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Policy for implementation of Index Based Weather Insurance revisited: the case of Nicaragua

Banerjee C. and Berg E.

Institute for Food and Resource Economics, University of Bonn, Bonn, Germany

c.banerjee@ilr.uni-bonn.de

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Banerjee C. and Berg E.

Abstract

International development organisations, through partnerships with local insurance companies, have been promoting weather index based insurance (WIBI) in developing countries. Due to lower operational costs, they expect shorter pay-off period, often overlooking high initial design costs. Experiences however show high post-pilot mortality of these programmes. Literatures report lack of insurance participation. We propose lack of push from insurance providers as an additional factor. To verify, cash flows of a Nicaraguan groundnut based WIBI and a comparable but hypothetical named peril insurance are simulated against 80 scenarios. Additionally, a test of stochastic dominance of their estimated Net Present Values show that WIBI take comparatively longer to pay-off yielding lower returns with considerable risk. WIBI, given its advantages is undoubtedly an efficient agricultural risk management tool. Therefore, to make it sustainable, long-term pilots and technical assistance is required until the product pays-off and yield profits for insurance providers.

Keywords: Index based rainfall insurance, weather derivative, operational cost, Nicaragua

1. INTRODUCTION

Weather index based insurances (WIBI) have been promoted over the last decade by international development organisations both through public and private insurance providers in the developing world. It is an innovative product with the potential to mitigate financial repercussions of adverse weather events in many developing economies. Index-based insurance, if feasible, might ease the burdensome task of donors and governments of intervening and supporting agriculture affected by adverse weather events. Such interventions-- which often involve government policies of agricultural credit bailouts-- have been popular but painfully counterproductive.

The alternatives to WIBI are named-peril or multi-peril insurance policies which indemnify losses to one's property or crops from specific adversities or wide variety of events respectively (Edwards, 2003). A classical example of named peril insurance in agriculture is the hail insurance common in Europe. Both named and multi-peril insurances are predominantly available in more developed countries. The inherent limits to the development of markets for these insurances in the developing countries are: (i) difficulty in controlling moral hazard, under which the insured individuals behave more riskily because of insurance cover and thus increase the probability of adverse outcomes; (ii) lack of check against adverse selection, whereby individuals with higher than average risk seek insurance and those with lower than average risks find it uneconomical (for a detailed discussion on Moral Hazard and Adverse Selection please refer to Doherty, 2000); (iii) underdeveloped infrastructure, due to which monitoring small

individual risks gets expensive. Added to the limits, many weather related shocks are covariate in nature, making it hard for insurance providers to efficiently and timely assess damages when it hits large number of farms over extensive areas.

A novel solution is hence an insurance indexed to an objective indicator of weather, such as rainfall or temperature. Depending on the crop and availability of data, indices like cumulative rainfall in a particular crop phase or the number of days with temperatures below or above a cut-off is in common use. Since weather is not affected by individual behaviour, and there is no asymmetry of information regarding occurrence of weather events, index insurance can address both moral hazard and adverse selection. Furthermore, since payouts are determined on the basis of objectively observed weather data from independent meteorological stations, monitoring costs are minimised (Barnett et al., 2008). Owing to these advantages, international development organisations have been piloting them in developing countries with the expectation that insurance providers would eventually scale up those pilots into larger operations and demonstrate that WIBI plays a major role in transferring risks from the agricultural sector.

Since operational costs are low, the promoters of WIBI expect a faster pay-off and higher returns for the insurance providers. This is reflected by the fact that a typical intervention involves piloting for 3 to 5 years, after which it is expected that the programme will self-sustain and scale up. What is often overlooked is that: (i) due to the inherent systemic nature of losses in agriculture, insurers retain less risk and transfer more of the business (risk and premium) to re-insurers with large financial capacity. (ii) Initial costs of designing WIBI are high and due to various reasons, they are difficult to scale up. (iii) High costs and low scale brings up the unit cost, jeopardising their projections. Experience corroborates that the balance is not completely tilted towards index based insurance products. Despite the best of intentions, these programmes die out after the pilots end. Literatures report lack of insurance participation (Giné et al., 2008). We surmise that lack of interest on part of insurance providers might also be a reason. In order to test our hypothesis, we test the validity of the basic assumption that owing to low operational costs, WIBI pays-off faster and yield greater returns in comparison to conventional crop insurances. If invalid, it would make such programmes unattractive to insurance providers and hence validate our original conjecture. For the analysis, we treat a groundnut based WIBI in Nicaragua as an investment option against a similar but hypothetical named-peril insurance (N-P).

In the following section we describe the groundnut based WIBI, and introduce the scheme for the hypothetical N-P insurance. In the methodology section, we describe the various variables of the simulation like: (i) insured area (as a proxy for insurance sales); (ii) quota share reinsurance parameters; (iii) expected payouts; (iv) premiums; and (v) interest rate. Next, we discuss the cash flow simulation, followed by a test for stochastic dominance and the respective results.

This study is not a comparison between weather index based insurance and named-peril insurances which are riddled with moral hazard, adverse selection and higher operational costs. But since WIBI are usually assumed to be scaled up and promoted by insurance providers due

to lower operational costs and higher expected returns, we merely verify this assumption. The question however is dealt purely as an investment decision problem, keeping in mind that these two insurance products are not comparable. This paper calls for review of the policies of Official Development Assistance (ODA) regarding piloting, implementation and up scaling of index based insurance products in developing countries. It also presents a methodology to answer practical questions such as: what volume of sales is necessary over what time horizon for a WIBI to pay-off and where does it stand in comparison to more familiar named peril insurances.

2. BACKGROUND

The Nicaraguan economy like many other developing economies is heavily based on agriculture and the performance of this sector strongly influences progress in poverty alleviation (Castro-Leal, 2004). Surveys show that rural households perceive weather adversity and price volatility of agricultural commodities as their primary sources of risk. This, coupled with high inequality in incomes and assets, has led financial institutions to concentrate their agricultural lending on large farmers who can guarantee credit with sufficient collateral. The absence of ex-ante initiatives to manage weather related risks has further constrained agricultural lending. Catastrophic weather events causing large losses in agriculture have led the public sector to adopt-- with support from the donor community-- a reactive weather risk management strategy to protect the poor. Experiences from around the world have shown that attempts to operationalise named and multi-peril crop insurance in developing countries have failed. Hence, there are concrete reasons as to why index based insurance products gained favour over traditional insurance among donor community.

2.1. The weather index based insurance

Since 2007, a public-private partnership has sought to develop and test an alternative approach to insuring weather related risks in Nicaraguan agriculture. The index based insurance contracts were offered by two insurance providers, INISER (Instituto Nicaragüense de Seguros y Reaseguros) and SEGUROS LAFISE S.A. LAFISE provided these services for clients of the LAFISE Bank, under reinsurance cover from Paris Re, while INISER was covered by Partner Re. Now both the reinsurance companies have merged. The programme in Nicaragua is mainly aimed at commercial groundnut farmers. It covers three types of risks named “A”, the risk arising from drought during the entire production cycle; “B”, the risk arising from excess precipitation during the entire production cycle; and “C”, the risk arising from excess water during the harvest period. The contract runs from sowing in July to harvest in December. The sowing dates are within the 1st and 31st of July with 5 days interval.

2.2. The hypothetical named peril insurance

Lower operational cost of WIBI is expected to help an investor break even faster with lower business volume. In order to verify this claim, a hypothetical named-peril insurance with the same coverage as the aforementioned WIBI is conceived and compared. The point of difference is physical assessment of damage instead of calculation of index based on objectively observed weather data. The hypothetical contract is of the following nature:

Like the WIBI, the policy runs for the same period of a cropping season and is set against the same pre-determined amount insured per unit area. An independent trained damage assessor visits the insured plot and assesses the damage that might have been caused by the aforementioned phenomena (risks A, B or C). It is important to note that damage caused by other causes (like pests), if identified, will not be recorded as damage, since they are not insured under the policy. This will follow indemnification as per report of the assessor. The cost incurred in this entire process is expressed as a percent of the Original Gross Premium (OGP) as reported by Mahul and Stutley (2010).

A salient feature of such a policy is that contract design costs are significantly minimised since, pricing methodology is well established and data requirements are comparatively lower than a WIBI. Dense network of weather stations are also not required since there is no need to know the occurrence of the weather phenomenon with high level of accuracy. In addition, basis risk is mitigated through first hand assessment. This also has the positive effect of boosting the confidence of policy holders since there is a human factor involved in damage assessment instead of the readings of a weather station which is often not verifiable by them (refer to ambiguity aversion, Hogarth and Kunreuther, 1989).

This brings us back to the argument of moral hazard and adverse selection. In order to make it comparable with the index based insurance, moral hazard in the proposed model is countermanded by indemnifying only those losses which caused by the weather phenomenon named in the policy. Therefore if the policy holder lets the crop suffer further damage caused by other agents, it does not promise her better indemnification. Adverse selection is defeated by the fact that this product like the WIBI covers only weather related losses. Since this trigger is covariate, the risk of adverse selection is minimised. Such a policy may be reasonably juxtaposed against WIBI, so as to give the reader a perspective.

3. METHODOLOGY

We do not intend to compare these two types of insurances. Owing to the fact that named-peril crop insurances have a longer history and are better known, we report their performances side-by-side. This merely offers the reader a frame of reference. WIBI cannot be compared to these programmes because of the following points of difference:

1. There are basic differences in the contract design. While N-P is an insurance contract, WIBI has the same contractual form as that of a Weather Derivative (Skees, 2008) and pays when there is a trigger, irrespective of the actual loss.

2. In case of N-P, loss is assessed by field inspections. The payouts are then calculated from a payout matrix, which tabulates the amount of indemnification corresponding to the assessed amount of loss. In case of WIBI, losses are never assessed. Instead, the payout is calculated on the basis of indices calculated from objectively observed weather data obtained from an independent meteorological station, hence removing the need for a field inspection. Both types of insurance products however involve: (i) hazard assessment, (ii) vulnerability assessment, and (iii) risk exposure.
3. Differences in fixed costs which include: (i) the cost of actuarial modelling, which is comparatively lower in case of N-P insurance due to availability of under-writing software and a well established methodology for pricing these products. WIBI on the other hand is new and hence expensive to design since every contract has to be specifically designed to fit a crop and a geographical location. Although cross hedging among different crops or design of contracts for crops with similar physiological characteristics is not uncommon, this does not come without considerable product basis risk (Woodard and Garcia, 2007). In addition, due to lack of local expertise in developing countries, foreign experts have to be consulted, bringing up the costs further. Unavailability of long term agronomic and weather data add to the limits bringing up the costs due to complexity of contract design. Therefore, on the basis of above argument, the cost of designing a N-P is negligible in comparison to that of a WIBI. (ii) There may be an additional cost of setting up and maintaining automated weather stations (only in case of index based insurance) in places where government run meteorological stations are sparse. But in our case, that is not an issue. (iii) Administrative costs are more or less same for both types of insurances of comparable size.
4. Differences in variable costs which include: (i) reinsurance and marketing costs, which are comparable in both cases and are project specific. (ii) Damage assessment costs (in case of N-P) are considerably higher than cost of collecting weather data from meteorological stations at regular intervals (as in case of WIBI). As reported in Mahul and Stutley (2010) the operational costs of index based insurance is hence lower than their counterparts because of the inherent difference in method of loss assessment as discussed above.

In congruence with the aforementioned reasons, we make a comparison between WIBI and N-P merely as two possible investment options for insurance providers. The methods usually applied to help make investment decisions are based on evaluation of the profitability of one or more exclusive investment projects which are characterised by a cash flow (Brandes and Odening, 1992). Although one might argue that the other methods might equally comment on the comparative attractiveness of two mutually exclusive investment options, our choice for pay-off method is justified on the following grounds: (i) The Net Present Value, Annuity and Internal Rate of Return methods requires pre-specified duration of investment. This is not available, and it is precisely the variable on which our argument hinges, hence these methods are ruled out. (iii) Terminal wealth method requires complete liquidation at terminal period, an

unrealistic assumption in our case. (iii) Although a less powerful instrument, pay-off method has the inherent advantage of incorporating future cash flow volatilities into account. Our choice for the pay-off method is further justified by the fact that we seek to know, how long it takes for an investment in WIBI to pay-off as against an investment in N-P insurances. From an ODA policy point of view this information helps determine the length of period for which the WIBI programmes needs to be supported as compared to conventional crop insurance.

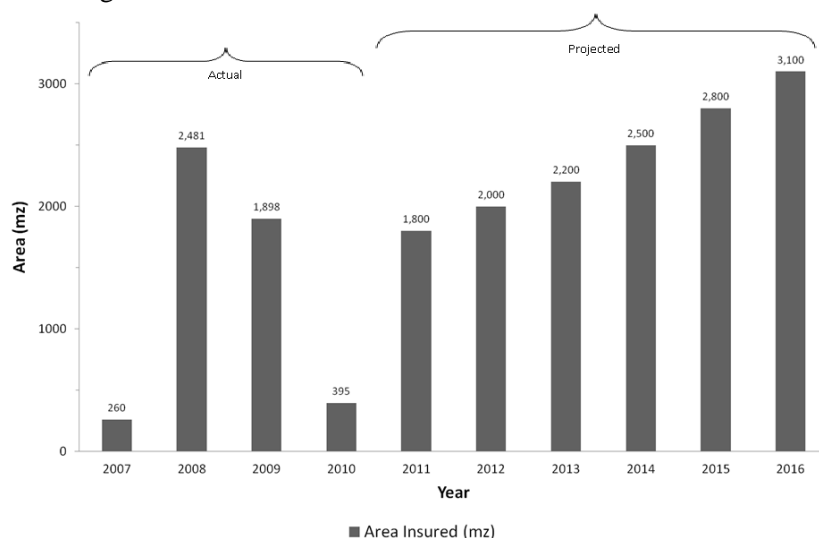
3.1. Parameters of the simulation

In order to estimate the pay-off periods, we first define the parameters which influence the cash flow function. It depends (i) on the provinces, which determine the expected payouts and premiums; (ii) on the insured area, reflecting the size of business and; (iii) the reinsurance contract, which decides how much business remains with the insurance company.

Provinces: The simulations were carried out based on the data gathered from four weather stations namely, Managua, Villa 15 de Julio, León and Chinandega. Groundnut is grown mainly in the Pacific coast of Nicaragua (León, Chinandega, Managua and Granada Provinces). Although, the weather stations of Sébaco, Raúl González, Panaloya have WIBI linked to them, they were excluded from the analysis since they are located close to paddy growing areas. Ing. J. Guerra, on other hand, is located in an area where maize, beans, cassava and sorghum are grown. Complete data was available for the aforementioned provinces for a period of 50 years (1958 through 2007). The sum insured per Manzana is uniform across provinces, fixed at USD 600 increasing at 2.02% p.a (refer to paragraph on “Interest rate”).

Insured area: The total area insured since 2007 and projections of area to be insured through 2016 as reported by INISER, is shown in Figure: 1. The projections after 2010, reported in the business plan of INISER, are wishful thinking at best, without consideration of business cycles.

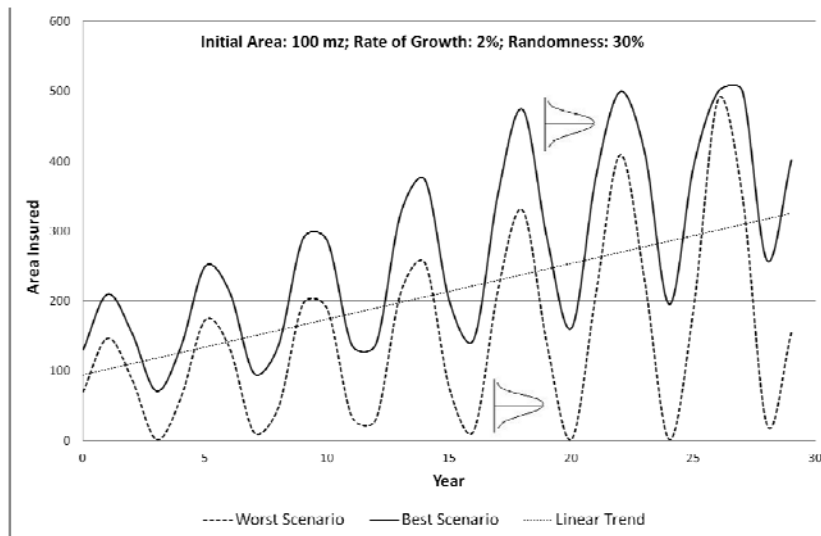
Figure 1. Total insured area



Source: INISER

Due to data constraints, we simulated the probable area insured based on expert opinion. The simulation was based on the following parameters and assumptions: The total area insured, despite projections of INISER, is not expected to exceed 2000 mz, which is 5% of the total area under groundnut. However, owing to adverse selection some years it might be possible that no insurance contract is underwritten.

Figure 2. Graphical representation of insured area simulation



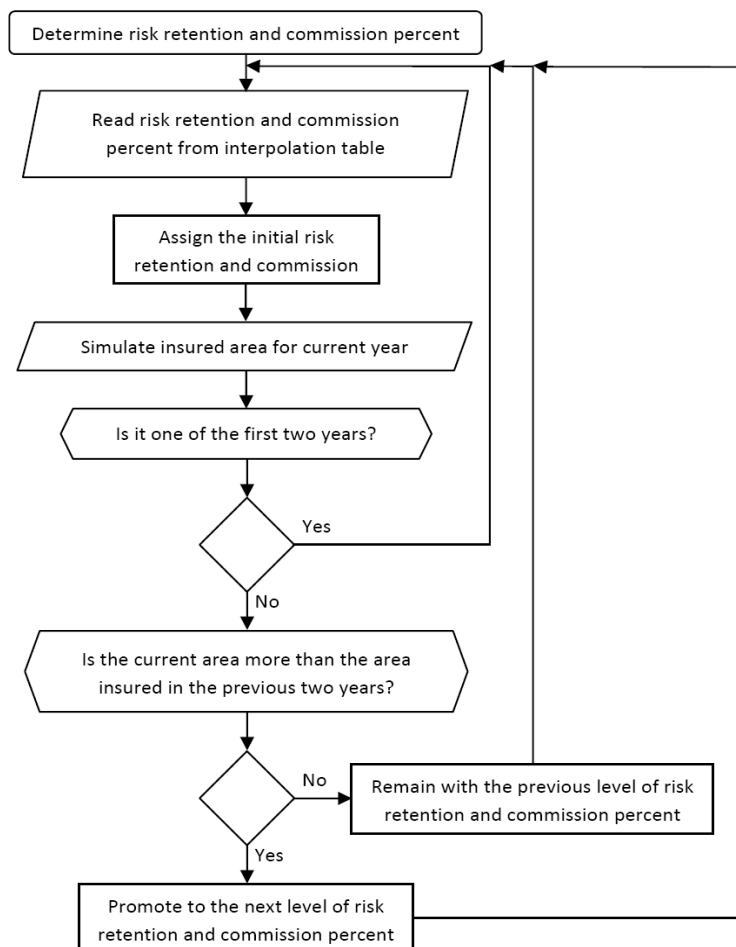
Source: own calculations

The variation in the insured area stems from the strong influence of El Niño on Nicaraguan precipitation pattern and consequently agriculture. This is seen in the growing seasons of 2009 and 2010. Reasons why sales in 2010 dropped were three-fold: i) the financial crisis in 2008 affected the loan availability to the agricultural sector for the period of 2009-2010. Many of the farmers who purchased their contracts in 2009 did it because of previous agreements with banks which financed the insurance premium cost as part of the total loan. Those who did not have such type of financial assistance preferred to use their savings to cover production costs instead; ii) adverse selection and cognitive risk: due to the extreme drought conditions that affected the central American region in 2009, the government through the Ministry of Agriculture and the National Meteorological Service (INETER), broadcast in radio and TV about possible negative effects of El Niño event on the agricultural sector in order to alert farmers. Many farmers, despite the financial crisis of 2008, tried to purchase insurance contract for groundnut and rice. In 2010, the onset of rainy season saw heavy rainfall in the region and farmers based on previous experience, thought the 2010 crop season was going to experience good rainfall patterns. Cumulatively, the fact that banks were not given new or more credits for agriculture caused a drastic drop in 2010 index insurance sales; and iii) lack of a policy that smoothens the progress of agricultural insurance in the country. Currently, none of the Nicaraguan banks— not even Banco Produzcamos, a state owned bank— transfer weather

risks, to national/international markets although this might affect their loan portfolio. Now that agricultural insurance is no more linked to crop loans, index based insurance growth is very slow. Hence our expectation for sales in 2011 is low too. This is an important piece of information that was built into our simulation so as to reflect bad sales following a four year cycle in tandem with El Niño. The simulation has a linear trend component, a sine function (to replicate the 4 year cycle) and a random component. In the simulations the insured area is assumed to be similar for WIBI and named peril insurance schemes. The result of the simulation can be seen in Figure: 2.

Reinsurance: The insurance providers have a quota share treaty with the reinsurer based on which, the percent of retained risk and commission was modelled. Quota Share Reinsurance refers to a pro rata reinsurance agreement under which the insurer and reinsurer agree to share a pre-determined portion of all insurance premium, and losses, which usually grow as the market matures.

Figure 3. Total insured area



Source: expert interviews

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Due to lack of information on procedure followed by reinsurance providers regarding the allotment of retention and commission percent, this modelling was based on the growth of insured area. In our model, the minimum and maximum percent of risk retained by the insurance provider is assumed to be 20% and 40% of the insured amount respectively. As for the commission paid back by the reinsurer to support the administrative, marketing & acquisition costs and also loss assessment costs (in case of N-P), is assumed to be between 25% and 35% respectively. Within this range, the risk retention and commission is modelled to grow linearly over a period of 30 years, provided there is a steady growth in insured area.

As explained in the flowchart in Figure: 3, when the insurance provider sustains a growth in insured area for a period of two years, it qualifies for the next level of risk and premium retention and also for a higher commission. Owing to the business cycle, the amounts never reach their maximums.

Expected Payout: Using the burn rate method (Odening et al., 2007), the mean, standard deviation, and range of putative indemnification, was calculated in percent terms and in USD per Manzana (mz) (1 Mz = 7025m², 0.7 ha approximately). On the basis of 50 years of rainfall data (1958 through 2007) we simulated the payouts according to the provisions of the contract, in percent terms by running 1000 iterations.

Premium: Cash inflow is mainly dependent on the premium. In case of WIBI however, premiums differ across provinces and on sowing dates (please refer to Table: 1). We averaged the premiums over the seven possible sowing dates. Unlike expected payout, it is not same for both types of insurance. For Named-Peril insurance-- since such a programme does not exist and the yield data on groundnut was not available-- calculating a technical premium and thereafter a commercial premium could not be undertaken. Based on expert interviews¹, the premium was estimated to be in the range of 5% to 10% of insured amount. To avoid complication, an average of 7.5% of insured amount was taken.

Table 1: Premiums for Groundnut WIBI, in percent terms

SOWING DATE	PROVINCES			
	MANAGUA	VILLA 15 DE JULIO	LEON	CHINANDEGA
Jul-1	5,31%	4,79%	9,08%	6,12%
Jul-5	5,31%	4,51%	7,67%	5,19%
Jul-10	5,31%	4,36%	6,61%	4,51%
Jul-15	5,31%	4,41%	5,91%	4,06%
Jul-20	5,31%	4,61%	5,55%	3,85%
Jul-25	5,40%	4,98%	5,55%	3,89%
Jul-30	5,65%	5,51%	5,91%	4,16%
AVERAGE	5,37%	4,74%	6,61%	4,54%

Source: Agricultural Risk Management Team. The World Bank

1. ¹ personal communication with, Mr. Rodrigo Pacas, Seguro LAFISE, January 4, 2011 and Mr. Pablo Valdivia, May 9, through June 6, 2011

Interest rate: The interest rate z which in this case refers to the Weighted Average Cost of Capital (WACC) is determined to be 2.02%, reported as the passive interest rate by the Central Bank of Nicaragua (dated: March 2, 2011). The sum insured per unit area, and hence the payout and premium, in addition to administrative and operational costs are programmed to increase at this rate.

4. PAY-OFF PERIOD

In order to find the pay-off period of the respective insurance schemes, the maximum time period was set to be 30 years, over which the simulation is supposed to run. Due to global climate change, a longer time period must incorporate changes in climate pattern while designing the products and also while calculating the expected indemnification. The cash flow was simulated with 1000 iterations against 80 scenarios, referring to all possible combinations of initial insured area (from 100 to 1750 manzanas) and planned rate of growth (from 1% through 10%) as seen in Figure: 4 and 5.

Cash flow: which is the end result of the simulation, determines the Pay-off period. It is the net present value of the difference of the inflow minus the outflow.

Cash inflow: is the sum of the earnings from the proportion of premium collected, as defined by the quota share reinsurance contract. And the sum of the commissions obtained from the reinsurer.

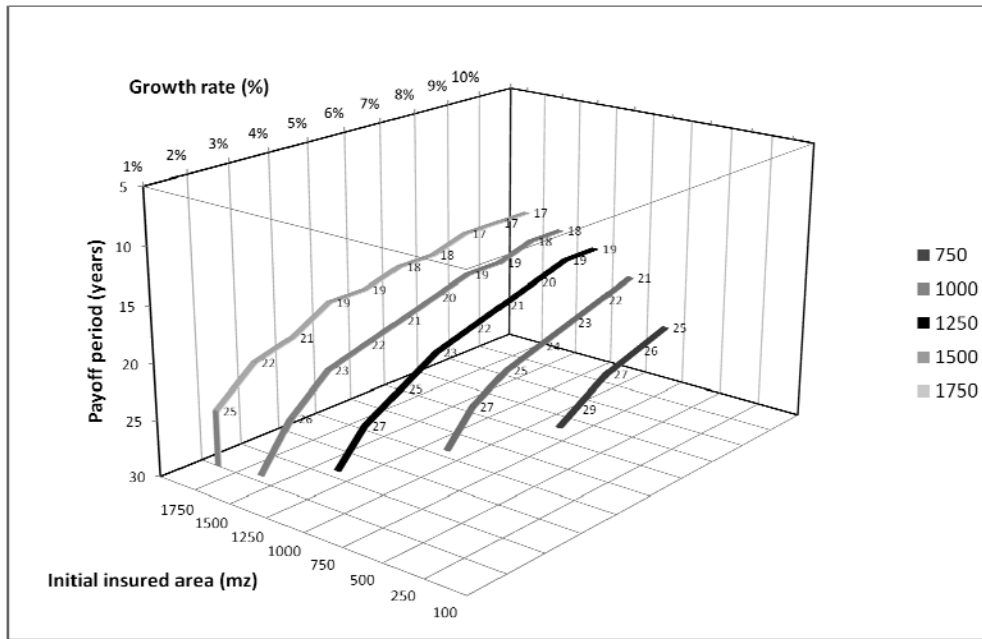
Cash outflow: is the sum of the expenditures pertaining to design cost, cost of collecting weather data, loss assessment costs, marketing and acquisition cost and administrative costs. This is added to the expected payout.

4.1. Results

The aforementioned analysis yields results which complicates the decision problem. On the basis of 1000 iterations, run over 80 scenarios, assuming 30% randomness in the area insured, we derive results as shown in Fig: 4 and 5. The analysis helps one visualise realistic expectations regarding the pay-off period, when one knows the initial insured area and has a fair estimate of rate of growth or needs to draw a business plan based on the former.

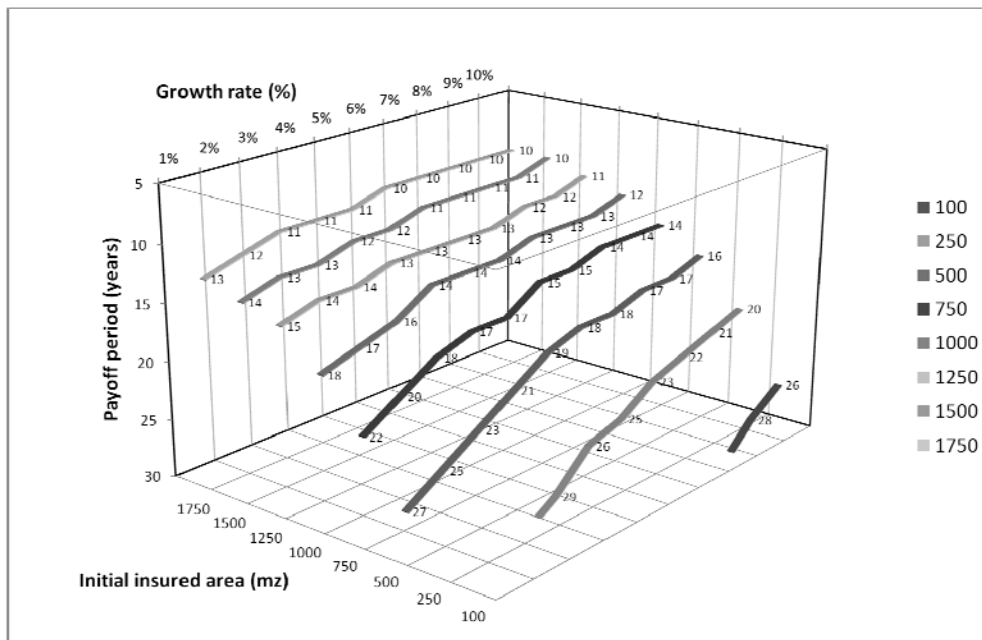
Most importantly, the analysis casts doubt on the oft reported fact that WIBI are economical to implement and run. If so, the pay-off periods should clearly have been shorter than traditional named peril insurance. As seen in Figures: 4 and 5, in order to pay-off within the useful life of the investment (30 years in this case), a WIBI scheme requires bigger initial size and higher growth rate in comparison to its named peril counterpart. For example, a WIBI needs at least 750 mz and 7% growth rate to pay-off in 29 years, while a named peril scheme requires 250 mz at 4%. Besides, at any given size and rate of growth a named peril insurance pays off faster than its WIBI counterpart, provided initial size of mere 100 mz.

Figure 4. Pay-off period for the WIBI



Source: own calculations

Figure 5. Pay-off period for the N-P



Source: own calculations

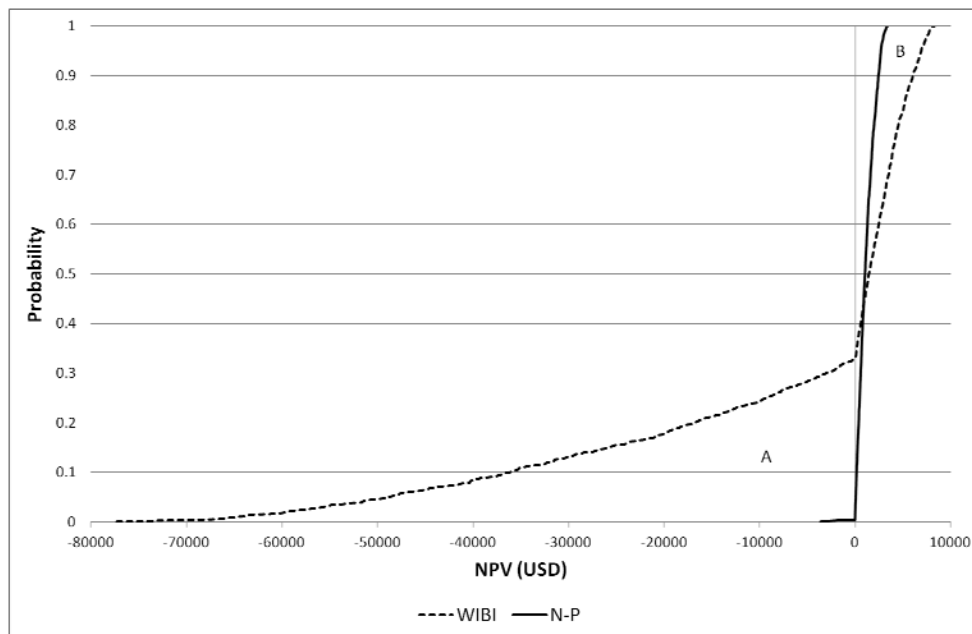
5. STOCHASTIC DOMINANCE

One might argue that a faster pay-off with lower NPV is not as attractive as a later one with a higher value. This brings us to the motivation of the following analysis, where we elucidate the stochastic dominance of the respective insurance options. Going by the argument that given the knowledge of pay-off period one would make business plans to get positive returns, we adjust the parameters of our simulation. We make the analysis, with 1000 m² as our minimum area so as to rule out situations where positive returns can not be expected at all. After determining the duration of the programme through the aforementioned method, we additionally conduct a test of Stochastic Dominance of their respective Net Present Values (NPV). This gives us not only the expected returns but also an idea of the extent of balance sheet exposures and hence the operational intricacies of the two insurance products.

5.1. Results

Figure: 6 shows the Net Present Values of returns from WIBI and named peril (N-P) insurance schemes at the time of pay-off. The expected Net Present Value of named peril insurance second order stochastically dominates that of WIBI. Which translates to the fact that named peril schemes are expected to yield higher returns (USD 1,175) than WIBI (expected to yield a loss of USD 6,435) and the variance of the former is significantly low (USD 866 for N-P as against USD 17,778 for WIBI), making WIBI quite unattractive for a risk averse, expected utility maximising decision maker, which in this case refers to the insurance providers.

Figure 6. Stochastic Dominance



Source: own calculations

This high value of variance might also be read as an indicator for operational difficulties that the insurance providers face, which due to lack of expert hand-holding translates into unsure returns.

6. CONCLUSION AND OUTLOOK

Implementation of WIBI is mostly justified on the grounds of: (i) transparency; (ii) objectivity; (iii) re-insurability; and (iv) administrative ease. In addition to those, if the product manages to reduce the inherent basis risk (Banerjee and Berg, 2011) then it will continue to be attractive to donor community. Who will readily finance the initial investment costs, provided it is scalable and contribute towards hedging weather risks in developing economies. Weather index based insurances have obvious advantages over named peril insurance, especially in cases of moral hazard and adverse selection. However in case of Nicaraguan groundnut based product, one of its significant advantages against adverse selection does not stand, as discussed in the paragraph titled “Insured-area”. This fact is not only case specific, but of international relevance, especially in countries that are directly affected by El Niño or any other major weather phenomenon like “Indian ocean dipole”, which might enable farmers predict future weather patterns. Having seen the detrimental effect this phenomenon of adverse selection may have on the feasibility of a WIBI, one might but argue the relevance of further research in this field.

This analysis also throws light on the fact that WIBI is not the most economical instrument of risk management in agriculture in developing countries. The results show that for any given initial size of business and any given business plan (planned rate of growth), named peril insurance schemes pay-off faster than its WIBI counterpart. Moreover, the expected Net Present Value of the return at the time of payout is also greater in case of named peril insurances than a similar WIBI, and the variance is significantly less in the case of the former than the latter. Although proponents argue that a WIBI does not incur the costs of damage assessment, since these costs are incurred at later dates, the initial investment costs of designing and implementing a WIBI seemingly outweighs the damage assessment costs.

However, there are noteworthy caveats to this analysis. Firstly, from a contract theoretical stand point WIBI is a completely different contract than a named peril one. And hence this study should not be confused as a comparative analysis. Secondly, the results are mostly specific to Nicaragua and so are the derivations and conclusions. But the central message is nonetheless clear. Just because it does not incur damage assessment costs, WIBI cannot be assumed to have shorter pay-off period. Additionally, since it does not yield significantly higher returns, it is wrong to assume that insurance providers will scale up and promote these products on their own. The product will self-sustain only when it yields profits for insurance companies and manage to get enough volumes to keep the business interest of their re-insurers.

Index based insurances; given its advantages is undoubtedly an efficient tool of agricultural risk management and should be promoted. Some revamping however needs to be done as far as the procedure of implementation is concerned. Therefore, the take home messages

are: (i) WIBI needs substantial initial investment in Research and Development (design) that most insurers might not be willing to venture into since there is no clear guarantee of scaling up. Moreover, because these costs are incurred in the initial years the pay-off period is prolonged as a result. (ii) Even so, insurers would need to go through a steep learning curve to increase volumes in order to make it profitable. From a policy perspective, some close technical companionship should be designed as part of an index based weather insurance program from the donor's side until the operations are streamlined. Quite contrary to popular belief among donors, a three to five year pilot project will not kick start a sustainable index based weather insurance programme in developing countries. A much long term planning in terms of financial backing and technical assistance needs to be taken into account before launching such a programme. Therefore, it is recommended to carry further research on the duration of piloting and technical assistance which needs to be designed on a case-to-case basis.

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