SERIE

estudios y perspectivas

SEDE SUBREGIONAL
DE LA CEPAL
EN
MÉXICO

92

Socioeconomic vulnerability to natural disasters in Mexico: rural poor, trade and public response

Sergio O. Saldaña-Zorrilla

NACIONES UNIDAS

CEPAL

Disaster Evaluation Unit

México, D. F., November 2007

This document was prepared by Sergio O. Saldaña-Zorrilla, consultant of Disaster Evaluation Unit, ECLAC/Mexico.

The views expressed in this document, which has been reproduced without formal editing, are those of the author and do not necessarily reflect the views of the Organization.

United Nations Publication
ISSN printed version: 1680-8800 ISSN online version 1684-0364
ISBN: 978-92-1-121661-5
LC/L.2825-P
LC/MEX/L.819
Sales N°: E.07.II.G.155

Printed in United Nations, Mexico, D. F.

Contents

Tables

Boxes

Figures

Abstract

The increasing frequency and economic losses from natural disasters within the framework of decreasing agricultural prices is becoming crucial in increasing poverty in the Mexican rural economy. During the past two decades, the governmental withdrawal from supporting the agricultural sector with investments in physical, financial and logistic instruments continues to stress agricultural livelihoods, as current private mechanisms have not replaced them effectively. Natural disasters occurrence is increasingly producing severe damages to the so-called traditional agriculture, highly exposed to climatic events due to its predominating rainfed cropping practices as well as its high marginalization conditions, especially in the South of the country. Together, it tends to amplify the negative effects from extreme events. This process undermines farmers' incomes given their limitations to increase neither productivity nor cropping land, as well as their overall inability to re-orientate production. This document assesses public response to natural disasters in Mexico, including risk-sharing and loss-transfer instruments. It concludes with a set of policy suggestions to the public sector in order to maximize benefits from the existing governmental programs for adaptation to the increasing natural hazard exposure of the country.

Executive summary

During the past two decades, over 80% of total economic losses from weather-related disasters occurred in the agricultural sector. In the same period, mean weighted agricultural prices have decreased over 50% in real terms, and since 1996 a trade deficit has persisted in this sector. Currently, the insufficient credit access, low coverage of crop insurance, as well as the near lack of investments to expand irrigation and further productive infrastructure is sharpening the vulnerability of rural livelihoods. These facts explain why this sector produces only 4% of the GDP despite employing one-quarter of the national workforce (INEGI, 2005). These facts undermine farmers' expectations of future incomes within the community, stimulating rural-urban out migration, which usually cannot be absorbed by the urban economy in sight of the modest industrial dynamism of the recent years. This leads to the enlargement of the informal sector in large cities and migratory flows to abroad, among others. In addition, climate change is predicted to make these conditions even more challenging. Even slight variations in the climate implies very large costs in Mexico as many places are already close to the upper temperature tolerance of activities such as crop production, what demands immediate adaptation (IPCC, 2007).

The increasing frequency of natural hazards over the past 35 years in Mexico has implied increasing economic losses as well. Hurricanes and floods have been the most damaging disaster type, mostly affecting subsistence farmers, whereas earthquakes have mainly hit the urban poor. Most natural disasters in Mexico have caused destruction of rural assets at large extent in mainly

marginalized regions. In addition, the current productive structure and trade-related hazards in the countryside have contributed to stressful living conditions, amplified by the insufficient response to anticipate negative impacts. Along with the higher exposure of agriculture to droughts, as the case that over three-quarters of agricultural surface in Mexico is rainfed, prevailing asymmetries in coping capacity and access to adaptive instruments in that regions is often observed, as for instance when comparing effects from hurricane Wilma and Stan in 2005 in Cancun and Chiapas, respectively. From its part, approximately 50% of population in Mexico lives in poverty, mostly concentrated in rural areas, with shares as high as 74% of the population (WB, 2002). The *per se* tendency of the poor to settle on disaster-prone areas in urban Mexico is being aggravated by the increasing newcomers from the countryside. Ironically, most these immigrants decided leaving their rural livelihoods as consequence of unfavourable conditions to improve agriculture-derived incomes due to a number of economic and natural hazards.

Along with recurrent natural hazards in this country, the economic environment has contributed to stress agricultural livelihoods. The overall Mexican economy has increased exposure to extern forces as the weight of foreign trade to GDP has increased. In addition to the ongoing deterioration of terms of trade of the agricultural sector, low prices of agricultural goods in Mexico's main trade partners –most likely due to high subsidies-, has resulted in higher agricultural imports, pressing downwards agricultural domestic prices.

Rural incomes tend thus to decrease to those farmers without possibilities to either increase productive yield or to enlarge cropping area, like subsistence farmers. It is leading to reduce subsistence farmers' ability to create a financial pool to face hazards their activities imply, drawing a vicious circle of low income, low coping capacity, lack of climate adaptive instruments (i.e. crop insurance, reserve fund), and higher disasters vulnerability.

Though there are remarkable governmental efforts for moving from programs with transitory effects on incomes to more investments in improving assets of the poor, but improving its results requires a better oriented hazards management. Policy instruments to reduce economic vulnerability of the overall population to hazards are being increasingly implemented. However, as in most disaster prone developing countries, the increasing occurrence of natural disasters exceeds public response. In Mexico, it threatens, particularly, rural livelihoods due to the, so far, insufficient implementation of prevention measures.

Despite their novel design, the insufficient penetration of disaster prevention measures has given rise to the current high reliance on post-disaster measures, allowing the propagation of moral hazard among stakeholders. Insurance, the most implemented *ex ante* instrument for financing disaster risk in Mexico, has decreased both covered area and beneficiaries. Whereas during the 1980s the crop insurance subsidy reached 40% of Mexico's cultivated area, from the 1990s the subsidy has only been relevant to farmers in 10% of cropland. In the 1970s and 1980s, agricultural insurance was inefficient due to a lack of surveillance, high moral hazard, and rent-seeking from some economic agents. Although from 2002 the current crop insurance system presents a financial surplus, but 90% of cropland is uninsured so far. From its part, FAPRACC offers catastrophic insurance to subsistence farmers, but few state governments have contracted it so far, concentrating its expenditure in aid for reconstruction to farmers and leaving exposure to natural hazards unchanged. Investments in mitigation works for infrastructure have been minor.

There is a widespread recognition among federal officials responsible for social programs about the relevance of integrating a strategy for natural disaster reduction in order to meet overall poverty reduction goals. However, states and municipalities only exceptionally make use of the respective federal programs. As federal resources access requires local administrations to carry on risk and vulnerability analysis as mandatory conditioning, too few initiatives have so far been presented. In most cases it is so because of technical and managerial limitations from the municipalities. In other cases due to risk underestimation from the local authority. It follows that

most resources on this matter remain unused. On this regard, the last section of this document presents a set of suggestions addressed to federal, state and municipal authorities.

Introduction

In the light of the increasing frequency and severity of extreme climatic events in Mexico, along with the lack of affordable instruments to hedge most farmers form disaster risk, municipalities of predominantly subsistence farmers cannot leave behind pre-existing marginalization conditions. It keeps them in a vicious circle with high vulnerability, insufficient disasters management instruments, and low incomes. It leads to a complex process which could be avoided if productive conditions and disaster prevention are strengthened.

As natural disasters disrupt production and damage assets, it gives us reasons to presume them to turn into a significant external shock on incomes. However, as damages from disasters differ from country to country in terms of scale, damaged economic activities and coping capacity, the subsequent effect on the whole economic activity is still under debate within the disaster research community. For instance, Albalá (1993) points out the negligible long-term impact of disasters on the economy in developing countries. Other authors find positive relations between frequency of natural disasters and economic growth (Dacy and Kunreuther, 1969); however this conclusion ceases to be valid for Mexico as their analysis is limited to developed economies. Other works consider natural disasters to have a positive effect on the economy as the destruction is biased to the side of obsolete capital stock, pressing for adoption of more efficient technologies, pushing up average industrial productivity and, in turn, production (Skidmore and Toya, 2002).

However, we discard that approach because the historically most affected population in Mexico lives in poverty and is mostly unable to get credit to upgrade their technology. In counterpart, some authors' results show a negative economic development from natural disasters. Some of the case studies are however based on small economies, like Dominica, Fiji, Vietnam and the Philippines (Benson and Clay, 2000). Due to their size, these economies seem too small to be able to draw any conclusion for the Mexican case. Caballeros and Zapata (1995) asses the impact of natural disasters on economic performance in Latin-America, finding that relatively small economies, like Nicaragua, suffer disasters' effects at a greater scale and for a longer period compared to large and more diversified economies. They state the 1985 Mexico City earthquake not have had noticeable long-term negative effects on macroeconomic variables. However, non-major frequent disasters events fall out of that analysis. The present document's research analyzes both minor and major natural disasters, finding natural disasters to have a negligible long-term negative impact on the overall economy of Mexico as well, but in parallel disaster losses spillover over certain economic sectors with a persistent negative impact in particular regions of the country.

Over the past three decades, natural disasters in Mexico have mainly affected the South of the country. This region is especially vulnerable to extreme weather events because of its geographic exposure, low incomes, and greater reliance on climate sensitive sectors such as agriculture. Depressing agricultural producer prices along this region shows signs of increasing poverty and reduces the ability of households to invest in better future and force them to make use of meager savings just for subsistence. In the whole country, only 24% of harvested hectares are irrigated (INEGI, 2006), which reveals the high dependence of agriculture on, each time less usual, benign weather. In sight of the prevailing adverse entitlements system in the country, more notorious in Southern states like Chiapas and Oaxaca, natural disasters-derived losses tend to exceed coping and adaptive capacity. As a response, farmers are increasingly migrating to urban Mexico. However, the limited capacity of the urban economy to absorb additional labor, most likely due to the low industrial dynamism of the last two decades, leads to both slums proliferation in large cities as well as increasing emigration to, mostly, the USA.

Currently, hazard exposure exceeds the public response along, mainly, rural areas. Although disaster preparedness (i.e. monitoring, early warning, etc.) has noteworthy improved from the 1980s, disasters prevention (i.e. mitigation works, insurance, etc.) remains a concern in this country. In practice, public response is too concentrated in *ex post* measures. But even there, delay in indemnities payments is still a challenge.

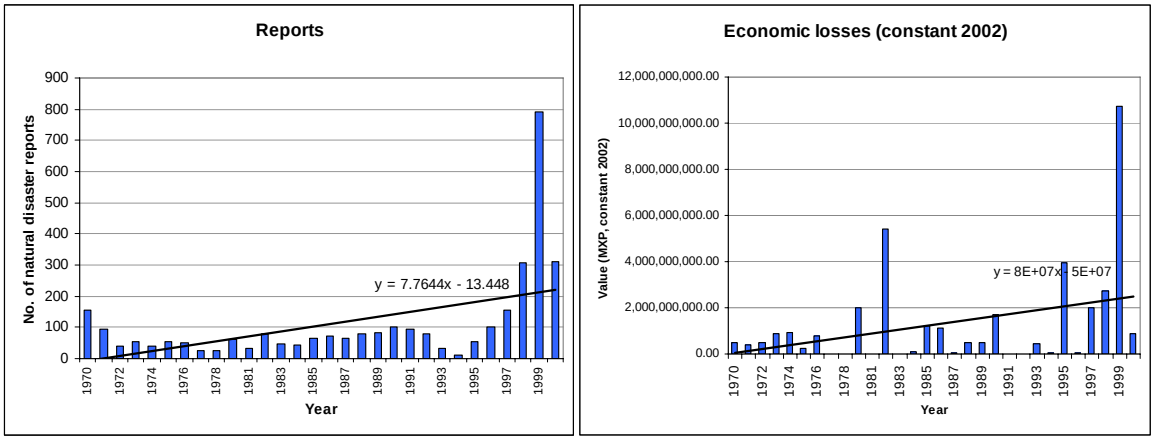
Drawing on evidence from the past and current exposure to natural disasters, Section 1 shows how vulnerable groups are affected in Mexico. Section 2 analyzes the specific weight of natural disasters in the agricultural sector, further assessed in Section 3 when discussing their influence on the poor and on rural-urban emigration in the country. Section 4 discusses the contribution of trade liberalization to increasing economic vulnerability in this country. Section 5 briefly describes key current public programs aimed at copping with disasters in this country, including *ex ante* and *ex post* instruments. Section 6 concludes with a set of suggestions tailored to the three government levels to increasing response and adaptive capacity to face natural disasters.

I. Natural hazards exposure

Mexico is highly exposed to a number of natural hazards. The Pacific Cost of Mexico is located at the so-called *Circum-Pacific-ring of fire* of tectonic activity. Hurricanes are a regular hazard on both the Atlantic and Pacific Costs. Droughts are increasingly affecting the whole country, and in some regions in the North a desertification process has started. Over the past three decades, natural disasters in Mexico have increased both frequency and economic cost (see charts below).

However, significant affectation has been due to weather-related disasters, responsible for approximately two-thirds of economic losses over the period 1980-2005 (see Table 1). As observed in the next section, the weight of hurricanes in total disasters losses has implied 68% of total losses over the same period. Moreover, weather-related extreme events are very likely to increase damages upon human societies as part of the on-going climate change process. Negative impacts are expected to be remarkable on the agricultural sector in Latin-America (Stern 2007 and IPCC, 2007).

Figure 1
FREQUENCY AND ECONOMIC LOSSES FROM NATURAL DISASTERS IN MEXICO, 1970-2000



Source: La Red (2003), SEGOB (2003) and CENAPRED (2001).

1. Hurricane

For its geographic location, Mexico can be hit at the same time by two independent cyclones, namely from the North Atlantic and the North Pacific. Hurricanes have mostly been originated in the Caribbean Sea and the Central American Pacific Cost, intensifying while moving into Mexican territory. For instance, in 1982 Hurricane Paul moved over the Pacific from El Salvador and Guatemala, upgraded from tropical storm in these countries to a 100 mph hurricane once in Mexican territory.[1] In 1997, Hurricane Pauline caused floods and mudslides, whipping up strong waves and currents with devastating effects across the coastline of Oaxaca and Guerrero. Alone in Acapulco, it killed over 200 people and caused over 400 millions of dollars of the United States to public assets (see Table 2). This region's uneven topography contributed to flooding and landslides following the hurricane. This calamity evidenced the rapid and wrong projected urbanization process in large costal cities of the recent years, which has led to increase potential economic and human losses from extreme climatic events.

The 2005 hurricane season. Munich Re said the 2005 hurricane season to be the all times most costly (Munich Re, 2005). Mexico got severely damaged by hurricanes in that season, particularly on the southeast of the country, where hurricanes Emily, Wilma and Stan hit within 3 months. Damages from Emily and Wilma accrued to mainly the tourist sector, whereas Stan hit mainly the poor in both urban and rural areas.

Emily made landfall on the Yucatan Peninsula on 18 July, provoking the evacuation of around 130,000 tourists from luxury beachfront hotels in the resort city of Cancun. The storm produced heavy rains and winds, demolishing buildings, triggering floods and affecting especially the tourism. Almost 3 months later, hurricane Wilma destroyed thousands of homes and hotels and flooded luxury hotels and resorts (Guy Carpenter, 2006).

[1] The Southeast of Mexico shares with Central America and Caribbean countries not only the above presented high hurricanes and earthquakes affectation, but also the fact that disaster-vulnerable population is highly poor. Affected population in Mexico are usually located in southeast states, which, as in Central American and Caribbean countries, are subsistence farmers without access to credit, with low crop insurance coverage, and working small farms. Although most the times these countries are hit by the same hurricane, relative higher economic losses and calamities occur in Central America and the Caribbean compared to Mexico. It is so particularly due to differences in coping and adaptive capacity among them.

Table 1
LOSSES FROM DISASTERS IN MEXICO, 1980-2005
(Losses in current millions of dollars)

Disaster type	Direct losses	Indirect losses	Total losses	As % of total
Weather	9 276	145	9 421	62
Geologic	4 044	517	4 561	30
Human	1 150	134	1 284	8
Total	14 430	796	15 226	100

Source: CENAPRED-ECLAC (2006), Guy Carpenter (2006), SEGOB (2003) and CENAPRED (2001).

In October 2005, hurricane Stan passed over the Peninsula of Yucatan, but derived climatic events caused dramatic human and economic losses rather hundreds of kilometers to the South in especially marginalized areas. Hurricane Stan itself was not as damaging as its derived strong winds, floodings and mudslides on Chiapas, Oaxaca and Veracruz, killing 42 people and destroying assets of over one million of people, exceeding 2,000 millions of dollars in direct losses. In Guatemala, losses from the events Stan triggered were higher in terms of human fatalities (1,400 dead), but lesser in economic losses, aproximately 1,000 millions of dollars. Nevertheless, losses in Mexico compared to national GDP are equivalent to 0.002%, whereas in Guatemala it reached 3.5% of GDP.

Table 2
MAJOR HURRICANES IN MEXICO, 1980-2005
(Losses in current millions of dollars)

Year	Hurricane	Economic losses a/
1982	Paul	82
1988	Gilbert	597
1990	Diana	91
1993	Gert	114
1995	Opal	151
1997	Paulina	448
2002	Isidore b/	235
2005	Emily	845
2005	Wilma	1 788
2005	Stan	2 006
Losses 1980-2000		6 357

Source: Period 2002-2005: data from CENAPRED-ECLAC (2006) and Guy Carpenter (2003, 2006); 1980-2001 SEGOB (2002).

a/ Period 1980-2000 are estimates of losses to exclusively public assets.

b/ Losses estimated at 50% total economic losses reported from Guy Carpenter in Mexico and the USA from Isidore.

2. Floods

While flooding caused by rivers overflowing their banks occurs almost once a year in Mexico (especially in summer), flooding from heavy rainfall occur permanently, causing erosion, landslides, and severe damage to housing, agriculture, livestock and public infrastructure. Floods category comprises river overflowing and heavy rainfalls only as they are cause of flooding.

Flooding is naturally less frequent in semi-arid regions, but however it can be particularly devastating when it does occur there.[2]

Heavy rains alone rarely cause floods. Soil erosion caused by deforestation, inadequate agricultural practices, and increasing urbanization, contributes to increasing the floods risk. Despite considerable investments in drainage infrastructure, Mexico City experience losses every year from flash flooding.

The occurrence of flooding is increasing in recently urbanized plain areas as change in land use broaden the capture of rainfall, producing flows that the natural basin cannot cope with. The loss from flooding in Mexico has been high. Alone between 1970 and 1990 more than 1,800 people died and about 7,700 millions of dollars in economic losses are estimated to be incurred from over 1,000 floods events in Mexico (LaRed, 2002 and Kreimer, 1999). In September 1998, floods and landslides strike dramatically the state of Chiapas. It devastated huge extensions in costal areas, left some 800,000 people homeless (25% of Chiapas population), and caused more than 200 fatalities. The most immediate problem was to reach the (isolated) areas affected for the flooding to provide aid relief and reconstruction to rehabilitate destroyed transport and telecommunication infrastructure. Other Mexican states affected by the torrential rains on that year were Guerrero, Morelos, Oaxaca, Guanajuato and Nayarit, which in turn are considered highly prone zones to landslides.

3. Earthquake

Historically, a number of large earthquakes have occurred within the Trans-Mexico Volcanic Belt, located approximately at 20˚ N latitude. This area runs from west to east, and its high tectonic activity is accompanied of active volcanic and faulting. Some of the largest earthquakes in recent history –like the 8.1 and 8.0 Richter degrees Michoacan and Colima earthquakes in 1985 and 1995, respectively- originated in this region and spread across the pacific cost (Manea and others, 2004).

Most seismic activity in Mexico is related to the active tectonic boundaries between the North America and the Pacific and Cocos plates (Manea and others, 2004). A northern boundary that accommodates friction between the North America and Pacific plates runs beneath the Gulf of California and runs southward parallel to the Pacific cost of Mexico (WB-Guy Carpenter, 2000). This area is part of the called *circum-Pacific Ring of Fire*, which draws a circle along Eastern Oceania's Islands, Asian Pacific, and North and Central American Pacific costs.

Further significant earthquakes, recorded in the recent times, have been originated in this area as well, like in January 30, 1973 (magnitude 7,5), November 29, 1978 (magnitude 7,8), March 14, 1979 (magnitude 7,6) and September 19, 1985 (magnitude 8.1) (CENAPRED, 2001). In general, these earthquakes' epicenters are located on seismic gaps, that is, on places where at least one strong earthquake has stunned in the past, but where no earthquake has taken place for a long time (WB-Guy Carpenter-IIASA, 2000). A natural hazards survey by the World Bank, IIASA and Guy Carpenter, reckons that Mexico can expect a 6.5 Richter degree or greater earthquakes every two years, a magnitude 7,0 or greater about every ten years, and a magnitude 8.0 or grater about every 33 years (WB-Guy Carpenter, 2000).

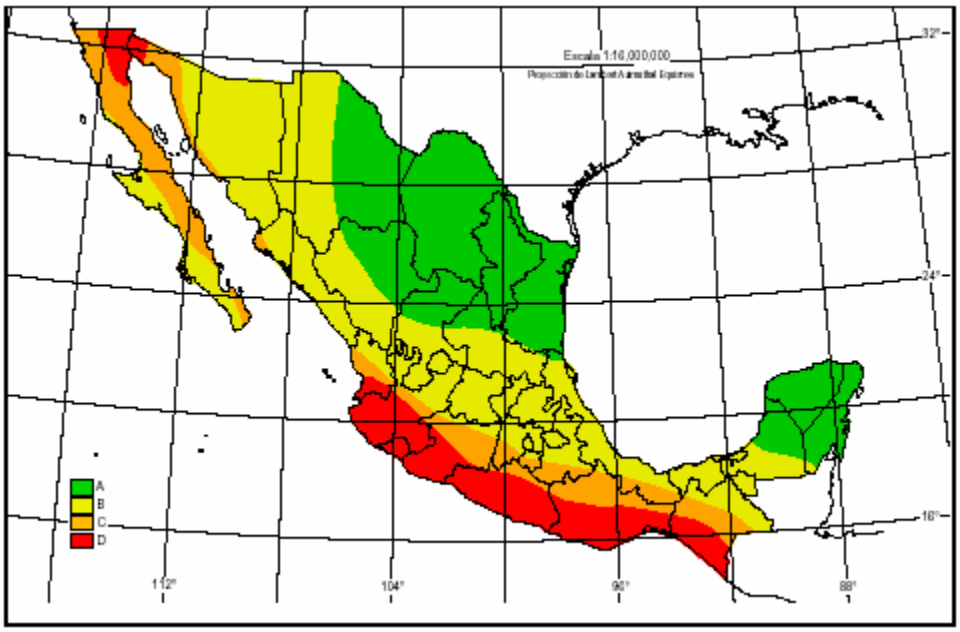
As observed in Figure 2, CENAPRED has elaborated a Seismic Map of Mexico based on historic registers of major earthquakes in Mexico and on data of terrain acceleration from major earthquakes. The map shows four zones: Zone A represents areas without seismic activity over the last 80 years, which terrain acceleration is expected to keep below 10%. Zone D is the area with

[2] As in the arid region of Monterrey in 1998 (CENAPRED, 2001).

high earthquake frequency, whose acceleration exceeds 70%. Zones B and C are mid-intensity regions.

Over 50% of Zone A (most prone to earthquakes) is located along Mexico's poorest states: Oaxaca, Chiapas and Guerrero (see Figure 2), recurrently hit by hurricanes and floods as well. These states are historically characterized by having Mexico's lowest *per capita* income, highest illiteracy rates, and the least health facilities in Mexico –and so on for most social indicatos. Precisely, all Guerrilla movements after the Mexican Revolution of 1910 have popped up on these three states, i.e. *Lucio Cabañas* Guerrilla in Guerrero during the 1970s, *Ejército Zapatista de Liberación Nacional* (EZLN) in Chiapas since 1994, *Ejército Popular Revolucionario* (EPR) and *Ejército Revolucionario del Pueblo Insurgente* (ERPI) in Guerrero and Oaxaca from 1995.

Figure 2
SEISMIC MAP OF MEXICO



Source: CENAPRED (2001).

Michoacan (or Mexico City) Earthquake. In 1985, the Michoacan earthquake caused severe damage and collapse of high-rise construction in Mexico City even despite its long distance from the epicenter (see map above). It is said to be so due to the fact that the period of vibration of deep lacustrine soils beneath Mexico City coincided with the fundamental period of many high-rise buildings. This earthquake produced 4,104 millions of dollars in economic losses, the most costly earthquake during the analyzed period (see Table 3). This event generated relevant social and politic changes in some cases, and accelerated other existing ones (see Box 1).

4. Volcanoes

As a result of the collision between the North America and the Pacific and Cocos plates, dozens of volcanoes are distributed along Mexican territory, but especially on the Trans-Mexico Volcanic

Belt (*Cordillera Neovolcánica,* see Figure 2), which defines the geomorphologic boundary between North and Central America.[3] In fact, 14 of these volcanoes have erupted in recent history.

Table 3
EARTHQUAKES IN MEXICO, 1980-2001
(Losses in current millions of dollars)

Earthquake	Dead	Direct losses	Indirect losses	Total losses
Mexico City 1985	6 000	3 589	515	4 104
Colima 1995	0	21.1	-	21
Oaxaca, Puebla and Morelos, June 1999	15	151	0	151
Oaxaca, September 1999	35	153.6	1.4	155
Guerrero 2001	0	2.9	-	3

Source: CENAPRED (2001), Ministry of the Interior, Mexico.

Box 1

POLITICAL CHANGES CATALYZED BY THE MICHOACAN 1985 EARTHQUAKE

The 1985 Michoacán earthquake in Mexico City caused 89% of total geologic losses over the period 1980-1999. Official assessments reckon losses at over 4,000 millions of dollars (CENAPRED, 2001). However, other sources consider this amount to be imprecise as, they state, the Mexican government over-inflated damage figures as a lever to relax IMF conditions for reconstruction loans (Albalá 1993, Proceso, 1995). By contrary, they presume the number of fatalities to have been underestimated in order to avoid the army of undertaking the emergency control, as stated in Mexican law[4] (Castillo, 1985). The students' genocide of 1968 in Mexico City (Tlaltelolco) might be behind that. Since then, military intervention is believed to irritate civil society in Mexico, which had put additional tension to the disaster itself.

This earthquake is commonly considered to have catalyzed Mexico's recent history. It undermined the image of the Federal government as warrant of national security in the country due to the delay and badly coordinated response (Monsiváis, 1987), as well as due to the governmental corruption evidenced through constructions approved by the authority despite not fulfilling buildings codes requirements (Castillo, 1985 and Ramírez, 2005). Since this disaster, corruption started to be perceived in this country beyond the economic burden and the public moral issue it is, but also as a factor of risk to citizens' life. The insufficient governmental preparedness and response to this disaster led the civil society to undertake rescue, cleaning up, and relief operations by themselves (Ramírez, 2005 and Monsiváis, 1987). It generated a collective feeling of absent state and led to crucial political transformations.

The political bill of such insufficient response was paid in the upcoming national elections of 1988. Likely influenced by these events, the hegemonic PRI –the ruling party since 1929-, split. *Corriente Democrática*, an intern organization of PRI, joint the leftist PSUM party, which obtained a gigantic electoral triumph in 1988, which included dozens of seats in the federal congress and municipal governments –and perhaps the presidency of the republic as well. In any case, that political change proved having contributed to the fast electoral growth of the opposition in the oncoming years as the congress reached a real multiparty representation six year later, leaving behind the *de facto* one-party political system of the previous six decades and facilitating the ongoing democratic transition process.

[3] In geomorphologic terms, the Trans-Mexico Volcanic Belt defines the boundary between the North American *Rocky Mountains-Sierra Madre Occidental* system, and the Mesoamerican *Sierra Madre del Sur- Sierra Madre de Chiapas*.

[4] Plan DN-III-E, Art. 42, Ley Orgánica del Ejército y Fuerza Aérea Mexicanos.

The most recent volcano eruption that resulted in catastrophic losses in Mexico was *El Chichonal* (State of Chiapas) in 1982, which completely destroyed eight communities and claimed 2,000 lives. The eruption lasted nearly six hours and caused severe damages to crops, cattle, and cultivable land within a 50-kilometer radius (Kreimer and others, 1999). Between 1993 and 1998, volcanoes P*opocatépetl*, *Colima*, *Tacaná*, and *Everman* have registered activity. According to seismographers from the National Autonomous University of Mexico (UNAM), a major eruption of *Popocatépetl* would affect thousands of people in settlements within a 20-30 kilometer radius (CENAPRED, 2001). As this volcano is located 64 km from Mexico City –where over a fifth of the ational population lives-, its activity is being carefully monitored for preparedness sake, including evacuation measures for communities in the vulnerable area.

5. Droughts

In Mexico, only around 24% of harvested hectares is irrigated (ECLAC, 2006 and INEGI, 2003). It reveals a high dependence of agricultural production from meteorological phenomena. Lack of water in form of droughts, forest fires, and high temperatures damaged over 36 million of crops hectares over the period 1970-2002 (García and Parra, 2002), which means 18 fold total cultivated surface in Mexico in 2002. Alone in the 1980s, economic losses from droughts reached 1,200 millions of dollars (CENAPRED, 2001).

II. Hazard exposure of agriculture

A significant share of the Mexican population is strongly dependent on natural disasters linked to the climate, and patterns of income distribution and poverty exacerbate the impact of climate extremes. The severity of the effect of natural disasters on regional incomes depends in part on the concentration of activity in climate-sensitive sectors, such as agriculture. Though the agricultural sector in Mexico contributes with only 4% of GDP (compared to 68% from services, 28% from industry), but this sector employs around one quarter of the national workforce (INEGI, 2004). Given current levels of rainfed agriculture, this sector is highly vulnerable to droughts: approximately 80% of cultivated area has no access to irrigation infrastructure. The 82 major weather-related events that have struck between 1980 and 2002 damaged mostly agriculture disrupting rural incomes.

With data from La Red (2004), the graphic above shows the distribution of 6,296 disasters (natural and anthropogenic) in Mexico over the period 1970-2001. Over one third of them are events caused by excess of water (floods, heavy rains, storms, etc.), whereas lack of water represented 18% of total events. Floods are the most frequently reported event (blue bar, over 1,112 reports), followed by fires (828 reports) and frosts (407).[5] Although other natural disasters have damaged less spectacularly, they have been more frequent. For

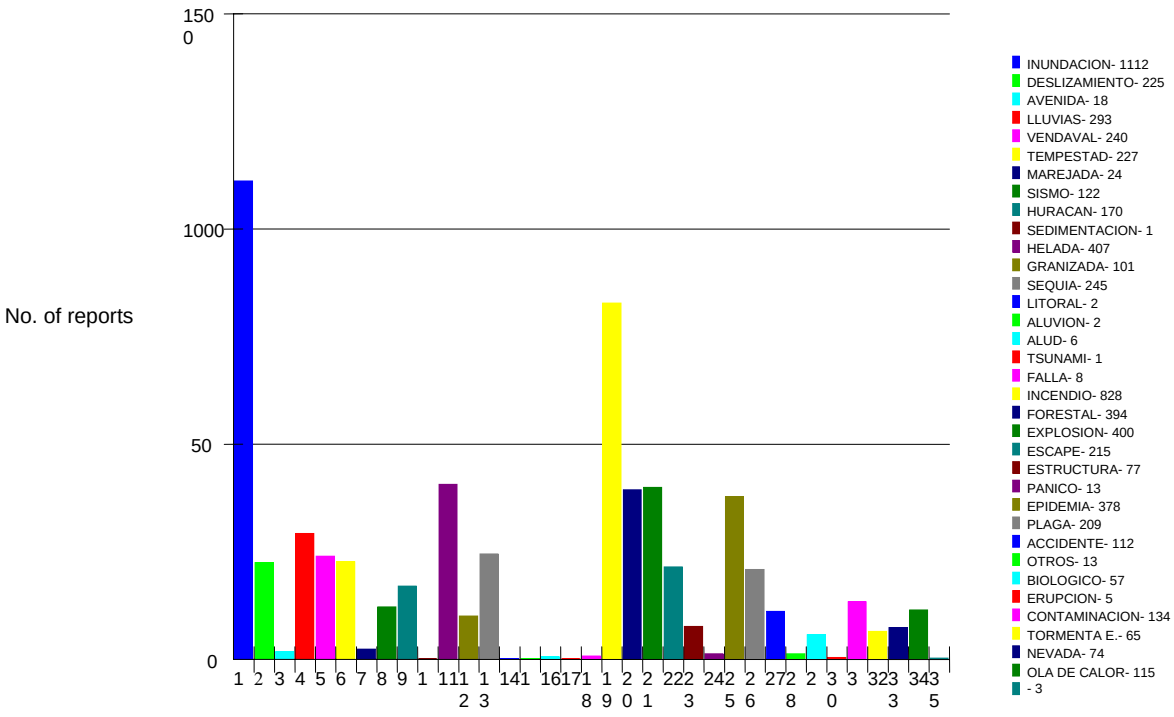
[5] This data basis has been created by Desinventar (DesenRedando, La Red, Mexico, 2003) by collecting reports from media, especially from three Newspapers for the Mexican case: El Universal, La Jornada, and Excélsior. Given that fact, data arising from Desinventar must to be carefully employed, since in detailed analysis some data may be incomplete, leading to either over- or underestimate losses due to its journalist nature. However, it is helpful to get general pictures of disasters. It also provides good approaches on magnitudes and disaster frequency. Amount of losses are still controversial, since they vary widely among observations, and rarely coincide with other sources.

instance, frost has permanently damaged the agricultural sector, accumulating 95,910 millions of pesos over the period 1979-1988, followed by hailstorms (30,153 millions of pesos) (CENAPRED, 2001).

Every time a hurricane strikes, most damages are located in agriculture. Thanks to reports from La Red (2003), we know that natural disasters affectation in agriculture over the past 35 years has mostly affected assets of poor and extreme poor farmers.

Figure 3
DISASTERS IN MEXICO 1970-2000 BY KIND OF EVENT

(Reports of disasters)



Source: La Red (2004).

1) In 1982, Hurricane Paul and its derived floods caused 7,4 millions of pesos in direct losses to the agriculture, equal to 70% of total losses from this event.

2) Floods in 1985 hit Mexico, and 85% of total losses were located in agriculture, damaging especially crops. In the same year, heavy rains caused losses at 4,177 millions of pesos, 97% in agriculture (infrastructure and crops).

3) In 1988, Hurricane Gilbert hit severely Peninsula of Yucatan and North-eastern Mexico, damaging the whole local economy. Losses in the agriculture sector reached 86% of total losses (US $ 65 mill.). During the same year, three more hurricanes hit Mexico causing economic losses to crops three fold Gilbert's losses (CAN, 1998 and CENAPRED, 2001).

4) In 1997, hurricane Paulina hit Oaxaca and Chiapas (the poorest Mexican states), sparking off severe damages on the whole economic activity and housing, but 88% of total losses accrued to agriculture and livestock.

5) Agricultural losses from climatic events repeated in 1998 in Chiapas and Oaxaca again, though more dramatically in the former. Heavy rains caused landslides and avalanches from the southern mountains of Chiapas to the cost. This disaster buried dozens of communities, destroyed 712 km of asphalted roads and over 50% of rural roads of the state (3,600 Km.), 22 bridges, among others. Over 25% of total infrastructure of Chiapas was totally destroyed. Losses reached 603 millions of dollars, equal to 9.3% of Chiapas GDP in that year.

6) In 1999, heavy rains continued damaging agriculture in Southern Mexico. Several poor communities in the states of Puebla, Veracruz and Tabasco were severely affected by heavy rains. Inhabitants of these communities survive historically of agricultural activities, and 66% of total losses accrued to rural infrastructure and crops of small-scale producers (1,767 millions of pesos; Bitrán, 2002).

7) The 2005 hurricane season exceeded, by far, historic records of economic losses in the agricultural sector. In the southeast of the country, hurricanes Stan and Wilma destroyed both small and large-scale plantations, crops and livestock, whose losses exceeded 400 millions of dollars.

III. Relative socioeconomic vulnerability of the poor and the south of the country

This document defines socioeconomic vulnerability as the susceptibility of an economic agent to absorb extern shocks (hazards) negatively, given its assets possession and entitlements system (coping capacity), as well as its implemented risk management and protection measures (adaptive capacity).Though being poor does not necessarily imply being vulnerable, but poverty makes individuals relatively more vulnerable to a given hazard. Adverse economic conditions make individuals less able to invest in all items, including those to manage risk and increase disasters protection. Developing countries have historically been more severely damaged relative to developed countries (Benson and Clay, 2000). In absolute terms, total economic losses tend to be higher in rich countries, but compared to economy value, losses are much higher in developing countries (see Freeman and Mechler, 2001). A given natural hazard with identical intensity can hit in different degree two distinct countries. Differences in civil protection system, health facilities and public financial ability (i.e. for reconstruction) make countries to absorb hazards differently. For instance, the same hurricane hit the Dominican Republic and Haiti in 2004, but it caused economic losses five fold higher in Haiti. It reflects differences in development stages among these two countries as well. As Cannon (1994: 24-26) points out, what turns a natural hazard into a disaster is not simply a question of money, but also of economic and political system. The way countries structure societies determines that similar hazard lead to very different impacts among societies.

1. Hazard exposure of the poor

As in many developing countries, most Latin-American countries present a disaster risk distribution of human assets biased against the poor. The most productive and safe terrains belong to middle- and upper classes, whereas less productive and/or unsafe areas have been left to the poor. For instance, most of the victims of Guatemala's Earthquake in 1976 were poor (23,000 deaths), living in highly earthquake- and landslide-prone ravines and gorges. From its part, the river Oder, which divides Germany from Poland, overflowed in 1997 producing severe floods. Lack of maintenance of dykes and flood defenses, along with settlements of the poor on the polish side, led to higher losses there than on the German side (Vatsa and Krimgold, 2000). That reveals, on the one hand, budgetary differences to mitigate disasters between these countries. On the other hand, it reflects differences in living conditions within population in these countries since in both Germany and Poland assets of lower incomes people got more affected. Additional evidence in the same way is found in Honduras with hurricane Mitch (Vatsa and Krimgold, 2000), El Salvador Earthquake in 2001 (ECLAC, 2001c), Dominican Republic with hurricane Georges (Butterfield, 1998), the USA when hurricane Kathrina hit in 2005 (Zapata, 2006), and so on and so forth.

2. Differences in coping and adaptive capacity

As observed in section 1, hurricanes Wilma and Stan affected the Yucatan Peninsula and Chiapas in 2005, with relatively higher damage to assets of the poor. Economic losses from Wilma exceeded 1,700 millions of dollars, while those from Stan in Chiapas were at 2,000 millions of dollars. However, crucial differences in terms of coping and adaptive capacity led to divergent outcomes. Coping capacity can be defined as the ability of a unit to respond to a harm occurrence as well as to avoid its potential affectation. Adaptive capacity is the ability of a unit to gradually transform its structure, functioning or organization to survive under hazards threatening its existence (Kelly and Adger, 2000). The adaptive capacity of affected population from Wilma in Yucatan proved to be much higher, as over 50% were insured losses (Guy Carpenter, 2006). It was so, especially because most losses from Wilma took place in Cancun, damaging luxury hotels and resorts. By contrast, losses derived from Stan were totally uninsured, affecting basically assets of the poor both in marginalized slums in urban areas (i.e. Las Américas in Tapachula) and in subsistence farmers regions (i.e. Escuintla, Mapastepec, Cacahoatan). As pointed out by Zapata (2006:22), the social effects upon these poor regions are remarkable and will have to face negative consequences for a longer term than those in Quintana Roo.

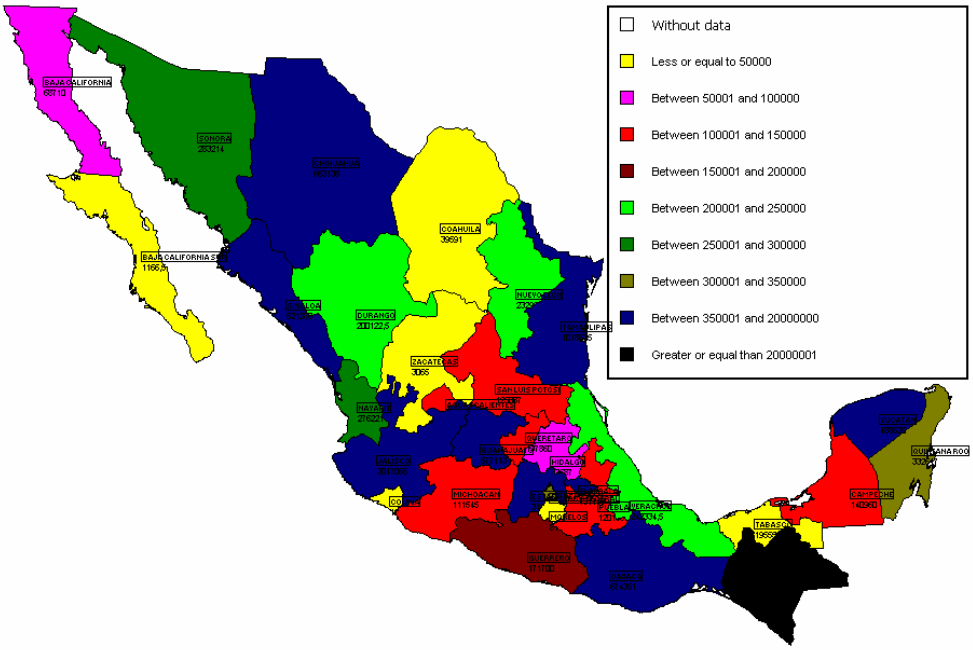
3. Spatial distribution of agricultural losses

The map below plots 1,372 reported events on agriculture affectation in Mexico over the period 1970-2001. The map is divided in states, colors represent ranges of damages. As observed, the most damaged state is Chiapas, followed by Oaxaca –in turn, Mexico's poorer states- and Yucatan, all they in the South. The 2003 poverty report of the Mexican government points out that Chiapas is the poorest state of Mexico, both in terms of GDP per capita as well as in social indicators. In addition, the development gap between Chiapas and the other states of Mexico is continuously enlarging (WB, 2003).

Assets of the poor. Increasingly, scholars argue that poverty is not only a lack of income or consumption, but also a lack of assets (Haveman and Wolff 2000, Oliver and Shapiro 1990). Assets are the key variable to understand households' impoverishment, which Vatsa and Krimgold (2000) define as the stock of wealth used to generate well-being. This concept is important when considering the effects of natural disasters, which may decrease the capital assets of households and

businesses and subsequently reduce the possibilities for them to generate income/outcome. The output also varies widely, depending on market price of the produced factor, and on the productivity of its use (profitability). As families pursue strategies to maximize their assets, they are in a better position to spread their risk to reduce their vulnerability. Among other authors, Chambers (1989) cautions about the relevance of increasing assets in low-income families, since this improves human conditions beyond poverty in terms of not only flows, but also structural vulnerability. For authors like Vatsa and Krimgold (2000), vulnerability is a broader and more dynamic concept, which involves the poor, but also households living above the poverty line at risk of falling below in case of an income shock (new poor). Factors that obstruct asset accumulation are, in turn, impeding poverty reduction and putting additional population into poverty. The figure below shows that most poverty increases during the 1990s in Mexico took place throughout those regions relatively more affected by natural disasters.

Figure 4
DAMAGED HECTARES DUE TO NATURAL DISASTERS IN MEXICO BY STATE (1970-2000)



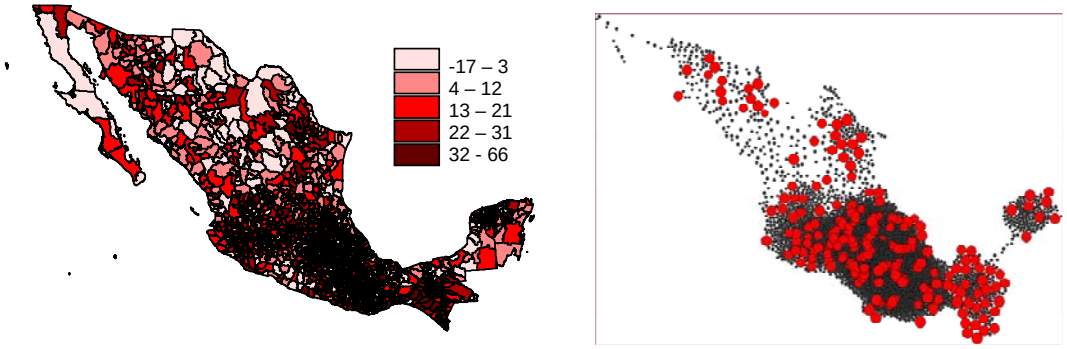
Source: La Red (2004).

4. Emigration as response to disasters vulnerability in rural areas

Given adverse entitlements system and assets distribution, losses from natural disasters in the Mexican countryside tend to exceed rural coping and adaptive capacity and so to terminate rural livelihoods, triggering domestic rural-urban and abroad emigration. Lack of support for the countryside and agriculture, as well as inappropriate urban projecting in large cities in Mexico has contributed to increasing urban vulnerability after the 1950s. As an efficient strategy for agriculture

and rural areas was not successfully undertaken, rural workers have been massively migrating to especially large domestic cities, i.e. Mexico City, Monterrey, Guadalajara, and Tijuana, building irregular settlements (mostly slums) on areas very prone to natural disasters as well. Out migration from Mexico to other countries has increased over the past two decades. The Population Census of 1990 reports that 0.24% of Mexican population was residing abroad, whereas in the 2000 Census this figure rose to 0.41% (INEGI, 2005).

Figure 5
SPATIAL CLUSTER OF IMPOVERISHMENT WITH DISASTER LOSSES



During the period 1990-2000, poverty increased particularly in the South and Center of the country, where economic losses from natural disasters have been higher.

Left: Percent increase in share of municipal population living with less than 2 dollars a day (1990/2000).

Right: Cartogram of economic losses from natural disasters 1991-2000. Red circles represent disasters events exceeding 500,000 dollars (2002 prices). *Author's estimations and plotting with data from INEGI, La Red and CENAPRED.*

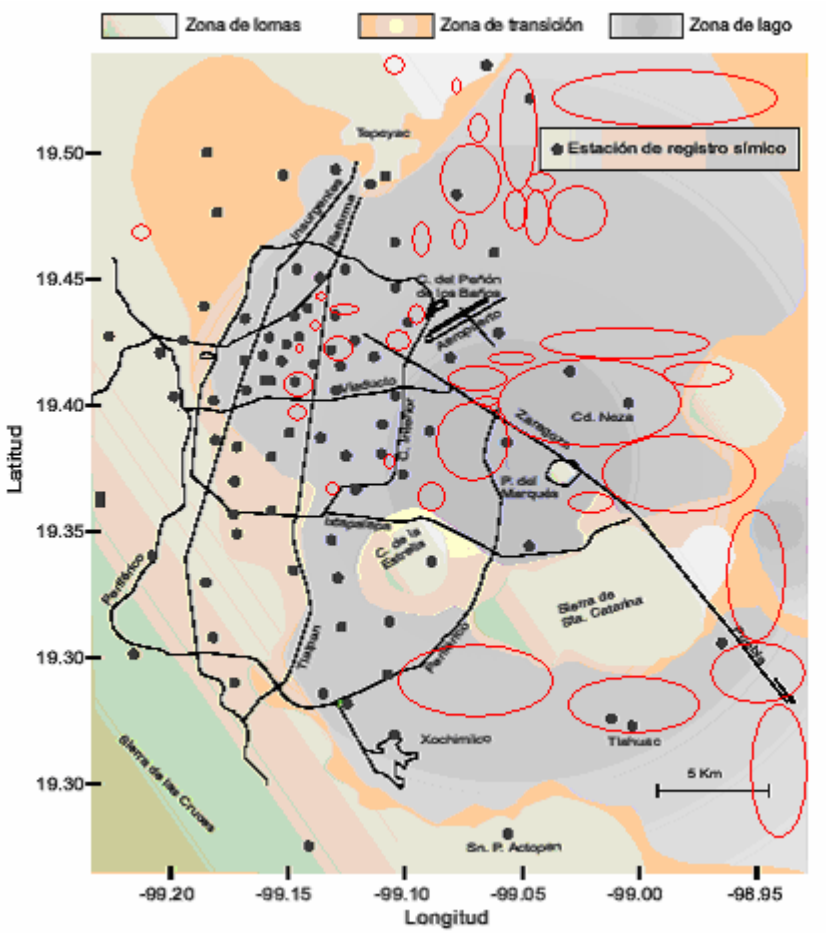
Most theories of rural-urban migration embracing slums concentrations in urban areas (Lewis, 1954, Fei and Ranis, 1964, Todaro, 2000) find labor market failures there due to (1) incapacity of agriculture to reabsorb rural workers together with its respective low-income (productivity), and (2) insufficient industrial development in the cities. For Todaro (2000: 305), migration is primarily an economic phenomenon, which for the individual migrant can be a quite rational decision despite the existence of urban unemployment. The Todaro model postulates that migration proceeds in response to urban-rural differences in expected incomes rather than actual earnings. That decision is taken in order to maximize their expected gains in life and, for a given time horizon the urban sector results more convenient. In that sense, as natural disasters reduces future incomes expectations from agricultural activities, it stimulates in turn slums growing as well. In line with that, a survey to assess natural disasters impacts in Chiapas found that those communities more recurrently affected by natural disasters tend to increase emigrants rates even more than those communities comparatively poorer (Saldaña, 2006b).

a) Domestic migratory flows

Massive rural-urban migration due to, mainly, adverse productive conditions in the Mexican agricultural sector along with the lack of effective urban regulation during the past four decades has led to the current slums proliferation. It has increased the *per se* disasters risk in a number of Mexican cities. The nature of the Mexican economy is dualistic, since in general terms exists a modern urban capitalist sector geared toward capital-intensive of large-scale production, coexisting with a traditional rural subsistence sector geared toward labor-intensive of small-scale production. In the same way, this dualism is observed in the urban economy, which divides into formal and informal sectors. In Mexico City, for instance, estimated share of urban labor force in the informal sector is 57%, and slums as percentage of population is reckoned to be 46 (ECLAC, 2003). The

most disaster-prone areas are populated by the poor. Socio-economic maps of Mexico City show the poor located predominantly on the East side, wider as moving southwards (INEGI, 2005), whereas richest areas are located on the West side, wider as moving to the South. The central part presents a mixture of incomes. This *bell-shaped* spatial distribution of incomes overlaps with the risk distribution to floods, landslides and earthquakes. Figure 10 below relates zones at high risk to earthquake in Mexico City with slums location. Violet color represents areas whose underneath is the lake Tenochtitlan. The severe damage and collapse historically experimented on this area has occurred due to the accelerating vibration of deep soils beneath (resonance effect) the lake, as in 1985 when the Michoacan earthquake hit Mexico City. Red circles represent slums and very poor areas, mostly located upon this high-risk area.

Figure 6
EARTHQUAKE RISK IN MEXICO CITY AND SLUMS DISTRIBUTION



Source: CENAPRED (2001) and INEGI (2005).

b) International migratory flows

About one-quarter of Mexico's labor force is still employed in agriculture, and as conditions in the countryside continue to worse, rural workers do not have incentives to stop out migration not only to urban Mexico, but also to urban and rural USA (Robinson and others, 1995). Mexico is the first country of origin of migrants to the USA, where roughly 1 out of 3 migrants was born in Mexico, integrating the first majority migrating community in the USA. It is so in 31 of the 50 states of the

American Union as well (Center of Migration Studies of Washington 2003, US Census Bureau 2002).

IV. Trade liberalization

The previous sections discussed the relevance of natural hazards to the agricultural sector, the rural poor, and their impact on out migration. This section discusses relevant facts to understand why, on the other hand, trade liberalization turns into another crucial hazard to this sector. It presents empirical evidence of the increasing imports trend and decreasing agricultural prices undermining rural incomes as well.

Despite the current trade agreements between Mexico and over 40 countries, Mexican foreign trade continues very concentrated with USA. These trade agreements include the North America Free Trade Agreement (NAFTA), the Mexico-European Union Free Trade Agreement (MEUFTA), and the Mexico-Central America Free Trade Agreement (MCAFTA), among others. In addition, Mexico is member of the World Trade Organization (WTO) since 1986 (GATT that time). It allows us to consider Mexico one of the most opened world economies. However, approximately 90% of Mexican foreign trade value is concentrated with exclusively the USA (Saldaña, 2003). Beyond trade, other productive factors are highly concentrated with the USA as well, i.e. labour move[6] and foreign direct investment.[7] That fact is understandable if one looks at the relevance geographic aspects posses in factors mobility.

[6] In terms of flows of people (legal and illegal), the trend is very similar too. Unlike some negligible programs on temporary work, Mexico has not signed trans-boundary labor agreements with the USA, and despite that fact, over 90% of international emigration goes to that country.

[7] Quiroz (2002) reckons that 60% of foreign direct investment (FDI) in Mexico arose from the USA in 1995 –the rest from Germany (5%), Japan (4.5%), etc. There is a widespread critic on the fact that most FDI in Mexico is comprised of investments of multinational companies in their existing branches in Mexico, rather than of new business implementation and incorporating new economic agents to the benefits of foreign trade (Dussel 2000). In addition, capital and exports concentration in very few hands is taking place after started trade liberalization in this country (Saldaña 2002).

1. Foreign trade as risk factor for certain sectors

As the share value of the foreign trade compared to the whole economy value increases, economies like the Mexican might become more exposed to extern factors. Foreign trade expansion is conventionally said to have a positive effect on the economy as a whole (Franker and Romer, 1999), especially when boosting exports (Micco and Pérez, 2001). However, international market fluctuations, in the frame of open economy, may alter significantly foreign trade -volatizing out of the scope of domestic measures, that is, increasing country's exposure (Briguglio, 2002). Small-scale economic agents turn, thus, into mere price takers without much ability to influence international prices. As the size of foreign trade of Mexico compared to GDP shifted from 43%, before NAFTA implementation in 1993, to 98%, six years later (INEGI, 2005), foreign trade exposure of small-scale farming has dramatically soared.

2. Negative terms of trade

As natural disasters, the recent trade policy has affected relatively more to the agricultural sector, whose liberalization process of the last two decades has been biased against this sector. The dismantling of crucial public companies to support the sector has been decisive in reducing coping capacity as well. In addition, negative Terms of Trade both of the whole agricultural sector as well as of most crops within that sector is stressing rural incomes. Incomes from exports depends both on the volume of these exports sold abroad and also on the price paid for them. The ratio between the price of a typical unit of exports and the price of a typical unit of imports is called commodity Terms of Trade. If the price of the country's exports falls relative to the price of the products it imports, commodity terms of trade are said to deteriorate for a country. Especially high is this risk for mono-crop regions. As Benson and Clay (2002: 23) point out, mono-crop regions must face vulnerability from not only natural disasters, but also those associated to world trade uncertainty due to non-diversified export products of primary commodities. In addition, the Prebisch-Singer thesis warns of the secular decline in the terms of trade of primary-commodity exporters due to a combination of low income and price-elasticity of demand (Prebisch, 1950, Singer, 1950).

In order to reduce the vulnerability associated to negative terms of trade, the Mexican economy opted for reducing the ratio agricultural/industrial products. By 1974, Mexico joined the ranks of the new industrialized countries (NICs), with manufactured goods representing over 50% of exports whereas agricultural goods felt back to 39% -and further to 4% in 2002. In addition, whereas oil exports represented 75% of Mexico's foreign exchange earnings in 1980, by 2000 this percentage was reduced to only 18%, decreasing, exports vulnerability to sudden oil prices reductions. However, public-revenues-vulnerability is still latent to date because over 60% of federal government revenues arise from PEMEX, the state-owned oil company. From its part, terms of trade of the traditional rural economy has increased as imports raised due to, among others, the trade liberalization process. In addition, the increasing natural hazards occurrence and the dismantling of public companies aimed at supporting adaptive capacity in the agricultural sector contributed to stress rural livelihoods. Other things equal, as long as the low dynamism of the urban economy continues, the pursued transition of agricultural productive factors to the secondary and tertiary sectors seems to remain far. In this regard, a productive re-orientation within the agricultural sector through more profitable and environmentally suitable crops may certainly restock this sector. It implies a more detailed production projection in order to enforce leaving behind loss-making activities by moving to more market-oriented crops.

3. NAFTA and agriculture

Despite surprisingly significant increases in exports from signed trade agreements, the gains from NAFTA have been unequally distributed in Mexico. It is especially valid for the agricultural sector, where imports (mostly grains) have contributed to drive small-scale farmers out of business and export opportunities have been caught by practically just large-scale commercial farmers. *Per se* asymmetries in the country along with a public planning that has underestimated some crucial elements of the country's vulnerability seem to lye behind it.

The impact of trade liberalization on the Mexican agriculture has received a lot of criticism even prior to the NAFTA implementation in 1994 (i.e. Calva, 2004, Baffes, 1998, Levy and Van Wijnbergen, 1994 and Burshifer and others, 1992), as well as more positive judgments from others (Lederman et al, 2003, Yunez-Naude and Barceinas, 2003). It has also become a very controversial point in the Mexican political arena due to the upcoming complete liberalization of the agricultural sector in 2008 under NAFTA.

4. Unfair trade

The exposure to foreign markets volatility discussed in the previous section seems to be not as damaging as trade unfairness. Trade unfairness is driven mainly by trade partner countries, but it is influenced by domestic factors as well.

There is an increasing pressure from poor farmers' unions to commit developed countries for making fair trade. Fare trade is focused on cutting back on subsidies in order to reduce damage they inflict on depressing prices and, in turn, on the income of poor Mexican farmers. Over 90% of total foreign trade of Mexico is held with the United States of America (USA) and the European Union (EU). Farmers from these countries have gotten more than 300,000 millions of dollars in subsidies every year, which allows industrial-size farms to produce more hectares of crops than needed for domestic consumption, and exceeding production is sold overseas at prices far below the international benchmark price (Saldaña, 2003). Usually, that exceeding production from large developed countries is big enough to drag down the world price of the commodity. On the one hand, farmers in developing countries like Mexico cannot compete with cheap imports. On the other hand, they cannot compete in foreign markets given depressed world commodity prices as well. It, thus, practically displaces them from both domestic and international markets.

High subsidies for agricultural producers from Mexico's main trade partners make Mexican small farmers more vulnerable to imports rise. Small-farmers' discontent is growing in all developing countries. Not only Mexican farmers participated actively in the demonstrations against unfair trade at the Ministers Meeting of the World Trade Organization on September 2003 in Cancun, but also farmers from over 30 developing countries. Unlike Mexico, ministers of trade from most developing countries at the World Trade Organization (WTO) support that discontent, and disagreed in going any further for liberalizing other industries' trade (as the Round of Doha proposals) as long as developed countries (centered in basically the USA, Canada, EU, and Japan) do not lift subsidies.

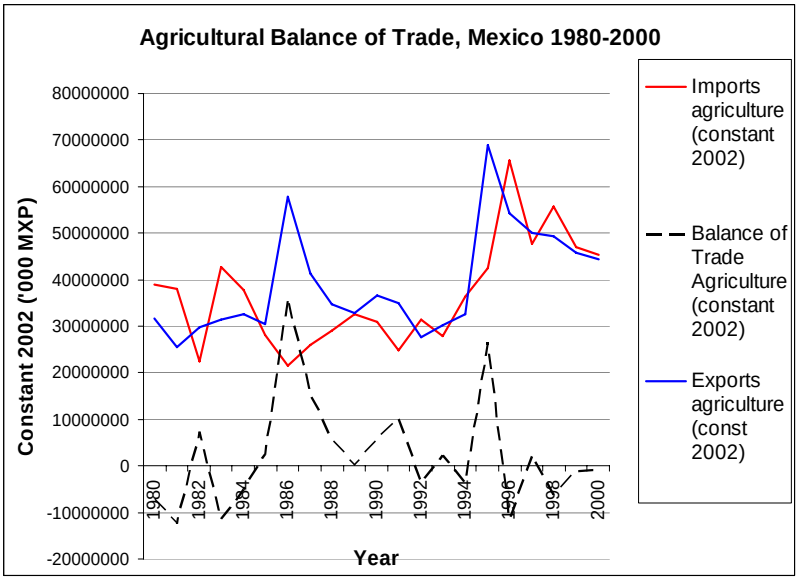
Though the external framework is crucial in defining foreign agricultural trade, domestic factors may become relevant as well. Macroeconomic stability plays a key role in agricultural vulnerability. For instance, Yuñez-Naude (2001) points out that a substantial share of the variations of domestic agricultural prices during 1980-1999 in Mexico were due to rather sudden exchange-rate fluctuations. There is also an increasing discontent in Mexican agricultural producers

because of dumping practices, smuggling, and trade triangulation.[8] It contributes to increasing imports, depressing prices, rural incomes, and, in last instance, enlarging poverty in the countryside. If one adds to this the discussed negative terms of trade, lack of public support in the form of credit, crop insurance, etc, as well as the high natural hazard exposure, one can easily warn of the need for an integrated strategy for reducing overall vulnerability in this sector.

5. Increasing imports, decreasing prices in the agricultural sector

After 1995, both agricultural imports and exports increased, but a slight deficit has been permanent (see chart below). The prevailing deficit in the Mexican agricultural trade of balance –most likely to be larger if integrating smuggling- is greatly explained by the rise in grains imports. On the Mexican side, grains are produced by subsistence farmers with low yields, whereas, beside subsidies, much more efficiently produced in the USA. It has led to increase imports biased to grains, with a consequent impact in reducing mean crops prices. The high deficit in balance of trade in the agricultural sector (approximately 20% of traded value) is mainly explained by grains imports from the USA (ECLAC, 2006). After the implementation of NAFTA, only a small share of the farmers, those with access to technology, has re-oriented their production to higher-priced exportable crops. Whereas exports of vegetables, mainly from tech-farmers, have grown significantly (9.6%) during the period 1994-2004,[9] the exports of grain, cropped mainly by non-tech-farmers, have practically remained unchanged. However, grains imports grew 7% during the same period (ECLAC, 2006).

Figure 7
AGRICULTURAL TRADE OF BALANCE, MEXICO 1980-2000



Source: Mexican Central Bank (Banco de Mexico, 2005).

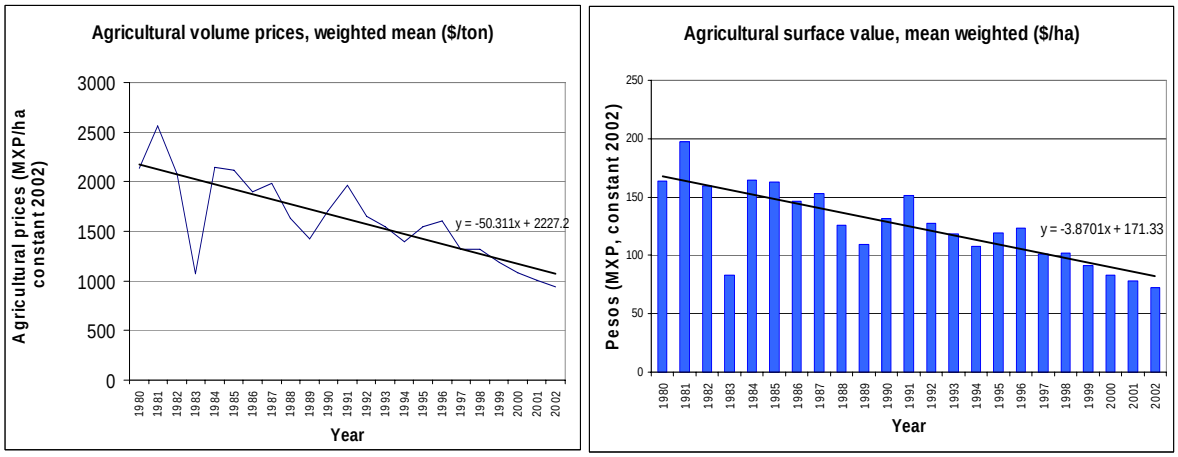
Prices drop of grains explains over 60% of the declining prices tendency shown in Figure 8. Grains cropping of maize, beans and rice represent the base livelihood of most subsistence farmers

[8] Trade triangulation is considered a kind of documented smuggling, since it consists of importing merchandise from a non-NAFTA country, but presenting false purchase bills from a NAFTA area country in order to get the tariff exemption agreed in NAFTA.

[9] Most likely due to their growing demand in the USA.

in this country (ECLAC, 2003a, 2001a and WB, 1994). Price reduction drops rural incomes of most farmers given their impossibility to increase neither their productivity nor cropping land. It keeps most of them in the self-consumption economy given the low capacity of trading at such prices over, usually, mean domestic costs. It impedes them of obtaining a surplus to reinvest in capital goods. Graph 10a shows mean weighted agricultural prices, which are estimations of the author based on registers of mean rural prices and production with data from SIACON (2005).[10] It is made of the mean prices of crops weighted by their share production in the corresponding year at 2002 constant prices. Graph 10b attempts at showing the net prices evolution after internalizing yield variations (tons/hectare), presenting thus weighted prices of a crop hectare in the country.[11] Comparing trend line slopes of these two graphics, one can observe a higher decrease in terms of cropping hectares ($/ha) than in production volume ($/ton) reflecting the slight yield increase taking place over this period. However, even including yield increases, prices trend has remarkably decreased. It advances our understanding of rural poverty and vulnerability to natural disasters.

Figure 8
DECREASING AGRICULTURAL PRICES (1980-2002)



12.a 12.b

Source: Subsistema de Informacion Agricola, SIACON (Ministry of Agriculture).

Finally, the economic policy reorientation implemented since the end of the 1980s has contributed to reduce farmers' adaptive capacity as it has dismantled some crucial instruments aimed at supporting agricultural productivity. One has to admit that it has helped to reducing excessive paternalism and fiscal burden. However, subsistence farmers are particularly susceptible to absorb negatively that withdrawal since they are often not eligible for private credit and the cost of key production and commercialization services turn unaffordable to them, e.g. freight, fertilizers, storages, and crop insurances. In fact, credit for the agricultural sector has decreased by 80% over the last ten years, representing only 2.5% of total credit (ECLAC, 2006). Finally, high transport costs and bad roads have been crucial in dropping framers' competitiveness. Freight costs in Mexico are higher than those of Mexico's main trade partners. For instance, the average price of one ton-kilometer of terrestrial freight is 20% more expensive in Mexico than in the USA, 0.035 and 0.029 dollars ton-km, respectively (Moreno, 2004).

[10] Subsistema *de Informacion Agricola*, Ministry of Agriculture.
[11] Obtained by multiplying weighted production prices ($/ton) by weighted agricultural yield (ton/ha).

V. Public programs to cope with natural disasters

The Mexican government has implemented a number of actions to reduce overall socioeconomic vulnerability, i.e. anti-poverty strategy, rural development, etc. Among the existing literature on social and productive programs in Mexico, the World Bank (WB, 2004), ECLAC (2003), and Wodon and Velez (2000), among others, coincide in, on the one hand, recognizing their -though modest- positive progress in improving living conditions as well as, on the other hand, tend to criticize their prevailing transitory effect. From its part, very little has been, however, discussed concerning natural disasters-related programs. Moreover, if climate change increases both frequency and severity of extreme weather events, as a number of scientists and recent evidence suggests (IPCC, 2007, Stern, 2006), the economic costs will continue to grow significantly unless considerable effort is made today to reduce vulnerability and exposure. Beyond disasters management, this section analyzes the responsibility taken on by the Mexican government for disasters risk reduction (insurance, mitigation works, etc.), for absorbing losses from natural disasters (loss-sharing), as well as briefly assesses its scope.

The government rebuilds not only public infrastructure, but also housing and provides some relief to the poor after disasters. Loss-sharing has been based on a combination of *ex post* instruments, like budget diversion, foreign credit, etc. From its part, risk-transfer has been based on mainly *ex ante* instruments like insurance, mitigation, contingent fund, and, more recently, catastrophic bond. This section

warns that, despite its high vulnerability, the agricultural sector makes mostly use of *ex post* instruments, whereas disaster prevention measures keep relatively low. The allocation of subsidies for agricultural insurance in Mexico after 1990 has led to less coverage compared to the 1980s in terms of both area and producers. From its part, mitigation works implementation is minor, whose trade-offs are also discussed. This section emphasizes the need for integrating risk-financing instruments to avoid them to render as mere transitory instruments to deal with poverty in the countryside, suggesting areas where public investments may produce greater effects in strengthening coping and adaptive capacity.

1. Governmental actions to reduce vulnerability to natural disasters in Mexico

Given the prevailing levels of poverty and hazard exposure, the Mexican government is committed to assume three basic sources of risk if natural disasters occur: *public assets, disaster relief*, and *private assets*. *Public assets risk* concerns the risk of loss to government buildings, including schools and hospitals, and infrastructure like roads, bridges, airports, etc. It includes the role of the government as insurer of last resort for the insurance markets. *Disaster relief* consists of emergency response and providing elemental health and housing facilities after disaster to the poor. *Private assets risk* focuses not only on the poor, but also on agriculture, strategic industries, and local governments. Although the Mexican government can cope relatively well with financing these first two categories, but *private assets* are increasingly a worrying source of risk.

The federal government has very developed and varied public instruments to reduce disaster risk. For instance, subsidy to crop insurance premia is available by means of AGROASEMEX, the public crop insurance company; rebuilding of public assets is possible by the federal fund FONDEN; mitigation works can be undertaken by the federal-state shared fund FOPREDEN; and FAPRACC is a fund designed for rebuilding, mitigation and insurance to the poorest farmers. Table 4 summarizes these instruments, as well as its jurisdiction. Nevertheless, where are failing these instruments? To answer this question, let us first briefly explain their working mechanisms.

Table 4
PUBLIC INSTRUMENTS FOR RISK MANAGEMENT FINANCING TO NATURAL DISASTERS IN MEXICO
(2003, by type of asset at risk)

Risk	*Ex ante*			*Ex post*
	Mitigation	Insurance	Reinsurance	Reconstruction
Private assets	FOPREDEN	AGROASEMEX Subsidy to crop premiums contracting Advises *Fondos* FAPRACC Only for small-scale farmers Administrated by Ministry of Agric.	AGROASEMEX a. For *Fondos* b. For Private companies	FAPRACC a. (only for small-scale farmers)
Public assets Disaster relief	FOPREDEN	Hidalgo Insurance	Large Reinsurance Companies	FONDEN - State governments - FONDEN - FAPRACC (wage compensation payments)

a) FONDEN

(*Fondo Nacional de Desastres Naturales*) is a fund to permit access to governmental agencies to financial resources after a natural disaster occurs, both at municipal, state and federal level. The fund is an attempt to give priority for rebuilding public assets involving poor families. It is operated by the Ministry of the Interior (SEGOB) in close coordination with the Ministry of Finance (SHCP).

Since its establishment in 1996, FONDEN's budget has varied widely because most years its payments have exceeded programmed budget (see Table 6 below). Some years, budget is below the final requirement level due to unexpectedly high disasters losses, and vice versa for years when expenditures are considerably below budget targets. In the first case, it leads to resources diversion from other programs and even other ministries in order to observe the commitment. In the second case, it follows that other governmental agencies struggle for FONDEN resources for the forthcoming year as they were underused (SHCP, 2000). FONDEN annual budget averages approximately 350 millions of dollars,[12] whereas economic losses of public assets averages 486 millions of dollars in the same period, that is, FONDEN is capable of covering 70% of public assets losses.

Table 5
INDICATORS ON NATURAL CATASTROPHES FINANCING IN MEXICO, 1982-2001
(Selected years in millions of dollars)

	1982	1985	1996	1997	1998	1999	2000	2001
Losses	314	4 160	5	448	670	1 221	304	271
Losses/GDP (%)	0.14	2.25	0.00	0.10	0.14	0.22	0.05	0.04
FONDEN disbursements	--	--	195	431	463	427	531	73
FONDEN/losses (%)	--	--	3 900	96	69	35	175	27
Loss/pub. exp. (%)	1.16	15.4	0.00	0.09	0.12	0.19	0.04	0.03 %

Source: Ministry of Finance, Ministry of the Interior (CENAPRED and FONDEN), INEGI and WB.

In terms of economic losses, 1985 was particularly damaging due to the Michoacan Earthquake in Mexico City, whose losses reached current 4,160 millions of dollars, which means 2.25% of GDP, equivalent to 15% of Mexican public expenditure in 1985, as indicated in Table 5. It is remarkable that when the Michoacan Earthquake hit Mexico City in 1985, there was no financial instrument from the government to undertake reconstruction, which derived in a billionaire credit from multilateral financial institutions. If a natural disaster reaches the same level of economic losses today, FONDEN resources would be by far insufficient to finance rebuilding. If so, FONDEN mean budget would scarcely represent 10% of losses.

The kind of natural disasters paid for by FONDEN has varied over its existence. Drought was dominant in 1996, hurricanes in 1997 and 2005, floods in 1998 and 2005, and earthquakes and floods in 1999. Although FONDEN actions neither prevents natural disasters nor tackles poverty, but it provides highly valuable support for immediate relief. FONDEN eliminates on the one hand a number of formalities and financial transfers inside the public administration. On the other hand, it is designed for public works coordination. In addition, this instrument contributes to public financing stability as long as avoids automatically contracting extern debt and budget diversion. Given FONDEN insufficiency for dealing with both private and public assets, private assets duty

[12] For further details, see *Reglas de Operación del FONDEN 2002* (DOF 2002).

has been, since year 2003, decentralized to other ministries. FONDEN is, thus, responsible for exclusively public assets.

FONDEN decentralization aims at shifting responsibility from the federation to state and municipal governments to encourage local governments to identify and further undertake risk reduction measures. In order to delimit FONDEN liability public entities are committed, by mandate, to contract insurance for their own assets, FONDEN provides matching funds through state trust funds (*Fideicomisos Mixtos Estatales*). The federal government continues assuming partial responsibility for local repairs and reconstruction. According to the FONDEN 2002 Rules for Working (*Reglas de Operacion del FONDEN 2002*), federal, state and municipal governments share the responsibility depending on the case. For instance, for province-owned transport infrastructure, the federal government is responsible for 50% of the losses; while for municipality-owned infrastructure, it covers up to 30%. Nevertheless, due to high indebted outstand of most state governments, the federation frequently finances the entire reconstruction.

b) AGROASEMEX

AGROASEMEX is the state-owned company to manage and grant subsidy for crop insurance premiums contracted by individual farmers or by *Fondos*. It is also responsible for advising FAPRACC –further explained. AGROASEMEX acts as re-insurer for private insurers as well. Both individual farmers and *Fondos* can obtain AGROASEMEX subsidy on contracted premiums with private insurance companies.

Fondos are mutual arrangements of farmers to contract and/or manage insurance, which work mainly along low- and medium income regions of the country. Risks *Fondos* cover include drought, excess moisture (due to floods, heavy rains, etc.), frost, hail, fire, wind, plant infestations, impossibility to cultivate, non-germination, livestock diseases, accidents, incapacity, and forced sacrifices. Table 6 summarizes the multi-peril *Fondos* coverage, which embraces both natural and biologic disasters, as well as hedges from some economic hazards such as yield variations due to changes in inputs costs and revenue-related risks.[13]

Table 6
TYPES OF INSURANCES OPERATED BY FONDOS

Type	Coverage	Remarks
Investments	Amounts of investments on the crop	Technological equipment and infrastructure improvements.
Investments adjustable to living stock	Payable at the moment of the disaster certification	
Plants	Hedges plant value to climate risks	An agreed price is stipulated
Expected harvest at agreed price	Pays indemnity for yield loss, adjusted to commercial price	i.e. per kilo
Yield	Pays indemnity when realized yield is under trigger yield due to cost increment	Insurance yield is an estimate of the long-run average yield based on historic registers of the insured[14]

Source: AGROASEMEX 2002.

[13] Ley General de Instituciones y Sociedades mutualistas, Art. 13; Ley sobre el Contrato del Seguro, Art. 40; Reglas Generales para la Constitución, Operación y Funcionamiento del los Fondos de Aseguramiento, de vida campesino, y conexos a la actividad agropecuaria (SHCP).

[14] In the USA, for instance, the Crop Insurance Reform Act of 1994 authorized the Federal Crop Insurance Corporation (FCIC) to enlarge coverage up to 85 percent in certain circumstance, but its coverage typically ranges from 50 to 75 percent of the expected yield in 5 percent increments (Skees 2000).

Along the past 20 years, subsidies to agriculture in Mexico have been shifting from indirect instruments (i.e. price protection, preferential credit, and insurance coverage) to others more direct (monetary payments per crop). During the 1970s and 1980s, the crop insurance system of direct support experienced a wide variety of corrupt practices and rent seeking. It led to the financial collapse of the crop insurance system, and forced for a reform (Hernández Trujillo, 1997: 5, Wenner and Arias: 8). Between 1990 and 2002, the Mexican public crop insurance company transformed into exclusively technical advisor of *Fondos* and liable of last resort for the private crop insurance markets (reinsurance). In general, although less governmental intervention in agricultural insurance has led to sounder public finances to the company, but it has implied less coverage of farmers and cropland over the past twelve years. The next section analyzes the reforms to the crop insurance subsidy, to further analyze its implications in farmers' adaptability to climatic hazards.

i) The crop insurance system 1961-1991. Although the first agricultural insurance program in Mexico dates back from 1942, it was rather arrangements between mutual unions and private insurance companies. Until 1961 was formally created the first specialized public company for crop insurance, the National Crop and Livestock Insurance Company (ANAGASA). ANAGASA started operations in 1963, working with clients of state development banks.[15] Credit granting was conditioned to crop insurance contracting through ANAGASA. Policies covered multiple-peril, premiums were entirely subsidized and insured cultivated area was large. Unfortunately, due to lax monitoring, actuarially unsound pricing, and fraud (filing of false claims), losses for ANAGASA were staggeringly high. Sometimes, indemnity payments represented up to 70% of the loan recoveries by BANRURAL, the public bank for rural development (Hernandez, 1997: 2).

Table 7
FINANCIAL PERFORMANCE OF CROP INSURANCE SCHEMES IN SELECTED COUNTRIES

Country	Period	Indemnities/premiums	Administration costs/premium	Total costs (Indemnities + administration costs)/premiums
Brazil	1975-1981	4.29	0.28	4.57
Costa Rica	1970-1989	2.26	0.54	2.80
Japan	1947-1977	1.48	1.17	2.60
Japan	1985-1989	0.99	3.57	4.56
Mexico	1980-1989	3.18	0.47	3.65
USA	1980-1989	1.87	0.55	2.42
USA[a/]	1999	0.96	0.96	3.68
Canada[b/]	1998-1999	0.48	0.07	0.56

Source: Hazell, 1992.

a/ Skees, 2000.

b/ Saldaña-Zorrilla, 2006[a].

Hazell (1992) compares the experience of ANAGASA with its counterparts in selected countries, evidencing its unsound financial results, presented in Table 7. Average payouts (indemnities plus administration costs) greater than average paid premiums mean net loss for the scheme. On one extreme, Brazil has a high costs-premiums ratio (4.57), where indemnities payments explain most the deficit (4.29). On the other extreme, Japan during the period 1985-1989 presents high administrative costs relative to premiums (3.57 of 4.56). Mexico's performance looks

[15] Such as *Banco Ejidal and Banco Agrícola* (later combined to form *Banco Nacional de Crédito Agrícola* -BANRURAL).

pretty much similar to Brazil: the ratio indemnity-premium in Mexico is extremely high (3.18) as part of total costs (3.65). To achieve a ratio below 1 (as Canada, Japan 85-89 and USA 99), some authors affirm it requires high investments in obtaining the right information for surveillance (Skees 2000, OECD, 2000).

In Mexico, lack of surveillance led to misestimating risk, and therefore made distortions in premia pricing during the 1980s (Wenner and Arias, 2000). The allocation of subsidies for agricultural insurance over that decade showed signs of bad management, which turned AGROASAMEX into a loss-making entity (Hazell, 1992). ANAGASA had to face too many indemnification claims. It turned so financially unsustainable that ANAGASA closed in 1988.

ii) The 1991 reform to the crop insurance system. The posterior reform to the Mexican crop insurance system combined direct insurance with *Fondos* implementation in order to reduce public burden. In 1991 AGROASEMEX replaced ANAGSA. Unlike current insurance cross-subsidization in the UK (Linerooth-Bayer and Vari, 2003), the Mexican government started reducing fiscal burden to farmers cropping in low-risk areas since the beginning of the 1990s, who in fact were subsidizing those farmers settled on high-risk areas through flat-premiums. In the 1970s, long before ANAGSA closure, some well-organized farmers realized disadvantages of ANAGSA when comparing premiums to real needs. In 1978 was founded the first mutual insurance fund (*Fondo Común de la Coalición de los Valles del Yaqui y Mayo*, CECVYM). Real disaster level of these farmers was very low compared to average in the zone, and therefore insurance contracts with ANAGSA meant net financial transfer for them (Hernández, 1997). This fund was created to reduce insurance costs, to offer technique support for members, to develop financial options, as well as to reinvest remaining (residual of premiums minus indemnity payments after administration costs -Gordillo 1988). These funds became the current *Fondos*.

Fondos budget consists of premiums funds (paid by farmers) plus governmental subsidy minus operation costs (reinsurance plus administration). Depending on farmers' decision, residual can be earmarked to either a contingent fund (to cover disasters exceeding contractual coverage) or to a social fund i.e. to purchase technological improvements for members. The main requirement to farmers to get into a *Fondo* is holding a profitable crop from a technical and financial perspective. Premium subsidy does not have to exceed 2,000 pesos per hectare (approximately 182 dollars), subsidizing between 25% and 45% of the premium[16] (DOF, 2002: Art. 6). If a disaster provokes high losses in unison, private companies rely on the AGROASEMEX re-insurance services, which act as governmental liable of last resort. It provides non-proportional re-insurance, which covers 50% of losses from private insurers when exceeding 120% of premiums fund.

During this public-private transition period, the covered surface has decreased despite being a major disasters period. In 1999, however, 14% of the national cultivated area[17] (3 mill ha) was lost to disasters. Over 90% of these losses were uninsured, since the subsidy reached to less than 10% of national cultivated area, compared to 40% before the reform.

From 2002, AGROASEMEX operates as exclusively agricultural re-insurer, allowing the expansion of private insurance in the country.[18] Whereas AGROASEMEX supported directly 56% of insured crops in 2000, in 2001 it dropped to 7%; private companies moved from 34% to 77%, respectively. The subsidy[19] per hectare increased from 330 to 401 pesos, and average insured

[16] *Determined* through a ranges classification of socioeconomic regions and type of crop –it includes 83 different crops.

[17] The national territory has an extension of 197 million hectares, 11% of which (approximately 3 millions ha) was cultivated in 1999.

[18] *Since* 1995, Mexican government started a program to reform subsidies for crop insurance premiums by reducing costs of contracting insurance and, at the same time, encourage participation of social and private agents, which allowed to establish the National System of Rural Insurance (*Sistema Nacional de Aseguramiento del Medio Rural*), which involved AGROASEMEX, as well as social and private agents related to crop insurance (ROSPSA, 2002). It led to latest reform of 2002. For further details, please turn to *Reglas de Operación del Subsidio a la Prima del Seguro Agropecuario* (2002). Diario Oficial de la Federación del 15 de marzo de 2002.

[19] The *subsidy* is paid once the producer contracted either private insurance or hedge the crop through a established *Fondo.*

amount rose from 3,435 to 4,032 hectares (AGROASEMEX, 2002).[20] From 2002, approximately 95% of subsidies goes to premiums contracted with private companies,[21] the remaining 5% is spent in subsidies to *Fondos*.[22] 68% of the subsidy value granted crops and the rest livestock.[23] On average, the subsidy accounts at 33% of the premium, and the average premium at 468 dollars for that year (AGROASEMEX, 2003). The trend of average premiums indicates that while price of *Fondos* premiums decrease, the price of private companies' premiums increases, stimulating farmers to better join *Fondos* system.

On *average*, *Fondos* are expanding especially due to its participation in basic (extensive) crops (i.e. maize, bean, wheat, potato, etc), whose insured amounts and premiums are lower. From its part, private insurance companies are being reducing participation in basic crops, but expanding in livestock and intensive crops (fruits and vegetables). In 2002, livestock insurance grew by 45% from the previous year. The expansion of private insurance companies explains that increment, which tripled insured units and caught up most of the clients left by AGROASEMEX.[24]

iii) Critics to the reforms.

1) *Paternalism*. The above discussed reforms have been positive in that of developing private crop insurance markets. The 1991 reform achieved to overcome fraud, rent-seeking and moral hazard. However, as the subsidy granting before and after the reform has not been accompanied by a successful strategy to encourage disaster prevention measures, little willingness for crop variation/diversification in *per se* risk prone regions continue dropping efficiency.

2) *Financial soundness but much lesser coverage.* Allocation of society's resources into crop insurance in Mexico over the 1980s shows clear signs of inefficiency. In a social perspective, however, the reform brought much lesser coverage in terms of both insured area and covered farmers. After the reforms, the Mexican crop insurance system works with a financial surplus, but insured surface of the present decade is nearly the half of that in the 1980s: approximately 7 million crop hectares (see chart below). In addition, government subsidy to crop insurance premia has only been relevant to farmers in 10% of Mexico's cultivated area during the 1990's, whereas during the 1980's the subsidy reached 40% of that area. However, the case of crop insurance is not unique, as only 25% of cultivated area has access to financing (credit, loans and/or insurance), keeping three-fourths of cropland out of institutional financial support and 90% uninsured.

3) *Exclusion.* Compared to the crop insurance system of the past, *Fondos* work in a much more decentralized frame, but it has implied atomization and exclusion as well. Most farmers are usually rejected by existing *Fondos* due to their lack of solvency. That is why they just expect some indemnity payments from the government if their municipality promotes FAPRACC. However, it is still exceptional in practice, as further discussed in the next section.

4) *Inequity.* Support for agricultural insurance premia is unequally earmarked, since there are relatively more resources spent on medium and large-scale farmers than on small farmers, evidenced in the distribution of insurance subsidy. For instance, in 2002, 95% of the subsidy went to premia individual farmers contracted with private companies. In so doing, it strengthens the private insurance market as well as a number of commercial farmers, but most benefits are not shared by poor farmers. Just a minor share is spent in *Fondos*, which, as said, are

[20] *According* to estimations from Hernandez (1997:8), average ratio of indemnity to reinsurance via *Fondos* accounts 13.06% for the period 1991-1996.

[21] 7 *private* insurance companies participate in this system (AGROASEMEX, 2002).

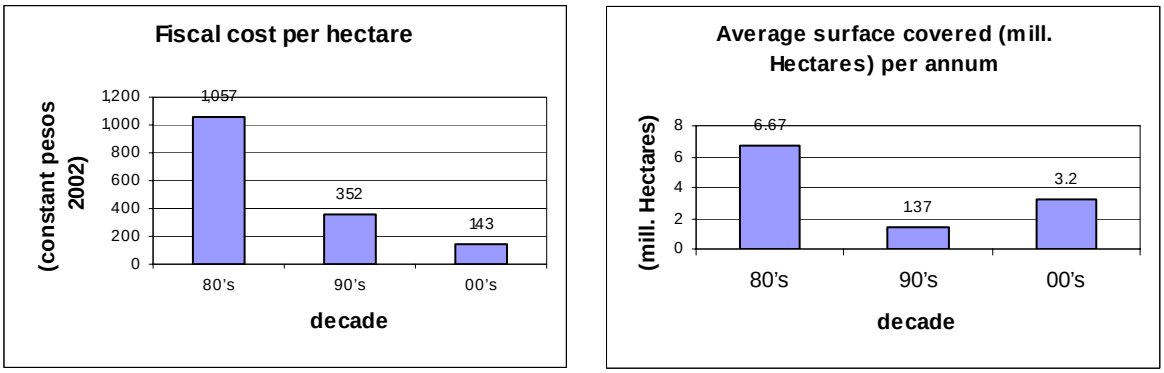
[22] By *2003*, the *Fondos* system consisted of 224 *Fondos.*

[23] *Livestock* insurance available via *Fondos* offer coverage related to risks of sickness, accident, physic inability, whose coverage includes from transportation, establishment, and adaptation to new habitats.

[24] Also, *livestock* coverage rose from 576 thousand animals in 1991 to 9.7 million in 2000.

made of farmers with a minimum of financial capacity. Perhaps if these beneficiaries were large-scale export-oriented producers, it may counterweight the high subsidies to farmers the USA. Under a *utilitarian* approach, it seems to contribute to enhancing coping capacity of the overall agriculture, but may be not a *marginalist* solution as it contributes to enlarging the inequity gap in, at least, the countryside. It follows that expanding crop insurance subsidy on a more active and selective basis to lower income farmers will certainly contribute to reducing poverty and inequity in rural areas, especially if simultaneously increasing investments in disaster risk mitigation in the overall agricultural sector.

Figure 9
AGRICULTURAL COVERAGE OF THE SUBSIDY ALONG DECADES



Source: AGROASEMEX, 2003.

00´s are estimations corresponding period 2000-2003.

c) FAPRACC, crop insurance for subsistence farmers

In 2003, the Ministry of Agriculture implemented FAPRACC,[25] Spanish acronym of *Fund to Attend Damaged Population due to Climatic Contingencies*. This fund is aimed at covering farmers without ability to afford private insurance and/or without solvency to adhere a *Fondo*. As over 85% of farmers in Mexico have neither credit access nor insurance (INEGI, 2003c), the government attempts at absorbing part of their agricultural risks. This instrument consists of an *ex ante* risk sharing system for subsiding crop insurance premiums, as well as a post-disaster fund to pay indemnities. In practice, however, most FAPRACC resources are allocated in indemnities payment. Resources disbursement is shared by the federal and state governments at 70%-30%, respectively (DOF, 2003: Art. 7). The program includes direct support to agriculture, livestock, and fisheries, granting: (1) per crop hectare, livestock unit, or damaged boat, depending activity; (2) wages, in the case of mitigation works; and (3) subsidy for catastrophic insurance contracting, summarized in the table below.

i) Indemnities. Indemnities payment is done on the basis of disaster declaratory, which is made through meteorological measurements. Once exceeded certain climatic threshold, e.g. mm of rain, temperature thresholds, etc. a disaster state can be declared. It follows that damaged agricultural producers listed as low-income population become eligible to obtain, upon request, an indemnity. State governments select grantees, further requesting the respective resources to the Federal Ministry of Agriculture. This post-disaster support covers only one event per year in a given region.

[25] Fondo *para Atender a la Población Afectada por Contingencias Climatológicas*

Table 8
THE FAPRACC SUBSIDY

Support	Unit	Maximum support	Amount (MXP)
A. Agricultural activity			
I. Annual crops	$/ha	5 ha/producer	800
II. Perennial crops	$/ha	5 ha/producer	800
III. Fruit plantations (including coffee, avocado and nopal)	$/ha	5 ha/producer	Up to 5000
B. Livestock	Animal unit (depending on specie)	25 animal units	380 per animal unit for droughts, 850 otherwise
C. Fisheries	$/boat	1/producer	2230/boat
D. Aquaculture	$/ha	2 ha/producer	1 110/ha
E. Others	Day-wage/producer	40 day-wages/producer	According to labour legislation
F. Catastrophic insurance contracting	$/ha or animal unit		100% premium price

Source: Diario Oficial de la Federación (27 de mayo de 2003), complemented with DOF (2005).

ii) Insurance. State governments are responsible for contracting crop insurance to cover farmers within a region. It requests resources to the federal government based on research conducted with AGROASEMEX and, eventually, with the Water National Commission (CNA) and beneficiaries as well. Beneficiaries must accomplish all requirements stated in Operation Rules of FAPRACC (DOF, 2003: Art. 4), which demands being small-scale producer (in accordance to certain ranges). Agreed parameters of climate risks rule the insurance contract, and the eventual beneficiary of catastrophic crop insurance (*Seguro Agrícola Catastrófico*) should renounce to additional benefits of FAPRACC in case a covered disaster occurs.

iii) Prevailing *ex post* delayed usage. Despite its novel design, FAPRACC spends in indemnities for reconstruction.[26] Though these indemnities were needed, but the insurance penetration still keeps low compared to the latent hazard exposure and individual economic vulnerability in the country. In 2003, all insurance subsidies were allocated in 95,415 hectares in the State of Guanajuato, equal to 0.005% of uninsured crop area in Mexico, 1% of FAPRACC annual budget.

In a recent assessment to FAPRACC elaborated by UNAM upon request from the Ministry of Agriculture, Gay and Conde, and others (2004: 5-6) criticize delays in indemnities payments to act negatively on reincorporating farmers to their agricultural activities. For instance, Zacatecas, a Center-North state of Mexico, has suffered of extreme weather for the past 20 years, what varies from frosts to warm wave (ranging from +50 to -10°C), as well as from floods to droughts. Over the last four years, this state has declared state of emergency once a year on average. First, FONDEN, and more recently, FAPRACC have provided resources but over one year later, and so on in most the states.

As AGROASEMEX *Fondos*, expanding cropland coverage is still the main challenge of FAPRACC. Most its budget goes to reconstruction financing. Moving from transitory-impact measures to more preventive initiatives seems to be FAPRACC's main challenge. In reaching that, a closer coordination with the Ministry of Social Development (SEDESOL) to carry on mitigation works along marginalized rural areas may lead to more substantial results. Finally, FAPRACC budget represents 15% of FONDEN mean annual expenditure over the period 1996-2001, a really low number relative to the high disasters losses trend in rural areas.

[26] In *2003*, federal budget authorized for FAPRAACC reached 300 millions of pesos (approximately 26 millions of dollars). This budget must add state disbursements, which may be additional 100 millions of pesos.

d) PIARSE, an attempt for productive reorientation

A relevant decision criterion to maintain long-term subsidy to crop insurance is the differentiation between risk to natural disasters and risk of bad management (Skees, 1999). In cases of bad or inefficient crop management, insurer internalizes that risk by transferring it to the deductible. Strong and close public surveillance is, thus, required in order to avoid misusing the crop insurance subsidy by evaluating land use and, further, redirect production from inappropriate agricultural practices or low profitability crops. In doing so, premiums and deductibles might get cheaper, reducing public expenditure in covering inadequate premium subsidies. It may allow redirecting resources for expanding coverage.

PIARSE[27] is a program for sustainable agriculture and productive reorientation in recurrent disaster areas. This program supports projects to change land use where natural disasters have been so recurrent that productivity keeps permanently low (DOF, 2003). For instance, PIARSE prevents poor grape producers in the state of Zacatecas of obtaining FAPRACC indemnities despite high drought losses given that chronic droughts in this region seem to rather be part of a desertification process. Instead, they are scheduled into a PIARSE project for productive reorientation in order to adapt cropping to the comparative advantages in the region, i.e. changing to less water-demanding crops, or, even, shifting to non-cropping activities. Undertaking parallel structural changes like these certainly contribute to enlarge benefits from the current agricultural insurance subsidy and so on for any subsidy. What is more, if farmers are to improve productivity by incorporating technological advances, they need to be previously advised in a similar way in order to make sure they are investing in rentable activities both in terms of market and climate.

e) FOPREDEN

The *Fund for Disasters Prevention*, FOPREDEN (in Spanish, *Fondo de Prevención de Desastres*) is a federal fund to provide financing for mitigation works and mitigation research. As FAPRACC, this fund is being underemployed. Resources granting is based on efficiency and feasibility analysis. State governments, federal ministries and federal organisms can propose projects before, first, a scientific reviewer committee (DOF, 2003b; Art. 9), for further approval of the Assessment Council (Art. 11). In case of province-proposed projects, FOPREDEN contributes with 70% of the project cost, whereas at 50%-50% for projects proposed by federal organisms (Art. 5). Projects are restricted to one per year by proposing entity and up to the budgetary top of the program. Although in 2005 its budget reached approximately 40 millions of dollars, but only 25% of that budget was implemented (Puente, 2005).

Instruments compatibility. If working right, all these instruments are complementary. The viability of investing in disaster mitigation works, insurance, or any further instrument, should depend on a cost-benefit analysis (CBA) at municipal level over a time period horizon. Insurance covers the risk during exclusively a contracted period, whose disbursement does not contribute to modify risk exposure. From its part, mitigation is a one-time large disbursement that reduces or eliminates risk exposure for a usually long period of time. A detailed cost-benefit analysis of mitigation investments should discount from its benefits maintenance costs, depreciation and further costs it implies –as well as potential shocks of demand of the concerning economic activities (changes in preferences, substitute commodities, etc). Investments in mitigation works demand a previous assessment of productive reorientation, i.e. crop diversification, crops change, etc. in order to exploit better risk-transfer instruments. In addition, assets profitability may substantially vary over time within a given municipality, so that the CBA should integrate regional economic prospects as well.

[27] Programa Integral de Agricultura Sostenible y Reconversión Productiva en Zonas de Siniestralidad Recurrente.

Mitigation is limited because of increasing marginal costs. As pointed out by Freeman and others (2002), constructing the perfect mitigation work, which reduces to zero the associated risk to disaster, can also be cost-benefit negative than mitigating until certain point (where marginal cost = 0) and from that point might be better to transfer the remaining risk. Some mitigation works can even reduce risk by 98%, but reaching 100% can cost more than the physic asset itself. In such a case, after protecting potential human victims, it might be more financially desirable to lose the asset than reducing the risk by 100%.

2. Public infrastructure: disasters mitigation and productivity enhancement

After a natural disaster occurs, damaged physic infrastructure is repaired, replaced or retrofitted in order to minimize negative impacts. Physical infrastructure consists of the stock of capital equipment in a country, including factories, farms, roads, schools, and other tangible assets. Damages or losses in public infrastructure tend to slow down economic growth as it is not repaired or rebuilt in time. In the case of the agricultural sector, it contributes to increase uncertainty along with the above discussed depressed agricultural prices. Concrete examples of long-term negative impact from delays in infrastructure reconstruction are Hurricane *Fifi* in Honduras, where roads and agriculture infrastructure got severely damaged without fast recover, as well as electricity supply in San Salvador and marine resources in Nicaragua and Peru (Caballero and Zapata, 2005). The proportion of aggregate losses from natural disasters to GDP in Mexico is much lower than in these countries: 1 to 1,000, mean value 1980-2002. Although it may suggest that natural disasters produce low impacts to the overall Mexican economy, but, as approached along this work, agricultural vulnerability makes natural disasters a factor of impoverishment, triggering out migration and economic informality. That is why is crucial to strengthen public infrastructure, making sure that public infrastructure keeps working despite disasters and repairs are carried on prompt in case of major damages.

Box 2

AVERSION TO CHANGE AND THE ENDOWMENT EFFECT

Public projecting must consider attitudes heterogeneity among economic actors before implementing public policies for disaster vulnerability reduction. Aversion to change is frequent, especially when the situation does not reach critical level. In Mexico, the initial allocation of wealth is a very illustrative origin of the problem, though not unique. As in the in the short-run, property and land tenure issues seem to still be far from a immediate solution, implementing productivity-related measures might contribute to reducing vulnerability in the mean time. The economic neoclassical theory holds that initial allocations of wealth does not matter as long as markets allow people to trade their stakes (Coase theorem). Also, neoclassical theorists support the statement that the people should be considered as rational economic agents. On the contrary, "behaviouralists" say that the people not always get their complicated sums right (maximizing utility subject to a budget constraint).

Daniel Kahneman, awarded Nobel Prize on economics 2002, points out that in practice, people tend to judge their well-being relative to others, not in absolute terms; their actions depend on the way choices are represented; they fear loss more than they crave gain (prospect theory). In the same way, the "endowment effect" says that people place an extra value on things they already own (Kahneman and others, 1991). In that sense, although transferring labour from rural to urban areas seems to be economically viable, it implies high politic costs and traumatic social processes. In turn, even if one opts for promoting crops-rotation in order to diversify the agricultural risk, it could not be successfully applied to all producers. As asymmetries about markets information makes clear differences among producers in both opportunities and desirability to expand trade, in a similar way not all producers might be determined to change crops and diversify markets, as usually recommended. John List, economist-researcher at the University of Maryland tested empirically the endowment effect and found that only more experienced traders (producers) are less prone to the endowment effect, and trade as keenly as neoclassical predicts.

Poor risk-averse households tend to switch to low risk crops. In a survey to assess copping capacity in Chiapas, farmers have been found to allocate a larger share of land to safer traditional varieties of maize than to riskier but high-return crops (Saldaña, 2006). Itself, this response to climate adversity tend to reduce there farmers' mean incomes. We should, thus, consider that producers in developed (or capitalist) agriculture are subject to work under market efficiency mechanisms, as well as to be expected to react to its incentives (included insurance contracting). On the other hand, we must build particular strategies for traditional producers to reduce vulnerability to disasters, even if contradicting market efficiency criteria.

VI. Suggestions to the public sector

The present document suggests that the number of people living in poor conditions tend to be aggravated by disasters losses and dropping prices of the regional commodity. Consequently, it warns of the risk of an even larger percentage of the population falling below the poverty line in the future, given the current trend of increasing frequency and economic losses from natural disasters, as well as the decreasing agricultural prices in the country.

Triggered by a vulnerable agriculture, the rural economy has experienced a crisis process during the past two decades, which has consequently stimulated out- migration to large cities and abroad. In order to counteract that process, the present document suggests not only expanding the coverage of disaster prevention measures, but simultaneously expanding productive infrastructure to boost productivity along with more favourable production projections —considering the relative price structure— and expanding credit access and risk-sharing mechanisms in parallel.

There are three basic functions of public infrastructure: those related exclusively to keep or enhance productivity (i.e. roads, energy supply, etc.), to hedge from disasters (i.e. regulators of river levels), and to both productivity and disasters (i.e. irrigation systems, green houses, etc.). Due to the duality of the latter function of public infrastructure, it is particular difficult to distinguee the amount of productivity-related investments from exclusively disasters mitigation works, as well as to separate their positive effects on productivity. To date, there exists few documented evidence of exclusively disasters mitigation works in Mexico. It is so mainly because mitigation is

usually included into infrastructure works and, as that, its tasks rely increasingly on local governments (state and municipal) at a large extent as a consequence of the federal budget decentralization. That occurs with mitigation works for disaster risk derived from current disaster instruments (mainly FOPREDEN and FAPRACC) as well, where the initiative has been left to state authorities upon request from the municipalities. However, just a minor share of budgetary resources for disaster prevention is being employed due to the lack of project proposals from state and municipal governments.

The following points summarize the main policy challenges for reducing disaster risk and vulnerability in Mexico on this regard:

1) The decentralization process has transferred responsibilities to local administrations exceeding their technical and managerial capacity. It has led to the under-utilization of existing disaster-prevention programs.

2) FAPRACC spends most on indemnities for reconstruction (which is never enough) and a negligible share is spent on prevention, which is really needed.

3) Support for agricultural insurance premiums and rural mitigation works are unequally earmarked: more resources are spent on medium and large-scale farmers than on small farmers; geographically, the relatively most impacted regions in the South of the country receive less as well.

4) The most high-exposed/less-prepared local administrations ignore the existing federal managed risk-reduction programs as well as lack prepared personnel for risk identification and to apply for financing.

From the above, most of the suggestions made would entail actions at the three government levels are as follows:

Federal government

1) To encourage municipalities and states to carry out individual disaster prevention projects, setting mandatory deadlines for those most risky states and municipalities.

2) If they do not respond in time, the Federation should undertake the corresponding projects (subsidiarity principle).

3) Develop a methodology to identify socioeconomic vulnerability, particularly aimed at local administrations.

State governments

1) Elaborate cross-tables of climatic risk and socioeconomic vulnerability (embracing poverty and inequality) in order to identify and reach the most vulnerable population.

2) Give priority to those disaster-reduction projects that simultaneously increase regional productivity and reduce poverty.

3) Plan a reorientation of production to adapt to current and those most likely forthcoming climatic conditions.

Municipal governments and community leaders

1) In coordination with the state government, train personal on disaster-risk identification, as well as on access to and financial management of public programs.

2) Consult the community to capture risk perception and identify real needs and realistic solutions.

3) Detail municipal maps of risks for projecting and monitoring and share these with other government entities and scientific/academic community as feedback for updating existing geographic data basis.

Finally, the findings from the present document regarding poverty and development warns of the need for further analysis addressing the coupled economy-nature relations based on a cross-section analysis. Mexico needs to actively implement multiple interconnected municipal projects (both rural and urban) for reducing vulnerability to natural and economic hazards coordinated by the social development authority. These projects should be carried out based on a transparent and stakeholders-inclusive mechanism, optimizing resources usage, and, in parallel, making sure that progress becomes compatible with equity.

Bibliography

AGROASEMEX (2003), Informe de Cierre de las Operaciones del Sistema Nacional de Aseguramiento al Medio Rural en el Año Fiscal 2002; Migración al Segundo Piso; Consolidación como Reaseguradora; Fortalecimiento en actividades de fomento; Qué son y cómo operan los fondos de aseguramiento, and Portafolio de Servicios. Working Papers. Mexico City.

___ (2002), Manual de Normas y Procedimientos para la Constitución de los Fondos de Aseguramiento. Mexico City.

___ (2001), Lineamientos Generales para la Constitución y Operación de los Fondos de Aseguramiento. junio del 2001. Mexico City.

Albalá-Bertrand, J. M. (1993), The political economy of large natural disasters. Clarendon Press Oxford. Oxford.

Baffes, John, and Jacob Meerman (1998), From Prices to Incomes: Agricultural Subsidization without Protection? World Bank Research Observer 13(2).

Banco de Mexico (2005), Estadísticas. On-line consult. Central Bank of Mexico. Mexico City. www.banxico.gob.mx

Benson, C. and Clay, E. (2000), Disasters, Vulnerability and the Global Economy. In: The Future of Disaster Risk: Building Safer Cities, Conference Papers. Edited by Kreimer, A., Arnold, M., and Carlin A., The World Bank. Washington, DC.

Bitrán, D., and others (2002), Impacto Socioeconómico de los principales desastres ocurridos en la República Mexicana en el año 2001. Centro Nacional de Prevención de Desastres, Secretaría de Gobernación. Mexico City.

Briguglio, L. (2002), The Economic Vulnerability of Small Island Developing States. In: Sustainable Development for Island Societies: Taiwan and the World, Asia Pacific Research Program w/SARCS Secretariat Publication. Taiwan.

Burfisher, M., Sherman Robinson, and K. Thierfelder (1992), Agricultural and Food Policies in a United States-Mexico Free Trade Agreement. North American Journal of Economics and Finance 3: 117-139.

Caballero, R. and Zapata, R. (1995), The impacts of natural disasters on developing economies: implications for the international development and disaster community. Disaster Prevention for Sustainable development. ECLAC, Mexico City.

Calva, José Luis (2204), Ajuste Estructural y TLCAN: efectos en la agricultura mexicana y reflexiones sobre el ALCA. In: El Cotidiano No. 124. Universidad Autónoma Metropolitana, Mexico City.

Cannon, Terry (1994), Vulnerability Analysis and the Explanation of 'Natural' Disasters. In: Varley, Anne. Disasters, development and environment. Ed. John Willey & Sons. Chichester.

CENAPRED-ECLAC (2006a), Características e Impacto Socioeconómico de los Huracanes "Stan" y "Wilma" en la República Mexicana en 2005, The Ministry of the Interior of Mexico in cooperation with ECLAC. Mexico City.

CENAPRED – Centro Nacional de Prevención de Desastres (2006b), Características e Impacto Socioeconómico del Huracán "Emily" en Quintana Roo, Tamaulipas y Nuevo León en Julio de 2005. Mexico City.

___ (2001), Diagnóstico de peligros e identificación de riesgos de desastres en Mexico: Atlas Nacional de Riesgos de la República Mexicana. Ministry of the Interior of Mexico. Mexico City.

Center of Migration Studies of Washington (2003), Population Growth, Immigration, and the Problem of Sprawl. August 2003. By Roy Beck, Leon Kolankiewicz, and Steven A. Camarota. http://www.cis.org/articles/2003/sprawlcoverage.html

Chambers, R. (1989), Vulnerability, Coping and Policy." IDS Bulletin 20:1-7.

Dacy, D.C. and Kunreuther, H. C. (1969), The economics of natural disasters, Free Press, New York.

DOF - Diario Oficial de la Federación (2005), Modificaciones y Adiciones a las Reglas de Operación del Programa del FAPRACC publicadas el 27 de mayo de 2005. SAGARPA, 30 de marzo de 2005. Mexico City.

___ (2003a), Reglas de Operación del Programa del Fondo para atender a la Población Afectada por Contingencias Climatológicas (FAPRACC). Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación. Mexico City.

___ (2003b), Acuerdo que establece las Reglas del Fondo para la Prevención de Desastres Naturales. DOF – Diario Oficial de la Federación, 10 de octubre de 2003. Mexico City.

___ (2002), Reglas de Operación del Subsidio a la Prima del Seguro Agropecuario and Lineamientos para Aplicación de las Reglas de Operación del Programa de Subsidio a la Prima del Seguro Agropecuario. 15 de marzo. Mexico City.

___ (2000), Reglas Generales para la Constitución, Operación y Funcionamiento de los Fondos de Aseguramiento Agropecuario, de vida campesina y Conexos de Actividad Agropecuaria. 8 de junio, Mexico City.

Dussel Peters, Enrique (2000), El Tratado de Libre Comercio de Norteamérica y el Desempeño de la Economía en México. Naciones Unidas. Comisión Económica para América Latina y el Caribe (CEPAL). Mexico City.

EC - European Commission (2001), Risk Management Tools for EU Agriculture – with a special focus on insurance. Directorate A. Economic Analyses, forward studies, evaluation. January.

ECLAC - United Nations Economic Commission for Latin-America and the Caribbean (2006), Mexico: Crecimiento Agropecuario, TLCAN, Capital Humano y Gestión del Riesgo (LC/MEX/L.686/Rev.1), 8 de febrero de 2006. Mexico City.

___ (2003a), Handbook for Estimating the Socio-Economic and Environmental Effects of Disasters.

___ (2003b), Panorama Social de América Latina 2002-2003. Pobreza y distribución del ingreso. Santiago de Chile.

___ (2001a), Instituciones y pobreza rurales en México y Centroamérica. LC/MEX/L.482. P. 30. Mexico City.

___ (2001b), Economic Survey of Latin America and the Caribbean 1999-2000. Santiago de Chile.

___ (2001c), The Earthquake of January 13, 2001 in El Salvador. Socioeconomic and Environmental Impact. Mexico City.

Fein, J. C. H., Ranis, G. (1964), Development of the labor surplus economy: theory and policy.

Ffrench-Davis, R. (1989), Ajuste y Agricultura en la América Latina: un examen de algunos temas ECLAC. El Trimestre Económico, vol. LVI. Mexico City.

Frankel, J. A., and D. Romer. "Does Trade Cause Growth." American Economic Review 89(3): 379-399.

Freeman, P. and Mechler, R. (2001), Public sector risk management in Mexico for Natural Disaster Losses. Issues paper for a Wharton-World Bank Conference on "Innovations in Managing Catastrophic Risks: how can they help the poor?" Washington, DC.

Freeman, P., Martin, L., Bayer, J., Mechler, R., Saldaña-Zorrilla, S., Warner, K., Pflug, G. (2002), National System for Comprehensive Disaster Management, Phase 2: Financing Reconstruction. Inter-American Development Bank Regional Policy Dialogue.

García, V. and Parra, M. (2002), Desinventar y los registros sobre escasez de agua en México. 1970-2000. In Nueva época. Año 7, septiembre-diciembre 2002. CIESA. Mexico City.

Gordillo, Gustavo (1988), Campesinos al asalto del cielo. Ed. S. XXI. Pp. 130. Mexico.

Guy Carpenter (2006), Tropical Cyclone Review 2005. Instrat Briefing. January 2006. http://gcportal.guycarp.com/portal/extranet/popup/pdf/GCBriefings/Tropical_Cyclone_Review_2005.pdf

___ (2003), The World Catastrophe Reinsurance Market: 2003. September.

___ (2002), Tropical Cyclone Review 2002. Instrat Briefing. January 2003. http://gcportal.guycarp.com/portal/extranet/popup/pdf/GCPub/tropcyc_02.pdf

Harwood, I., and others (1999), Farmers Sharpen Tools to Confront Business Risk. Agricultural Outlook. Economic Research Service. United Sates Department of Agriculture. March.

Harwood, I., and others (2000), From Risk Pooling to Safety Nets: Crop and Revenue Issues in the United Sates. In: Income Risk Management in Agriculture. Agriculture and Food. OECD. Paris.

Haveman, R. and Wolff, E. (2000), Who are the asset poor? Levels, trends and composition, 1983-1998. Washington University Center for Social Devlopment. Working Paper 00-12. St. Louis.

Hazell, Peter B. R. (1992), The Appropriate Role of Agricultural Insurance in Developing Countries. Journal of International Development, 4: 567–81.

Hernández Trujillo, José Manuel (1997), Evaluación y perspectivas de los fondos de aseguramiento agropecuario (Assessment and perspectives about insurance crop Funds). Departamento de Economía. UAM-Azcapotzalco. Mexico City.

Hume, D., Kraft, D., and Simpson, W. (1997), A framework to analyze income support and income stabilization policies in Canadian agriculture. Agriculture and Agri-Food Canada. Technical Paper 3-95.

INEGI (2005), National Institute of Statistics, Geography, and Informatics: http://www.inegi.gob.mx

___ (2003), National Institute of Statistics, Geography, and Informatics. Anuario de Estadísticas por entidad federativa. Ed. 2003. Cap. Agricultura, ganadería, pesca y silvicultura. http://www.inegi.gob.mx/difusion/espanol/bvinegi/aepef/AEPEF%202003%20(parte%202).pdf

IPCC - Intergovernmental Panel on Climate Change (2007), Working Group III. Contribution to the IPCC Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability. Summary for Policymakers.

Kahneman, D., Knetsch, J. L. and Thaler, R. (1991), The Endowment Effect, Loss Aversion and Status Quo Bias. Journal of Economic Perspectives. Volume 5, Number 1. Winter 1991. Pp.193-206.

Kelly, P. M. and Adger, W. N. (2000), Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptation. Climate Change 47.

Kreimer, A., Arnold, M., Barham, C., Freeman, P., Gilbert, R., Krimgold, F., Lester, R., Pollner, J., Vogt, T. (1999), Managing Disaster Risk in Mexico: Market Incentives for Mitigation Investment. The World Bank Disaster Management Facility. Washington, D.C.

La Red (2004), Social Studies Network for Disasters Prevention in Latin-America. Panamá. www.desinventar.org

___ (2002), Desinventar y los registros sobre escasez de agua en Mexico. 1970-2000. In García, V. & De la Parra, M. Nueva época. Año 7, septiembre-diciembre 2002. CIESA. Mexico City.

Lederman, D. and others (2003), Lessons learned from NAFTA. NAFTA's remaining trade barriers. The World Bank Group. Washington, DC.

Levy, Santiago, and Sven van Wijnbergen (1994), Labor Markets, Migration, and Welfare: agriculture in the North American Free Trade Agreement. Journal of Development Economics 43: 73-276.

Lewis, W. A. (1954), Development with Unlimited Supplies of Labour. Manchester School of Economics and Social Studies.

Manea, V. C., Manea, M., Kostoglodov, V., Currie, C. A. and Sewell, G. (2004), Thermal structure, coupling and metamorphism in the Mexican subduction zone beneath Guerrero. Geophysical Journal International 158 (2), 775-784.

Micco, A. and Perez, N. (2001), Maritime transport costs and port efficiency. Inter-American Development Bank. Washington, DC.

Monsiváis, Carlos (1987), Los días del temblor. In: Entrada libre: Crónicas de la sociedad que se organiza, Ed. Era, Mexico City.

Munich Re (2005), Net Cat Service – 7 November 2005. http://www.munichre.com/

O'Brien, K. and others, (2005), Hurricane Katrina Reveals Challenges to Human Security. Aviso. Issue Nº 14. October 2005. GECHS International Project Office. Oslo, Norway.

OECD - Organization for Economic Cooperation and Development (2000), Income Risk Management in Agriculture. Agriculture and Food. Working Paper. Paris.

Oliver, M. L. and Shapiro, T. M. (1990), Wealth of a nation: a reassessment of asset inequality in America shows at least one third of households are asset-poor. American Journal of Economics and Sociology 49 (2).

Prebisch, Raúl (1950), The economic development of Latin America and its principal problems. United Nations, New York.

Proceso (1995), No. 986, September 25th, 1995. Weekly magazine. Mexico City.

Puente, Sergio (2005), Evaluación del Fondo para la Prevención de Desastres Naturales (FOPREDEN). Ejercicio 2005. Centro de Estudios Demográficos, Urbanos y Ambientales. EL Colegio de Mexico. Mexico City.

Quiroz Cuenca, Sara (2002), Competitividad e Inversión Extranjera Directa en México. In: Análisis Económico. Nº 37, vol. XVIII. Universidad Autónoma Metropolitana-Azcapotzalco, Mexico City.

Ramírez Cuevas, Jesús (2005), Cuando los ciudadanos tomaron la ciudad en sus manos. La Jornada, News. September 11, 2005. Mexico City.

Robinson, S., Burfisher, M., Thierfelder, K. (1995), The impact of the Mexican crisis on trade, agriculture, and migration. Trade and Macroeconomic Division. International Food Policy Research Institute. Washington, DC. http://www.ifpri.org/divs/tmd/dp/papers/tmdp08.pdf

Saldaña-Zorrilla, Sergio O. (2006a), Reducing Economic Vulnerability in Mexico: Natural Disasters, Foreign Trade and Agriculture. PhD dissertation. Faculty of Economics. Vienna University of Economics (Wirtschaftsuniversitaet Wien). Vienna, Austria. (http://epub.wu-wien.ac.at/dyn/virlib/diss/eng/mediate/epub-wu-01_ac1.pdf?ID=epub-wu-01_ac1).

___ (2006b), Stakeholders' Views in Reducing Rural Vulnerability to Natural Disasters in Southern Mexico: Hazard Exposure, Coping and Adaptive Capacity. Working paper of the Advanced Institute of Vulnerability to Global Environmental Change. START-IIASA, Washington, DC: http://www.start.org/links/cap_build/advanced_institutes/institute3/p3_documents.html

___ (2003), El Comercio Mexico-Unión Europea. In: Análisis Económico Nº 37., vol. XVIII. 1er. Semestre 2003. Universidad Autónoma Metropolitana-Azcapotzalco. Mexico City. http://redalyc.uaemex.mx/redalyc/src/inicio/ArtPdfRed.jsp?iCve=41303708&iCveNum=1769

SEDESOL (2005), Pobreza y desigualdad a nivel municipal y estatal. Subsecretaría de Prospectiva, Planeación y Evaluación. Mexico City. http://www.sedesol.gob.mx/subsecretarias/prospectiva/main.htm

SEGOB (2002), Personal communication with the Secretaría de Gobernación of Mexico Ministry of the Interior): Dirección General de Protección Civil, Centro Nacional de Prevención de Desastres, Fondo Nacional para Desastres, and Dirección de Investigación de CENAPRED.

Singer, H. (1950), The distribution of gains between borrowing and investing countries. American Economic Review 40: 473-485.

Skees, J. R. (2000), Agricultural Insurance Programs: Challenges and lessons learned. Workshop on Income Risk Management. Session 4: from Risk Pooling to Safety Nets: Insurance Systems. OECD, Paris. 15-16 May.

Skidmore, M. and H. Toya (2002), Do natural disasters promote long-run growth? Economic Inquiry 40/4.

Stern, N. (2007), The Economics of Climate Change: The Stern Review. Part II. The Impacts of Climate Change on Growth and Development. page 96

Todaro, Michael P. (1982), Economics for a Developing World. Second edition. Ed. Longman Group Limited. Essex, UK.

Todaro, Michael P. (2000), Urbanization and Rural-Urban Migration: Theory and Practice. In: Economic Development. Seventh Edition. Ed. Addison Wesley Longman. Essex.

US Census Bureau (2002), On-line downloadable tables: http://www.census.gov/acs/www/

Vatsa, Krishna S. and Krimgold, Frederick (2000), In: Managing Disaster Risk in Emerging Economies; "Financing Disaster Mitigation for the Poor". The World Bank.

WB - World Bank. (2003), Mexico Southern States Development Report. The World Bank Group. Pp. 3-7. Washington, DC.

___ (2002), Country assistance strategy of the World Bank Group for the Mexican United States, 2002. Washington, DC.

___ (1994), Staff Appraisal Report of Rainfed Areas Development Project June 1994. Agriculture Operation Division. Country Department II. Latin-America and the Caribbean Regional Office. Washington, DC.

Wenner, M. and Arias, D. (2000), Agricultural Insurance in Latin America: Where Are We? Paving the way forward for rural finance. An international conference on best practices. Risk Management: Pricing, Insurance, Guarantees. Inter-American Development Bank. Washington, DC.

Wodon, Q. and others (2003), Migration and Poverty in Mexico's Southern States. In: Mexico Southern States Development Report. The World Bank Group. Pp. 4 and 17. Washington, DC.

Wodon, Quentin and Velez, Eduardo (2000), Poverty and Inequality (Chapter 3). In: Mexico: A Comprehensive Development Agenda for the New Era. The World Bank Group. Washington, DC.

World Bank, Guy Carpenter & Co. Inc., EQECAT, and IIASA (2000), Managing the financial impacts of natural disaster losses in Mexico. Report prepared for the Government of Mexico.

Yúnez-Naude, Antonio (2001), Mexican Agricultural Change and Mexico-US Immigration. Issues paper presented at the Conference of the Project Changing Face of Rural California, University of California, Davis, Holtville, CA. Zambia and Zimbabwe, ed. Valdes, A. and Muir-Leresche, K., Washington, DC.

Yúnez-Naude, Antonio and Bárceinas, Fernando (2003), "Los Impactos del TLCAN (NAFTA) en el sector agrícola de Mexico." Mimeographed. Department of Economics. El Colegio de Mexico, Mexico City.

Zapata-Martí, Ricardo (2006), Los efectos de los desastres en 2004 y 2005: la necesidad de adaptación de largo plazo. Punto Focal de Evaluación de Desastres. ECLAC. Mexico City.

Annex

International experiences on crop insurance systems

This annex briefly describes crop insurance systems in some developing countries, as well as in Mexico's main trade partners. Crop insurance in Latin-America presents still a number of challenges to face. Low coverage and insufficient penetration tend to be the most remarkable, whose causes vary widely within this region. Whereas Uruguay experiences high coverage even without governmental subsidy, insured cropland in Chile is increasing thanks to discriminatory subsidies combined with the participation of private insurers. By contrast, Mexico continues to maintain low coverage even despite governmental subsidies and the facilities conceded to private insurers. From its part, Argentina presents both low coverage as well as the absence of governmental subsidy. Public expenditure for crop insurance subsidy in the USA is over 100 fold higher than in Mexico, hedging from shortfalls in crop yield and gross revenue. From its part, Germany does not grant crop insurance subsidy, but pays indemnities to farmers based on a risk transfer scheme supported by the derivatives market. It is noteworthy the high crop insurance coverage in Spain (40% of surface) and in the USA (36% of farmers)

Uruguay

So far, Uruguayan government does not provide any subsidy to crop insurance. However, insurance coverage in this country is greater than in most subsidized agricultural schemes in the world. Since the 1970s, self-insurance (*autoseguro agrícola*) has been an intensively employed instrument. It consists of a shared-risk pool funded by farmer's arrangements. This instrument covers especially hail risk of mainly winter crops. Unlike the rest of Latin-American countries, the increasing natural disasters occurrence experienced over the 1980s in Uruguay led to the emergence of a number of private crop insurance companies, leaving behind the state monopoly in this market.

Chile

Chilean agriculture is recurrently hit by frosts –due to the dominating *Andes*-, droughts in the North –besides the Atacama desert- and heavy rains throughout most the territory. In 2000, the Ministry of Agriculture established the agricultural insurance company (COMSA), which is operated by private insurance companies. COMSA grants subsidy depending on farmer production scale. Crop insurance in this country embraces climate and market risks. The subsidy consists of financing 50% of net premiums on average, plus a fix fee (approximately 36 dollars) per insurance contract. The subsidy grants small-scale producers with 80% of the premium price; 50% for medium farmers; and less than 50% for large scale farmers. The subsidy covers up to 1,320 dollars per farmer/season, and embrace most crops types.

Since 2001, net weighted surface coverage of the subsidy in Chile exceeds 50% of cropland, noteworthy high compared to Mexico (10%) and Argentina (7,7%). Besides risk management, resources allocation matter: per-farmer subsidy in Chile is around four-fold higher than in Mexico.

Argentina

Only 2 of 26 millions of hectares of cropland are covered by insurance in Argentina. Mainly due to budgetary constraints, the government is reluctant to subsidize. It exacerbated after the 2002 economic crisis. 70% of existing insurance contracts cover exclusively hail, 29% are multi-peril, and 1% covers livestock. Despite the fast growth of the crop insurance market during the present

decade (annual 12%), insurance coverage is still expensive for producers: premiums cost fluctuates between 3 and 6% of production costs. During this period, increasing pressure from social and economic actors demand the government to implement crop insurance subsidy in light of the increasing risk associated to the adoption of enhanced technologies along with the climatic variability. The exports boom of agricultural goods (mainly soy bean) and livestock to China over the past five years has generated unexpected revenues to the country, which is being the main argument to give agricultural some subsidies in return (Saldaña 2006).

USA

The 1996 Farm Bill removed traditional price and income supports to farmers in the USA. Instead, the crop insurance program expanded coverage from only covering losses from shortfalls in crop yield to cover losses in gross revenue (Skees, 2000: 2). Solely in 2001, budget for crop insurance increased 40% compared to 1999. The crop insurance subsidy reached 3,400 millions of dollars for that year in the USA, whereas in Mexico it keeps below 32 million, 0.9% compared to the USA system. Catastrophic Insurance (CAT) coverage is totally subsidized, and the maximum subsidy accounts at 42% of premium price. Farmers in the USA can obtain a minimum level of insurance coverage (CAT coverage) for a nominal administrative fee (60 dollars in 1999). Crop insurance is used by 30%-36% of farmers in the USA – and 69% makes use of a governmental program (Harwood, 1999: Annex C1). Crop insurance subsidy embraces 75 different crops[28]. CAT pays indemnities if yield crop is below 50% of average yield and covers 55% of a maximum fixed price. In addition, producers can contract other premiums to hedge 50%-75% of crop's yield through private insurance. Since 1994, the CAT system includes a complementary crop disaster assistance program for non-insurable crops, which transfers risk through private reinsurance companies (Harwood, 2000).

Canada

In Canada, three different programs provide basic coverage for yield and income risk in farming: the Crop Insurance Program (CI), the Net Income Stabilization Account (NISA), and the Agricultural Income Disaster Assistance (AIDA). Province governments are responsible for management and operation of the subsidy to crop insurance. The federal government provides 60% of funding and provinces 40% (1,800 millions of dollars in 2000). Coverage varies between 70%-90% of average crop yields over a 10 to 15 year period. Since its implementation, governmental support has represented 56% of total indemnities payments (OECD, 2000: 37).

Canada experienced a failed incursion in implementing crop revenue-insurance programs. The Gross Revenue Insurance Plan (GRIP) provided indemnity payments to farmers based on the shortfall between market revenue and the target revenue for crops. The government financed 66% of the plan and farmers contributed with the rest. But over 4 years of implementation, the plan accumulated a 1 billion deficit. Some critics identify its failure in the lack of market orientation, moral hazard, and costly for taxpayers (Hume and others, 1997).

Germany

Germany has no direct crop insurance subsidy, but pays indemnities to farmers in case of disaster transferring the risk to the derivatives markets. Based on the Chicago Board of Trade (CBT), the *Warenterminbörse Hannover* makes contracts of futures for agricultural commodities. The market includes potatoes, hogs, wheat, rapeseed, rapeseed meal and rapeseed oil. Nevertheless, the coverage seems to be still low in terms of traded volume. For instance, traded wheat and hogs (the

[28] However, some crops are excluded (e.g. citrus fruits, pears, peppers, plums and flax)

most representative ones) in 1999 reached only 2% and 3.5% of the market, respectively (EC, 2001: 22).[29]

Spain

In Spain, 40% of agricultural surface is covered by an insurance scheme, and the public subsidy to premium fluctuates between 8% and 45%. ENESA (*Entidad Estatal de Seguros*), the Public Insurance Agency at the Ministry of Agriculture, is responsible for establishing the parameters and for granting the subsidy. Insurance contracts are delivered to framers by means of participating private insurance companies. These companies integrate *Agroseguro* (*Agrupación Española de Entidades Aseguradoras de Seguros Combinados S.A.*), which manages the system, sets specific tariffs, conditions, pool premiums and the subsidy amount (OECD, 2000: 37). Independent experts hired by *Agroaseguro* assess and evaluate claims. Reinsurance is mainly provided by *Consorcio de Compensación de Seguros*, a public company –which also offers a broader reinsurance plan to private companies. Large international reinsurance companies reinsure the whole insurance system in turn. As most European Union countries, Spain has a long standing experience in mainly hail insurance, whereas futures, mutual funds and option markets are less implemented.

India

The National Agricultural Insurance Scheme (NAIS) was introduced in 1999 to replace the former Comprehensive Crop Insurance Scheme in India. NAIS covers all crops types, regardless cropping scale.[30] Small-scale producers and marginal farmers are granted with subsidies at 50% of the premium, sharing the cost 50%-50% State and Central Governments. The subsidy in premium is phased out over a five-year period. In 2001, 18 of 36 Indian states had joint the scheme. Livestock insurance is provided by the General Insurance Corporation of India, and covers either an agreed insured sum, or up to 100% of the animal's market price. NAIS covered over 6 million farmers during the agricultural season 1999-2000, equivalent to 14 millions of dollars of expenditure from governmental budget to support premiums.

[29] *Although* one should add German crops traded in international commodities markets abroad. For a detailed analysis see: European Commission (2001). Risk Management Tools for EU Agriculture – with a special focus on insurance. Directorate A. Economic Analyses, forward studies, evaluation. January.

[30] *Including* food crops, oilseeds and horticultural crops.

NACIONES UNIDAS

OFICINA SUBREGIONAL DE LA CEPAL EN MÉXICO

CEPAL **Serie estudios y perspectivas**

Issues published

A complete list of the papers included in this collection and the articles in pdf format are available on our website at: www.eclac.org/publicaciones
www.eclac.cl/mexico

92. Socioeconomic vulnerability to natural disasters in Mexico: Rural poor, trade and public response (LC/L.2825–P) (LC/MEX/L.819)) N° de venta: E.07.II.G.155, 2007.
91. Competencia y regulación en la banca: el caso de Honduras, Marlon Ramsses Tábora (LC/L.2824–P) (LC/MEX/L.818)) N° de venta: S.07.II.G., 2007.
90. México: Capital humano e ingresos. Retornos a la educación, 1994-2005, Juan Luis Ordaz (LC/L.2812–P) (LC/MEX/L.811)) N° de venta: S.07.II.G.143, 2007.
89. Indicadores de capacidades tecnológicas en América Latina, Gustavo Eduardo Lugones, Patricia Gutti y Néstor Le Clech (LC/L.2811–P) (LC/MEX/L.810)) N° de venta: S.07.II.G.142, 2007.
88. Growth, poverty and inequality in Central America, Matthew Hammill (LC/L.2810–P) (LC/MEX/L.807)) N° de venta: E.07.II.G.141, 2007.
87. Transaction costs in the transportation sector and infrastructure in North America: Exploring harmonization of standards, Juan Carlos Villa (LC/L.2762–P) (LC/MEX/L.794)) N° de venta: E.07.II.G.122, 2007.
86. Competencia y regulación en la banca: el caso de Panamá, Gustavo Adolfo Paredes y Jovany Morales (LC/L.2770–P) (LC/MEX/L.786/Rev.1)) N° de venta: S.07.II.G.107, 2007.
85. Competencia y regulación en la banca: el caso de Nicaragua, Claudio Ansorena (LC/L.2769–P) (LC/MEX/L.785)) N° de venta: S.07.II.G.106, 2007.
84. Competencia y regulación en las telecomunicaciones: el caso de Honduras, Marlon R. Tábora (LC/L.2759–P) (LC/MEX/L.781)) N° de venta: S.07.II.G. 96, 2007.
83. Regulación y competencia en las telecomunicaciones mexicanas, Judith Mariscal y Eugenio Rivera (LC/L.2758-P) (LC/MEX/L.780)) N° de venta: S.07.II.G.95, 2007.
82. Condiciones generales de competencia en Honduras, Marlon R. Tábora (LC/L.2753-P) (LC/MEX/L.778)) N° de venta: S.07.II.G.93, 2007.
81. Apertura comercial y cambio tecnológico en el Istmo Centroamericano, Ramón Padilla y Jorge Mario Martínez (LC/L.2750-P) (LC/MEX/L.777)) N° de venta: S.07.II.G.87, 2007.
80. Liberalización comercial en el marco del DR-CAFTA: Efectos en el crecimiento, la pobreza y la desigualdad en Costa Rica, Marco V. Sánchez (LC/L.2698-P) (LC/MEX/L.771)) N° de venta: S.07.II.G.48, 2007.
79. Trading up: The prospect of greater regulatory convergence in North America, Michael Hart (LC/L.2697-P) (LC/MEX/L.770)) N° de venta: S.07.II.G.47, 2007.
78. Evolución reciente y perspectivas del empleo en el Istmo Centroamericano, Carlos Guerrero de Lizardi (LC/L.2696-P) (LC/MEX/L.768)) N° de venta: S.07.II.G.46, 2007.
77. Norms, regulations, and labor standards in Central America, Andrew Schrank y Michael Piore (LC/L.2693-P) (LC/MEX/L.766)) N° de venta: E.07.II.G.44, 2007.
76. DR-CAFTA: Aspectos relevantes seleccionados del tratado y reformas legales que deben realizar a su entrada en vigor los países de Centroamérica y la República Dominicana, Amparo Pacheco y Federico Valerio (LC/L.2692-P) (LC/MEX/L.765)) N° de venta: S.07.II.G.43, 2007.
75. Competencia y regulación en las telecomunicaciones: El caso de Guatemala, Carmen Urízar (LC/L.2691-P) (LC/MEX/L.729/Rev.1)) N° de venta: S.07.II.G.42, 2007.
74. Competencia y regulación en las telecomunicaciones: El caso de Panamá, Ricardo González (LC/L.2681-P) (LC/MEX/L.721/Rev.1)) N° de venta: S.07.II.G.31, 2007.
73. Competencia y regulación en las telecomunicaciones: El caso de El Salvador, Pedro Argumedo (LC/L.2680-P) (LC/MEX/L.723/Rev.1)) N° de venta: S.07.II.G.30, 2007.
72. Mejores prácticas en materia de defensa de la competencia en Argentina y Brasil: Aspectos útiles para Centroamérica, Diego Petrecolla (LC/L.2677-P) (LC/MEX/L.726/Rev.1)) N° de venta: S.07.II.G.26, 2007.
71. Competencia y regulación en la banca de Centroamérica y Mexico. Un estudio comparativo, Eugenio Rivera y Adolfo Rodríguez (LC/L.2676-P) (LC/MEX/L.725/Rev.1)) N° de venta: S.07.II.G.25, 2007.

70. Honduras: Tendencias, desafíos y temas estratégicos de desarrollo agropecuario, Braulio Serna (LC/L.2675-P) (LC/MEX/L.761/Rev.1)) N° de venta: S.07.II.G.24, 2007.
69. Ventajas y limitaciones de la experiencia de Costa Rica en materia de políticas de competencia: Un punto de referencia para la región centroamericana, Pamela Sittenfeld (LC/L.2666-P) (LC/MEX/L.763)) N° de venta: S.07.II.G.17, 2007.
68. Competencia y regulación en la banca: El caso de El Salvador, Mauricio Herrera (LC/L.2665-P) (LC/MEX/L.727/Rev.1)) N° de venta: S.07.II.G.16, 2007.
67. Condiciones generales de competencia en países centroamericanos: El caso de El Salvador, Francisco Molina (LC/L.2664-P) (LC/MEX/L.720/Rev.1)) N° de venta: S.07.II.G.15, 2007.
66. Modelos de privatización y desarrollo de la competencia en las telecomunicaciones de Centroamérica y Mexico, Eugenio Rivera (LC/L.2663-P) (LC/MEX/L.724/Rev.1)) N° de venta: S.07.II.G.14, 2007.
65. Integración regional y políticas públicas. Evaluación de la experiencia europea y posibles implicaciones para la integración latinoamericana, Juan Tugores (LC/L.2647-P) (LC/MEX/L.760)) N° de venta: S.06.II.G.173, 2006.
64. Retos de la política fiscal en Centroamérica, Juan Alberto Fuentes K. (LC/L.2646-P) (LC/MEX/L.719/Rev.2)) N° de venta: S.06.II.G.172, 2006.
63. El seguro agropecuario en Mexico: Experiencias recientes, Erasto Díaz Tapia (LC/L.2633-P) (LC/MEX/L.758)) N° de venta: S.06.II.G.157, 2006.
62. Competencia bancaria en Mexico, Marcos Avalos y Fausto Hernández Trillo (LC/L.2630–P) (LC/MEX/L.722/Rev.2)) N° de venta: S.06.II.G.155, 2006.
61. La sosteniblidad de la deuda pública y la postura fiscal en el ciclo económico: El Istmo Centroamericano, Edna Armendáriz (LC/L.2629–P) (LC/MEX/L.757)) N° de venta: S.06.II.G.154, 2006.
60. The effectiveness of technical assistance, socio-economic development, and the absorptive capacity of competition authorities, Simon J. Evenett (LC/L.2626–P) (LC/MEX/L.755)) N° de venta: E.06.II.G.150, 2006.
59. Los instrumentos económicos en la gestión del agua. El caso de Costa Rica, Liudmila Ortega Ponce (LC/L.2625–P) (LC/MEX/L.754)) N° de venta: S.06.II.G.149, 2006.
58. The political economy of Mexico's dollarization debate, Juan Carlos Moreno-Brid and Paul Bowles (LC/L.2623–P) (LC/MEX/L.753)) N° de venta: E.06.II.G.147, 2006.
57. DR-CAFTA: ¿Panacea o fatalidad para el desarrollo económico y social en Nicaragua?, Marco Vinicio Sánchez y Rob Vos (LC/L.2622–P) (LC/MEX/L.752)) N° de venta: S.06.II.G.146, 2006.
56. Valuing damage and losses in cultural assets after a disaster: Concept paper and research options, Kaspars Vecvagars (LC/L.2610–P (LC/MEX/L.731)) N° de venta: E.06.II.G.135, 2006.
55. Estado de bienestar, desarrollo económico y ciudadanía: Algunas lecciones de la literatura contemporánea, Sonia Draibe y Manuel Riesco (LC/L.2601–P (LC/MEX/L.742)) N° de venta: S.06.II.G.112, 2006.
54. Los efectos de los desastres en 2004 y 2005: La necesidad de adaptación de largo plazo, Ricardo Zapata (LC/L.2594-P (LC/MEX/L.733)) N° de venta: S.06.II.G.123, 2006.
53. Opciones de financiamiento para universalizar la cobertura del sistema de pensiones de Costa Rica, Fabio Durán (LC/L.2593-P (LC/MEX/L.732)) N° de venta: S.06.II.G.122, 2006.
52. Condiciones generales de competencia en Guatemala, Antonio Romero y Carlos E. González (LC/L.2550–P (LC/MEX/L.718)) N° de venta: S.06.II.G.77, 2006.
51. Health benefits guarantees in Latin America: Equity and quasi-market restructuring at the beginning of the Millennium, Ana Sojo (LC/L.2546-P (LC/MEX/L.717)) N° de venta: E.06.II.G.74, 2006.
50. ¿Se erosiona la competitividad de los países del DR-CAFTA con el fin del acuerdo de textiles y vestuario?, René A. Hernández, Indira Romero y Martha Cordero (LC/L.2545–P (LC/MEX/L.691/Rev.2)) N° de venta: S.06.II.G.73, 2006.

- Readers wishing to obtain the listed issues can do so by writing to: Biblioteca de la Sede Subregional de la CEPAL en Mexico, Presidente Masaryk N° 29 – 4º piso, 11570 Mexico, D. F., Fax (52) 55-31-11-51, biblioteca.cepal@un.org.mx.
  These publications are also available on the Internet: http://www.eclac.org/ and http://www.cepal.org

Name: .....

Activity:.....

Address:.....

Postal code, city, country: .....

Tel.: ..... Fax: ..... E.mail: .....