Mutuality Matters

Quarterly Mutuality update from DHAN Collective

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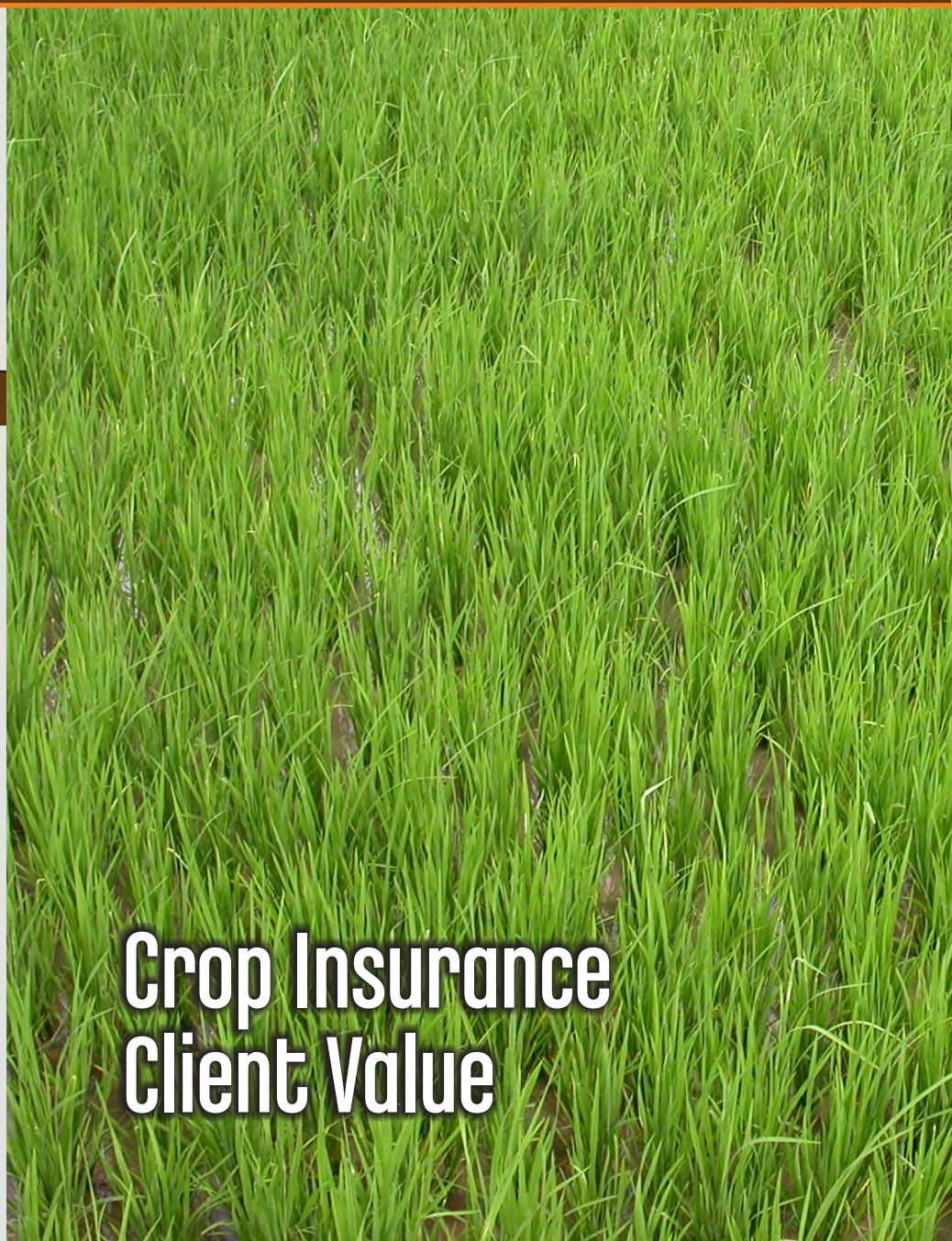

Crop Insurance Client Value

Mutuality Matters
Quarterly Mutuality update from DHAN Collective

Publishers

We invite articles to the magazine.

We encourage contributors to share scientific and analytical papers based on experiential knowledge on micro insurance.

The articles can be limited to 3 pages of about 2000 words with relevant pictures.

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From the Editors' Desk

Dear Readers,

Greetings from People Mutuals !

In the age of globalization and digitalization and the resultant individualization, the mutual insurers and insured are facing significant impact on the member solidarity. Apart from challenges, there are opportunities of wider adoption of mutuals due to their inherent characteristics, as lucidly covered in the article by Simon Kadijk on "The Mutual Insurance Company in the digital age".

The genesis of mutual insurance was mostly with the farmers in rural areas of different parts of the world. The risks of crop husbandry still continue to be the major focus of mutuals. The mainstream crop loss indemnification insurance in developing nations involve the challenges of small land holdings, absence of data and loss assessment mechanisms at farm level. These make weather indexed crop insurance programs more appropriate. The article on the Impact of Weather Based Crop Insurance Scheme reflects on the challenges from the perspectives of different stakeholders.

The weather index insurance involves different basis risks and most significant of them is the spatial risk. The data on the insured weather parameter at the reference weather station has to represent the field conditions. This warrants appropriate installation of weather stations at strategic distances. A study report on spatial basis risks and rainfall insurance throws light on appropriate spacing of raingauges to address the challenges of spatial basis risks in rainfall insurance.

Usually market studies would be undertaken by the insurance companies before launching a product. This would come out with the clients insurance needs and a product designed in tune with these would result in effective enrollment. The value perceptions of the insured are vital for the viability and sustainability of a product. The crop insurance client value article details the tools for assessing the client value by comparing three crop insurance products. The article provides valuable insights on the demand side perspectives of insurance.

I look forward to your valuable feed back to enrich the magazine.

S. Balasubramanian

Mutuality Matters

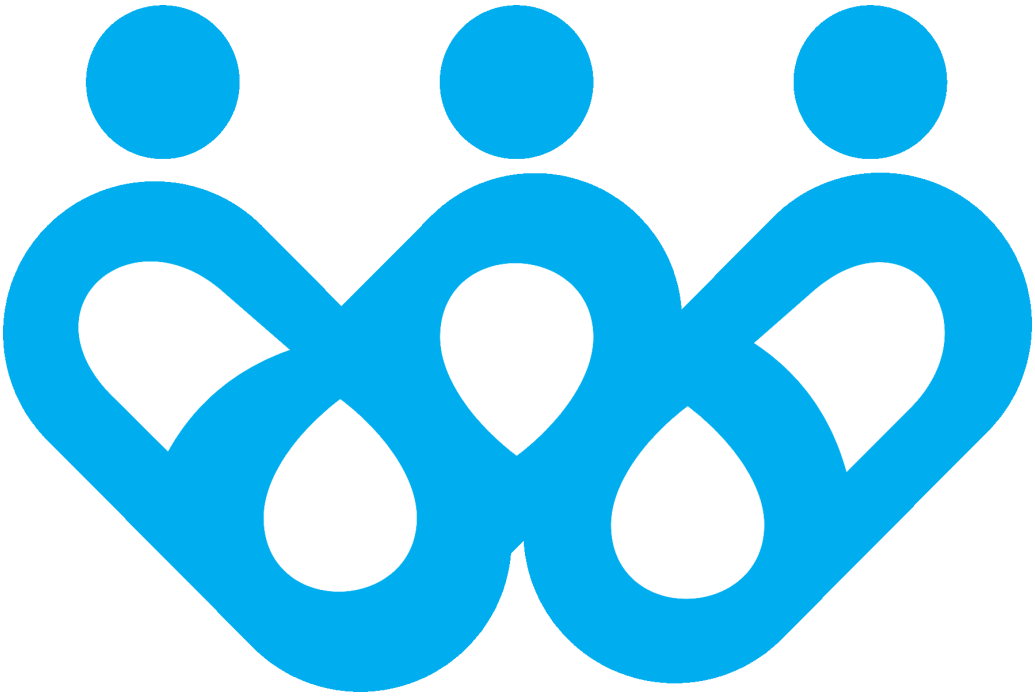
Historically mutual help mechanisms and processes were found to be in existence with rural and agricultural communities. There were significant insurance like mutual systems for crop risks, which metamorphosised into mutual insurance entities.

However due to the inherent characteristics of multi various risk factors influencing crop yield, most of which are not identifiable, quantifiable and the magnitude of loss is determinable, the crop loss indemnification programs are not actuarially priced across the globe as indicated by the claim ratio being over one.

These brought to fore the weather indexed crop insurance programs that cover the specific weather perils that affect the crop. Due to the availability of time series data and absence of subjectivity, these programs are more appropriate and sustainable due to their actuarial pricing. Yet, in practice, they are associated with significant basis risks – Spatial, temporal and product. These need to be addressed by strategic placing of weather stations, appropriate contextualized product design and intense insurance literacy of farmers. Whatever may be a rosy product in paper, it the client value that would decide the effective insurance access and the resultant sustainability.

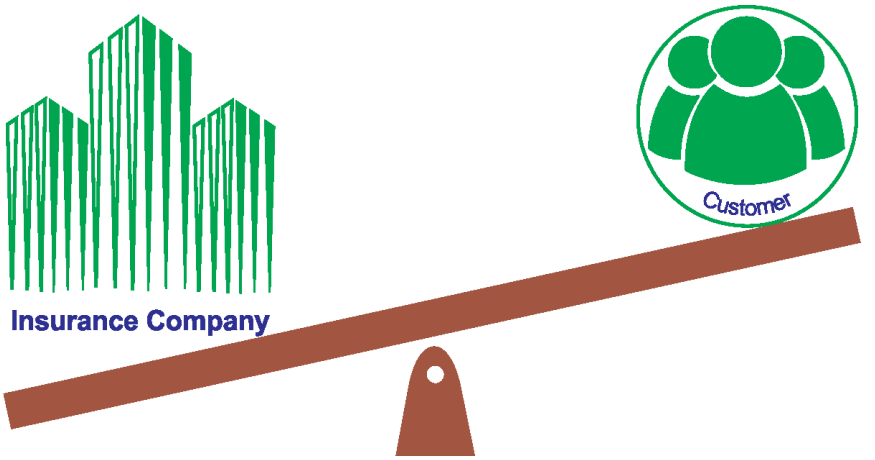
Moreover insurance cannot be an elixir for all crop risks and non monetary risk coping practices are common among farming communities through appropriate agronomic practices including diversified cropping and cultivating contingency crops like millets during drought conditions.

Further, it is pertinent to note that the crop and climate risks are covariate and at times of disastrous situations of droughts and floods – flash, monsoon, cyclonic floods, the state's relief measures are the appropriate solutions, due to the devastating nature and extent of loss.



The mutual insurance company in the digital age

Simon Kadijk*



Developments have accelerated tremendously in the last 25 years. Globalisation has emerged. Technology has made a huge contribution. And the development of digitalisation has also led to a different view of banks and insurance companies. The opportunities have greatly increased, but so also the threats. What does this mean for mutual insurance companies?

Insurance companies and banks have a public function. For this reason, supervision by government is a legal requirement. However legislation is always one step behind what is actually happening. And legislation is not always the best way to influence behaviour. Let me illustrate this with an example.

Behaviour and rules

Research has been done in Israel into behaviour and penalties relating to day care for children. Day care centres had a problem with some parents who picked up their children too late at the end of the day. So they measured the effect of penalties. If parents picked up their children too late, they were given a warning on the first occasion. If it happened a second time or more frequently, the parent had to pay a fine of a few shekels. The amount of the fine depended on how much too late the child was picked up and on the number of times this happened. After a while, the effect was measured. And what did they find? On average the children were picked up from the day care centre too late more often that before the fines were introduced. The researchers wondered why that way. So they interviewed a number of play leaders. One of them gave the example of a man who came to pick up his child more than an hour too late. When they spoke to him about that, his answer was: what are you talking about? I'm paying for it, aren't I? In other words: the system of fines means people are no longer considering the morality of their behaviour; it's just a question of money. They've paid for their moral misbehaviour. It's simply economics and morality doesn't come into it any more.

This example also applies to some extent in the insurance world. In my opinion, the mutual

Simon Kadijk, *Director Donatus Verzekeringen, the insurer for churches and monuments in The Netherlands.*

insurance companies have a head start here. More than with the commercial insurers, it's the interests of the customers – the members – that are central. Making a profit is less important. The more the members exercise supervision of the policy of the insurer, the more that will have a positive effect on the behaviour of the insurer. It does mean the insurance company has to involve its members in its policy, and has to allow them to influence that policy - both formally and informally. Formally, that can be done through the General Meeting, or by installing a members' council with the right authorisation. And informally, the influence of the members can be organised through theme days, surveys, panels on forum days etc.

Information and antiselection

Digitalising has opened up tremendous opportunities to analyse all kinds of data from insurance companies. Claims are now far more transparent than before. Which groups of insured people make more claims than average? Breakdowns of customers by age, income, family composition, occupation or region. That give insurance companies a lot of opportunities to make better estimates of risk, and as a result to adjust their premiums and conditions accordingly. You might think that would give insurance companies a commercial advantage, but that isn't the case. This is because the opposite also applies! Customers can use Google and all kinds of comparison sites to check which insurance company offers the best price-quality ratio for them. Internet has increased the choices available to customers.

That may look attractive for both sides ¬– insurance companies and their customers – but there's also another side to it. We call that 'antiselection'. An example could help to make that clear. Just imagine three insurance companies: insurer A bases its prices for car insurance on the weight of the car; insurer B uses the catalogue price of the car, and insurer C uses the brand of the car. All these companies have had all the thousands of items of data calculated by actuaries. And they then work out their premiums on the basis of all that data. But their customers do exactly the same thing. For example, a customer might have a Toyota car with a catalogue price of € 20,000 and a weight of 1000 kg. He is then faced with 3 different premiums from the 3 different insurers. And – assuming the terms and conditions of the policies are more or less the same – he will choose the cheapest insurance policy.

What that means is that the calculations of the actuaries are no longer right. Because insurance company A doesn't build an evenly distributed portfolio, but only gets customers that the other insurers – based on different statistic – consider to have a higher risk. So insurer A doesn't have an average risk profile, but one that is higher than average. We call this 'antiselection'. The customer knows his own risk profile better than anyone else, and in the digital world he is best able to take advantage of that.

Supervision and rules

In reaction to consumer behaviour, banks and insurance companies have quite frequently launched complex products that have been rather difficult to compare. The financial crisis was caused partly by the fact that too few people understood the risks of these products. In Europe, supervision of insurance companies has greatly increased in recent years. This can be seen in the regulations relating to Solvency II. Insurance companies have to clearly identify the risks they run; they have to calculate those risks and describe scenarios for how they expect their solvency to develop if specific risks become reality, and they have to report on all these things to the government, to their insured customers and to the public.

The most important consideration in all this is the solvency. Which factors influence the current solvency of an insurance company, and how is that likely to change in the coming years? And to what extent will the insurance company be able to manage and maintain its solvency?

The positive side of these developments is that insurance policies are easier to compare relative to each other. A second effect is that people are much more aware of risks and of how they are related

to each other. Not only insurance risks, but also foreign-exchange risks, investment risks and the risks associated with image and reputation.

The disadvantage of this new supervision is that insurance companies have to spend a lot of time and effort in gaining and sharing that understanding. It also costs a lot of money to do that. The Dutch Minister of Finance, Mr.JeroenDijsselbloem, announced in May 2014 that he thinks the costs to the government of monitoring and supervision this whole process should be paid by the industry itself. It wouldn't be right to allow the taxpayer to bear these costs. In other words, the costs of government supervision are charged to the insurance companies. And they in turn will pass those costs on to their customers through their insurance premiums. The customers, of course, are the same people who pay the taxes. And that will increase the cost of taking on risks. But on the other hand this gives insurance companies and especially mutual insurance companies, the opportunities to improve the way they accept risks from their members. The better you know the risks, the better you are able to avoid or limit those risks by taking preventive measures and the better you are able to make your premiums and conditions competitive.

A separate problem is the smaller mutual insurance companies. The question there is whether the government regulation and requirements are in proportion. It sometimes looks as though supervision has become a goal in itself, instead of a means to an end.

Effects on the mutual insurance companies

Developments in the last 25 years have had a huge effect on the mutual insurance companies and indeed also on their members. For them too, the world has become a lot more transparent. Within moments, we now know all about disasters in other parts of the world, whether it's a war, an earthquake, a flood or an epidemic. It's much easier for us to compare ourselves with others. What's my life expectation? Do I have an average income for my education and the region where I live? We travel a lot more, and we're much more willing to live and work in other parts of the world, either temporarily or permanently.

One of the effects is individualisation. For many people their social group has become less important and they can change more easily between one social group and another. That affects solidarity. On the one hand there is more emphasis on the individual and individual decisions, but on the other hand we see that people are becoming more strongly bonded with their own group. Yugoslavia and the Soviet Union disintegrated into smaller republics. Minorities in Spain and Ukraine want separation. People's own ethnic groups and/or languages and/or religion are important.

Mutual insurance companies need to realise that you can't take anything for granted any more. You have to ask yourself once again which risks you want to accept, and for which target groups.

Opportunities for micro-insurers

On the one hand, globalisation and digitalisation are threats for insurance companies. Small mistakes now have a much bigger impact. Competition is more intense and supervision is stricter. But on the other hand this also opens up opportunities. Most of all, I think there are opportunities for micro insurers. They have access to huge resources of information. And they can draw on a library of data, best practices, statistics and research reports. This gives them unprecedented opportunities to link the new world of globalisation and digitalisation to the old world in which people live more in a fixed social group or context.

You could even say that micro insurers would never have arisen without globalisation and digitalisation. The challenge is to adopt the positive aspects of the 'macro' insurance world, and to avoid the negative aspects. If these micro insurers also have the characteristics of mutual insurance companies, then that could even be more widely adopted. In brief, there are a lot of opportunities and challenges and we'll talk about those another time…

Impact of Weather Based Crop Insurance Scheme

Balasubramanian S*

Farming is fraught with various risks and to protect the farmers from different risks of crop husbandry, Government of India is implementing three major agriculture insurance schemes. They are National Agricultural Insurance Scheme, Modified National Agricultural Insurance Scheme and Weather Based Crop Insurance Scheme (WBCIS). Of these, on WBCIS a study was undertaken to understand the stakeholders' perspectives in Perambalur District of Tamil Nadu state.

Study area

Perambalur Distirct is centrally located in TamilNadu and is 267 K.M away, in southern direction, from Chennai. In this district out of the total geographical extent of 3,69,107 hectares, only 2,38,814 hectares are used for agricultural purposes. Of these, the area under irrigation is 35488 hectares. There is no canal irrigation in the district. About 27138 hectares are under well irrigation and 8350 hectares are under tank irrigation. The remaining cultivated lands are under rain fed conditions and it constitutes about 90 percent of the agricultural lands of the district. The average rainfall of the district is 908 mm and the average rainfall received during north east monsoon is 475 mm and during south west monsoon is 314 mm. Due to the fact that rain fed being the predominant farming condition in the district, WBCIS is more appropriate for covering the rainfall risks in cropping.

In this connection, four Automatic Weather Stations have been established at Kalarampatti, Padalur, Kunnam and Veppanthattai. They are situated at:

- Panchayat office, Kalarampatti
- Sridevimangalam road, Padalur
- Taluk office, Kunnam
- Cotton Research station, Veppanthattai

They record the rainfall, wind velocity, wind direction, maximum and minimum temperature, sunshine hours etc. The weather data is the basis for the WBCIS, which is in implementation in the district. This also helps the farmers to know the rainfall level and decide on cropping based on the medium range forecasts.

Sampling of the study

The sample comprised of

- Scheme coverage wise – WBCIS insured (loanee and non loanee) and Non insured
- Land holding size wise - Marginal farmers, small farmers and large farmers
- Social Category wise - Scheduled Caste, Scheduled Tribe, Other Backward Class, General
- Gender wise – Male & Female
- Education qualification wise - School, graduate and post graduate

Farmers responses

The responses of the farmers on WBCIS are not varying under different strata of sample farmers. The most critical constraints to the adoption of the WBCIS by the farmers are:

- Lack of knowledge about how insurance works
- Do not feel that crop insurance is useful for them
- Lack of information about the scheme
- Bad experience with crop insurance in the past
- Lack of trust on intermediary / insurance company
- Unaffordability to pay the premium by non loanee farmers

Almost all the covered farmers are only loanee farmers and the non loanee farmers are mostly not interested in taking up the scheme due to lack of awareness / knowledge on the scheme / product. Further their past experience of delayed claim settlement and non-transparent & complex claim processes work against the enrollment by non loanee farmers.

It is a common phenomenon that many farmers are reluctant to avail crop loans due to the mandate of crop insurance as they feel that they are only going to pay the premium for crop insurance without any claim even when there are crop losses.

***Balasubramanian S**, *Chief Executive, People Mutuals, Tamil Nadu, India.*

- Their suggestion to the government and insurance companies for improving the WBCIS in this regard are:
  - ⇨ Full information should be given to farmers about the WBCIS scheme and the product
  - ⇨ Premium amount should be reduced
  - ⇨ Types of risks covered are not sufficient and need to be broadened
  - ⇨ Timely claim payments without delay
  - ⇨ Claim benefits should be adequate to meet the crop losses suffered by farmers

Other Stakeholders responses

The responses of the other stakeholders - Government officials, bank officials and insurers brought out the following:

Broadly WBCIS is considered to be appropriate for dry farming tracts like Perambalur district and further it is viable since it is recognized to be an actuarially priced product with scalable features. However at the field in Perambalur district, the product features are not at all known to any – District administration, agriculture department and bankers apart from the insured farmers. In the absence of knowledge of product features / terms – covered risks (rainfall deficiency, dry spell, excess rainfall etc) risk period, triggers and trigger benefits / payout amounts, the scheme has been implemented as a targeted activity. It is pertinent to note that even though the year 2012 was a drought year in the district, no claim payouts were received by the insured farmers, and this is blamed by all and however nobody is aware of the reasons of non triggering, due to lack of knowledge on product terms.

Further the enrollments were permitted up to August 2012, where as the sowing was able to be taken up only during September – October 2012. This is a clear indication of temporal basis risk as the product features would not be in tune with the crop stages. i.e. the critical period of water requirement for crop as per product would not match with the actual critical crop conditions in the field. This might be the cause for the insurance coverage of about 3,000 hectares only out of the agricultural lands of over two lakhs hectares.

It is ironical that the insured farmers, bank branches (master policy holders) as well as the implementing government machinery, are all put under dark of the insurance product features. If at all the free look period criterion of IRDA is applied to this scheme, insured farmers would be eligible for refund of the entire premium paid, as the insured / bankers were not at all issued with policy document and hence not able to look into it within 15 days.

Further the stakeholders are not able to access the rainfall data of the reference weather stations resulting in non transparency. The officials expressed that the premium is not affordable to the farmers.

In this regard, specific responses of bankers are:

- The coverage of eligible loanee farmers under WBCIS is mandatory. However some felt that mostly farmers with irrigation facilities avail crop loans and hence WBCIS may not be appropriate to them and hence could be made voluntary for loanee farmers also.
- The education on WBCIS product is necessary and at present it is lacking completely and the systems are not transparent resulting in the apprehensions in their minds on the unreliability of crop loss computation and claim settlements resulting in lack of satisfaction of farmers on the scheme
- Bankers are not finding any impact of WBCIS crop insurance on loan recovery position
- Due to the inherent characteristics, the bank branches are not in position to take steps / efforts on creating an understanding of crop insurance among the farmers
- To facilitate enrollment of farmers under crop insurance, the insurance premium could be met out of the interest subvention amount of the crop loans
- The enrollment system is complex and they face significant challenges in this regard.

Overall, the WBCIS was not appropriately positioned with the different stakeholders - Farmers, bankers and government departments in the district. There is an urgent need for insurance literacy programs to farming community on the concept of WBCIS and the product features, well ahead of the crop season. Moreover the other important stake holders – Government officials and bankers need to be imparted with the WBCIS product and process appreciation programmes, well in advance. More importantly, the role of the insurer is vital in this regard on setting systems for ensuring transparency by sharing the daily weather data to stake holders apart from ensuring prompt claim settlement.

Spatial basis risks and weather indexed crop insurance

Gayathri S*

Agriculture is the livelihood of most households in India. Nearly 50 percent of labour force is engaged in agriculture. Indian farmers are faced with multiple production and market risks. The farm output in India largely depends on weather parameters, of which rainfall is the key factor. About 60 percent of land area in India is under agriculture, of which 61 percent is under dry land farming. In the absence of perennial rivers, these areas depend only on monsoon rains. India gets rain from two monsoons namely, Southwest monsoon and North east monsoon contributing 80 percent and 20 percent of annual rainfall respectively. However, vagaries in the rainfall in terms of distribution and quantity make farming the worst nightmare. Despite the availability of vast stretch of cultivable land and ample human resources, farming does not give the due comparative advantage because of high involvement of weather risks. The farming households often find it very difficult to cope up with these risks by adopting traditional instruments such as community help, saving for contingencies, managing the loss by taking loans etc., apart from appropriate agronomic practices. However these are not adequate and farming households are left with high debts, resorting to migration to other places or other livelihoods. Adequate investments are not being made in the farming sector in general and dry land farming in particular. This poses a great challenge to the economy as a whole by not only affecting the food supply but also by limiting the supply of raw materials to the firms affecting all players in the flow.

Properly designed and administered crop insurance programs could offer effective solution to mitigate the production risk in farming. Weather index based insurance is one such solution with advantageous features over the traditional yield based indemnity products. The yield based crop insurance programs indemnify the farmer based on the loss in yield. Such indemnity products involve high cost of administration besides suffering from issues such as moral hazards and longer time taken for ascertaining the yield loss. This makes the product unaffordable and does not provide timely compensation to farmers who are forced to deal with the situation by taking loans.

On the other hand, weather indexed insurance program has the advantage of ascertaining the likely loss in the yield by objectively measuring the weather parameter that determine the yield. Further, instrumentation and automisation of measurement of the chosen weather parameter helps in getting real time weather data which minimizes the errors and also results in quick payout to the farmers in the event of adverse outcome. However, weather indexed insurance suffers from the existence of basis risks. Basis risk is the situation that arises when the index does not correlate with the actual loss. This flaw can be minimized by computing a weather index that perfectly correlates with the loss situation. There are three types of basis risks that concern those dealing with weather indexed insurances.

Product basis risk arises when there is no clear-cut relationship noticed between loss and the indexed weather peril (e.g. rainfall). For example, yield loss in mango may be more due to wind speed during flowering rather than quantity of rainfall or relative humidity. Temporal basis risk arises due to inter-annual variations in seasonal crop phases which mean that the insurance phases are not temporally aligned with the intended crop growth stage. This may happen due to changes in the sowing dates. Sowing decisions are taken based on the onset of monsoons. However, the weather indexed crop insurance products are designed with assumptions on sowing period. When the actual sowing period changes, the critical crop growth stages would not coincide with the critical periods of risks, assumed in the crop insurance product design. Spatial basis risk arises due to local variations in the occurrence of the peril (e.g. rainfall) within the area surrounding a weather station. The research study highlighted in this article deals with the spatial basis risk and the need for having optimum reference rain gauge

**Gayathri S*, Programme Leader, DHAN Foundation*

stations for measurement of more accurate rainfall data.

Spatial variation in rainfall

The spatial variation of rainfall is largely determined by the spatial and temporal variations of the vertical motion of air needed to cool the air and condense the water vapor contained in it. There are three types of vertical motion of air namely, convective vertical motion, bounded vertical motion and general vertical motion.

Convective vertical motion refers to the elevation of air in an area of one to 5 miles diameter and to a height of few thousand to more than 50,000 feet. This is the cause of rainfall in tropical regions of India especially during summer season. This is the type of rainfall that shows very high variation within a very short horizontal distance. Hence, it calls for a dense network o f rain gauges.

Bounded vertical motion of air occurs over a band of 5 to 50 miles. Hence, within this band the rainfall is fairly uniform without much variation. This is the phenomenon causing rainfall during monsoon seasons and rainfall in humid regions. However, variations are significant in shorter periods among the shorter distances.

General vertical motion is caused by lifting up of air due to depression resulting in highly erratic rainfall.

In general, the spatial variability of rainfall is greater in arid and mountainous regions over small areas, than in humid and flat regions over large areas. Hence, the locations in the peninsular regions of India need denser network of rain gauges.

Measurement of rainfall data

Rain gauges are the instruments used to measure the rain fall. The number of rain gauges to measure the rainfall over an area depends on the purpose of measurement, size of the area, frequency of measurement, relative economic importance of measurement/ use of data. In India, rain gauge stations are commissioned by various organizations. Indian meteorological organization is the premier organization which has established the weather stations in each district. Agriculture universities and research stations, state departments also have established rain gauge stations for their own purposes being crop modeling, forecasting calamities and disaster management, etc; crop insurance is rarely a purpose for establishing rain gauge stations. However, the insurance companies have an arrangement with these authorities for data sharing based on which the rainfall data are obtained and used for the administration of weather indexed crop insurance.

In crop insurance, the index of rain fall is taken as a proxy for the success or failure of crop. Unless the rainfall measured in the reference rain gauge is close representative of the actual rainfall of the farmers' field, the basis risk will make the farmer lose his confidence on the mechanism of rainfall indexed crop insurance. This calls for having optimum number of rain gauges reasonably distributed in the area covering the farmers' field. This in turn decides the economic feasibility and sustainability of the initiative. The World Meteorological Organization and the Bureau of Indian Standards have prescribed the following densities with regard to the measurement instrument being rain gauges.

Standards of World Meteorological Organisation (WMO)

S.No	Region	Ideal	Acceptable
1.	Flat regions of temperate, Mediterranean and tropical zones	1 station for 600-900 sqkm	1 station for 900-3000 sqkm
2.	Mountainous regions of temperate, Mediterranean and tropical zones	1 station for 100-250 km2	1 station for 25-1000 km2
3.	Arid and polar zones	1 station for 1500-10000 km2 depending on the feasibility	Ten per cent of rain gauge stations should be equipped with self-recording gauges to know the intensities of rainfall

Standards of Bureau of Indian Standards

S.No	Region	Ideal
1.	Plains	1 station for 520 km2
2.	regions of average elevation 1000m	1 station for 260-390 km2
3.	predominantly hilly area with heavy rainfall	1 station for 130 km2

However, these standards are blanket recommendations and may not be suitable for the purpose of rainfall indexed insurance program. In order to reduce spatial basis risk, insurers often stipulate the maximum distance of 20 kilometers between the measurement instrument and the insured location. The stipulated distance of 20 kilometers between the weather station and the insured farm is the result of cost consciousness by the insurance providers and consequently the farmers not getting their legitimate claim.

DHAN's pilot on rainfall indexed insurance program

In the absence of availability of weather indexed insurance products without basis risks, DHAN Foundation initiated a pilot project on rainfall indexed crop insurance with the support of International Labour Organization (ILO). About 159 automated rain gauges in fifteen locations in two states of India were installed for recording the rainfall data. Each project location was given with 7 to 13 rain gauges. Placements of rain gauges were not decided on geometric distances but on potentials. The rain gauges were erected at strategic villages with mobile connectivity and where there are adequate members of farmer associations and there is existence of buildings without obstacles and there is willingness of building owners for installation of rain gauges. Thus, in practice the distance between rain gauges happens to be about 2 kilometers to 10 kilometers.

Product design and index decision are the key factors in minimizing product and temporal basis risks. Designing the product and product pricing involve identifying and quantifying the risk to be insured, computing the index based on the correlation between the weather parameter and the risk as well as deciding on how the index will be measured and monitored. The pilot envisages the involvement of farmer communities in evolving the design inputs such as critical periods of crop growth, rainfall requirement, amount of loss in the event of different level of peril, etc. Based on these inputs, indexed insurance product and premium are worked out actuarially.

The pilot confirmed the existence of micro climate zones which could be observed from the variation in rainfall among the rain gauges installed in the same block. Hence, a study was commissioned to estimate the optimum number of rain gauges required for each block with in a geographical area of about 400 to 500 sqkms and to identify the appropriate location for installing those rain gauges.

The study used the tools of coefficient of variation method to determine the number of rain gauges and Theissen Polygon method to identify the location for installing rain gauges prescribed by Bureau of Indian Standards (IS 4986: 1983 and IS 5542: 1969 respectively).

The Bureau of Indian Standards (BIS) gives the following formula for estimation of optimum number of rain gauges in an area by correlating the rainfall data of existing rain gauges in the area.

$N = (CV/P)^2$ Where,

N = Optimum no. of rain gauges to be installed in the region

CV= Coefficient of variation of rainfall for the existing rain gauge network

P = Permissible degree of percentage error for the estimation of the average areal rainfall

(Lower the degree of error, higher will be the number of rain gauges required)

Whereas, Thiessen polygon method proposed by BIS, suggests a way of creating polygons of uniform weight, in terms of depth of precipitation. These polygons indicate the locality for setting up of rain gauges.

This article is written with reference to T.Kallupatti block which is one of the locations taken up for the study. T.Kallupatti is located in Madurai district of Tamilnadu state, India. Crops like sorghum, pearl millet, finger millet, maize and cotton are

S. No	Rain gauge stations	Aug-11	Sep-11	Oct-11	Nov-11	Total	% of variation
1	U.Ammapatti	55.5	20	158	60	294	-141
2	Silarpatti	30	0	68	101.5	200	-254
3	Sittulotti	51.5	24.5	231	135.5	443	-60
4	Chinapulampatti	132	38.5	249	178	598	-18
5	Kilankulam	44	53.5	210	169.5	477	-48
6	P.Muthulingapuram	93.5	42.5	173.5	112.5	422	-68
7	K.Rengapalayam	65	57.5	278	236.5	637	-11
	Average	**67**	**34**	**195**	**142**	**438**	**-61**
8	Madurai Airport (IMD)	83	163	332	129	707	
	% of variation	**-23**	**-382**	**-70**	**9**	**-61**	

S. No	Station	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Total	Average
1	U.Ammapatti	55.5	20.0	158.0	60.0	8.5	302.0	60.4
2	Silarpatti	30.0	0.0	68.0	101.5	59.0	258.5	51.7
3	Sittulotti	51.5	24.5	231.0	135.5	62.0	504.5	100.9
4	Chinnapulampatti	132.0	38.5	249.0	178.0	98.0	695.5	139.1
5	Kilankulam	44.0	53.5	210.0	169.5	80.5	557.5	111.5
6	P.Muthulingapuram	93.5	42.5	173.5	112.5	45.5	467.5	93.5
7	K.Rengapalayam	65.0	57.5	278.0	236.5	55.0	692.0	138.4
Total		**471.5**	**236.5**	**1367.5**	**993.5**	**408.5**	**3477.5**	**695.5**
Average		**67.4**	**33.8**	**195.4**	**141.9**	**58.4**	**496.8**	**99.4**
Standard deviation								**34.34**
Co efficient of variation								**34.57**
Optimum number of rain gauges								**12**

grown through rain fed farming. Most of the farmers are small and marginal farmers with very small land holdings of less than a hectare. There are 7 village level rain gauges functioning in the block established by DHAN. There is a rain gauge station at Airport, Madurai, established by India Meteorological Department (IMD). It is about 40 km from T.Kallupatti block. The rainfall data during the cropping season helps to understand the spatial variation in the rainfall between the rain gauges and the IMD rain gauge at the airport.

The above table emphasizes the need for having a dense network of rain gauges in the block. However, in order to understand the number of rain gauges required to minimize risk of spatial variation in rain fall, the coefficient of variation method was used as follow:

After arriving at the optimum number of rain gauges required for T.Kallupatti block, the next steps is to decide on the additional rain gauges and exact locations to install these additional rain gauges. This was done by adopting the Theissen Polygon method. Polygons were created to measure the area covered by each of the existing rain gauge.

Construction of the polygons occurs in four steps, illustrated below:

Step 1: Plot the locations of the stations and the boundary of the region on the map.

Step 2: Connect adjacent stations with straight lines.

Step 3: Construct perpendicular bisectors across the lines connecting stations.

Step 4: Connect the bisectors to outline the polygon belonging to each station.

Step 5: Count squares on the graph paper to determine the size of each area.

To determine the area covered by the rain gauge in the open polygon, extrapolation method was followed.

Step 1: Equal length should be taken on the opposite side connecting the nearby rain gauge. This should be done taking into account all the nearby rain gauge stations.

Step 2: Construct perpendicular bisectors taking into account the mid-point of the line length taken on the opposite side.

Step 3: Connect the bisectors to outline the polygon belonging to each station.

Step 4: Areas of polygons are calculated and expressed as fractions of the total area.(P)

Step 5: Each station is weighted by multiplying the optimum number of raingauges (arrived earlier from CV method, in this case 12) and the ratio of the rain gauge area to total area for the respective rain gauge region. This gives the number of rain gauges to be installed in the respective region of the rain gauge. The difference between this and the existing number of rain gauges in the rain gauge region gives the number of additional rain gauges required for the respective rain gauge region.

The process of arriving at the additional rain gauges for T.Kallupatti block is given in the table below:

S. No	Rain gauge station	Catchment area (sqkm)	Ratio of area covered by the rain gauge to total area (P)	N*P	N*P rounded	No. of existing rain gauges	Additional rain gauges required
1	U.Ammapatti	13.0	0.0	0.6	1	1	0
2	Silarpatti	23.5	0.1	1.1	1	1	0
3	Situlotti	35.5	0.1	1.6	2	1	1
4	Chinapulampatti	52.3	0.2	2.4	2	1	1
5	Kilankulam	25.5	0.1	1.2	1	1	0
6	P.Muthulingapuram	19.0	0.1	0.9	1	1	0
7	Rengapalayam	91.8	0.4	4.2	4	1	3
	Total	**260.5**	**1.0**	**12.0**	**12**	**7**	**5**
	Optimum number of rain gauges (N)						**12.0**

The exact location of the additional rain gauges is decided based on the availability of buildings suitable for installing rain gauges and the willingness of owners of the buildings.

The study is not without limitations. The co efficient of variation method does not have much limitation except for considering the appropriate level of error to be accounted in the formula. Higher the percentage of error, less will be the optimum number of rain gauges required. Moreover in the Thiessen polygon method, finding the area through extrapolation method may not resemble the exact ground reality. This would require correlation of data manually for a reasonably longer period.

Despite these limitations, the tools followed in the study are simple and it fairly reflected the rainfall experienced in the T.Kallupatti block during the study period. However, this study has to be continued for a reasonably longer period and further it has to be related to the other parameters like topography to arrive at some theories that could be applied in similar situations.

Crop Insurance Client Value

Balasubramanian S and Karthikeyan M*

Introduction

Index insurance may be a solution to problems with traditional agricultural insurance. From an insurer's perspective it may reduce problems of moral hazard and adverse selection and reduce high administration costs (Skees and Collier, 2008, Barnett, Barrett and Skees, 2008). However, index-insurance also poses a challenge: basis risk. Especially from the client's perspective,

In this article, client value in weather index insurance is discussed on DHAN Foundation's rainfall index insurance. This insurance is an interesting case as with the help of ILO's Micro insurance Innovation Facility, DHAN Foundation has set up a dense network of local automatic rain gauges in the state of Tamil Nadu and Andhra Pradesh, India. In this dense network, the average distance between rain gauges is around five kilometers. It can be assumed that basis risk caused by spatial variation between the farm and the reference weather station is relatively low, which makes the study of additional sources of basis risk and their impact on client value feasible.

Another interesting feature of this rainfall index insurance is that it is delivered through a mutual organization: DHAN People Mutuals. Through the mutuals, farmers are involved in processes of installation of rain gauges, product design and supporting processes. It is hypothesized that their involvement in these processes contributes to an increase of client value of the product, potentially solving certain problems with weather index insurance.

Client value

As was mentioned above client value tries to understand the insurance product from the client's perspective.

In this article we use the ILO's Micro insurance Innovation Facility's PACE tool to analyze the client value of DHAN's rainfall index insurance. The PACE tool analyzes client value based on four dimensions: product, access, cost and experience:

- Product: Describes the degree to which the product meets the most important risk-

Balasubramanian S*, *Chief Executive, People Mutuals, and* **Karthikeyan M, *Programme Leader, DHAN Foundation*

management needs of the target population. It reviews coverage, benefit level, eligibility criteria and availability of value-added services.

- **Access:** Describes the accessibility and simplicity of the product by investigating choice, enrolment, information, education, premium payment method and proximity.
- **Cost**: Measures both affordability and value for money, while also looking at additional costs and efforts to keep down overall costs of delivery.
- **Experience**: Assesses responsiveness and simplicity by looking at claims procedures and processing time, policy administration, product tangibility and customer care.

Weather index insurance and basis risk

Index insurance uses a weather parameter which correlates with realized crop losses such as measurements of rainfall or temperature at a weather station. Claims are paid as soon as the index reaches a certain level, regardless of actual losses (Skees, Barnett and Collier, 2008). Index insurance allows for removal of individual loss assessment and reduction in administration costs because it can make use of standardized contracts. In addition, the independently verifiable index allows for reinsurance and therefore insurance companies can efficiently transfer part of their risk to international markets (Hazell et al., 2010).

As mentioned above, index-insurance also has many challenges. The major one is basis risk. Basis risk refers to situations where individuals suffer losses but don't receive a payout or situations where individuals don't suffer losses but do get a payout. From the perspective of a farmer the first situation leads to demotivation for uptake of the insurance. However, the the second situation may lead to opportunistic behavior of the farmer because it may provide payouts while there are no losses.

Moreover, time periods in which losses can occur may vary from the risk cover periods in the design of the insurance product. This would imply for the farmer that some of the risks to his or her crops are not covered. Further experience with insurance in developing countries is low and often negative. Building trust and understanding of index insurance products is therefore a challenge (Barnett and Mahul, 2007), especially because it carries basis risk.

Hypothesized client value from weather index insurance

In relation to the product dimension of client value, it seems straight forward that weather index insurance meets an important risk management need: protection against weather risk. However, farmers are not necessarily interested directly in weather risk but more, like is the case with traditional indemnity insurance, in protection against crop losses. In this light it is assumed that the correlation between weather and crop growth should be at least 80%. It can therefore be hypothesized that weather index insurance leads to lower value with respect to the product dimension than traditional insurance.

With respect to the access and experience dimensions weather index insurance is not a simple product which is one of the client value determinants. Understanding the product, the weather stations and claim payment methods is more complicated than with indemnity insurances. However, claim payment, because it is based on an index, can be done faster, which contributes to client value.

The cost dimension, because of removal of expensive loss assessment procedures, should make weather index insurance more affordable from the clients' perspective.

Additional value from the mutual model?

The institution responsible for most of the execution of DHAN's rainfall index insurance project is People Mutuals. People Mutuals is owned by villagers and facilitated and organized by DHAN foundation. The experience of People Mutuals with offering life insurance to its members dates back to 2003, while DHAN Foundation has been working in many villages since 1990. The existing institutional structure for the delivery of insurance is based on mutual pools organized in locations through federations of farmers' groups. The location pools typically are small. A mutual catastrophe system between the locations is organized via DHAN People Mutuals. This mutual catastrophe program diversifies risk over two states. Till 2009-2010 the reinsurance was done by Eureko Re, but since 2010-2011 the entire risk was transferred to AIC of India.

The characteristics of the mutual model have their implications for client value. It is hypothesized that involvement of farmers in product design will increase the value of the product dimension because it is assumed that the risk management needs of the farmers are better represented if they themselves are involved in the design of the product. The access dimension by involving farmers is also assumed to improve because of farmer involvement in education, marketing and sales, which leads to increased understanding of knowledge needs and trust. Additional value from the cost dimension is uncertain. On the one hand the mutual can take over activities such as education and trust building which implies that the product can be cheaper. However, involvement in product design may lead to an increase in costs. Finally, the mutual is assumed to increase the value of the experience dimension of the product especially because of farmer involvement in claims settlement.

DHAN's rainfall index insurance and its alternatives

DHAN's rainfall index insurance covers the main crops in the region: Chillies, Paddy, Cumbu, Sorghum, Maize, Pulses and Groundnut. The unique feature of this product is that the product design is done at the level of location. The premium varies, depending on the crop, between 725 – 1300Rs. per hectare which is 5 - 12% of the sum insured. Up to 2011 almost 6000 farmers bought the insurance. The net income ratio, incurred expense ratio and incurred claims ratio were 82,18,2 respectively for the year 2009-2010 and -61, 90, 70 for the year 2010-2011 against ideal ratios of 5,20,75 (Wipf and Garand, 2010).

As Matul, Tatin-Jaleran and Kelly (2011) explain, client value of an insurance product should always be considered in relation to alternatives.In relation to client value it is important to establish what the clients consider to be alternatives. In this light, two other crop insurance products were mentioned by the farmers. The government crop insurance scheme 'National Agriculture Insurance Scheme' (NAIS) and the 'VarshaBima' (VB) product of the Agriculture Insurance Company. The NAIS product is an area-yield index and the VB product is a rainfall index product. Even though NAIS is not a rainfall index the fact that farmers discuss both products as competitive products is an indication of the fact that in the view of the clients not the type of insurance is important but the fact that the insurance provides a cover for crop losses. DHAN RII and VB will be easier to compare because they are similar insurance products (rainfall index) while NAIS is a different product. However, to do justice to the client value view, NAIS is also considered in our comparison.

Raju and Chand (2008) and Ifft (2009) explain about NAIS that the scheme is operating on the basis of both an 'area approach' for widespread calamities, and an 'individual approach' for localized calamities such as hailstorm, landslide, cyclone, flood, etc. The product covers all food grains, oilseeds and annual horticultural and commercial crops. The premium in 2006 was 194 Rs. per hectare which is 1.5 to 3.5% of the sum insured. There is a 50% subsidy for small and marginal farmers, to be shared equally by the Government of India and respective State governments.

The VarshaBima product of AIC, like the DHAN RII, consists of a cover for deficit rainfall, consecutive dry days and excess rain. The premium for paddy in 2010 varied between Rs.898 to 3250 per hectare according to the risk profile of different blocks in different districts. For each different cover there is a different pay out. Crops covered include paddy, groundnut etc

Methods

Mr.Balasubramanian and Mr.Sivaprakash from People Mutuals (PM) of DHAN foundation (DHAN) and Mr.PranavPrashad from the Micro Insurance Innovation Facility (MIF) of the International Labour Organization (ILO) and Ms.KarlijnMorsink, external consultant to the MIF jointly studied the program and implementation of DHAN's ainfall index insurance. Two days were spent at the DHAN office to interact with DHAN and PM staff and two days were spent in the field to allow for extensive interaction with farmers. During the two days spent in the field, two out of a total of five locations were visited.

Mudukulathur and Singampunari

These were chosen because they vary with respect to the financial status of the population and type of

crops. Mudukulathur is a relatively poor area where farmers mostly crop one season while Singampunari is better off and farmers tend to crop two seasons. These factors are assumed to influence the value that farmers perceive from the product.

In Mudukulathur two focus groups were held. One focus group with 30 farmers representatives from the farmer federations. The second focus group was held with about 15 DHAN field staff from Mudukulathur. In the afternoon two villages were visited where the rainfall index insurance had been introduced in 2010. Both villages rely on the same rain gauge but in one village all federation members took the insurance while in the other village none of the federation members took it. This was seen as an interesting exposure. Focus groups were held in both villages with 20 participants.

In Singampunari also two focus groups were held. One with representatives from the farmer federations and one with the Singampunari field staff. In the afternoon one location which had been exposed to the crop Insurance in both 2009 and 2010 was selected with the aim of understanding changes in the demand for the insurance. Three separate interviews were held with farmers to understand their perception of value of the product.

Further to these focus groups, interviews and discussions with DHAN and People Mutuals staff, documents and reports were analyzed on the product, access, cost and experience dimensions.

Conclusions: Basis risks and client value from DHAN RII

The analysis led us to conclude that the index insurance is associated with basis risk influences. The product value would be challenged because of low correlation between actual crop growth and the index in the rainfall index insurance. Because DHAN RII leads us to conclude that the weather index and its associated basis risk influences especially the product, access and experience dimensions of client value.

The product value is challenged because of low correlation between actual crop growth and the index. Because DHAN RII's spatial basis risk is relatively low we were able to identify other sources of basis risk. As is known, basis risk may be caused by other risks than rainfall, such as diseases, farm inputs and soil quality. In addition, the critical risk period which is determined in advance for the design of the product may differ from the actual period of rainfall. Thirdly the nature of rainfall needed for the different stages of the crop growth process should be adequately reflected in the product design and specialized for different crops.

With respect to the access dimension, despite the fact that index insurance is said to be able reach out to larger amounts of farmers, any index insurance leads to problems with marketing and education because farmers intially have to build up trust in the rain gauges / crop cutting experiments and the insurance product. It can be hypothesized based on the interviews and focus groups that farmers need more evidence that the product is reliable than in the case of area index insurance. In all the three crop insurance programmes, premium collection process is problematic because it is collected during periods of cash outflow and the time frame for sales is too short. Significant improvements are anticipated if flexible payment options are offered for the premium by providing a premium loan or allowing payment in installments.

The experience dimension with weather index is positively influenced because the rainfall index allows for relatively fast and transparent claim processing times and procedures, especially because the farmers have access to the rainfall readings under DHAN RII. However, large basis risk may lead to high levels of unsatisfaction with claim payments. Therefore transparency is even more important.

Conclusions: Client value from the mutual model.

Through the mutual model, farmers were involved in placement of rain gauges, product design, processes of marketing, education and sales and claims settlement of DHAN RII. With respect to the product dimension of client value, the involvement of farmers in product design did not contribute to a product with low basis risk especially because of lack of knowledge about insurance principles among farmers.It can therefore be hypothesized that farmer involvement in product design of weather

index insurance may not neccesarily contribute to increased client value by lowering basis risk.

However, on the access and experience dimensions their involvement in education, marketing, sales and claims settlement has contributed to trust on rain gauges and a better understanding of claim payments. Their involvement in education has currently not yet led to increased value because there is a lot of misunderstanding about the product because of basis risk. Collier, Barnett and Skees (2010) explain that an important component of education about weather index insurance it to focus on the fact that the insurance provides a cover for rainfall, not for crop growth (Collier, Barnett and Skees, 2010). If a specific index insurance education strategy is developed, the mutual involvement may lead to increased client value. With respect to marketing and sales client value has also not increased which is likely to be caused by short time periods for these activities.

However, farmer involvement in the organization processes has led to trust in the product which has increased client value from both access and experience.

With respect to the cost dimension of client value the costs and benefits of involving farmers in rain gauge installation, product design and processes should be further studied. The involvement of farmers in rain gauge installation led to low labour costs and trust which is likely to outweigh costs of installation if not done in collaboration with the farmers.

Conclusions: Relative client value of DHAN RII, NAIS and VB of AIC

The overall comparison of the four client value dimensions of DHAN RII and NAIS lead to the hypotheses that DHAN RII offers better value with respect to the access and experience dimension and NAIS with respect to the product and cost dimension. However, access to the NAIS and claims settlement is not always perceived as transparent by farmers. In some locations farmers had heard about NAIS but had never been able to access it while in other locations both access and claim payment were common.

However, in locations with access to NAIS the cost dimension appeared to be an important motivation for take up of NAIS.

Discussion and recommendations

Basis risk refers to situations where individuals suffer losses but don't receive a payout or situations where individuals don't suffer losses but do get a payout. Next to spatial basis risk an important source of basis risk was found to be the product design. Adequately reflecting the risk period and the pattern of rainfall during different crop growth stages should receive ample attention in designing weather index insurance.

An important lesson here is that next to adequate product design, adequate communication about the product and its design features may also reduce perception of basis risk by farmers. Explaining that weather index insurance insures weather risk and not crop growth risk seems important. Studies testing different education and marketing mechanisms should be done to know how uptake can be increased.

Assessing the influence of basis risk on the four dimensions of client value allows for understanding different mechanisms that lead to client value of weather index insurance. This allows for targeted improvements in the product and processes instead of only focusing on the reduction of spatial basis risk.

It was hypothesized that farmer involvement in product design through the mutual could reduce basis risk but in DHAN RII this was not the case. Farmers without experience with rain gauges were found not to be aware of actual mm rainfall required in different stages of the crop growth process. In addition, unawareness of insurance principles led initially, to a product with low client value.A product with low value is not in the interest of farmers but also not in the interest of the insurer. It should be further studied how weather index insurance experts can work together with farmers to improve product design.

The four dimensions of the PACE tool for assessing client value help in understanding relative client value of both products. This is especially important because access to NAIS and claims settlement is not perceived as transparent in all areas. In these areas DHAN RII can offer competitive value, despite being more expensive, through offering better client value on the access and experience.

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Fee: USD 750 for international participants and Rs. 30,000 for Indian participants for the course towards food, stay, tuition, course materials, field visits and local sightseeing.

The application form can be downloaded online at http://www.dhan.org/tda/artmp01. The filled in applications along with the fee should reach us on or before October 31, 2014.

For further information, please contact:

Ms. S. Gayathri (Course Coordinator)

International ART on Micro Pension - Tata-Dhan Academy

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Tata-Dhan Academy

Announces

Twelfth International Course - Advanced Reflective education and Training (ART) on Micro Insurance

December 8-11, 2014

ART course enables participants from around the world to learn from large scale successful, sustainable, and viable experiences in micro insurance.

Participants

Micro insurance practitioners, micro finance institutions, micro finance networks, NGOs, researchers & academia, donors, insurers, governments and international agencies.

Course Design

The course comprises of five interdependent modules.

Module 1: Micro Insurance through mutuality, focusing on demand stream perspectives of insurance as well as the alternative distribution approaches to reach insurance to poor.

Module 2: Micro insurance and life and non-life risks, covering different micro and mutual products, models, principles, practices and challenges

Module 3: Micro Insurance product design lab, involving actuarial experts with a hands on practical session on actuarial analysis.

Module 4: Micro insurance sustainability and regulations, focusing on safety net mechanisms including reinsurance and broad perspectives of global micro insurance regulations

Module 5: Micro Insurance International perspectives, with the sharing on country specific micro insurance experiences

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Visit to community organizations and health care providers, implementing micro and mutual insurance.

Faculty

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Registration

Fee: USD 1000 for international participants (INR 40,000/- for Indian participants only) for the course towards food, stay, tuition, course materials, field visits and sightseeing.

Application form

The application form can be downloaded online at http://www.dhan.org/tda/art12.php.

The filled in application form along with the fee should reach us on or before October 31, 2014.

Please send filled-in applications, or requests for further information to:

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