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CROP YIELD INSURANCE – NEGOTIATING BETWEEN GOVERNMENT, FARMERS AND INSURANCE COMPANIES

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Abstract. The purpose of this paper is to analyse the experience of crop yield insurance in Lithuanian agricultural sector against unfavourable climatic factors causing the losses of crop harvest and their impacts on the insurance premiums and the indemnity for damage. The huge problem of Lithuanian crop insurance system is the low rate of farmer's participation and problems arising in defining insurance premiums. However, there are noticeable substantial climate changes during the last 20 years, and agricultural sector in future will be more affected by unfavourable climatic conditions and such natural disasters require the Government to provide assistance to farmers. The amount of insurance premiums for crop insurance are relatively high, because a single Insurance Company does not accumulated sufficient statistics, so farmers rarely use its services: now there are insured only 7% of insurable crop areas in Lithuania. Consequently, negotiating takes place between farmers, Insurance Company and Government concerning compensation for crop yield losses. The aim of paper is to analyze the advanced experience of other countries, to evaluate principles of crop insurance in order to give proposals for all negotiating parties. Methods of the investigation are comparative analysis of the problem, descriptive approach, synthesis, modeling. The results and conclusions of the paper suggest to modify the principles of crop insurance driving to „low-premium", „wide coverage" system, to increase the transparency of damage evaluation and payment of insurance claims and to be more focused on trends of climate change in future.

Key words: Crop insurance, loss indemnity, insurance premium, yield, weather-related disasters.

JEL code: G18, G22, Q18, Q54.

Introduction

Lithuanian agriculture employs about 5% of all persons employed. The production of agricultural sector accounts approximately 8% of GDP of Lithuania. Agriculture is a strategic sector of the economy of Lithuania due to its ties to elements essential to the quality of life of a country's population: food supplies and the environment. Crops were grown by 159 600 farms in 2013. Widespread crops in Lithuania are winter cereals and spring cereals. The winter

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cereals harvest has increased by 12.0% (169 thousand t) and harvest of spring cereals – 4.7% (59 thousand t) in Lithuania throughout 2000 – 2010 year period (Balezentis, 2011). However, it is also one of the activities with the highest risk exposure, mostly because it is carried out in a natural environment. It can also be argued that the degree of uncertainty in agriculture will be even more marked in the future due to the tendency of significant changes in weather conditions (climate change and environmental risks) and the increased international trade and free market conditions.

As for a long time insurers lacked competence in assessing the impact on plant violations to the final harvest, the ability and willingness competently and understandably to explain for farmers damages assessment methods. Hence, the negotiations between insurers and the farmers concerning crop insurance ended to conflicts typically and moved to the courts, what increased the unpopularity of the crop insurance service even more and formed negative attitude of the farmers to the insurers.

In this context, agricultural risk management has been the focus of both recent and current reforms in many countries belonging to the Organisation for Economic Cooperation and Development (OECD). Agricultural insurance is probably one of the most efficient and best known tools for managing the risks associated with agriculture. The trust of farmer in the policy of insurance is the clearest indicator of the insurance policy efficiency. It‘s validity becomes clear when an assessment is made on the extent of damages suffered by the insured product, since this is the time when the policy either meets or fails to meet the holder's expectations. For this reason, damage assessment is of crucial importance as it can guarantee insured farmers a satisfactory return on their work.

The objective is to carry out an investigation of crop insurance in Lithuania in order to define and offer proposals which can help solving problems arising in negotiations between farmers, Insurance Company and Government. Could the coverage level of crop insurance be capable to offer adequate compensation for yield loss from natural disasters or encourage farmers to purchase crop insurance? With the help of statistical data ratio analysis, this paper is to give recommendations for improving crop insurance system of Lithuania.

1. The overview of world agricultural insurance systems as a risk management tool

Crop insurance is an important tool to alleviate natural disaster risks. There are three types of crop insurance in the world: 1) cost insurance, 2) yield insurance and 3) revenue insurance (Ruihua *et al*., 2010).

The yield insurance is widely used in about 40 countries. Lithuania is using Government - subsidized crop insurance system from 2008, according to which the coverage level is defined on the yield cost incurred during crop production. Under the current policy of principles of crop insurance system the insurance system aims to stabilize the life of farmers in cases where natural disasters occur.

Three groups of countries can be distinguished in the European Union, which have different agricultural insurance systems (Bielza *et al.,* 2009). In Greece and Cyprus, crop insurance is mandatory only from hail, but farmers must be insured against other risks. Agriculture sector of another group of EU countries, which includes Spain, Portugal, Italy, France, Austria, Luxemburg, the Czech Republic, Slovakia, Latvia, Estonia and Lithuania, is cooperating with private insurance and public sectors and uses a variety of support measures. In other countries, the insurance system operates without state support, or only covers a number of possible risk factors (hail). The principal instruments used for risk sharing are disaster funds, regional cooperative programs and agricultural insurance. However, if the systemic risks covered in an agricultural insurance system are not passed on in the reinsurance market or backed by state guarantees (many farmers often suffer losses at the same time) insurance companies are obliged to create sizeable reserves of capital, the cost of which forces them to raise premiums to higher, and maybe impossible, levels for farmers. This means that agricultural insurance programs need the support of the public sector in order to provide ample cover at a price farmers can afford. Even though, governments disagree on the subject of whether or not to participate in the application of insurance models, analysis has shown that the most highly developed models are attained with government backing, within certain limits. Subsidies for insurance policies awarded by member states vary from one country to another and depend on the national policy on risk coverage, support for certain subsectors or assistance to certain types of agriculture. Some countries, have adopted this system as an essential part of agricultural policy for the stabilization of rural incomes.

At the time of the Common Agricultural Policy (CAP) when "Health Check" reform passed in November 2003, the EU rejected the implementation of a common risk management policy due to the wide range of different risks affecting European agriculture. More recently, the EU rejected and opted for conceding greater autonomy to member states to solve these problems themselves, with financial support from the EU.

Despite reservations of Commissions about the concept of an EU-wide insurance scheme or revenue insurance, there is a trend towards encouraging farmers to take responsibility for production risks. State aid guidelines provide that from 1 January 2010, compensation for losses due to adverse weather effects must be reduced by 50% if the farmer does not have insurance covering at least 50% of annual production or production-related income from the statistically most frequent climatic risks.

The new agreement on CAP reform reached in 2013 maintains two pillars, offering a more holistic and integrated approach to policy support. Specifically it introduces a new architecture of direct payments; better targeted, more equitable and greener, an enhanced safety net and strengthened rural development. As a result it is adapted to meet the challenges ahead by being more efficient and contributing to a more competitive and sustainable EU agriculture. The second pillar offers a new risk-management toolkit including insurance schemes for crops, animals and plants, as well as mutual funds and an income stabilization tool.

The agricultural sector is highly supported in the European, with various CAP instruments, reducing the level of income variability faced by farmers. However, in addition to these measures most countries have specific measures designed to help farmers manage risks, for example insurance. With regard to insurance type schemes, the level and extent of coverage and subsidization can vary widely in various countries.

2. Development of Crop insurance system in Lithuania

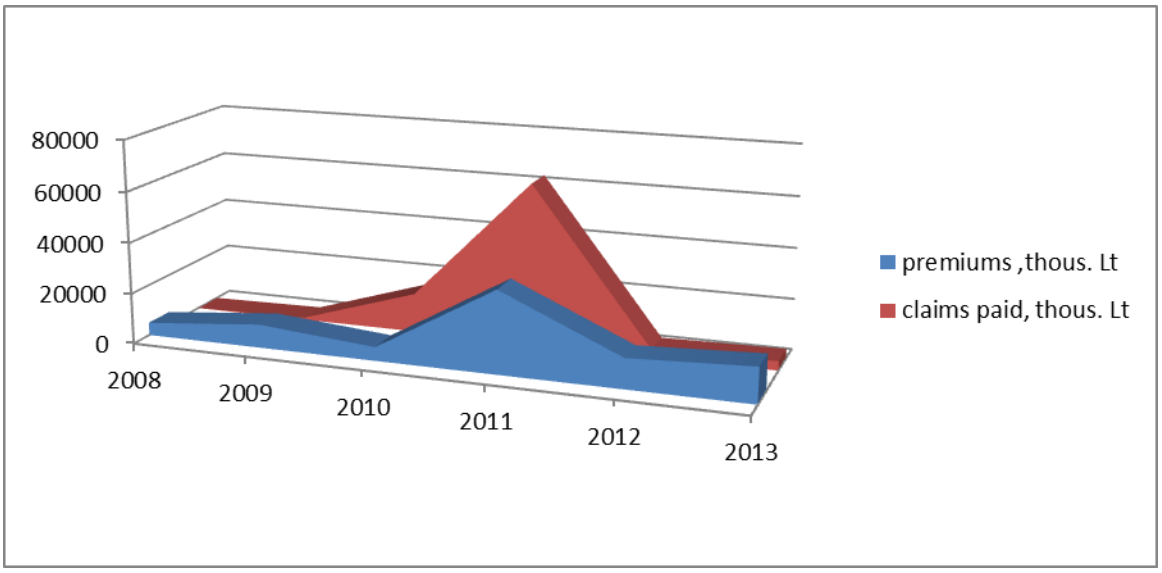
In 2006, the farmers of Lithuania suffered from drought: according to calculations, the losses exceeded LTL 600 million. Crop insurance has been carried out only by single insurance company "PZU Lithuania" in this period, for very high premiums, so only small part of farmers could insure their crops (they insured only 0.5% of overall size of crops), crop insurance for this company was unprofitable (during 5 years insurance company made only 1 000 insurance policies and insured approximately 10 000 ha of crops), therefore, farmers appealed to the state asking to cover losses caused by drought.

Already in 2006, assessing farmers' dissatisfaction with the insurance quality, the Ministry of Agriculture created a working group, which was instructed to prepare Lithuanian concept of crop insurance system that could meet the expectations of farmers, the state strategy, the European Union's priorities, trends and also would be attractive for Lithuania insurance companies. Members of the group undertook a detailed analysis of European, American and Asian countries experience on crop insurance, their existing legislation, the main trends and made recommendations for future model. It was found that the main components of risk management process are: the risk identification and assessment, its potential impact on the economy forecast; the creation and implementation of an action plan for risk management.

So working group in preparing the crop risk management action plan defined the main principles of crop insurance system (Radzevicius, 2007): interest and willingness; cooperation (coordinated interaction entities); interest and willingness; cooperation (coordinated interaction entities); fairness and objectivity; effectiveness; transparency; flexibility, adaptability; system stability; continuity of the system (development option).

German specialized crop insurance company Vereinigte Hagelversicherung VvaG „Branch" VH Lithuania" (Insurance Company) for carrying out crop insurance in Lithuania was selected in 2007 according to defined principles, which is cooperating successfully with Government of Lithuania and farmers up to now. However, the majority of the country's farmers are still unwilling to insure their crops: this is evidenced by statistics of the 2014 winter crop season, which began in August. Most farmers insured their crops against three risks: hail, rainfall and storms. No farmer had insured crops from drought risk. The winter crop insurance against the frost risk still gets a lot of discussions not only in Lithuania but in Europe also. Lithuania farmers complain of increased insurance premiums, although last winter did not make a lot of damage. However, the most famous European reinsurer's professionals say that farmers of Lithuania just were lucky in 2013 winter, because there was about 5 cm thicker coat of snow

cover. Only, in seaside region of Lithuania, where a snow cover was slightly lower, almost all winter crops have frozen. Consequently, Insurance Company have changed the insurance conditions for winter crops against frost risks in 2014, considering to the losses of last two years (Figure 1), when more than LTL 600 million of claims were paid due crop destruction by frost: the insurance premium for winter cereals and rape were increased from 1.8 to 2.5 times. So now the maximum premiums are for insurance of crops against destruction by frost. Yet, policyholders are repaid 20% of insurance premiums amount. In cases of a natural disaster, the Government can decide whether to provide support for this critical situation. It should cover losses not compensated by insurance. Member States in this case must inform the European Commission, that they intend to provide such support.



Source: author's construction based on statistics of Bank of Lithuania, Insurance supervisory authority

Fig.1. **Ratio of Insurance premiums and claims paid by Insurance Company**

The Insurance Company has opinion that crops' destruction by frost is loss insurance, rather than yield insurance because farmers can again re-sown crops, and can get a new harvest in the same year. In contrary, the hail can destroy the entire harvest. In the future farmers should focus more on crop insurance from destruction by frost or to sow less amounts of winter crops.

3. The main risk determinants and their evaluation

The most complicated issue for Insurance Company is definition of proper coverage level of the crop indemnity and determining the value of the sum insured. In 20I2 year the Ministry of Agriculture introduced restriction of 50% reimbursement of premium but no more than a certain amount of crops. This reimbursement amount is the main issue in negotiations between the Insurance Company and farmers. Defining the method of calculating reimbursement amount is essential. The decision was made to calculate it according to the income obtained from the crop production per hectare. Conditional income per hectare from growing one or

another kind of plants is calculated by statistical data - what is the average yield obtained from such unit of area and what is value of such production. After calculation the average income per hectare, the Insurance Company determines the highest amount for compensation of insurance premium: more income is higher, the insurance is more expensive, however, and the amount of compensation is higher. The Insurance Company acknowledges that now insurance premiums in Lithuania are relatively high, because the Insurance Company still does not have a so-called "history" that is, it have not accumulated enough statistical data that would allow to focus on questions: how often natural disasters touch agriculture, what areas do they cover. Insurance Company usually focuses on 30-year statistical average, while in Lithuania they work only for 7 years. Lithuania's specificity is that they have to persuade farmers to insure crops, when in other countries the insurance is much more common.

In summary can be said that there are too much constraints in trying to select feasible crop insurance scheme: lack of historical yield data, small sized farm holdings, low value crops, relatively high cost of insurance, distrust of farmers in insurance system.

4. Comparison of the harvest, areas and yields in estimation of loss indemnity costs

Winter cereals and spring cereals are the most common crops in Lithuania. Comparison of statistics on harvest, areas and yield of these two main kinds of crops in 10 counties (Alytus, Kaunas, Klaipeda, Marijampole, Panevezys, Siauliai, Taurage, Telsiai, Utena, Vilnius) has been displayed in Table 1 throughout the period of 2000-2010 on the basis of Lithuania Statistics database. Considering the results of analysis the total harvest increased about 110 thousand tons or by 4.0%. The total area of crops also grew up by 54 thousands ha or by 5.7% but the total yield of crops decrease from 2.7 to 2.6 ton per ha because of the yields drop of winter cereals from 3.1 to 2.9 ton per ha during the same period of time.

As for winter cereals, their area increased by 18.3%. More specifically, the share of winter crops compared with the whole area of Lithuania increased for counties of Marijampole, Siauliai, Telsiai, Panevezys and Taurage. On the other hand, this share decreased for counties of Kaunas, Vilnius, Utena, Alytus, and Klaipeda.

Table 1

Dynamics of crop harvest, area and yield in Lithuania under 2000 -2010 years

Cereals	Year	Harvest, t	Area, ha	Yield, t/ha
Winter cereals	2000	1410055	448934	3.1
	2010	1579274	530998	2.9
Spring cereals	2000	1247570	530693	2.3
	2010	1188492	505178	2.3
Total	2000	2657625	979627	2.7
	2010	2767766	1036176	2.6

Source: author's calculations based on Lithuania Statistics database

As for spring cereals, their area decreased by 4.8%, that is 25.5 thousand ha during 2000–2010 period. At the counties level the following shifts in crop structure were observed: in counties of Panevezys, Kaunas, Vilnius, Telsiai, Siauliai and Alytus has increased, whereas in counties of Marijampole, Taurage, Klaipeda and Utena has decreased.

Indeed, the research (Balezentis, 2011) has reported that the most efficiently operating farms were those in counties of Marijampole, Siauliai and Klaipeda. Hence, it might be concluded that farming is associated with growing of winter cereals efficiency and therefore counties of Marijampole and Siauliai were those managed to increase their share in total area of winter cereals in Lithuania (increases of 3.1% and 2.9%). Indeed, these findings can be based on commonly known advantages of winter cereals.

Considering the winter cereals, their harvest has increased by 12% (169 thousand t) in Lithuania throughout 2000–2010. The highest rates of increase were observed in counties of Telsiai, Marijampole, Taurage and Siauliai. At the other end of spectrum, counties of Vilnius, Utena, and Alytus exhibited the highest rates of decrease in harvest. The yield values have also been varying across different counties.

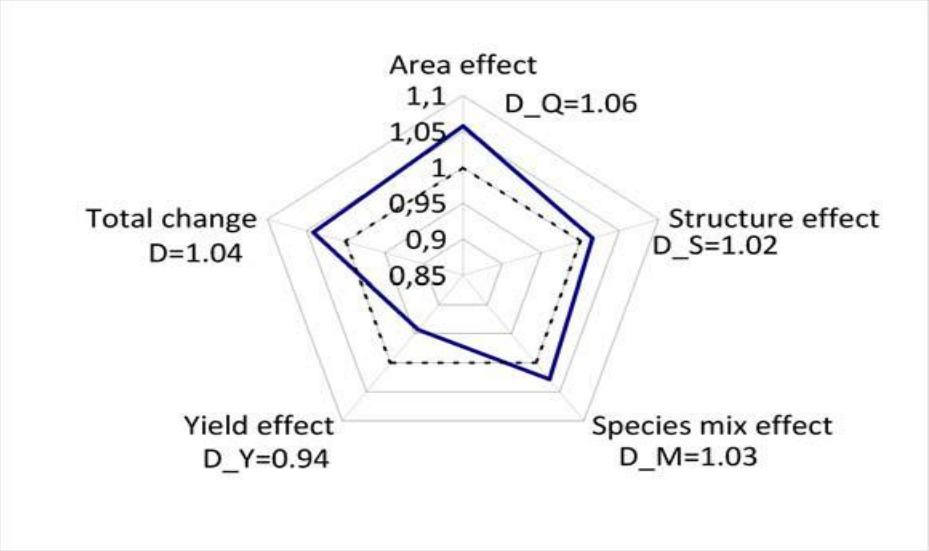
The alteration of the area proportions under different cereal species in certain county lead to positive effect of their mix. Hence, these changes can be considered as rational ones. Nevertheless, adverse climatic conditions lead to decrease in yields. Yield effect, hence, caused decline of 6% or 246 thousand t in total harvest. In accordance with the results obtained by Lithuanian scientists (Balezentis, 2011), the results of multiplicative index decomposition analysis (IDA) for cereal crop harvest in Lithuania during 2000–2010 year period, which are presented in Figure 2, suggest that the area effect caused increase in harvest of some 6%. Meanwhile, species mix effect led to increase in harvest of 3%, whereas structure effect – to that of 2%. The yield effect caused decrease of some 6%. The total harvest during researched period, therefore, grew by 4%.

Over time, the loss experience for an average individual producer is generally related to:

- the crop characteristics,
- the production area,

- and the weather.

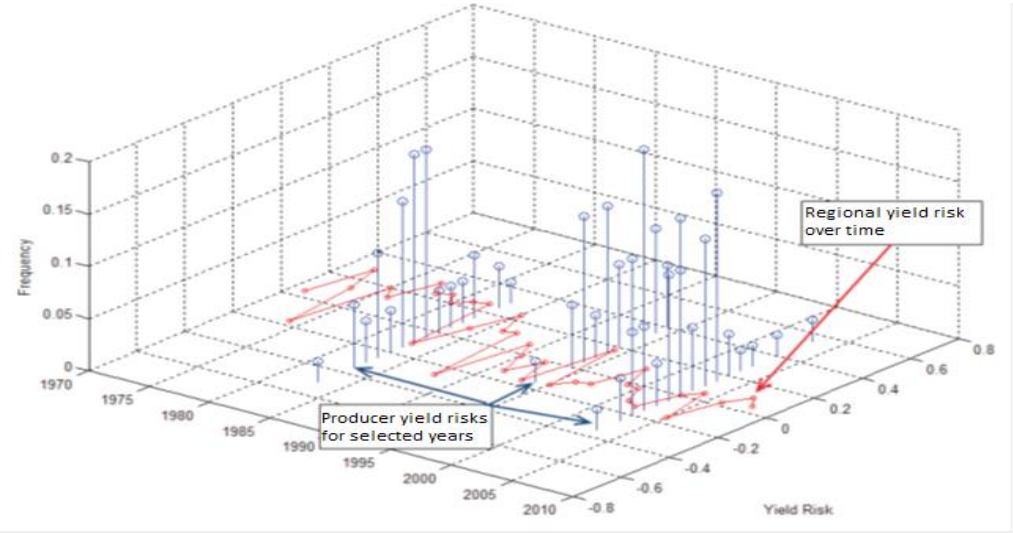
A group of producers in a particular region will generally exhibit yield risks over time in relationship to the time periods of the geographic region. This relationship is illustrated in Figure 3 that shows the evolution of regional de-trended yield risks over time and the corresponding set of producers' risk for selected years. When regional yields increase or decrease around the expected (zero percent) trend level, the producer yield distribution within the region tends to shift in the same direction. A proper yield-based insurance rating analysis would sample across each producer at various coverage levels and all years to estimate loss indemnity costs.



Source: author's construction based on research Balezentis, 2011

Fig.2**. The changes in crop harvest of Lithuania in 2000–2010**

The weather is becoming an increasingly important variable in the recent period. The year 2010 can be described as specific meteorological conditions year in Lithuania: during the winter cold was of 5 degrees below, in summer - the heat was of 5 degrees higher. Agriculture particular suffers from early spring and autumn frosts, heat waves and flaw.



Source: author's construction based on Cole, Gibson, 2010

Fig. 3. **Times periods of Regional Yield and Selected Cross-sectional Producer Yield Risks**

Lithuanian climate conditions have been slowly changing over the last 20 years. While climate changes vary in different regions of Lithuania, but overall changes are observed everywhere. Research results of soil freezing depth showed that it decreased in regions (Vilnius, Utena, Varena), where history has been observed high level of soil freezing, and increased in Birzai, Kaunas, Siauliai (Stuoge *et al.,* 2012). Thus Insurance Company should be more focused on climate change trends in the future, rather than complain about the lack of statistics.

5. Negotiation strategy between Government, farmers and Insurance Company

In the crop insurance practice, it is essential to determine proper coverage level and affordable premium. However, the majority of the country's farmers are still unwilling to insure their crops. On the basis of results of the analysis, it can be concluded that crop insurance in Lithuania is ineffective, what is causing a lot of financial problems for farmers. Consequently, there are basic tasks for negotiations between Government, farmers and Insurance Company:

For Government: the government-subsidized crop insurance system is acceptable for farmers, but state budget deficit more and more restricts possibilities of subsidies payment to farmers. The Government should be interested to initiate a revision of the principles of crop insurance, which must be driven to: low-premium, wide-coverage and to plan guarantees in the state budget for cases of huge, unpredictable natural disasters.

For farmers: Farmers' crop yields are particularly dependent on the weather conditions, therefore the crop insurance has significant demand. For this purpose it is necessary and appropriate Government support. Farmers must intensify the use of crop insurance in the face of the Government and Insurance Companies' efforts to improve conditions for crop insurance.

For Insurance Company: The Insurance Company is controlling the risks by collecting insufficient amount of premiums. The biggest problem is that the Insurance Company is faced with the low rate of farmer's participation. The systematic risks in high frequency partly come from the poor agricultural infrastructure and unpredictable disasters. In future the Insurance Company must decrease insurance premiums which will help to attract more farmers, as they have a high potential: only 7% of insurable crops in Lithuania are insured now. The Insurance Company needs to increase transparency in the calculations of extent of the damage and the payments of insurance allowances, which will help to increase the confidence of the farmers for crop insurance. In addition, the Insurance Company should pay more attention to climate change trends in the future.

Conclusions

1. In Lithuania there are too much constraints in trying to select feasible crop insurance scheme: lack of historical yield data, small sized farm holdings, low value crops and the relatively high cost of insurance, farmers distrust of insurance system.

2. Insurance premiums for crop yield insurance in Lithuania are relatively high, as Lithuania's Insurance Company still does not have a so-called "history" that is, insurance premiums in Lithuania are relatively high, because the Insurance Company still does not have a so-called "history" that is, it have not accumulated enough statistical data that would allow to what will enable to evaluate all the risks and determine the correct amounts of insurance premiums. There is a high potential of crop insurance market: only 7% of insurable crops in Lithuania are insured now. If Insurance Company would like to attract a greater number of farmers it must decrease insurance premiums. The main principles of Insurance Company must be driven to: „low-premium, wide-coverage".

3. The Government must give guarantees in the state budget for cases of huge, unpredictable natural disasters if it wants to encourage the farmers to insure their crops.

4. The Insurance Company must increase transparency of process on estimation of insurance premiums and procedures of claim payments and be more focused on climate change trends in the future. This will increase the confidence of the farmers for crop insurance.

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