Impact of Crop Insurance on Agricultural Scenario: A Study of Some Selected Crops in the District of Hooghly (West Bengal)

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To the University of Burdwan
For the Degree of
Doctor of Philosophy in Economics
2012

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1.1. Introduction

Agriculture which is an important sector of economy is considered widely as an industry. It faces various types of natural hazards. Insurance is an important instrument to give protections under risky activities and that plays significant role in the agricultural production decision, chemical use decision, cultivation practices and cropping pattern decisions.

Crop insurance is an important measure/instrument used by farmers for mitigating the financial losses due to various types of natural calamities/risks which damage and destruct the production. It is also one of the important instruments that can be used by a farmer to stabilize his income against partial or complete crop failure due to adverse weather [such as disasters, flood, hail, drought etc.] or due to related adverse physical crop conditions which are beyond his control.

Before the introduction of crop insurance farmers took crop loan from the different financial institutions, that is, from different formal credit institutions such co-operative credit institutions, regional rural banks and commercial banks. So they became loanee farmers. There were no crop insurance facilities. In that case if the crops were damaged by natural calamities, there was no chance of getting or receiving indemnity from the insurer. After crop damage they were bounded in debt trap.

After the introduction of crop insurance scheme (the Comprehensive Crop Insurance Scheme (CCIS) was introduced in Indian agriculture from 1st April 1985 over all India and the National Agricultural Insurance Scheme (NAIS) or Rashtriya Krishi Bima Yojana (RKBJ) has been running well for the session 2000-2001 with the active assistance and agreement of the West Bengal Government (W.B Govt.) in the state of West Bengal) all the loanee farmers are compulsorily insured and get the benefits of crop insurance after crop damages due to natural calamities. The National Agricultural Insurance Scheme (NAIS) pays the indemnity to the affected farmers by its own indemnity paid rule.

1
Various types of crop insurance schemes have been introduced in the field of Indian agriculture such as Compressive Crop Insurance Scheme (CCIS), National Agricultural Insurance Scheme (NAIS) or Rashtriya Krishi Bima Yojana (RKB), Seed Crop Insurance Scheme (SCIS), Firm Income Insurance Scheme (FIIS), Rainfall Insurance Scheme (RIS) and Weather Based Crop Insurance Scheme (WBCIS). The crop insurance schemes are operated on area approach, individual approach and pilot basis according to the types of crops. Among the above stated crop insurance schemes, the Compressive Crop Insurance Scheme (CCIS) and the National Agricultural Insurance Scheme (NAIS) are operated on the basis of area approach and the NAIS also operates on individual approach for localized calamities, and the remaining crop insurance schemes are followed on pilot basis. In case of area approach crop insurance scheme, unit of area may be District, Subdivision, Block and Gram Panchayat. In India, at the beginning of the crop insurance scheme no specific area is chosen as unit. Consequently various problems were found. Later on district was chosen as a unit of area, then extended to subdivision, Block and finally it tries to manage its extension to the Gram Panchayat level. Similarly in West Bengal, district is chosen first as unit area, then sub division, after subdivision block is chosen as unit area and today Gram Panchayat is selected as unit area.

1.2. Objectives of Crop Insurance Scheme
The objectives of crop insurance scheme are:

- To protect the farmers against the loss of their crops [declared affected crops] due to natural disasters such as hail, drought and flood etc. or the loss of revenue due to decline in the prices of agricultural commodities.
- To encourage the farmers to use progressive agricultural strategies, high yielding seeds and fertilizers, and to use advance technology in the agriculture.
- To stabilize the income of the farmers in the years’ of natural calamities

1.3. Need for Study
India is an agriculture based country. About 92 percent (Agriculture Insurance Company of India Limited, Kolkata Office) people depend on agriculture directly. For having no adequate irrigation facility farmers of India have to depend on nature. There is a common word that Indian
farmers are born in debt and die in debt. The main cause of this fact is loss of crops due to natural calamities. Multidimensional progress of our country is not possible till the development of the peasants and farming. For this purpose National Agricultural Insurance Scheme (NAIS) has been taken into consideration for the security of the farming and the farmers employed in the field of agricultural. This scheme (NAIS) has been running well for the session 2000-2001 with the active assistance and agreement of the West Bengal Government (W.B Govt.).

1.4. Objective of the Study

Nobody would deny the feasibility of introduction of crop insurance in agriculture. If the crop insurance system is in force the farmers could be easily mobilized to face various hazards in agriculture. They become interested to produce more risky and highly expensive crops with less tension.

In the district of Hooghly under our study, it is observed that all insured farmers are loanee but there are no non-loanee insured farmers. If the loanee farmers properly utilized their crop loan for productive purpose, their income would have been generated as expected. After crop damage due to natural calamities, if the insured farmers would have the opportunity to recover some part of loss or total loss, they would have been more interested to crop insurance. Thus the crop insurance acts as a safeguard to the farmers.

We have three definite basic objectives of our study. These objectives are mentioned below.

- We measure the growth rate of area under cultivation, total output and yield rate of Aman Paddy, Boro Paddy and Potato during the period 1990 to 2010.
- We want to measure the growth rate to total NPK consumption and per acre NPK consumption for Aman Paddy, Boro Paddy and Potato during the period 1990 to 2010.
- We want to study the growth rate of irrigated land as proportion to total land during the period 1990 to 2010.
- We also measure the growth rate of total revenue from Aman Paddy, Boro Paddy and Potato.
We have collected secondary data from district statistical handbooks of the district of Hooghly, and the different issues of the economic review and the statistical abstract of the West Bengal.

There are five important objectives that have been considered on the basis of our secondary data collected from district statistical handbooks of the district of Hooghly, the different issues of the economic review and the statistical abstract of the West Bengal the above sources and the Regional Office of Agriculture Insurance Company of India Limited, Kolkata.

- Impact of crop insurance on Area under cultivation, total production and yield rate of Aman Paddy, Boro Paddy and Potato.
- Impact of crop insurance on the total NPK and per acre NPK consumption of Aman Paddy, Boro Paddy and Potato.
- Impact of crop insurance on the irrigated land as proportion to total land.
- Impact of crop insurance participation, total sum insured and premium collected on the total area under cultivation and total production of Aman Paddy, Boro Paddy and Potato.
- Impact of crop insurance on the total revenue from Aman Paddy, Boro Paddy and Potato.

Therefore, to analyze the above objectives we assumed linear functions that are estimated simple by the ordinary least square method (to be detailed in Chapter Three).

We have collected panel data during the period 2006 to 2010 of three hundred fifty five farms by field survey from our study district (Hooghly) in the State of West Bengal. All the farms are divided into five categories, namely, marginal farms with land size less than one acre, small farms with land size between one and two acres, medium farms with land size between two and four acres, semi-medium farms with land size between four and ten acres and large farms with land size more than ten acres. We have chosen three important explanatory variables such as insurance participation for a crop, education level and time itself. Therefore, we have considered the following objectives farms of all different sizes.

- The objective of our study is to analyze the effect of the above stated three important explanatory variables on the area under cultivation, total output and yield of Aman Paddy, Boro Paddy and Potato.
- We also want to study the impact of crop insurance participation on the input use for three important crops such as Aman Paddy, Boro Paddy and Potato.
1.5. Analytical Model and Methodology of Estimation and Data

The growth rate of all variables (area of under cultivation, output, yield, total and per acre NPK consumption under principal crops, irrigated land as proportion to total land and total revenue) during the period 1990-2010 can be measured simply by taking a log linear trend equation. The log linear trend equation can be written as follows

$$\ln y_i = \beta_0 + \beta_t t + u_i; t = 1,2, \ldots, n$$

(1.5.1)

where $u_i$ satisfy all the assumptions of the classical linear model. Therefore we apply simple method of least square technique to estimate the time coefficient ($\beta_i$) which gives the growth rate of all specified variables in our models.

To analyze the impact of crop insurance we use simple ‘spline function’ approach which is developed by Poirier in 1974. The entire study period (1990-2010) can be divided into two parts. One is pre-crop insurance regime (PREINSREG) from 1990-91 to 1999-2000 and other is crop insurance regime (POSTINSREG) from 2000-2001 to 2009-2010.

Assuming a linear trend, the postulated model is

- Pre-crop insurance regime: $\ln Y_t = \alpha_1 + \beta_1 t + u_i$ for $t \leq 2000$
- Crop insurance regime: $\ln Y_t = \alpha_2 + \beta_2 t + u_i$ for $2001 \leq t \leq 2010$

(1.5.2)

Let us define the following variables:

$$w_{1t} = t; \quad w_{2t} = \begin{cases} 0 & \text{if } t \leq 2000 \\ t-2000 & \text{if } 2000 < t \end{cases}$$

(1.5.2a)

and reparameterise the function as

$$\ln Y_t = \alpha_1 + \delta_1 w_{1t} + \delta_2 w_{2t} + u_i$$

(1.5.3)

The expression $\left[ \exp(\beta_i) - 1 \right] \times 100$ will yield the percentage growth rate of all selected variables for the pre-crop insurance and crop insurance regimes ($i = 1, 2$), where $\beta_1 = \delta_1$ and $\beta_2 = \delta_1 + \delta_2$.

Equation (1.5.2) will be used to compute the growth rates of all selected variables for pre-crop insurance and crop insurance regimes.

We shall use the panel data regression models to estimate the area under cultivation, total production, yield and the cost of different factors of production of different farm-size on the
basis of our collected primary data directly from field survey during the period 2006-2010. In that case we use the restricted and un-restricted panel regression models.

We have collected the secondary data on area under cultivation, total production and yield rate at block level during the year 1990-91 to 2009-10 from the various issues of District Statistical Hand Books. The crop insurance related secondary data has been collected during the period 2001-02 to 2009-10 from the Hooghly District Central Co-operative Bank Limited and the Regional Office of Agriculture Insurance Company of India Limited in the Kolkata. The primary data for our study has been collected by field survey with the help of suitable questionnaire for these three crops (Aman Paddy, Boro Paddy and Potato) from the insured farms of the district Hooghly during the period 2006-2010.

1.6. Basic Findings

Our basic findings of the empirical experiments based on the secondary data during 1990 to 2010 and primary data during 2006 to 2010 in the district of Hooghly can be stated as follows.

(i) In the district of Hooghly, in the case of Aman Paddy the area under cultivation and gross average output are the highest. On the other hand, the yield rate of Aman paddy is reasonably lower than that of other Paddy during the period 1990 to 2010. The variability of production of Potato is lower compared to the variability of production of Boro Paddy during the period 1990 to 2010.

(ii) In the crop-insurance regime (2000-01 to 2009-2010) the average area under cultivation of Aman Paddy has been found to decrease compared to that in the pre-crop insurance regime. On the other hand, both the gross average production and yield have empirically observed to increase in the crop-insurance regime compared to those things in the pre-crop insurance regime. In the crop-insurance period, an average area has increased but average production and yield rate have decreased for Potato. But for Boro Paddy the average area under cultivation, output and yield rate have increased. In the crop-insurance regime (2000-01 to 2009-10), the growth rates of area under cultivation of both Aman Paddy and Potato have been found to increase and this rate is significant for Potato only. Both the growth rate of output and the yield rate have significantly
increased for Aman Paddy in the crop-insurance regime. But the growth rate of area under cultivation of Aman Paddy is insignificant.

(iii) In the crop-insurance regime the growth rate of output of both winter crops such as Boro Paddy and Potato has decreased. It has been pointed out that the growth rate of production of Boro Paddy has decreased nearly twice in the crop-insurance regime. This rate is insignificant. This happens mainly due to decrease in the growth rate of insured area.

(iv) In the crop-insurance regime the growth rate of total NPK use has increased for Aman Paddy, Boro Paddy and Potato and also for ‘all crops’ together. For Boro Paddy, there is the highest growth rate of total NPK utilization and also per acre growth rate of NPK consumption. We may point out that the crop insurance strongly and significantly affects utilization of total NPK and per acre NPK.

(v) From the empirical analysis, our findings is that the total number of insured farmers for Aman Paddy, Boro Paddy and Potato nearly ninety nine percent belong to the small and marginal farmers group. The ninety nine percent of total insured acre, total sum insured, total premium collected and claim or indemnity paid are under the small and marginal farmers for all crops of our study.

(vi) There are only four percent insurance participation for both Aman Paddy and Boro Paddy farmers. This implies that only four percent farmers come under the crop insurance scheme in the case of Aman and Boro Paddy. The insurance participation is very high for Potato for which it is twenty eight percent and also the loss ratio is very high.

(vii) The average production is highest for large farms and lowest for marginal farms for all crops. The variation or fluctuation of production is decreased with increase in the farm-size. Another important point is that the yield rate varies inversely with the farm-size but the fluctuation of yield varies directly with the farm-size. The variability of cost of input per acre is also highest in case of marginal farms and lowest for large farms that is variation is inversely related with the farm-size. On the whole, the insurance participation of a crop is also highest for
both marginal and small farms as the numbers of both types of farm-size are very large in the district of Hooghly. In general among the different crops, the average trend of insurance participation is highest for Potato in the all types of farm-size in the district of Hooghly.

(viii) We have observed that the significant statistical different exist between Boro Paddy and Aman Paddy at the one percent level of significance for all types of farms. The significant difference of insurance participation between Potato and Aman Paddy also exist for different farm-size. From the analysis of test of mean difference of insurance participation between different farms, the significant difference exists between large farms with medium, small and marginal farms for all crops. Furthermore statistically significant difference exists between semi-medium and small farms for all study crops, and also the mean difference for the crops between medium and marginal is statistically significant at five percent level of significance.

(ix) The insurance effect on area, insurance effect on total output and insurance effects on yield rate continuously increase with the decrease of the farm-size for Aman Paddy, Boro Paddy and Potato. The growth rate of area, growth rate of output and growth rate of yield are increased with the decrease in the farm-sizes. The overall education effect is insignificant for all types of farms for all crops under study.

(x) We have found that in the case of Aman Paddy the insurance effect and the growth rate costing of the labour input is highest for large farm and lowest for marginal farm. The insurance effect on use of labour varies inversely with farm-size. The insurance effect as well as time effect of the seed cost are indirectly related with the farm-size. Similarly the growth rate of seed cost and the farm-size are negatively related. Both the insurance effect and education effect are directly related with the farm-size for irrigation cost. The growth rate of irrigation cost varies inversely with farm-size.

(xi) The insurance effect on fertilizer and pesticide for Aman Paddy reaches the highest level for marginal farm and it is in the lowest level for large farm. Both the growth rate of fertilizer and pesticides cost arrive at the highest extent in the case of small and marginal farms and the lowest level for large farm.
(xii) We observed that the insurance effect on use of labour cost for Boro Paddy is the highest extent for large farms. The growth rate of labour cost reaches at the highest point for large farm. On the other hand the insurance effect on use of labour cost is in the lowest position for medium farms. The growth rate of labour cost is in the lowest level for marginal farms followed by small farms but both are significant. The insurance effect on seed cost and fertilizer cost is in the highest position for marginal farms and it is the lowest extent for medium farms. The growth rate of irrigation cost, fertilizer cost and pesticide cost for Boro Paddy vary indirectly with the farm-sizes. The insurance effect on pesticide cost is in the highest position for the marginal farms and it is followed by the small farms. On the other hand the insurance effect and also the growth rate of pesticide cost are in the lowest position for the large farms. We also observe that the education effect on all inputs for all farm-sizes is insignificant.

(xiii) The labour cost for Potato is in the highest level for the large farm. Both the insurance effect and the growth rate of labour cost are highest for large farm. On the other hand both the insurance effect and the growth rate of the labour cost are lowest for the marginal farms and it is followed by the small farms. The education effect on the labor cost for the semi-medium farm size is zero and is negative for the large, medium and marginal farms.

(xiv) The seed cost for Potato is lowest for the medium farms and it is followed by the large farms. On the other hand, the insurance effect on the use of seeds cost is highest for the marginal farms and it is followed by the small farms. The growth rate of the seeds cost of the marginal farms is highest and it is followed by the small farms. The education effect on the seed cost of the different farm-sizes is negative and insignificant. The education effect on the irrigation cost is negative for the marginal farm size and positive and insignificant for the remaining farm-sizes. The growth rate of irrigation cost is highest for the large farm and lowest for the medium farms for Potato.

(xv) The growth rate of the fertilizers cost of the marginal farms is highest and it is lowest for the large farms in the case of Potato. But the growth rate of pesticide cost is highest for the large farm and it is followed by the medium farm. On the other hand, the insurance effect on fertilizer
and pesticide cost is lowest for the large farm and it is highest for the marginal farm and followed by the small farm. The education effect on the pesticide cost due to the insurance participation is insignificant for all types of farms.

1.7. Policy Recommendations
Depending on the findings of our study in the district of Hooghly we can prescribe some economic policies by which both the farmers and insurer will be benefited over a long period of time. These policies are presented below.

(1) In the district of Hooghly during the time of our collected secondary data from the Agriculture Insurance Company of India Limited (AICIL), we find that only two paddies such as Aman Paddy and Boro Paddy are included under the crop insurance scheme. But in our study district there are three Paddies which are cultivated by the farmers are Aman Paddy, Aus Paddy and Boro Paddy. It is necessary to include the Aus Paddy into the crop insurance scheme. In the some parts of the district only Aus Paddy and Boro Paddy are cultivated as these parts are flood prone area.

(2) In the winter season many crops are cultivated. Among these the important crops are Wheat, Mustard, Potato, Musur, Arhar, Mung,Gram, and Maskalai. But there are only two predominant crops under the crop insurance scheme such as Boro Paddy and Potato. Both Boro Paddy and Potato are more risky crops and also credit limit is high. In that situation if the insurer takes initiative to include other winter crops under crop insurance scheme, the farmers will be benefited. It influences the farmers to change in cropping pattern. Because the Mustard Seed, Musur, Arhar, Mung, Gram, and Maskalai are less risky crops and the credit limit is very low compared to Potato.

(3) The indemnity limit is fixed by the insurer and remains unchanged during the insurance period. But it is necessary to vary year to year as the amount of crop damage due to natural calamities changes in the affected years.
(4) If the produce is affected by the low quality of seeds the insurer does not pay any indemnity to the affected farmers. So we may point out that in this case if the seed insurance scheme that is the Pilot Seed Crop Insurance scheme is implemented in the Hooghly district, the farmers will be benefited by this scheme.

(5) It is noticed that the insurers only pay the indemnity to affected insured farmers if the crops are affected by natural calamities like drought, flood, paste etc. Due to decrease of market price of the produce the farmers have no opportunity to enjoy any indemnity for their crops. It is observed that the diminishing market price of the produce is an important cause of the farmers suicide. In that situation if the Department of Agriculture and Cooperation implements the Farm Income Insurance Scheme (FIIS) in the district of Hooghly, the farmers will be protected by ensuring minimum guaranteed income.

(6) Near about ninety nine percent insured farmers belong to the small and marginal groups. They are economically weak. In that situation it is necessary to implement the Farm Income Insurance Scheme (FIIS) especially for commercial crop Potato and more risky paddy, Boro Paddy in the district Hooghly.

(7) The actual yield (AY) is calculated by the crop cutting procedure. In that case it is necessary to be careful for selecting the specific area to avoid the biasness.

(8) In the district of Hooghly during the time of our survey we have noticed that only loanee farmers are compulsorily insured. The insurers always neglect the non-loanee farmers to include under crop insurance scheme. The lack of information provided by the insurer is one of the important causes of this picture in the district of Hooghly. In such case the mechanism used for the non-loanee farmers by the insurer is lengthy and not suitable for the non-loanee farmers.

(9) From our collected secondary data we observed that very small percent (only four percent) of Aman and Boro Paddy producing farmers come under the crop insurance scheme. The large portion of Aman and Boro Paddy producing farmers is outside the crop insurance
scheme. This happens mainly due to the certain rules and regulation of the insurer about the disbursement of crop loan.

(10) Sometimes it is observed that at the time of our collected primary data few insurers (Co-operative Banks) give loan to the farmers for cultivating specific crop such as Boro Paddy or Potato. But the area under these insurers is not suitable for the cultivation of this crop. They use the crop loan for non-agricultural activities. In that situation it is necessary to take the crucial steps by the Agriculture Insurance Company of India Limited at the time of the disbursement of the indemnity.

(11) The insured farmers continuously increase the use of different fertilizers and pesticides under the crop insurance policy. That negatively affects the environment. In that situation it is necessary to examine the acidity of the land by the government and force the farmers to follow the government’s rules and regulations of fertilizers and pesticides consumption.

(12) The government should take measures so that the loanee farmers cannot be converted into local moneylenders and re-lend the some of money borrowed by them at high rate of interest in the local money market (to the other farmers). This will resist the diversification of the crop loan from the productive investment to non-productive activities.

(13) The productive use of crop loans has always a positive and favourable effect on the actual production of agriculture and the ability to repay the crop loan to the banks. The government or the appropriate crop loan sanctioning authority should be watchful enough so that the loanee farmers do not get the scope to diversify the crop loan from the agricultural activities to non-agricultural activities.

(14) The education level insignificantly affects the total production, total area under cultivation, yield rate and inputs cost. The farmers are educated by the traditional education. Their average education level is tenth standard. If the government introduces the extensive education system related to the agriculture among the farmers it will be helpful for them to select the crop insurance policy.
Small and marginal farms and in many cases medium farms have been able to use the costly input like fertilizers and seeds. Even though did not have bore-well irrigation facility, the crop insurance scheme has help them enjoy the facility of irrigation by purchasing irrigation facility from big and semi-medium farm who have the capacity of installation of shallow and deep tubewell for watering their own land. In reality this has resulted in the increase in output and yield rate by the small, marginal and medium farms compared to that by semi-medium and large farms. Thus eventually the crop insurance scheme has helped the small, marginal and medium farms more than the large and semi-medium farms. We therefore, suggest that there should be a crop insurance scheme especially for the marginal and small farms. As a matter of fact the large and semi-medium farms by virtue of the land size enjoy a big amount of loan and insurance facility. Often these farms do not utilize the crop loans for the agriculture production only. Rather they diversify the loan funds from productive activity to non-productive activity, as a result of which in the district of Hooghly the large and semi-medium farms have not been able to increase their productivity to the extend the small, marginal and medium farms were able. But unfortunately the small, marginal and medium farms get the small quantity of crop loans as their land size is small. These farms properly use the crop loans in the district of Hooghly as it is evidence from their picture of productivity.

1.8. Conclusion
Here we pointed out in brief about the meaning of crop insurance and various types of crop insurance applicable for Indian agriculture. Even we also discussed in brief about the main objective of crop insurance and need of the study. We also pointed out about the main objectives and main methodology of our thesis. Beside this we pointed out the main findings of empirical estimation of our thesis. Besides we discussed in brief about the main policy prescriptions of our study in this synopsis. From the above description we can clearly and easily understand about the main objectives of our thesis.