Paving the Way Forward for Rural Finance
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Discussant Reaction Paper

Comments on Paper

"Risk Management Challenges in Rural Financial Markets: Blending Risk Management Innovations with Rural Finance"
by Jerry Skees

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RELATIVE IMPORTANCE OF AGRICULTURE IN THE RURAL ECONOMY OF MEXICO

According to empirical studies[1], the contribution to the annual average income generated from agricultural activities in rural areas of Mexico is only 14%. Nevertheless, if we consider the agricultural related economy as a whole, taking into consideration activities such as the supply of inputs for agricultural production, the temporal employees hired for the production of different crops, processing and merchandising; the contribution of agriculture rises to 40%. This number does not consider the consumption multiplier effect, since the income generated from agricultural activities is expended in the local stores and services providers. Just to illustrate this fact, it is important to mention that the non agricultural enterprises are typically microenterprises, occupying 50% of the total work force, but whose products are almost exclusively sold at local markets. Therefore, for the rural economy in Mexico agriculture remains as the main source of income, and because of itz nature, it also represents the mayor source of variability to the incomes of the rural population.

These same empirical studies have demonstrated for Mexico that the diversification of income generating activities (including migration) allows the economic agents in the rural areas to diminish the probability of being below a certain poverty line. Nevertheless the results also demonstrate that diversification generates a limitation in achieving higher incomes (economic development) that is usually achieved when specialization occurs, and also demonstrate that diversification does not function as an efficient risk management strategy when faced with correlated risks as droughts, etc. These results go in line with the arguments presented by Dr. Jerry Skees in his paper.

PROFILE OF RISKS FOR AGRICULTURAL ECONOMIC AGENTS

Regretfully, the study of risk on empirical works of rural finance or any other study related to the economy of the rural sector in general is usually not considered. Therefore most of the countries have neither information about their risk profile of their rural economies, nor information about the way economic agents in the rural sector cope with different risks, and therefore have little idea about the specific economic consequences of risks on rural economies. This is something donor agencies promoting sound microfinance practices, like the USAID, should analyze in detail.

In Mexico, Institutions like the World Bank have made some efforts to analyze the topic of risk management. A survey of rural entrepreneurs (REs), which was carried out in 1994[2], indicated that about 60% of the respondents experienced an "economic crisis" between 1989 to 1994 (World Bank, 1995).[3] According to the same survey, the main source of risk for rural economic agents involved in agricultural production is low yields. 48% of those economic agents with farming activities answered that low yields was their source of risk for the economic crisis experienced during the period under analysis, while the second most important source of risk for

[1] Wiggins Steve etal. "The Impact of Agricultural Policy Liberalization on Rural Communities in Mexico". 1999

[2] The survey, conducted in July-August 1994 covered 1,944 rural households in Guanajauto, Puebla, Taumalipas and Veracruz.

[3] Economic crisis was defined as an abnormal year resulting in lower income than the average. With this relative definition of the economic crisis, information could be captured both for people above and below the poverty line. As a matter of fact, in terms of measuring risk it is not important if the individual is in poverty or not. When it becomes important to divide the population by income is when you are analyzing the impact of such risks and the way the individuals are coping with it.

economic agents with agricultural production was the expenses related to the illness of the entrepreneur or a member of its family (15%). Yield risk is almost 3 times more important than the second source of risk for rural entrepreneurs with agricultural activities. It is of outmost importance to highlight the fact that the mayor source of risk for yield variation is weather risks, therefore this is another important conclusion to support the argument of Dr. Skees in favor of the relevance to develop formal mechanisms to manage weather risk for farmers in rural economies.

As we mentioned earlier, besides looking at the various sources of income risk, it is also important to assess the risk management strategies and capabilities of small farmers. Unfortunately, the 1994 survey (World Bank, 1995) did not report on risk reduction (e.g., crop or field diversification) and/or risk mitigation strategies (e.g., crop insurance, savings), but only on risk coping strategies. However, the reported risk coping strategies do shed some light on alternative risk management strategies available to small farmers. The major risk coping strategies for small farmers were increased labor market participation by the farmer and/or household members (38%), reduced consumption (22%), interest-free loans and/or donations from friends and relatives (15%), sales of assets – notably livestock[4] - (10%) and interest-bearing loans from formal or informal sources. Interestingly, only about 1% of the respondents reported that they delayed repayment of loans (although, only a small proportion had access to formal or informal loans). It was also noted (World Bank, 1995) that loans for consumption smoothing were usually received from informal lenders (since formal lenders usually restrict loans to productive purposes), and that interest rates for these informal loans were considerably higher than for formal sector loans, although repayment rates were more flexible and based on the ability to repay. Another, more recent study of rural financial markets (World Bank, 2000c) indicates that many small farmers resort to a variety of self-insurance strategies that include precautionary savings – primarily using livestock and/or food stocks[5] – along with social capital (e.g., assistance through social networks, including remittances from relatives living outside the area) and, to a much lesser extent, financial assets (e.g., savings). Clearly, it is difficult to assess the short- or long-term efficiency of these coping strategies, without knowing more details about the benefits and costs of the different options. This is therefore another recommendation for donors agencies: it is of outmost importance to develop the appropriate conceptual framework to evaluate the comparative efficiency of the different risk management mechanisms, in order to make policy recommendations oriented toward achieving a more efficient risk management system. As we have explained this issue should become one important topic in the design of poverty alleviation strategies.

NATIONAL INSURANCE SYSTEM FOR THE RURAL SECTOR IN MEXICO

The history of agricultural insurance in Mexico can be tracked back to the 1940's. Nevertheless, the history is full of failures with different models of insurance (monopoly of state, private insurance, insurance based on collective association initiatives, etc.). The most successful model began in 1990 with the creation of Agroasemex as a government owned Insurance & Reinsurance Company. The reason why I am going to describe in detail the Mexican System is

[4] In many cases, the asset sales were livestock, which are often held by small farmers for home consumption, cash sales, and for their value as a form of precautionary savings.

[5] A major problem with holding livestock as a form of savings to be used in times of economic crisis is that many farmers might also be experiencing such a crisis and attempting to sell their livestock – thereby lowering the value of the livestock for risk management. Use of financial savings could improve the ability of small farmers to utilize their assets to manage risk.

because it is one of the only worldwide available systems for a developing country that has combined the participation of the state, mutual organizations and private companies, which will be useful for the discussion of the topics included in Dr. Skees paper.

The current national insurance system for the rural sector consists of AGROASEMEX, the state-owned insurance company established in 1990 to succeed ANAGSA, the Fondos de Aseguramiento, or Insurance Funds, and private insurance companies. AGROASEMEX provided direct insurance to farmers until 2001 and provides reinsurance to the Fondos and the private companies. A Fondo is a group of farmers in a more or less homogeneous area that provides mutual insurance to its members. Because of the limited capacity to absorb systemic risk, the *fondo* reinsures itself through AGROASEMEX. In addition, AGROASEMEX supervises the *fondos* and provides technical assistance, for example in management, technical expertise, training, etc. There are 295 *fondos* of which in 1999 there were 195 in operation and 200 in 2000. The participation of the private companies is restricted to 6 companies (less than 7% of the total insurance companies registered in Mexico).

The present crop insurance system in Mexico focuses on agricultural regions with productive potential and financial viability. Subsistence and poor non-commercial farmers are supposed to be covered through the government's national disaster scheme called FONDEN. Thus, from the 21.9 million hectares of agricultural land in Mexico, only 1.6 million hectares are insured. About 55.7% of the insurance (in terms of area coverage) goes to four states namely Sinaloa, Sonora, Chihuahua and Tamaulipas. These are states with relatively large share of commercial agriculture. This is one of the primary limitations of the traditional crop insurance schemes. To control moral hazard and adverse selection (concepts which are well defined in Dr. Skees paper) insurance is usually limited to the most productive areas in order to try to maintain under control transaction costs (this is true even for the self insurance funds which has become the most successful, comparatively, institutional provider in terms of handling transaction costs combined with a good technical and profitable result from crop insurance).

If you look to the historical results of the Mexican system for the period 1991-2000, AGROASEMEX had a loss ratio[6] for agricultural insurance of 81.4% and 63.8% for livestock insurance. Overall, the loss ratio is 75.7%. The loss ratio is higher compared to the *fondos* for the same period estimated at 56.5%. The overall good loss ratio of the system can be favorably compared to any system in the world. Even though the insurance area is concentrated and only about 10% of the agricultural land is insured, transaction cost still remains a big threat to the system.

This phenomenon of concentration is enhanced by the fact that insurance is linked to credit, since the credit institutions are usually the ones who forced the producer to buy insurance as a guarantee of repayment to the creditor. Credit access in countries like Mexico is concentrated in larger farmers, as can be shown in the next table.

[6] A simple definition of loss ratio is the ratio of indemnities paid over premiums collected. A loss ratio above 100% means that the insurance company is loosing money. The loss ratio presented here does not include administrative costs. Thus, even with a loss ratio below 100% the insurance company may be loosing money if it has high administrative costs.

Table 1: Credit, insurance and household characteristics

Landholdings in hectares	0	0.1 to 5	5.1 to 15	>15	All
ORGANIZATIONAL PARTICIPATION					
Cooperatives	0.0%	1.0%	3.0%	4.0%	2.0%
Producers Associations	0.0%	4.0%	4.0%	3.0%	4.0%
Credit Unions	0.0%	0.0%	0.0%	0.0%	0.0%
Self Insurance Funds	0.0%	1.0%	2.0%	5.0%	2.0%
CREDIT					
Received Credit for Gov. Institutions	0.0%	16.0%	20.0%	25.0%	19.0%
Comercial Credit	0.0%	1.0%	1.0%	1.0%	1.0%
Banrural Credit	0.0%	7.0%	12.0%	19.0%	11.0%
Pronasol	0.0%	4.0%	4.0%	4.0%	4.0%
Non Banking Formal Credit	0.0%	1.0%	0.0%	1.0%	1.0%
Other Sources of Formal Credit	0.0%	4.0%	2.0%	3.0%	3.0%
Requested Formal Credit	9.0%	19.0%	24.0%	31.0%	23.0%
Received Credit from Informal Sources	17.0%	14.0%	17.0%	18.0%	16.0%
Tiene cartera vencida	0.0%	9.0%	14.0%	17.0%	12.0%
INSURANCEe					
Crop Insurance	0.0%	1.0%	5.0%	6.0%	3.0%
Insurance for Machinery	0.0%	0.0%	0.0%	0.0%	0.0%
Life Insurance	0.0%	2.0%	5.0%	2.0%	3.0%
Health Insurance	17.0%	5.0%	12.0%	13.0%	9.0%
Other Type of Insurance	0.0%	0.0%	0.0%	0.0%	0.0%
Number of observations	23	511	457	263	1,254

Source: 1996 ejido survey.

An analysis of the 1996 Ejido data survey suggests however, that most smallholder farmers do not obtain formal credit nor purchase formal insurance. (Table .1). Overall, about 3% of the ejido farmers surveyed in 1996 indicate that they purchase crop insurance with the higher percentage of those surveyed have 5 hectares of land or more. On the other hand, 19% of the farmers surveyed report that they receive official credit of which 11% is from BANRURAL. Aggregate data also shows that the link between insurance and credit was not as binding at the time of the ejido survey in 1996 but may have increased as a result of the more recent policies of FIRA and BANRURAL (development banking institutions) that encourage risk management at the farm level. Moreover, few ejidatarios participate in the types of associations that might facilitate credit. According to the survey results, only 2% of those ejido farmers surveyed reported that they belonged to a mutual insurance fund (*fondo de aseguramiento*). And a higher percentage of these farmers had more than 15 hectares of land.

Additionally it is worthwhile to mention that even though we have not detailed information about microfinance institutions portfolio in rural sector, we have received comments from respectable professionals in this business, that credit for agricultural activities has been historically low even for microfinance institutions, since they believe their sustainability as institutions providers of credit depend very much on the high repayment rate of their portfolio and agriculture represents a big risk in terms of the overall health of it.

Looking to this scenario is when it becomes important to analyze such topics as the possibility to blend risk management innovations with rural finance, as Dr. Skees suggests in his paper.

During the year 2000, Agroasemex approached the World Bank to get involved in the initiatives to develop insurance schemes based on weather indexes. The main reasons for that was our impression that they could really become an interesting approach to diminish moral hazards and adverse selection, lower transaction costs, and in general arouse as a more efficient formal option to hedge weather exposure at different levels (farmers to insurance companies, insurance companies to reinsurance companies or capital markets, reinsurers to reinsurers or capital markets, government CAT exposure to financial markets, etc).. There is one additional feature, which is very well explained in Dr. Jerry Skees paper, regarding the recent developments in the international financial markets. The new generation of products is fundamentally based on indexes, which means the parameters of risk in a financial contract are agreed at the moment of signature (cat bonds, weather derivative tradable indexes, over the counter weather derivative contracts, securitization of risk in general, etc.).

The work with the World Bank in 2000 was oriented towards evaluating the feasibility to use weather index products to hedge the exposure of crop yield to weather variability. The study demonstrated in very aggregate terms that yield was correlated to rainfall in this case, for some states in Mexico. This work shed some light about the potential of index products in Mexico. Nevertheless, the lack of experience worldwide in applying this schemes to reality (making them feasible in operative terms) required very specialized tasks like the design of the contracts, the design of pricing models to register the product with the insurance regulators, develop an accepted weather database for the international markets, develop or enhance the measuring networks for contract settlement, etc. when we finished the work with the World Bank it was difficult to realize how complex were the problems ahead, and most important how to solve them. Since this kind of instruments have really become viable in developed countries mostly, where you won't find such serious problems like the quality of weather data, there was no previous experience on how to solve the hurdles in countries like Mexico, with such many institutional, legal, infrastructure, etc., limitations.

It took almost a year and a half before we were able to design the first parametric financial instrument, which was used as a substitute of reinsurance for Agroasemex agricultural risk portfolio. Several factors played in our favor like the existence of very strong technical teams concentrated in the market makers as Enron & Aquila, which allowed them to invest human resources in the development of new solutions. With the extinction of these companies the technical teams of these companies have distributed in different banks and reinsurance companies around the world to develop indexed products. But with the current financial situation, such teams remain small and therefore concentrate in bigger deals. It is very difficult to convince their management to allocate their small resources available to explore new businesses in countries interested to develop such mechanisms. Therefore there exists very few opportunities for interested countries to find support for the design of feasible schemes (technically, financially, and operatively). As I mentioned before the efforts of the parties interested in promoting these instruments worldwide are not comprehensive enough.

It was until 2003 that we were able to comply with the requirements (infrastructure, design of contracts, etc.) for the formal launch of the first commercial scheme to hedge the weather catastrophic exposure that agricultures faces in a specific state of Mexico (Guanajuato). All these issues are mentioned in order to raise the case for international donors to find mechanisms to support the creation of really knowledgeable institutions or advisors that could assess interested

countries on this topic with a broader perspective on rural economical development issues, and with the capability of assessing newcomers in this business.

At this point it is impossible for us as Agroasemex to share with the audience of the conference organized by WOCCU, the results of the implementation of commercial indexed products, because we have just began in this journey, in terms of designing products to be bought by external economic agents as farmers, state governments, insurance companies, etc.

DESIGN OF APPROPRIATE INSTRUMENTS TO HEDGE WEATHER IN THE INTERNATIONAL MARKETS

I would like to deepen the discussion over some issues related to hedge weather that usually is missed from most of the technical papers about the use of alternative markets to hedge weather risks.

When analyzing the most efficient way to manage any risk, including weather risk, it is very important to develop a well understanding or characterization of it. Risks might be defined according to four categories:[7]:

a) Frequency: Risk by definition is related to the uncertainty of the future outcomes of reality in different time frames (seconds, minutes, weeks, years, etc.). The frequency of any risk can be defined by the expected number of times the risk will materialize in reality in relation to a certain time frame. Following this line of argument we could say that risks might be of low or high frequency. For example, the bite of a mosquito in a tropical place might be a high frequency risk. On the other hand, the risk of getting infected from a disease eradicated in a certain place, like tuberculosis in the US, is a low frequency risk.

b) Intensity: In order to evaluate how serious might be the effects of a certain risk on the well being of a certain individual or group of individuals, frequency is not the only issue to analyze, intensity is also very important. Following the previous example, the bite of a mosquito might be a very frequent risk but has a very low intensity, therefore the impact on the well being of the affected individual is quite small. On the contrary, tuberculosis might be a very low frequent risk, but its intensity is very high since it can really impact the health of the people affected.

c) Individual vs. Covariate (Collective) Risks: There is risks that might affect individuals on an isolated basis, like diseases and personal accidents; and there is another type of risks that affect a group of individuals at the same time, like droughts. Therefore the presence of a covariate risks are based on the degree of positive correlation between the members of a certain group of individuals.

But weather has one important feature; it is a very complex system with a great degree of variability. When scientists refer to the pattern of behavior and variability of weather, they usually refer to the cyclical nature of weather (short, medium and long terms cycles interacting together)[8]. Weather varies in different forms. Some of these forms are well understood scientifically, but others have not been decoded.

[7] Morduch J.,"Between Market and State: Can Informal Insurance Patch the Safety Net? 1997.
[8] Dischel Robert. “Climate Risk and the Weather Market”. 2002

The main pattern of variability is related to the annual cycle of stations (travel of the earth around the sun). Besides this source of variability there exists several other phenomena at different scales (global, regional or local) whose influence modulate the normal patterns of weather. One of the most worldwide studied modulator is ENSO (Southern Oscillation "El Niño"). Another very well studied regional phenomena are the topography, the wind patterns and the variations of sea temperature nearby a certain area of influence. The changes of weather due to this phenomena occurs in different time scales (between stations, years or even longer periods), but their impacts in some cases are still not completely understood.

Weather is also vulnerable to different modulators whose influence lasts for longer periods (decades, centuries). These phenomena are known as low frequency oscillation. Their effects are usually not yet fully understood by scientists. The Pacific Decadal Oscillation (PDO) is one example of such misunderstood phenomena.

All the above technical description has been included in order to make the next several points:

- Catastrophic events are usually defined in the financial markets according to the frequency of risks. In the securitization markets, catastrophic events are those whose frequency is 1/50 or lower. Even though catastrophes are also related to the intensity of the event, the frequency has become an important criteria for investors in determining their involvement in securities related to catastrophic events like earthquakes. According to market experts, the appetite of investors hasn't been attracted to those phenomena with a frequency higher than one in fifty years event. Therefore it seems that other kinds of risk with higher frequency would require different engineering of the products to attract the interest from the capital markets.
- The main challenge of agriculture is that it is often subject to very important exposures to weather events with greater frequency and still catastrophic impacts. For example in Mexico important information has been generated to demonstrate the impact that ENSO has on Mexican agriculture. According to the leading experts the ENSO cycle lasts 5 to 7 years, with strong ENSO events repeating every two cycles (10 to 14 years). In Mexico 1983 was a catastrophic year for agriculture, as it was 1997, both related to strong ENSO events.
- This problem is aggravated when we add the fact that the economic impact from different weather variations patterns cannot be quantified yet.
- One of the most important recommendations for donor agencies will be related to the fact that there are very few instruments, advisors, etc., worldwide capable of assessing interested parties in evaluating the accessibility of certain markets to hedge a specific exposure to weather risk and even more important capable of evaluating the comparative efficiency of the available instruments on the market. These aspects related to complex financial engineering decisions are available to only but a few worldwide. Developing proper technical bodies, seminars and literature is very important for educating countries, companies, etc., on how to hedge more efficiently their weather exposure, specially in agriculture where in some cases there are events which have catastrophic consequences relatively frequently.
- Since weather can affect several individuals at the same time, it is considered a covariate risk, following Dr. Skees nomenclature of his paper. The presence of covariate risks limits the capability of the risk taker to diversify the risks geographically. It has been demonstrated empirically that the coefficient of variation for the technical results of

insurance companies in the US (indemnities/premiums) specialized in property business (automobiles, fire, etc.) ranges from 5.3% to 5.6%., while the same coefficient for companies specialized in agricultural insurance is around 84%. This variability added to the fact of the low price discovery in traditional reinsurance markets, as was also explained by Dr. Skees in his paper, is translated to very discretionary loadings over the pure expected price of risk, which difficult the assessment of the efficiency of traditional reinsurance contracts.

- Lastly it is also important to consider the transaction costs associated in the design of the different risk transference mechanisms. For example, it is estimated that the placement costs of a Cat Bond (including commission of placement institution, modeling for the assessment of risk, etc) is around US $1,000,000. These costs are almost independent of the size of the operation, therefore small operation become more expensive in relative terms.

Most of the comments in this section were drafted in order to raise the consciousness of interested parties in the design strategies to transfer weather risk to the international markets. Each problem (countries exposures for example) requires a proper analysis to avoid any surprises in the efficiency or costs related to it.