climate change and natural catastrophe events, which pose a significant risk to food producers by skewing crop yield and food prices. The agricultural sector is vulnerable to volatile production costs, for example, when high energy prices drive up the cost of fertilising or harvesting, which often cannot be passed on fully to consumers. Information asymmetry in the emerging markets can lead to price distortions that depress the income of small-scale farmers. Inadequate infrastructure and under-developed supply chains (storage, distribution and financial services) are further challenges in food production

Production risk refers to a shortfall in output or sub-standard quality, due to various operational, weather and social factors.

- *Production risk* is one of the key risks that farmers face, and its impacts can range from revenue loss for the individual farmer to chronic food shortages at the national level. Consumers and food processing companies are also increasingly demanding food with a high nutritional content, which raises the risk that farm produce may not match the quality required. Predicting output and quality with certainty is challenging, especially considering such factors as:
  - adverse weather and natural disasters, including floods, windstorms, hailstorms and droughts;
  - the availability of natural resources, including water and arable land;
  - pests and crop diseases that can destroy produce or affect crop quality at the farm level. Outbreaks of livestock epidemics such as foot-and-mouth disease can also lead to losses;
  - social risks such as war, terrorism, riots or social instability.

In short, risks related to volatility in yield and shortfall in production stem from multiple factors, some of which can be controlled at the farm or regional level, while the impact of others (such as natural catastrophes) can only be mitigated through effective financial risk management at the national level.

There are numerous operating risks relating to liability, currency, and business interruption.

- *Operational risk* comes in many forms, including unavailability of labour during the harvest season, input shortages, critical equipment failure, theft, fire, or accidents. Risks relating to liability (such as food recall risk) and business interruption can affect food processing companies and exporters. Liability risk stems from deficiencies in the quality control of agricultural produce or infected food grains/livestock that lead to health concerns and sometimes litigation. Contaminants can also be added during food processing. Rising consumerism has also contributed to increased regulations on food safety. At the same time, the growing use of genetically modified seeds and complex fertilisers has given rise to uncertainties regarding the longer-term health impact of these agents. Meanwhile, food processing companies and distributors face the risk of revenue loss when supplies are received late or in inadequate amounts.

Market or price risk is related to uncertain input and output prices.

- *Market/price risk* arises from price volatility, in terms of both input and output prices, and is triggered by demand and supply conditions in the local or global marketplace. International prices for maize, for example, dropped 26% in 2009 only to rise sharply by 12% and 57%, respectively, in 2010 and 2011.<sup>26</sup> Similarly volatile price patterns have been observed in other basic foodstuffs. The extent to which local prices (and demand/supply factors) move in concert with those of the global marketplace is influenced mainly by the degree to which the markets are open to trade. External shocks have a more significant short-term impact on open economies.

<sup>26</sup> Source: IMF World Economic Outlook Database April 2012.

Price volatility affects farmers/producers and other input providers through operating costs and revenues. The main challenge has less to do with expected profits and more to do with heightened uncertainty with regard to farming income. This uncertainty arises because farmers are locked in a year-long production cycle during which they may face rising input costs for which, at the time of harvest, market prices may not be adequate to compensate. This can discourage investment in farm production and deter banks from extending credit to farmers. In comparison to commercial farmers in advanced economies, small-scale farmers in emerging markets are particularly vulnerable since they are less able to deal with price volatility through cooperatives and hedging. The interplay of price volatility and yield variability affects farming revenue and profit margins.

Financial risk is related to uncertainty about the availability and cost of farm credit.

- *Financial risk* includes risks related to the access and/or availability of financing, interest rate risk and currency/foreign exchange risk. Agricultural production usually incurs a funding gap due to its long production cycle during which financing is required at different stages: when purchasing/leasing agricultural land, purchasing inputs and investing in farming equipment. The lack of access to financing is a major challenge in emerging markets and has contributed to the limiting of agricultural production. Farmers sometimes must resort to borrowing informally or from local money lenders at very high interest rates. Uncertainty about the availability and cost of funding represents one of the inherent risks of agricultural production in emerging markets.

Technological changes can impact a farm's competitiveness.

- *Technology risk* involves advances in technology (such as the launch of an advanced fertiliser or new genetically modified seeds) that render some farmers' existing processes or equipment outdated in the short to medium term, thereby reducing their competitiveness. The risk can also emerge from the failure of new technologies when, for example, the use of advanced fertiliser or genetically modified seeds fails to deliver the expected higher yields.

Institutional and regulatory risks relate to the impact of changing government regulations and agricultural policies.

- *Institutional and regulatory risk* arises from policy changes at local or national governmental level. These entities usually have a policy framework within which to govern, support and protect the domestic agricultural sector. The framework can consist of favourable policies, large-scale national agricultural programmes, price support mechanisms, subsidies or other measures. Changes to these policies or a reduction in support can significantly affect a farm's earnings. For instance, ad-hoc export restrictions to meet domestic demand mean that farmers cannot reap the full benefits of higher international prices for their products.

Infrastructure challenges relate to a lack of or inadequate support infrastructure.

- *Infrastructure risk* originates from inadequate infrastructure for agricultural production and distribution. Infrastructure challenges may stem from warehouses (for storage), financial institutions (for credit) or wholesale/retail networks (for distribution). For instance, an inefficient distribution network or a poor warehousing setup can result in the loss of perishable agricultural products before they reach end-consumers.

These risks are interrelated and can exacerbate or negate each other.

All these risks are interrelated. The negative correlation between price and yield risks (on a macro and not an individual level) is unique and helps to offset or reduce risk for farmers, thus acting as a natural hedge. Regulatory changes can impact the liability risk faced in agricultural production and food processing. Technological development can bring about new types of seed that are more resistant to drought or diseases, but can also represent a potential liability if health concerns are later unearthed. The complexity of the risk landscape requires a holistic risk management strategy that spans the entire risk spectrum and its interconnectivity. This can be easy for large commercial farmers to achieve but very difficult for small subsistence farmers.

If the wide spectrum of interrelated risks is not managed holistically, food insecurity could increase.

The failure to manage this wide spectrum of risks can lead to reduced incentives to engage in agricultural production, thereby aggravating food insecurity and fuelling a vicious cycle. At the individual farmer level, such risks could result in lost production and earnings thereby leading to lower global food security and higher food prices that only serve to exacerbate poverty. In the aftermath of a natural disaster or a bad harvest, farmers may need to sell some of their productive assets including land or livestock, in turn, reducing their future earnings capacity and leading to underinvestment in farming material. Without support from the state or their community, or protection from agricultural insurance, these farmers become even more vulnerable to weather events and bad harvests.

Agricultural risks can also result in macro implications such as higher food price inflation and low production.

The biggest problem at regional/national level is when the risks take on such dimensions that farmers shift away from agricultural production and sell their land to pursue other opportunities. If the farmland can be consolidated for more productive food-producing activities such as commercial farming, the shift may possibly benefit society in terms of higher agricultural output. However, if production remains low and fragmented or if land is used for purposes other than food production, higher food price inflation and insecurity can result.

### **Managing agricultural risks in emerging markets**

Managing agricultural risks constitutes a major part of boosting production, supporting farm income and eventually increasing food security.

Agricultural risk management is important in helping to raise farm output and income. It allows farmers to focus on boosting production levels and productivity. The failure to manage the risks adequately can result in under-investment in farm productivity, while some farmers may simply avoid farming in exposed regions. An efficient and effective risk management framework is thus important for incentivising farmers and producers to invest in agriculture.

Agricultural risk management in emerging markets has evolved rapidly in recent decades.

Agricultural risk management in emerging markets has evolved rapidly over the past few decades. Initially, farmers and local communities relied heavily on self-insurance, government support and international aid to deal with adverse events or natural catastrophes. Other informal strategies have included mobilising personal and household savings, leveraging non-farming income, borrowing from local money lenders or arranging for farmers and local communities to support each other in the event of an agricultural loss. Farmers can also engage in risk prevention through production diversification and crop sharing. However, these measures tend to be insufficient when major disasters or financial/regulatory shocks hit. Most of the severe shocks that hit agriculture are systematic in nature and affect whole regions or communities. Therefore, formal risk management instruments need to be combined to create a sustainable risk solution and avoid additional financial burdens following loss events. The most effective risk management strategies are both market-based and government-supported and include a degree of risk prevention, risk control and financing. Table 3 summarises the key risk management instruments and strategies that can be deployed at the local, regional market and country levels.

Table 3  
**A menu of possible farm risk management instruments and strategies**

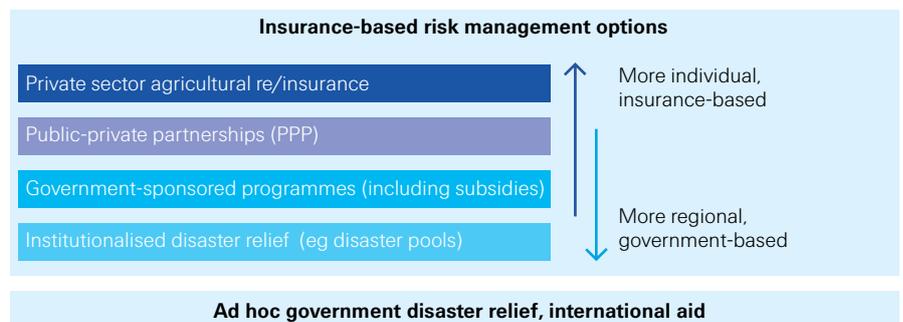
	<b>Farm/household/ community</b>	<b>Market</b>	<b>Government</b>
<b>Risk reduction</b>	Technological choice	Training on risk management	Macroeconomic policies Disaster prevention (flood control...) Prevention of animal diseases
<b>Risk mitigation</b>	Diversification in production Crop sharing	Futures and options Insurance Vertical integration Production/marketing Contracts Spread sales Diversified financial investment Off-farm work	Tax system income smoothing Counter-cyclical programmes Border and other measures in the case of contagious disease outbreak
<b>Risk coping</b>	Borrowing from neighbours/family Intra-community charity	Selling financial assets Savings/borrowing from banks Off-farm income	Disaster relief Social assistance All agricultural support programmes

Source: "Managing risk in agriculture: A holistic approach (extracts)", OECD, 2009, p. 22

There is a shift from ex-post to ex-ante risk financing.

Given increasing risk exposure and overstretched government budgets, many ex-post (after-the-fact) risk financing measures are becoming unsustainable. This is giving rise to the development of comprehensive agricultural risk management strategies which are more proactive in nature in a number of emerging markets. Some of these strategies involve opening up the agricultural risk financing markets to private insurers (agricultural insurance), creating government insurance programmes, forming public-private partnerships and microinsurance. Figure 11 highlights the mix of increasingly diversified insurance-based agricultural risk management options that are available. Depending on the market, an effective strategy may encompass some or all of them.

Figure 11  
**Insurance-based agricultural risk management options**



Source: Swiss Re Economic Research & Consulting

Farmers in advanced markets have access to a wide spectrum of risk management instruments...

The ready availability of these risk management instruments is critical to protecting farmers and all those in the food value chain. Farmers in advanced markets often have access to different risk management instruments and options, including well-developed private agricultural insurance markets, futures and options exchange opportunities and to the latest farm technology. They may also benefit from government-sponsored programmes, catastrophe funds, and various types of subsidies that help protect them against losses from adverse events and major disasters.

...which are usually not available to farmers in emerging markets.

By contrast, farmers in emerging markets are at a relative disadvantage. They have limited access to the latest technology to bolster farming productivity and are not necessarily aware of the benefits of market-based risk management instruments. Also, in emerging markets, private insurance markets themselves are either in a nascent stage of development or simply not accessible to farmers due to various constraints including ineffective distribution or high administration costs. Even if an agricultural insurance market exists, the choice of products is often either limited or fails to match farmers' needs. For example, insurance products such as revenue insurance that aim to protect farmers' incomes are typically unavailable in emerging markets. Government support and risk financing programmes are also sometimes unavailable or ineffective. Nonetheless, in the past decade, an increasing number of emerging market governments have been engaging in providing holistic risk management solutions for farmers (see Box: Agricultural risk management strategies in China).

With strong government support, private agricultural risk management is developing quickly in China and opening the door for insurance.

### **Agricultural risk management strategies in China**

As China advances and integrates itself into the world commodity market, policymakers have recognised the need for a stable food supply and a sustainable agricultural system. The State Council, in its No 1 Document of 2007, signalled the government's intention to construct an "agricultural risk prevention mechanism", which includes:

- strengthening the agricultural sector's ability to monitor natural perils and undertake preventive/mitigating measures against potential losses;
- developing agricultural insurance that is "guided by the government, supported by policies and operated by the market, with voluntary participation by farmers";
- expanding state-subsidised agricultural insurance pilot schemes to more regions;
- improving the mechanism for the sharing and transfer of large catastrophe risks and exploring the development of a reinsurance system supported by central and local fiscal resources;
- encouraging agricultural cooperatives and other intermediate institutions to promote agricultural insurance to farmers.

Efforts are advancing towards a sustainable risk management framework.

Over the past few years, the Chinese government has made major efforts to develop an agricultural insurance system. In 2012, the premium subsidy programme for crops has been expanded to include not only the original six selected provinces but also the whole nation. At the same time, other agricultural subsidisation programmes have been implemented.

Source: Based on an extract from Swiss Re, "An insurance recipe for the Chinese food and agricultural industry", 2008 and policies on agricultural insurance issued by the Ministry of Agriculture of China.

Insurance should be an integral part of any sustainable agricultural risk management regime.

### **The role of agricultural insurance in enhancing food security**

To meet the objectives of food security, a multi-stakeholder response is required to improve agricultural productivity, distribution, risk management, education and awareness, not to mention the use of natural resources. Risk management is critical to ensuring sustainable agricultural production. The agricultural risk landscape, in advanced and emerging markets alike, is complicated and needs holistic risk management of a wide spectrum of risk factors and their interconnectivity. Access to an improved risk management toolbox that takes local market conditions into consideration can help farmers increase their knowledge and improve their farming techniques. Agricultural insurance can help fill the void in risk financing and risk management expertise. Indeed, insurance plays an integral role in effectively managing any agricultural risk.

The role of insurance in agricultural risk management is multi-faceted. It provides cover for weather-related losses, ...

In emerging markets, private insurance in the agricultural sector can significantly improve risk management. It helps players build sustainable strategies to deal with agricultural risk and complements public assistance when disasters hit.<sup>27</sup> In managing agricultural risks, insurance can:

- reduce the negative impacts of natural catastrophes (such as floods, droughts or typhoons) through effective risk transfer;
- expedite recovery by ensuring the availability of funding to compensate insured losses;
- enable investment in the agricultural sector by reducing fluctuations in investment returns due to adverse events;
- improve credit availability in the agricultural sector, where agricultural insurance can act as collateral and help to reduce default rates with a positive impact on credit terms;
- reduce government contingent liability in financing post-disaster reconstruction, which can be more costly to government coffers than insurance programmes;
- generate greater risk awareness among farmers and encourage the adoption of risk mitigation measures;
- encourage structural reforms to improve the insurability of agricultural risks, for example, by incorporating incentives for sustainable farming into national agricultural policies;
- provide a safety net for poor households through market-based solutions.

...enables farm investment, ...

As illustrated in Figure 11, apart from insuring against weather-related losses, agricultural insurance can encourage investment in equipment and better technology for the agricultural sector, thereby contributing to higher production and supporting the leap from subsistence farming to sustainable farming. Without credit, growth in the agricultural sector would be marginal at best, with agricultural insurance sometimes required as collateral for extending farm credit to small-scale farmers. In some emerging markets such as India, agricultural crop insurance is compulsory for farmers requesting financing/credit from financial institutions. Agricultural insurance helps support the economic sector and promotes economic growth in a number of emerging markets where the agricultural sector constitutes a significant part of national income.

... promotes the development of support infrastructure, ...

Insurance also provides risk management solutions across the agricultural food value chain. It provides protection against various non-weather-related risks including business risks specific to food processing (such as input shortfall), or infrastructure and transportation risks. This risk management and protection all along the food value chain help support food security at the local, national and global levels.

... and enhances income stability, which, in turn, alleviates poverty.

Furthermore, agricultural insurance helps ensure that farmers' earnings are protected and stabilised. This income stability allows low-income farmers to increase their children's education, improve their diet, and further their skills.

Microinsurance in particular has become more popular in recent years.

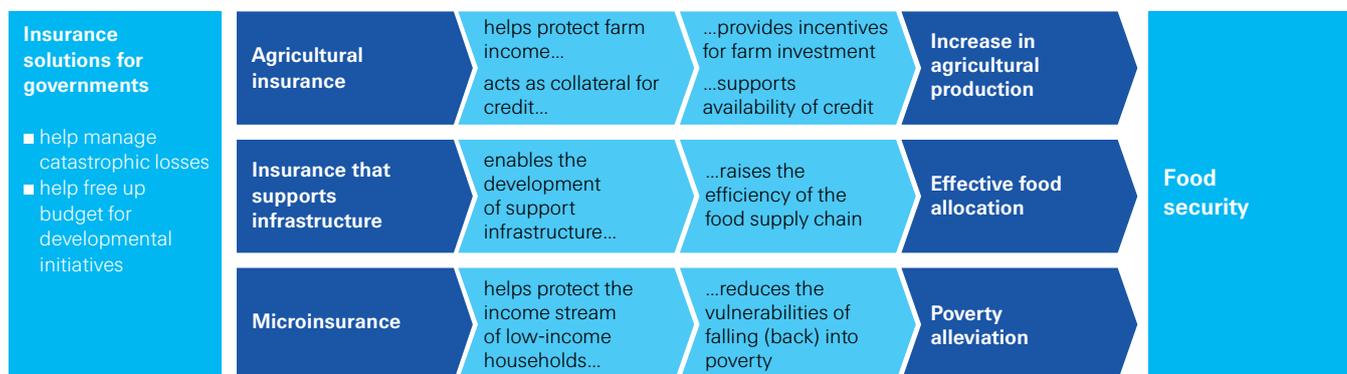
Microinsurance, in particular, offers low-income farmers/households a viable way to manage their life and health risks and reduce their vulnerability to extreme events.<sup>28</sup> As risk awareness increases and low-income farmers gain a better understanding of the benefits of agricultural insurance, there is a strong possibility that demand for conventional insurance products will rise. This could include, for example, term life covers, savings insurance products, family health protection or hospitalisation products.

<sup>27</sup> See Swiss Re *sigma* 1/2007, "Insurance in emerging markets: sound development; greenfield for agricultural insurance".

<sup>28</sup> See Swiss Re *sigma* 6/2010, "Microinsurance – risk protection for 4 billion people".

Figure 12

**The role of re/insurance in agricultural risk management**



Source: Swiss Re Economic Research & Consulting

**Liability insurance and the food supply value chain**

The scope of liability exposure in relation to food production and distribution is broad but often receives insufficient attention.

One risk that usually receives little or no attention is liability risk. In emerging markets, liability insurance currently has a very low penetration because it is often considered to be small and manageable. Yet liability insurance will become a key type of insurance cover in emerging markets in the future – as it currently is in developed markets. Liability exposures can include business interruption risk, third party liability risk (in case the quality of food products/produce does not meet the required standards) and risks related to food recall. Product recall (specifically food recall, such as when it is contaminated) has now been recognised as a significant risk for the food industry. The estimated recall costs for the industry already exceed USD 1 billion per year, thereby putting a heavy burden on industry profitability.<sup>29</sup> Against a backdrop of rising consumerism, growing producer liability and more stringent food quality regulations, demand for insurance protection against recall costs and third party liability claims is likely to continue rising in the future.

Business interruption is another area where there can be significant risk exposure of food producers/processing companies.

Business interruption is one liability risk related to food production that is growing. Increasingly sophisticated global supply chains demand the timely delivery of inputs from various suppliers. They also apply to agricultural food production processes where, for example, multinationals engaged in food processing are dependent on food produce from cooperatives/producers across the globe. As a result of the heightened risk of business interruption, demand for insurance to protect against losses is on the rise. Business interruption insurance<sup>30</sup> can cover, for example, stoppages in food processing due to a shortfall in inputs and is also relevant when equipment breaks down during production or processing, or when livestock supplies cannot be delivered due to a disease or epidemic. Therefore, agricultural insurance can help not only food producers but also other players in the food supply value chain.

<sup>29</sup> "Food and Agribusiness", Jardine Lloyd Thompson Asia, 2010, p.4.

<sup>30</sup> Business interruption insurance is complementary to property insurance, covering extra expenses or losses incurred while business is interrupted when damage is being repaired. What is covered depends on the property damages insured in the underlying property insurance policy. It can also include the extra expense of operating out of a temporary location. For smaller corporations, basic property insurance covers are often sold as part of a package policy, such as a Business Owners' Policy. See Swiss Re *sigma* 5/2012, "Insuring ever-evolving commercial risks", for more details.

## The main agricultural insurance products

Agricultural insurance is gaining significance in emerging markets.

Agricultural insurance is one of the most complex and challenging insurance segments. It has a long history in the advanced markets of the US and Europe and has now begun to make an increasingly deep footprint in emerging markets. Agricultural insurance is a specialised segment of insurance that is not only limited to the insurance of crops (although crop insurance constitutes the majority of premiums) but also includes the insurance of livestock, forestry, aquaculture and greenhouses.<sup>31</sup> The scope of coverage is also expanding from pure property to include liability and other financial exposure. The full range of agricultural insurance products spans from indemnity-based products (which constitute the bulk of premiums) to innovative solutions including index-based products, microinsurance, and public private partnerships (PPP).

Of all indemnity-based products, named-peril insurance is the most basic agricultural insurance product and covers single perils.

### **Indemnity-based crop insurance products**

1. *Named-peril insurance* covers single perils (such as a hail, fire, storm or frost event) and the sum insured is based on the value of agricultural inputs such as seeds and fertiliser. The market for single-risk hail insurance, for example, is well developed, common in most European countries and available in some emerging markets. In Argentina, which has the oldest crop insurance programme in Latin America, the majority of premiums come from crop hail insurance.

MPCI insurance covers multiple perils and can be extended to cover revenue shortfall.

2. *Multi-peril crop insurance (MPCI)* covers multiple peril events that can cause widespread losses (including drought, flooding and sometimes disease). The sum insured is based on the value of crops insured and the pay-out is the yield shortfall below a pre-agreed threshold, multiplied by a pre-agreed price. An extension of MPCI covers are revenue covers which are based on yield assessment and crop prices. Farmers are paid when actual revenue falls short of expected/guaranteed revenue due to lower yields and/or crop prices. Area-based MPCI covers are based on district or country yields of a wider farming community. MPCI coverage, including revenue cover, is most common in the US, where it has a long history.

MPCI has met with some success in Africa.

Some MPCI programmes have been successfully implemented in Africa as well. Based upon a product study and actuarial analysis in 2007, MPCI programmes similar to those in South Africa have been introduced in Kenya with the cooperation of local insurers and Swiss Re, mainly for malt barley farmers but over time also for other crops. The insured area has since gradually increased to 70 000 hectares and has a positive outlook for further growth. The combination of farm loans backed by an insurance policy has made this programme highly successful.

In Latin America, revenue insurance has the potential to grow.

There are strong prospects for revenue insurance in Latin America. With wide acceptance of the US dollar as the currency for agricultural trade and market orientation towards US prices in general, revenue insurance can be expanded to offer Latin American farmers protection that goes beyond MPCI, especially those farming on a medium and large scale farmers or in small farming cooperatives. In Brazil in 2009, Swiss Re Corporate Solutions piloted revenue insurance products that cover three risk components: production, price and USD/BRL foreign exchange risks. Other markets including Mexico are expected to follow this successful launch of revenue insurance products.

However, these indemnity-based products suffer from high loss-adjustment costs.

Named-peril insurance and MPCI are traditionally indemnity based. However, despite focusing on an individual farmer's needs, they come with high risk inspection, loss assessment (adjustment) and administration costs. Moral hazard and anti-selection are additional challenges when covering farms unless insurance is mandatory. To help address this concern, particularly when high distribution and administration costs render traditional agricultural insurance uneconomical, index-based crop insurance solutions have been developed to better serve small-scale farmers in emerging markets.

<sup>31</sup> "Agricultural Insurance, primer series on insurance", The World Bank, Issue 12, Nov 2009, p. 3.

Index-based solutions are gaining popularity in some emerging markets, but from a low base.

Area-yield insurance is an index-based solution that depends on the availability of accurate and long, historical yield data by region.

In Asia, Vietnam implemented area-yield crop insurance in 2010 on a large scale ...

... with government support in the form of premium subsidies.

Weather index products, although introducing basis risk, provide faster claims settlement and are easy to understand.

### **Index-based crop insurance products**

Innovative index-based agricultural insurance products are becoming increasingly popular in India, Vietnam and some African countries. Their relative advantages over indemnity-based agricultural insurance products have underpinned their rapid growth and encouraged governments to test their viability. Index-based products have fast, effective and efficient claims settlement processes and are relatively easy to administer. However, despite the surge in index-based insurance arrangements across emerging markets, the majority of global premiums still come from MPCI, revenue insurance and crop hail insurance.

1. *Area-yield insurance* bases pay-out on the shortfall in realised yield of an area relative to its average historical yield. The area can be defined as a group of villages or districts that are homogenous in crop production and yield. The index is based on a guaranteed yield for the insured area, normally in the range of 50% to 90% of the expected yield.<sup>32</sup> Such products exist in a number of markets including the US, India, Brazil, Mexico and Canada. They are also widely available in India, where they form the bulk of agricultural insurance premiums. The feasibility of area-yield index-based products is dependent on the availability of accurate and long-term historic data on an area and its yield. This form of crop insurance offers a number of advantages, including ease of administration, fast claims settlement and the minimisation of moral hazard and adverse selection.

Vietnam recently implemented area-yield crop insurance on a large scale in an effort to provide its farmers with risk protection. The agricultural sector in Vietnam is significant, accounting for roughly 22% of its GDP and employing approximately 60% of its population. Rice is the key crop with an annual production of 38 million metric tonnes, making Vietnam the second-largest rice exporter in the world. The Vietnamese government aims to provide protection to rice farmers against natural hazards and to shift from ex-post (after-the-fact) to ex-ante (before-the-fact) risk financing. Working with re/insurance companies VinaRe, BaoViet and BaoMinh, the government began implementing area-yield crop insurance in 2010.<sup>33</sup>

The pay-out for area-yield insurance in Vietnam is triggered when the actual yield is less than the guaranteed yield per district and rice season. The government pays premium subsidies according to farmers' income levels. This programme has some unique features: first, the insurance product can be renewed four times a year to provide protection for four rice crop seasons per year and, second, distribution is supported by government officials, with the community heads issuing insurance certificates to the farmers and collecting premiums. This helps reduce the cost of distribution and, in turn, the programme's operating expenses. In addition, there are the usual advantages of area-yield products, namely faster claims settlement, coverage of all perils and no need for loss adjustment at the farm level.

2. *Weather insurance* products are often modelled using an index of parameters, such as rainfall or temperature, which is highly correlated with the loss experience. To structure an "index", historical weather data from a dense network of weather stations and agricultural production statistics needs to be available. The insurance pay-out is often defined as a fixed amount, which is a function of the deviation of the actual weather parameter from the one that was previously agreed. For instance, in the case of a rainfall insurance product, if the rainfall measured is less than the rainfall specified in the contract, the insurer will initiate the pay-out (as per the contract) irrespective of the actual losses incurred by the insured. The use of indices as benefit triggers, also called parametric products, therefore introduces the element of basis risk (see Box below for more details). However, such indices lead to savings in claims determination and loss adjustments when compared to other indemnity-based products by virtue of their fast pay-out and reduced administrative costs. They are also easy to understand.

<sup>32</sup> "Agricultural Insurance, primer series on insurance", The World Bank, Issue 12, Nov 2009, p. 14.

<sup>33</sup> Swiss Re acts as a development partner/advisor and is one of the key reinsurers.

In Central and Eastern Europe, interest in drought and excess rainfall insurance products is growing.

Pilot schemes for weather insurance have been rolled out in Africa and significant inroads have been made in India.

Serbia was one of the first countries in the emerging region of Central and Eastern Europe (CEE) to introduce weather insurance, when it introduced drought and excessive rainfall protection for farmers in the Vojvodina province in 2009. Compared to other emerging markets such as India, the CEE region remains a difficult place to market new products, one of the reasons being that products based upon rainfall indices have difficulty in penetrating the markets due to farming practices and data unavailability. However, future developments in the region are expected to lead to more risk transfer solutions adapted to the needs and circumstances of the individual CEE markets. Drought and excess rainfall index products are expected to develop on a large scale in this part of the world.

Recent pilots in Africa and current large-scale weather schemes in India showcase the vast potential of weather insurance products in helping to manage agricultural risks. The Weather Based Crop Insurance Scheme (WBCIS) in India, which uses weather parameters as a proxy for crop yield for indemnification of losses, has proved to be very successful. The scheme covered over 9 million farmers in financial year 2010 to 2011 and generated premiums of USD 258 million with a total sum insured of USD 3.17 billion.<sup>34</sup> The scheme has a number of advantages, including fast claims pay-out, and the chance for private sector participation, and is based on risk-adjusted actuarial pricing. There are nevertheless areas of weather insurance programmes that are in need of further improvement, such as increasing farmers' risk awareness and fine-tuning product features to reduce basis risk.

### Basis risk of index-based agricultural products

Basis risk measures the shortfall between a hedging instrument and the underlying risk.

Index-based agricultural products have strong potential but are sensitive to basis risk.

There are, however, ways to reduce basis risk.

Basis risk refers to the difference between a farmer's actual loss experience and the index-based loss indemnification received. The extent to which losses are positively correlated with the index determines the basis risk. If the correlation is low, basis risk is high and farmers may not receive indemnity payment even if they incur losses. Conversely, they may also receive a payment without incurring a loss.

For example, assume a farmer wants to hedge the value of a crop against drought. The farmer buys agricultural insurance protection based on an index of measurable rainfall collected from an array of weather stations. However, there can be incidences where the precipitation in the farmer's field deviates from that measured by the index. This lack of perfect correlation between the index and actual precipitation can result in a loss or in over-compensation.

Basis risk can be reduced by using better, more granular indexes, by applying the right parameters and by using high-density, high-quality weather station networks. From the insurer's perspective, index cover can also be sold to a financial institution/aggregator<sup>35</sup> to lower basis risk. The aggregator then becomes responsible for allocating the aggregate claims payment to the individual farmers based on their losses. The composition of the index can be constructed such that it fully reflects loss events or risks such as drought or extreme temperatures. The selection of the index is also important, as it should be objective, accurate and timely. Basis risk is usually lower for weather insurance products that provide coverage against low-frequency weather events (natural catastrophes) because the impact is regional and individual losses are highly correlated with the insured event. When index covers are sold at a portfolio level, the basis risk can be handled more effectively by the financial institution/aggregator.

<sup>34</sup> "Weather based crop insurance in India", Policy research working paper, The World Bank, March 2012, p. 2.

<sup>35</sup> Examples of aggregators include, banks/(micro)finance institutions, farmers' associations, input suppliers, non-governmental organisations, etc.

Livestock insurance covers cattle, swine and poultry against mortality from non-epidemic diseases, fire, natural perils, and accidents.

Business interruption covers for livestock producers are available in Germany.

Index-based livestock insurance products are being tried in Kenya and Ethiopia.

Aquaculture is important for some emerging markets, but insurance is underutilised.

The salmon industry in Chile has a significant amount of aquaculture insurance coverage.

### **Other types of agricultural insurance products**

1. *Livestock insurance* covers cattle, swine, and poultry against mortality from non-epidemic diseases, fire, natural perils and accidents. Epidemic diseases can be insured as an endorsement, where farmers are paid the difference between government payments in the case of a slaughter order and the full value of their livestock. Additionally, there is cover for clean-up costs and business interruption. Risks to livestock are often underestimated by producers. As a result the livestock insurance take-up rate is quite low. However, risk can be significant. In the 2000s, EUR 9 billion in economic losses resulted from Avian Influenza in Asia, and over 250 million birds had to be culled.

One of the best insurance solutions for livestock producers can be found in Germany. Animal mortality losses are to a large extent borne by regional Animal Health Funds which are funded by levies on all producers. As additional cover, private insurers offer business interruption (BI) insurance for livestock farmers (cattle, dairy, swine and poultry) to mitigate the risk of business interruption following disease outbreaks. BI losses are a problem not only when farms are affected directly but also when they are affected indirectly by movement restrictions when animals or their output cannot be transported off the farm but still need to be fed, thus resulting in additional costs. This insurance solution could also be adapted to emerging markets.

The concept of index-based insurance is also being applied to livestock insurance in pilot schemes in Kenya and Ethiopia. Claims are paid based on a trigger (index) that is highly correlated with the insured event. For livestock insurance, the trigger could be drought or a shortage of forage (livestock feed) that leads to above-average livestock mortality. In Kenya, livestock represents both an income source and an asset for the majority of the population living on Arid and Semi-Arid Land (ASAL), where drought is regarded as the single-greatest cause of livestock mortality. An innovative index-based livestock insurance pilot scheme was initiated in the Marsabit district in Northern Kenya in 2010. It is based on satellite data on forage availability, and insurance claims are triggered when forage scarcity is predicted as being the cause of livestock deaths in an area.<sup>36</sup> Initial results suggest that index-based livestock insurance is commercially viable, and pilot products are being designed for other districts in Northern Kenya.

2. *Aquaculture insurance* provides coverage for on- and off-shore fish (eg salmon and tuna) and other types of aquatic farm (eg shrimp and shellfish) against losses from natural perils, diseases, algae bloom or predators. In some cases, on-shore hatcheries, off-shore cages and other devices are included in the cover. Even though aquaculture as an industry is growing rapidly, aquaculture insurance business is still in its infancy.

In Latin America, aquaculture insurance accounted for around 3% of total agricultural insurance premiums in 2009. The main markets are Chile and Mexico. The aquaculture insurance market in Chile emerged in the mid-1990s, driven by the booming salmon industry. Around 50% of salmon farming centres are insured in Chile. Aquaculture insurance policies in Chile provide broad, named-peril cover against the loss of installations (fish cages and nets), equipment, and fish stock. Insured perils include, for example, storms, tidal waves, strong currents, red tides (algae), diseases, predator attacks and theft. In Mexico, shrimp farming insurance is developing rapidly, with approximately 10 000 out of a total of 70 000 shrimp-farming hectares currently insured.<sup>37</sup>

<sup>36</sup> Andrew Mude, International Livestock Research Institute, "Index based livestock insurance in Northern Kenya and Southern Ethiopia", presented at TFESSD workshop, Washington D.C., 19 Feb 2012.

<sup>37</sup> "Agricultural Insurance in Latin America- developing the market", The World Bank, 2010, p. 58.

Forestry insurance covers losses from fire and storm.

3. *Forestry insurance* compensates the owners of commercial plantations (eg pine, eucalyptus) against fire and storm losses, with claims payments based on pre-agreed timber values. The costs of fire-fighting and re-establishing the forestry areas can also be included. Forestry insurance is a small line of business in the agricultural insurance sector, with products mainly available in advanced markets such as Australia, Canada, New Zealand, Germany and France. Forestry insurance products are nonetheless expanding to emerging markets and are developing quickly in Latin America, highlighting the strong growth potential of this insurance segment. In Chile and Uruguay, for example, it is estimated that over 80% of the commercial forest area is currently insured. Forestry insurance products are also available in Argentina, Brazil, Costa Rica, Mexico, Ecuador and Colombia.

Forestry insurance solutions can also be developed for governments. In Canada, for example, Swiss Re reinsured the government of the province of Alberta to provide indemnification for wildfire losses in 2006. The payments helped offset wildfire suppression costs. It was a semi-parametric solution where the loss was calculated by multiplying the area burnt in hectares by a dollar amount per hectare. A similar concept could be implemented in other regions, with the Alberta solution serving as a best practice example of classic, ex-ante financing for natural forestry disasters.<sup>38</sup>

Greenhouse insurance provides comprehensive coverage against natural perils, fire, and business interruption.

4. *Greenhouse insurance* provides greenhouse structures with coverage against natural perils, plants against frost and debris from damaged greenhouse structures, equipment against machinery breakdown or fire, as well as certain aspects of business interruption. For example, East Africa's modern greenhouse industry specialises in flowers and exports to Europe with daily flights of fresh produce to the European markets. Its sophisticated supply chain and state-of-the-art production facilities need appropriate insurance and reinsurance protection. Modern greenhouse risks in East Africa are insured by local insurers backed by international reinsurance companies with the necessary financial capacity and technical expertise.

### The present state of agricultural insurance and its growth drivers

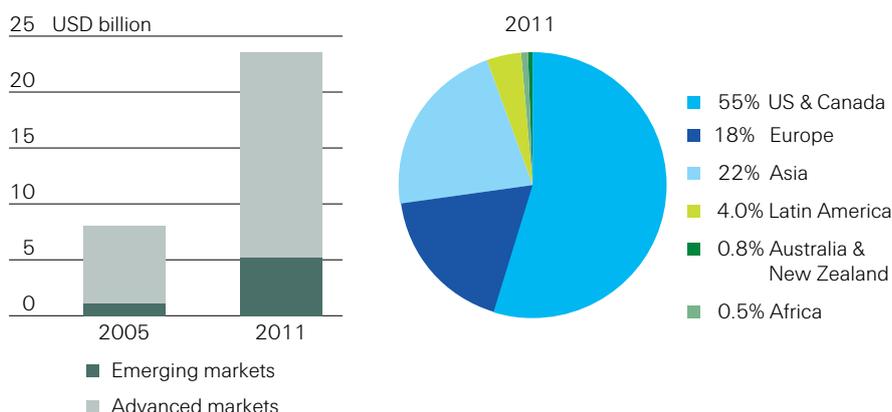
Global agricultural premiums were estimated at USD 23.5 billion in 2011.

In 2011, agricultural insurance premiums worldwide amounted to an estimated USD 23.5 billion. Compared with USD 8 billion in premiums in 2005, agricultural insurance premiums have almost tripled (Figure 13).<sup>39</sup> This represents an annual average growth rate of around 20% between 2005 and 2011, almost double the rate of growth of agricultural value added (in current dollars) worldwide, which averaged 11% over the same period of time. In emerging markets, agricultural insurance premiums more than quadrupled during the same period (with annual growth close to 30%) and was USD 5.2 billion in 2011. The share of emerging market premiums in total premiums increased from 13.4% in 2005 to 22% in 2011. China and India were the key growth drivers, accounting for 62% of agricultural insurance premiums from emerging markets by 2011.

<sup>38</sup> "Agricultural Insurance in Latin America – developing the market", The World Bank, 2010, p. 41.

<sup>39</sup> The aggregate data is based on estimated agricultural premiums across the emerging and advanced markets and includes premiums from government-supported agricultural insurance schemes.

Figure 13  
**Estimated agricultural insurance premiums worldwide, 2005 and 2011**



Sources: The World Bank; Swiss Re Economic Research & Consulting

A number of factors have contributed to the rapid growth of agricultural premiums in emerging markets, but proactive government policies are arguably the most significant contributors.

Agricultural insurance premiums from emerging markets have grown rapidly in recent years, driven mainly by:

- the positioning of agriculture as a priority sector in a number of emerging markets. This has resulted in favourable policies and an enabling environment. Governments are increasingly moving away from ex-post to ex-ante financing solutions to manage risks related to the agricultural sector. As a result, the need for risk protection and insurance solutions has increased.
- large-scale government insurance schemes and/or increased government support in the form of premium subsidies. These measures have been an important source of insurance awareness-raising and participation encouragement, particularly among small-scale farmers. Government subsidies have helped to make many schemes available to farmers that would otherwise not be commercially viable.
- opening up the local agricultural insurance sector to global and private insurers, resulting in more innovative product offerings and the transfer of global expertise and practices.
- innovation in agricultural insurance products, such as index-based products and products with remote-sensing aspects for analysis or even loss settlement. These have helped to enhance the insurability of emerging market agricultural risks. At the same time, to help extend the reach of insurance products to remote areas, there have been further innovations in distribution channels, which sometimes take place parallel to the development of microfinance/microinsurance.
- an increased focus by global reinsurers and supranational organisations on the development of agricultural insurance. Reinsurers provide global expertise, capacity and innovative re/insurance and capital management solutions. Some supranational organisations are being instrumental in mobilising regional governments and in providing financial and technical support.
- public-private partnerships. These involve cooperation between governments and private re/insurers, and have increased in recent years and contributed to the successful implementation of many agricultural insurance schemes in different emerging regions.

Agricultural insurance penetration is still very low in emerging markets, indicating its strong growth potential.

Even though growth has been strong, the global agricultural insurance market remains underdeveloped, especially in emerging markets. Agricultural insurance penetration, defined as agricultural insurance premiums as a percentage of agricultural value added,<sup>40</sup> was estimated at a mere 0.2% in 2011 for the emerging markets as a whole (see Table 4). This penetration is extremely low compared with 7.2% in the US, or even with the global average of 0.8%. While the low penetration indicates the significant potential of emerging markets, it illustrates the many hurdles that insurers face in promoting agricultural insurance in these regions.

Table 4

**Agricultural insurance penetration and key agricultural statistics in emerging markets (versus the US and the world)**

	Agricultural land (% of land area) <sup>1</sup>	Employment in agriculture (% of total employment) <sup>2</sup>	Agriculture, value added (% of GDP) <sup>3</sup>	Agricultural insurance premiums (USD million), 2011 estimates	Agricultural insurance penetration, 2011 estimates <sup>4</sup>
<b>BRICS countries (aggregate)</b>					
Brazil	31.3	17.0	5.8	430	0.35%
Russia <sup>5</sup>	13.2	9.7	4.0	552	0.98%
India	60.5	51.1	19.0	673	0.19%
China	56.2	39.6	10.1	2 543	0.36%
South Africa	81.7	5.1	2.5	153	1.77%
<b>Emerging markets (aggregate)</b>				<b>5 176</b>	<b>0.23%</b>
<b>United States</b>				<b>11 400</b>	<b>7.15%</b>
<b>World</b>				<b>23 511</b>	<b>0.83%</b>

1 2009 data

2,3 Latest year data as available during the period 2007–2010

4 Agricultural insurance premiums as a % of agricultural value added

5 For Russia, the agricultural insurance premiums involving risk transfer is though much lower estimated at around USD 100 million in 2011

Sources: The World Bank; Swiss Re Economic Research & Consulting

<sup>40</sup> In current US dollars.

## Agricultural insurance market development across the world

There are significant variations in agricultural insurance markets across the world.

Agricultural insurance programmes differ from country to country and are primarily driven by socio-economic developments, agricultural practices, infrastructure and government policies. Hence, there is no single agricultural solution that can be applied across the globe. Every market needs tailor-made products/programmes to cater to the needs of their farmers/producers and other stakeholders in the agricultural food value chain. The structure of agricultural insurance programmes is derived from a number of elements such as the risks to be covered, the type of coverage (compulsory or voluntary), the players (government participants, private market player, or both), government support (ex-post or ex-ante) and the kind of product (traditional or index-based).

Indemnity-based products are common in advanced markets.

In advanced markets such as the US, Canada, Australia and Europe, agricultural insurance has a long history and is relatively well developed. These markets are characterised by large-scale farming practices that involve the use of the latest technologies, well-established supply-chain systems and easy access to financing. Governments in these markets support the agricultural sector with subsidies and various tax rebates. Indemnity-based agricultural insurance products are very common in these markets and provide extensive coverage against named perils, multiple perils, pricing risk, and operational risks. The agricultural insurance market is well structured and involves specialised insurers and reinsurers offering risk protection, agents and brokers supporting distribution, and specialised loss-adjusters for claims inspection and settlement. In these advanced markets, a long history of agricultural insurance data is usually available, which is crucial in determining accurate proxies of past events and return periods and thereby aids in accurately pricing insurance products.

## Agricultural insurance in the US

In the US, the government participates in agricultural insurance product design and subsidies.

The agricultural crop insurance programme in the US is the largest in the world and was estimated at an insured value of USD 114 billion and USD 12 billion in premiums in 2011.<sup>41</sup> The agricultural insurance system in the US is market based but subsidised by the government. The system works according to a public-private partnership model, where private insurers work in collaboration with the government's Risk Management Agency (RMA), which is part of the United States Department of Agriculture (USDA). RMA is involved in product design and administering subsidies while private sector insurers distribute the products.

A wide range of agricultural insurance products are available in the US.

The history of crop insurance in the US dates back to the 1930s with the formation of the Federal Crop Insurance Corporation (FCIC), which focused on major crops in the principal producing regions. The programme was enhanced and extended to cover multiple crops in 1980, 1994, and 2000. The 2000 legislation encouraged greater participation of private sector insurers in developing new agricultural insurance products. Insurance plans are available for over 100 crops and include various yield-based products, crop revenue coverage, a dollar plan and group risk plan and livestock policies.<sup>42</sup> Catastrophic Risk Protection Endorsement is also available, wherein premiums are paid by the federal government and producers pay the administrative fees.

The US is also the only market where revenue products are sold widely.

Revenue-based crop insurance policies are the most popular and account for nearly 90% (2011) of total crop policies sold in the US, with the remainder being yield-based policies. In fact, the US is the only country where revenue-based crop insurance products are sold widely. Such products provide indemnity in case a farm's actual revenue falls below a certain percentage of target revenue, the latter of which is based on market prices and on the producer's yield history.

<sup>41</sup> "2012 Crop insurance update", Rain and Hail Insurance Society, May, 2012.

<sup>42</sup> Other products include Group Risk Income Protection, Livestock Gross Margin, and Rainfall Index, Vegetation Index. For more details on these products, see the website of the US Department of Agriculture at: [www.rma.usda.gov/policies/](http://www.rma.usda.gov/policies/)

Agricultural insurance has grown rapidly in emerging markets, but these markets vary in fundamental ways.

Traditional indemnity-based products face major developmental challenges in some of the key emerging markets.

Agricultural insurance has developed rapidly in emerging markets, where agriculture is a vital part of the economic sector upon which the livelihood of the majority of the population still depends. For example, around 60% of the population in India, Thailand and Vietnam depends on agriculture. Agricultural practices differ considerably among markets, however, with the agricultural sector model in Brazil and Russia, for instance, more closely resembling that of advanced markets, with large-scale farming and the use of modern technologies. As a result, the two countries' agricultural insurance markets mirror those of advanced insurance markets where indemnity-based agricultural insurance products are more common.

In India, China, Southeast Asia, and Africa, small farms are more prevalent and the agricultural sector is often characterised as being underdeveloped with rudimentary supply-chain systems and financial markets. There is also a general lack of awareness of formal insurance among small-scale farmers, to which they have only limited or even no access. Distribution constraints, a lack of agricultural and weather data and the high costs of individual loss assessment tend to limit the development of traditional indemnity-based agricultural insurance products. In some markets, innovative approaches to agricultural insurance such as index-based covers are being explored in addition to indemnity-based products. The box below summarises the development and latest status of agricultural insurance in the Brazilian, Russian, Indian, and Chinese (BRIC) markets.

### **Agricultural insurance market development in BRIC countries**

#### ***Brazil***

Brazil, the world's fifth largest agricultural producer, is a top global player in a number of agribusiness sectors. Major crops include sugar cane, coffee, soybeans, maize and cotton. Brazil's agricultural production represents around 6% of the country's gross domestic product (GDP). The major risks affecting its farmers are drought, excessive rainfall and price volatility. The state supports agriculture with farm credits at preferential conditions, price support and stabilisation mechanisms, agricultural insurance premium subsidies and a government-run insurance fund covering insured losses from catastrophic events.

The Brazilian government is very active in agricultural insurance...

...leaving little incentive for private insurance market players to provide protection.

Brazil was already a pioneer in multi-peril crop insurance (MPCI) in South America in 1953, and the Brazilian government has operated an agricultural activity guarantee programme (PROAGRO) since 1973 that insures small and medium-sized farmers in climate risk zones against credit obligations. With so much state support, only a small amount of agricultural protection was provided through private insurance companies, amounting to about USD 16 million in premiums in 2001. Following two consecutive drought seasons in 2003 and 2004, the government began encouraging agricultural insurance via premium subsidies of up to 50% and made MPCI insurance mandatory for all farmers applying for production credit. However, insurance companies have little incentive to provide catastrophe coverage because to do so they would be obliged to participate in a catastrophe insurance fund with an unfavourable premium-sharing structure.<sup>43</sup>

<sup>43</sup> For example, the premium for the coverage provided by the catastrophe fund is equal to 30% of the profits made in crop, livestock aquaculture, and forestry. Hence, the premium structure provides little incentive for insurance companies to participate. See "Betting the farm? Agricultural risks in Brazil", Swiss Re focus report, 2009, p.6.

Agriculture in Russia is dominated by large-scale, commercial farming.

Compulsory agricultural insurance has been rescinded in Russia, but new regulations have been launched to promote insurance coverage.

Despite the fact that the livelihood of half of the Indian population depends on agriculture, participation in state-run protection schemes was, for a long time, lukewarm.

However, an enhanced scheme launched recently and featuring stronger participation from private sector insurers seems to be more effective.

### **Russia**

Around 80% of all agricultural land in Russia is run by large corporate farmers including the former cooperatives. Subsistence and small-scale farms account for 15% of agricultural land, while the remainder (around 5%) takes the form of small household plots.<sup>44</sup> Although agriculture is an important part of Russia's economy, providing 10% of employment and 4% of GDP, it also faces challenges in the shape of low productivity (relative to advanced markets), a shortage of skilled labour, inadequate management and poor work incentives.

The agricultural insurance market in Russia experienced a major transformation in the early 1990s, when compulsory insurance coverage was abolished to make way for voluntary participation. Voluntary federal coverage was extended to crop insurance in 2006, but fraud, late settlement and unpredictable policies resulted in the low penetration of agricultural insurance. It wasn't until 2009 and 2010 that disastrous droughts made clear the need for a new agricultural insurance system. A new law<sup>45</sup>, in force since 1 January 2012, regulates the terms and conditions of state support in agricultural insurance, aiming to increase the share of insured crops from 10% today to around 70% in the future.<sup>46</sup> The law and its coverage are expected to extend to livestock in 2013 and to fish farming in 2014.

### **India**

The agricultural sector is significant to India's economy, accounting for 19% of GDP and about 15% of total export earnings. Around half of the population depends on agriculture for their livelihood. However, 80% of crop yield variation is attributable to weather, thereby highlighting the importance of agricultural insurance for protection against extreme weather. A state-run crop insurance scheme was introduced in the 1970s, and the National Agricultural Insurance Scheme (NAIS), based on area yield indices, was set up in 1999 to cover a variety of crops and provide access to credit. However, these schemes relied on ex-post funding, straining government budgets and delaying claims settlement. As a result, voluntary take-up was weak and covered only about 6% of the relevant population, leaving approximately 95 million farmers uninsured.<sup>47</sup>

India piloted a modified NAIS scheme (mNAIS) in 2010 and 2011 aimed at improving penetration and pricing accuracy using actuarial calculations and lower settlement levels to reduce basis risk. It moved from ex-post to ex-ante financing through the active participation of private sector insurers and reinsurers. Initial indicators suggest the scheme got off to a strong start, with around 360 000 farmers covered for the 2010 winter crop season across 12 states. Gross premiums in 2010 were USD 10 million, with a total sum insured of over USD 151 million.<sup>48</sup> Most states were covered by mNAIS, but two states chose to purchase protection directly from private insurers and international reinsurers.<sup>49</sup> The weather insurance market in India is also developing quickly, supported by the government-subsidised Weather Based Crop Insurance Scheme (WBCIS).

<sup>44</sup> See "Sowing the seeds for record harvests: risk reduction a must for Russian agriculture", Swiss Re report, 2011.

<sup>45</sup> Federal Law No. 260-FZ.

<sup>46</sup> "Federal law on state support of agricultural insurance", USDA Foreign Agricultural Service, 2011.

<sup>47</sup> Improving farmers' access to Agricultural Insurance in India, Policy Research Working Paper, The World Bank, March 2012. Apart from the 6% voluntary take-up, another 11% purchased covers as compulsory protection.

<sup>48</sup> Source: Department of Financial Services, India.

<sup>49</sup> Improving farmers' access to Agricultural Insurance in India, Policy Research Working Paper, The World Bank, March 2012.

The Chinese government has implemented strong policies to support the development of its agricultural sector.

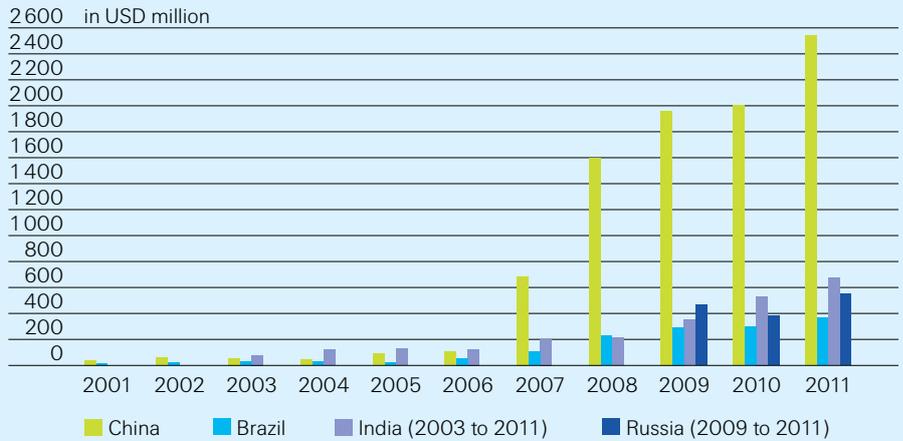
The Chinese agricultural insurance market has grown tremendously since 2007 to become one of the largest among emerging markets.

**China**

China is one of the world’s largest agricultural producers, with its agricultural sector contributing 10% to GDP and generating 40% of the country’s employment. Despite its global significance in the agricultural sector, however, China faces major challenges in meeting its own domestic food requirements and protecting its produce against natural perils such as floods, droughts or typhoons. Therefore, spurred by a significant drop in grain production between 1999 and 2003, the Chinese government undertook a series of actions to bolster agriculture, including increasing subsidies for agricultural inputs and machinery, guaranteeing minimum purchase prices for grain, allowing tax exemptions and providing direct grain subsidies. Developing the agricultural sector has since remained high on the agenda of the Chinese government, which also aims to improve its access to the world’s agricultural commodity markets and raise the economic and social status of its farmers.

Since 2007, the Chinese government has supported farmers with agricultural insurance premium subsidies, thereby making agricultural insurance affordable. The central government subsidises the national MPCl pilot programme, which covers six provinces and a number of major crop types. It also subsidises the livestock programme, covering breeding sows and cattle. In 2012, the pilot programme has been expanded to cover the entire nation and include further crop types such as grains, cotton, oil plants and sugar plants. The central government also plans to design and develop more insurance programmes for forestry, swine and rubber. Additionally, some specialised crops that do not qualify for central government subsidies are supported by provincial government subsidies. As a result of these continuing developments since 2007, agricultural insurance premiums in China have shown spectacular growth of around 70% per year, up from USD 300 million in 2007 to USD 2 500 million in 2011.

Figure 14  
**Agricultural insurance premiums in BRIC markets, 2001 to 2011**



Note: Figures in parentheses denote available data span for India and Russia.  
Sources: National insurance regulation authorities, Swiss Re Economic Research and Consulting.

# Ensuring food security ahead

Agricultural insurance premiums in emerging markets could rise fourfold by 2025.

Despite the recent growth in agricultural insurance premiums and the launch of new insurance programmes across emerging markets, penetration still remains low, so there is significant untapped protection potential. Assuming the continuation of supportive government policies and stable economic growth, agricultural insurance premiums in emerging markets could reach between USD 14 billion and USD 19 billion by 2025, from its current market size of USD 5.2 billion. This translates into an annual nominal premium growth rate of 7% to 10% between 2011 and 2025. The main driver will be providing agricultural insurance coverage for currently uninsured farmland in emerging markets. Food price inflation and productivity gains will also affect insurance exposure.

Numerous hurdles will need to be overcome before agricultural insurance can reach its full potential.

## Challenges for agricultural insurers in emerging markets

There are, however, a number of hurdles that need to be overcome in order to realise the strong growth potential of agricultural insurance in emerging markets. Insurance companies and governments face the tasks of improving demand-side factors, overcoming supply-side constraints, shaping public policies and regulations and building infrastructure and support services. Anecdotal evidence suggests that some of the key challenges that stand in the way of agricultural insurance in emerging markets include a lack of:

- supportive policies and regulatory frameworks
- quality data needed for accurate pricing
- awareness of insurance products among farmers
- distribution channels to remote rural areas
- affordability, requiring insurers to find ever-more cost-effective business models

How to efficiently customise agricultural insurance for individual emerging markets is just one of the questions that needs to be addressed when building sustainable insurance schemes.

Given the complexity of modern agricultural insurance, the approach adopted for each individual market must be customised to the needs of local farmers and take the market's unique characteristics into account. What types of peril should be covered, and should coverage be provided on an area or on an individual basis? Should agricultural insurance be purely market based or compulsory with the support of the government? Insurance challenges such as moral hazard, fraudulent claims and adverse selection often lead to high administrative costs. These need to be managed effectively using innovative measures that include technology such as satellite monitoring or weather stations. The sector also requires specialised agricultural insurance expertise, an efficient claims settlement process and innovative underwriting methodologies to better price the risk exposures and keep premiums affordable. How these and other questions and issues are addressed in each market will determine the long-term sustainability of agricultural insurance in emerging markets.

There are a number of key success factors in overcoming the challenges faced by agricultural insurers.

## Overcoming the challenges

Securing the food supply for the world’s estimated 9 billion people by 2050 remains a major challenge for policymakers globally. The situation is further complicated by the close to one billion poor who currently remain undernourished. There is no doubt that the agricultural sector requires both sustainable development and higher investment to ensure adequate food supply. Support infrastructure also needs significant development to minimise loss and wastage, particularly in emerging markets. For successful and sustainable agricultural insurance programmes in emerging markets, the following ingredients are crucial:

Figure 15  
**Ingredients for successful, sustainable agricultural insurance programmes in emerging markets**



Source: Swiss Re Economic Research and Consulting.

Effective distribution is key to making products accessible to farmers.

- **Access** – A successful insurance programme should be accessible to as many potential policyholders as possible. Reaching remote regions is vital, especially in Africa and Asia, where many small farmers operate in rural areas. Microinsurance has so far been a successful way for local communities and non-governmental organisations to work together to supplement traditional channels. The use of technology will also become increasingly important in reaching remote areas, as recent schemes using mobile and internet technologies have successfully demonstrated.

Stakeholders need to build awareness among farmers to encourage participation.

- **Participation** – Agricultural insurance products should be affordable and relevant to farmers so that they have a high incentive to subscribe to them. Farmers should be willing to pay premiums and participate in programmes over the long term and not just for a year or two. To ensure higher participation, the promotion of awareness of the benefits of insurance protection is needed. From the insurer’s perspective, the objective should be to make insurance products attractive to a wider segment of the population while at the same time successfully dealing with insurance challenges such as adverse selection.

The agricultural insurance business model must be cost-effective to ensure that products are affordable.

- **Cost effectiveness** – Agricultural insurers should aim for efficient distribution networks and increased use of technology to minimise administrative and claims settlement costs. Recent successful insurance programmes in emerging markets have made extensive use of mobile technology and automated weather stations. Remote sensing technology is also being tried for index-based insurance products across the emerging markets. Allianz Re has gone one step further and is developing radar-based remote sensing technology that will not only measure biomass growth but also measure the potential yield of agricultural areas. The technology is expected to bring lower operating costs by simplifying the risk assessment process for insurers and broadening the area that can be covered.

Insurers should strive to base their products on actuarially sound pricing.

Having access to objective, accurate, and timely data is paramount.

Agricultural insurance needs a good infrastructure if it is to thrive.

Emerging market governments play a key role in the growth of agricultural insurance.

- *Actuarially sound pricing* – In order to ensure sustainable insurance programmes, insurance product pricing must be based on actuarially sound principles and not on opportunistic pricing for market penetration. Insurers should strive from the onset to design modular schemes that can achieve both socio-economic and commercial objectives.
- *Data/statistics* – Actuarially sound pricing and fair loss assessments often depend on the objectivity, accuracy and timeliness of weather and yield data.
- *Infrastructure support* – Lack of infrastructure is a major challenge, particularly in emerging markets. Financial services such as credit and banking, logistics, transportation, storage, road networks and the like are critical for effective risk management and agricultural insurance to function.
- *Government support* – It is difficult for the agricultural insurance sector in emerging markets to develop without supportive government policies given that governments and policymakers play an active role in enabling greater participation from the private sector. Through premium subsidies, they can stimulate higher agricultural risk protection uptake from low-income farmers. Enabling policies are also important. There are instances, for example, where local regulators do not recognise index-based agricultural products, hence limiting the growth of agricultural insurance. The regulatory/legal framework, which includes licensing conditions for insurers, agents, loss adjusters, and so forth, needs to be aligned to the development of the agricultural insurance sector. Governments can also provide essential infrastructure and services for the development of the agricultural sector and agricultural insurance, such as building roads or collecting weather and yield data. Yet it is important that government initiatives do not crowd out private participation.

### Alternative agricultural re/insurance arrangements

Alternative agricultural re/insurance arrangements are also an option.

A number of alternative re/insurance arrangements also exist that can provide not only risk protection to farmers and producers, but can also help develop agricultural risk management solutions for governments, communities, public institutions, cooperatives and private institutions. The players may not be directly involved in food production, but the benefits of such arrangements can boost the economic welfare of farmers/producers and ultimately contribute to food security.

Public-private partnerships (PPP), for example, have gained traction in recent years.

#### **Public-private partnerships (PPP)**

Recent developments attest to the success of public private partnerships (PPP) in promoting risk awareness and supplementing government initiatives to support agriculture. A PPP involves the cooperation of government, farmers and the re/insurance industry in managing agricultural risks. Governments provide the necessary legal framework and subsidies, farmers finance part of the risk through insurance premiums, while re/insurers act as the risk carrier and are involved in product development. Government efforts to improve rural financial infrastructure and weather data collection can also help insurers protect local populations against agricultural risk and, by extension, increase local and global food security.

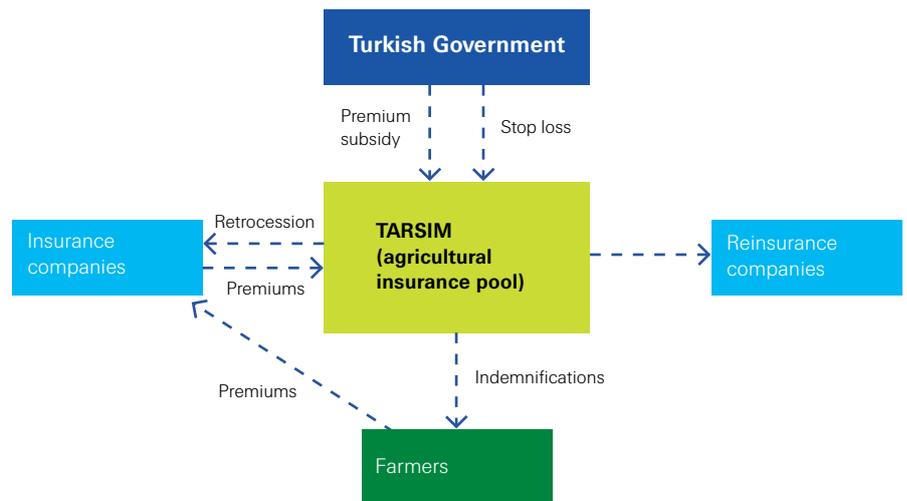
Major PPP successes have been noted in emerging regions.

In Asia, governments are increasingly lending support to the agricultural sector via innovative PPP insurance programmes, such as the large-scale rice insurance PPP schemes in Thailand and Vietnam. In 2011 in Thailand, for example, the government commissioned the General Insurance Association (GIA), Thailand’s non-life private insurers’ association, in partnership with key reinsurers, to develop and implement a rice insurance programme to help manage weather risks. Thailand, the largest rice exporter in the world, has significant flood and drought risks (75% of its arable land depends on rainfall). The Thai government pays premium subsidies and inspects total losses in declared calamity areas, and the Bank for Agriculture and Agricultural Co-operatives (BAAC) sells and distributes the products to around 50 000 farmers. The scheme is a good example of PPP, benefiting from re/insurance, lean distribution costs (via BAAC) and government support and subsidies to provide risk protection to farms against major weather events.

Strong government support is essential for success.

In 2007, Turkey established the TARSIM agricultural insurance pool, which is similar to the Spanish Agroseguros pool.<sup>50</sup> Its attractive, standardised products and close public-private cooperation have driven its successful launch and growth. In Turkey’s state-supported agricultural insurance system (see Figure 16), the government subsidises 50% of all agricultural insurance premiums except those for frost covers, where the subsidy is 66%. As evidence of the pool’s success, the total number of policies sold through the pool more than doubled from 218 938 in 2007 to 587 716 in 2011. Total premiums registered strong annualised growth of 50% (inflation adjusted) during the period of 2007 to 2011 and reached TRY 441 million (USD 260 million) in 2011.

Figure 16  
**Risk transfer mechanisms in the Turkish agricultural insurance pool**



Source: Presentation on Agricultural Insurance in Turkey, TARSIM

More and more governments are turning to reinsurance to protect themselves against agricultural risks.

**Protecting governments from agricultural risks via reinsurance**

Agricultural insurance solutions are also being implemented at the macro level, where reinsurers are helping governments to absorb large losses from natural catastrophes. In China, for example, the Beijing municipal government has collaborated with global re-insurers to develop a catastrophe protection scheme as part of its government-funded agricultural insurance programme. Insurers are responsible for losses below 160% of the annual premium, while reinsurers cover those ranging between 160% and 300% and the Beijing municipal government covers those above 300% under its Agricultural Catastrophe Risk Reserve. Transferring risk to the reinsurance sector can help absorb insurers’ large losses when distributing agricultural insurance under a national programme, thereby encouraging insurers to make agricultural insurance more affordable and accessible to farmers.

<sup>50</sup> See Swiss Re *sigma* 1/2007, “Insurance in emerging markets: sound development; greenfield for agricultural insurance”, page 35.

Lower administration costs and large portfolios are key rationales behind meso-level arrangements.

Microinsurance is a key way to support poor farming populations.

Most microinsurance focuses on life and health risks, but coverage for agricultural risks is increasing.

### ***Meso-level institutional arrangements***

Agricultural re/insurance arrangements also exist at the meso level. Meso-level insurance solutions (usually of an index nature) provide portfolio or group cover to an aggregator which then passes along benefits to its members. The aggregators are institutions (eg banks, microfinance institutions), farmers' associations, input suppliers, non-governmental organisations, etc. The major advantage of such group cover is its lower administration costs. Other potential advantages over individual agricultural insurance products include lower basis risk (for weather insurance products), a lower risk of anti-selection, and the relative efficiency of explaining the workings of insurance products to farmers. A number of meso-level solutions have been implemented in emerging markets across the world including in India (DHAN foundation, Pioneer seeds), Ghana (GIZ and Ghana Insurers Association), the Philippines (Microinsurance Innovation Programme for Social Security) and Haiti (Microinsurance Catastrophe Risk Organisation).<sup>51</sup>

### ***Microinsurance for low-income farmers***

Weather insurance protection is also being offered at the micro level to low-income farmers through microinsurance. Agricultural microinsurance can either be regarded as a category of agricultural insurance or as a delivery mechanism to reach out to low-income farmers in emerging markets. For markets where small farms are prevalent, there is hardly any difference between conventional agricultural insurance products and agricultural microinsurance products. However, a market for agricultural microinsurance products exists in addition to one for conventional products in economies where there is a mix of capital-intensive and small-scale farming.

Agricultural microinsurance products differ from conventional agricultural insurance products in terms of target population, premium-size, coverage limits and distribution. There are several innovative agricultural microinsurance projects under development, such as Kilimo Salama in Kenya, a weather index-based microinsurance programme offering small-scale farmers protection against financial losses due to drought or excess rainfall. The programme uses automated, solar-powered weather stations and a low-cost, mobile phone "pay as you plant" approach that allows farmers to try out insurance and later expand the coverage as they understand the benefits. Through a local agrovet network (agricultural dealer stores), farmers can use their mobile phones for paperless registration, premium payments, and pay-outs. The user-friendly technology reduces transaction costs and enables real-time policy and payment monitoring.<sup>52</sup>

<sup>51</sup> "Value for farmers from meso-level index insurance!", presentation by Micro Insurance Network for the 7th Annual International Microinsurance Conference", Rio de Janeiro, Nov 2011.

<sup>52</sup> <http://kilimosalama.wordpress.com>; Swiss Re *sigma* No 6/2010, "Microinsurance – risk protection for 4 billion people".

Compulsory insurance increases penetration while reducing moral hazard and anti-selection.

Bundling of an insurance product with another product can reduce distribution costs.

### ***Compulsory programmes and bundling of agricultural insurance products***

In markets such as India and the Philippines, crop insurance is compulsory for farmers seeking credit from banks or financial institutions. The same applies in Brazil to farmers seeking loans from state-owned banks. Compulsory agricultural insurance, such as loan-linked agricultural insurance, has multiple benefits. First, compulsory insurance products can be used as collateral for farmers seeking farm credit while helping increase awareness and penetration of agricultural insurance and mitigating adverse selection through wider participation. It can also reduce distribution and transaction costs.

Bundling of agricultural insurance products is another method being explored in emerging markets, either as a tie-up with existing products and services or through already existing distribution networks, to reach out to farmers in rural or remote regions. Agricultural insurance can be bundled, for example, with credit products (through banks or micro-finance institutions) or through input suppliers (via fertiliser stores or seed distributors). In markets where agricultural insurance is not required for credit, insurance products can be bundled with bank credit, thereby expanding the coverage. Reduced transactional and marketing costs are the biggest advantage of agricultural insurance bundling since it leverages the already existing distribution channel of another product or service.

# Conclusion

Ensuring adequate agricultural production is critical for meeting global food security objectives.

Today's food security concerns reflect a growing recognition of the technical and cultural complexities involved in strengthening the agricultural sector and undertaking public and private initiatives. The agricultural sector requires sustainable development and higher-than-ever investment over the next decades to ensure an adequate food supply to meet the needs of an expected global population of over 9 billion people by 2050.

Insurance improves agricultural risk management, promotes output and productivity and supports agricultural investments.

Although it is just one of the many effective measures that can be taken to meet the objectives of food security, insurance is an integral part of an agricultural risk management strategy. The global re/insurance industry can be a partner in enabling the agricultural sector to improve output, increase productivity and reduce revenue volatility. It can also facilitate further investment in the sector and support infrastructure, thereby reducing some of the pressure on global food suppliers.

Agricultural insurance penetration is still very low in emerging markets, indicating its strong growth potential...

Despite recent fast-paced growth in agricultural insurance premiums in emerging markets, penetration remains low compared to advanced markets. While this low penetration reflects the daunting challenge of promoting agricultural insurance in emerging markets, it also indicates its great potential. Properly managed agricultural insurance in emerging markets could grow to three to four times its current market size.

...which can be realized only with the coordinated efforts of multiple stakeholders.

Extending agricultural insurance to emerging markets, particularly to the millions of subsistence and small-scale farmers, will require a multi-stakeholder approach that employs market-based instruments and public-sector initiatives. To ensure high participation and success, agricultural insurance needs to be made accessible and relevant for the majority of farmers. The business model needs to be cost-effective to ensure product affordability, and insurance programmes need to be based on sound actuarial pricing in order to be sustainable. In addition, government participation and the availability of an adequate and efficient support infrastructure are key enablers.

The active role of government as an enabler is extremely helpful in ensuring the further development of the agricultural sector.

Supportive government action will significantly help the development of emerging market agricultural insurance. Governments can play an active role by creating an enabling policy framework, supporting small farmers, developing the necessary infrastructure and promoting holistic and preventative risk management methods at the national, regional and local levels. Governments can also evaluate compulsory agricultural insurance norms and facilitate credit availability, which can in turn help boost investment in the agricultural sector and increase insurance penetration.

Re/insurers can provide risk management solutions at multiple levels, ultimately helping to improve food security.

Re/insurers can provide not only risk protection for farmers and producers, but also agricultural risk management solutions for governments, communities, cooperatives or large public and private institutions. Public-private partnerships, which involve cooperation between the governments, farmers and the re/insurance industry, have been successful in numerous instances in the emerging markets and have gained strong traction in recent years. By leveraging the strengths of different stakeholders, a strong agricultural risk management regime encompassing the use of insurance risk transfer and financing can contribute significantly to increasing farming investment and productivity, ultimately helping the world to meet its challenge in feeding an ever-growing population.

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