



CROP INSURANCE, RISK MANAGEMENT TOOL FOR AGRICULTURE SECTOR OF PAKISTAN & ITS ACCEPTABILITY TO FARMERS: A CASE STUDY

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ABSTRACT

Climate change is adversely affecting developing countries. Their economies are heavily influenced by changing the climate, especially countries like Pakistan whose economy is mostly driven by the agriculture sector. Pakistan, which is prone to frequent floods, droughts and exposed to vagaries of climate change and is the 7th most affected country by it, desperately needed a risk management tool to mitigate the impact and to compensate those affected by it. Crop Insurance is one of the most effective tools for the highly risky agriculture sector. Crop insurance based on Area Yield Index is a best-suited product when it comes to providing yield loss coverage to the farming community. This case study is an effort to analyze the impact and importance of crop insurance which has recently been introduced by the Government of Punjab-Pakistan to support farmers against the impacts of climate change. For Area Yield Index, time-series yield data for several main crops are readily available with the Agriculture Department Punjab. This study has also explored the importance of different marketing strategies that made crop insurance acceptable to farmers.

Keywords: Area Yield Index Insurance, Climate Change, Crop Insurance a Game Changer, Yield Loss, Digital Marketing and Field Awareness Program.

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1. INTRODUCTION

The agriculture sector of Pakistan is considered as a backbone for the economy since it contributes more than 18.5 % towards Gross Domestic Product (GDP), more than 67% of the population is associated with this sector directly or indirectly. It is also one of the most

important sectors of Pakistan's economy in terms of employment and exports earnings [1]. During the last couple of decades, the phenomena of climate change and its impact on agriculture has increased manifolds. The weather conditions and patterns are more uncertain than ever and agriculture sector has witnessed severe floods, droughts, frequent and untimely rains. This has significantly affected the cropping patterns and increased pest's attacks, hence increasing farmers' vulnerability at the hands of climate change [2].

Because of climate change crops yield have decreased by 1 to 2 percent every decade in past century [3]. During the last few decades, the climate change has adversely affected agriculture sector [4]. This has also led to an economic loss to China's corn and soybean crops sector of around USD 820 million and this is projected to decline further up-to 19% by the start of 2100. Impacts of climate change in almost every domain is evident and its scale of effects will be more prominent and wide in years to come especially in agriculture sector [5].

In Punjab-Pakistan, floods are a common phenomenon during the monsoon season. Floods in Punjab usually affect Kharif (1) season crops. Punjab province in the recent past have witnessed two severe fluffing years i.e. 2010 & 2014. According to the Provincial Disaster Management Authority (PDMA), floods during 2010 & 2014 affected nearly 3.25 million acres of cultivated area or an average of nearly 815,000 acres per year. The year 2010 was the worst flood year that affected about 1.91 million acres or about 10.3% of the Kharif total cultivated area in Punjab [6].

Table 1 Floods 2010 & 2014 Disaster Statistics

Year	No. of Districts Affected	Villages Affected	Cropped Area Affected (Acres)
2010	11	1,810	1,914,104
2014	22	2,994	745,655
Total	33	4,804	2,659,759

Source: Provincial Disaster Management Authority Punjab 2014

According to the estimates of The World Bank, the value of lost crop production (gross revenue) in Punjab due to flooding was at an average of PKR 40.7 billion (US\$ 407 million) per year between 2010 and 2013, with a maximum loss in 2010 of PKR 95.7 billion (US\$957 million) [7]. Until recently, the government in Pakistan usually operates post disaster and compensates the affected people after the disaster to relocate and support costing billion to the national exchequer. For instance, according to the PDMA, around 3.3 million acres of crops were lost due to floods between 2010-2014. The provincial government compensated about USD 67 million for the losses to the affected farmers however, the World Bank report suggests that the losses were around USD 1.6 billion and the compensation was only 4% of the total losses [7]. This induced motivation to the introduce, Area Yield Index (AYI) based crop insurance as a tool to mitigate the impact of climate change and a mechanism to compensate the affected farming community in the Punjab.

2. CROP INSURANCE PROGRAM INITIATIVE

Based on the feasibility study conducted by the World Bank the Agriculture Department Punjab started working on AYI based crop insurance model for the first time in Punjab. The initiative had sufficient backing from the authorities and plan to roll out crop insurance as Pilot Project in four (4) districts (2) was prepared by a team (3) placed at Agriculture Department.

2.1. Implementation of Pilot Project

The team designed the basic features of the pilot project on experimental basis. There were many operational and procedural challenges to them best possible solutions were brainstormed to roll out the pilot project. The first challenge was which districts are to be selected. For this, many factors were taken into consideration i.e. district vulnerability to climate change index based on exposure to floods and droughts, area under cultivation (cotton & rice crops), number of farms households and penetration of crop loan insurance scheme (CLIS) (4). After detailed examination, four districts were selected which were Sheikhpura, Sahiwal, Rahim Yar Khan (RYK) and Lodhran. The pilot project was confined to two major crops i.e. Cotton and Rice of Kharif season 2018.

2.2. Crops Data Provision Challenge

The Crop Reporting Service (CRS) of Agriculture Department in each province of Pakistan has a mandate to estimate the crops yield through crop cut experiments (CCEs) for all the major and some minor crops. For this purpose, this wing of Agriculture Department has 1,240 sample villages pan Punjab province. The field staff supervised by their respective field officers harvest the randomly selected field in each of the sample village and record the yield obtained. This data is then multiplied with area under that specific crop in that particular district to calculate the average yield of the respective district. There are 36 districts in the Punjab province and the district data is ultimately consolidated at provincial level following the same methodology to estimate the approximate yield of the province for a particular crop. Crops yield data are well maintained and is the sole source at present for used for policy, decision making, research and other purposes.

The concept of Area Yield Index based crop insurance is dependent on the yield data derived by estimating crops yield through CCEs. From AYI perspective if the yield of a specific well defined geographical area is declined below the set level or benchmark yield, the claim will be triggered allowing insurance company selected under the program to compensate the affected registered farmers for the yield loss.

The key advantages of the Area-Yield approach are that moral hazard and anti-selection are minimized and the costs of administering such a policy are significantly reduced, making this product much more suitable to offer to small-scale farmers. Under an AYII policy yield losses are settled against the area average yield index as opposed to settling losses on individual farmers' fields. This means that individual farmers cannot influence the yield outcome, for example by purchasing crop insurance cover only for fields in low lying areas which are subject to flooding and water logging (anti-selection) or by applying sub-optimal levels of husbandry and pest and disease and weed control (moral hazard) in the expectation of then claiming the yield loss on their crop insurance policy.

The main disadvantage of an AYII policy is "Basis Risk" namely the difference in the actual yield outcome achieved by individual farmers on their own fields and the average area-yield. For example, an individual farmer may incur severe crop production and yield losses due to localized perils e.g. hail, or flooding by a nearby river, but because these localized losses do not impact on the district or tehsil or departmental average yield, the grower does not receive any indemnity or claim.

The yield data for each of the four selected district were obtained from the CRS and was transformed into Tehsil (5) level yield data. One of the significant challenge was to reflect the district data for each tehsil of that particular district since district is the main administrative unit and yield data used to report at district level. To solve this issue, district data was detrended (reverse engineering) and were verified with yield record available for each of the sample village.

The team refined the yield data for these four districts and calculated 10-year average yield for each of the Tehsil for each crop (Cotton & Rice). The 10 years' average yield data were named as 'Benchmark Yield' data.

Table 2 Tehsil Wise Average Yield of Cotton Crop (Kg/Acre)

Districts	R.Y.Khan				Sahiwal		Lodhran		
Tehsils	R.Y.Khan	Khanpur	Liaquatpur	Sadiqabad	Sahiwal	Chicha Watni	Lodhran	Kror Paka	Duniapur
10 Years Av. Yield	834.4	717.5	658.4	749.4	626.3	725.7	780.1	725.7	670
Claims Threshold Yield (80%)	667.5	574	526.7	599.5	501	580.6	624.1	580.6	536

Source: Crop Insurance Unit, Agriculture Department Punjab

Table 3 Tehsil Wise Average Yield of Rice Crop (Kg/Acre)

Districts	Sheikhupura				Sahiwal	
Tehsils	Sheikhupura	Muridkay	Ferozwala	Sharaqpur	Sahiwal	ChichaWatni
10 Years Av. Yield	1280.0	1127.5	1063.7	1206.1	1325.1	1155.7
Claims Threshold Yield (80%)	1024.0	902.0	851.0	964.9	1060.1	924.6

Source: Crop Insurance Unit, Agriculture Department Punjab

2.3. Issues Regarding Insured Farmers' Data

Under limited time and resources, it was difficult to register farmers and verify their credentials from different departments. To avail the credit facility for inputs (fertilizer, pesticides, seed etc.), the interested farmers need to provide their landholding revenue record and other credentials to Punjab Land Record Authority (PLRA) to get themselves register for interest free loan facility. Further, this record was subject to reverification by the lending bank to sanction the loan. Since, the verified farmers record was readily available, although for credit facility, therefore, it was wise to capture that data for the selected four districts rather than investing precious financial and human resources in registering the farmers again. Therefore, the crop insurance product was offered to those farmers' who registered themselves for the interest free credit scheme by the Agriculture Department Punjab.

This data was linked to crop insurance web portal developed to automate the scheme to ensure transparency and maintenance of activity logs. A total of 16,750 farmers were insured in the selected districts for both crops. A sum insured of PKR 50,000/acre was fixed for each crop that means in case of zero yield, the beneficiary farmer would be compensated by PKR 50,000 for each of his/her land holding (per acre). Since both crops are prone to flooding, therefore the insured yield level was fixed at 80% of the benchmark yield. In other words, decline in crop yield below the 80% yield with respect of 10 years' average benchmark yield, farmers will get compensation for every percent loss beyond that insured yield level with a maximum compensation of PKR 50,000/acre if the yield of that specific Tehsil fall down to zero. Further, only those farmers were insured who were having a landholding of ≤ 5 acres of cultivated land.

For the Pilot Project, a comprehensive bidding process was initiated to hire the services of an insurance company to underwrite the risk for both crops in the selected districts. After the selection of an insurance company, the project team provided 10-years' average yields of cotton and rice crops along with verified farmers' data. The table III shows summary of the pilot project.

Table 4 Summary of Insured Farmers, Area & Premium Amount of Pilot Districts Kharif 2018

District	Number of farmers Insured		Total Insured Farmers	Area Insured (acre)		Total A Insured Area (Acres)	Total Premium (mil)		Total Premium (PKR mil)	Sum Insured (PKR mil)
	Cotton	Rice		Cotton	Rice		Cotton	Rice		
Sheikhupura	72	4120	4192	144.7	10315.6	10460.3	0.1	5.9	6.0	1640.6
Sahiwal	3295	253	3548	6610.2	536.3	7146.5	7.4	0.331	7.7	
Lodhran	1060	4	1064	3866.9	16.0	3882.8	2.3	0.003	2.3	
RYK	7930	16	7946	21251.8	37.5	21289.2	25.4	0.023	25.4	
Total	12,357	4,393	16,750	31873.6	10905.3	42778.9	35.3	6.3	41.5	

Source: Crop Insurance Unit, Agriculture Department Punjab

2.4. Transparency

The system of public procurement should try to achieve performance in terms of cost by not compromising on quality and standards [8]. The public procurement should ensure transparency that further accountability and openness [9]. For the purpose of openness and ensuring transparency, all the processes and transactions were fully automated through a web-portal having access to the relevant/concerned authorities. The system was back to back encrypted to attest that all the transactions are accurate and cannot be manipulated at any stage. Further, for claim amount compensation was made through Branchless Banking Operator (BBO). There are roughly ten BBO in Pakistan through a vast agent network. The claims compensation through BBO has reduced the claim disbursement time significantly. This is a secure and safe way to provide relief to the farmers in the remote areas cutting down their travel expenses and long queues outside the banks for the claim payment. Moreover, every transaction through BBO, is trackable which has lessened the work burden on the implementing agency.

2.5. Marketing Strategies for Crop Insurance Product & its acceptability campaign

One of the biggest challenge for its success was to make it understandable and widely accepted by the farming community. For this purpose, a comprehensive farmers' awareness program was developed having three pronged strategies. At first place Tehsil level awareness sessions were arranged. These sessions were designed in a way that a trainer at Tehsil level would deliver crop insurance related requisite information to the farming community and fellow colleagues. The trainers were imparted training under Training of Trainers Program (ToTP) at provincial level. A total of two ToTP were organized. The trainers conducted around 32 awareness sessions in the selected districts. On an average, 80-100 farmers participated in each session. To make farmers understand about the crop insurance, awareness material comprising of a brochure, posters and pamphlets were printed and subsequently distributed among the farmers.

Secondly, the farmers were intimated and educated through short messaging service (SMS) that included all the major information regarding crop insurance program. Similarly, social media was also of a great help. The Agriculture Information Department of Punjab designed several short videos and messages that were uploaded on Facebook. Print media was also used for widespread information about the crop insurance initiative taken by the government. Lastly, a television commercial was also telecasted at national level which gave boost to this program.

3. ECONOMIC & SOCIAL IMPACT OF THE PROJECT

The crops sown in Kharif season usually harvested in late September and early October each year. Similarly, the CRS field staff as per general standard operating producers (SoPs) performed its CCEs in the field all over the province including the districts insured under Pilot Project. When the final results were compiled, it was revealed that in Tehsil ChichaWatni of Sahiwal district, the cotton crop yield declined by 16.3% below the insured yield level i.e. 580.56 kg/acre (80% of 725.70 kg/acre benchmark yield of 10 years' average). This yield loss triggered a claim payout of PKR 8171/acre to all the 1,986 insured cotton growers in that particular Tehsil.

The yield data from the field have been automated through mobile application with a provision to send the yield information directly onto the crop insurance web portal. The web portal is populated with farmer's data, crop yield data (10 years' average ~ benchmark yield), insured yield and actual yield from the field. The insured yield is compared with actual yield estimated in the field during that particular season by an automated process and the difference is compensated in the form of claims by the insurance company.

Out of 14 Tehsils of four selected districts, claims pay out was triggered only in one Tehsil. Table V contains the summary of claim payout by the selected insurance company. According to the claim payout statistics, a total of PKR 32.7 million were given as compensation to the affected farmers of the yield loss in Tehsil ChichaWatni. The maximum payout of PKR 40,588 was given to those farmers having 5 acres of landholding. The claim amount of PKR 32.7 million was 79% of the total premium paid i.e. PKR 41.5 million to the selected insurance company.

Table 5 Claim Pay-Out Details For Kharif 2018 Season

Total Insured Farmers	District	Tehsil	Kharif Crop	Area Insured (Acres)	Insurance Index (Threshold yield kg)	Current Index (Yield Acquired kg) Kharif 2018	Estimated Calculated Claim (PKR mil)
1986	Sahiwal	Chicha Watni	Cotton	4193.31	581	485.839	32.72

Source: Crop Insurance Unit, Agriculture Department Punjab

During the Rabi (6) 2018-19 season, the program was extended to five more districts namely Multan, Muzaffargarh, Narowal, Rajanpur and Faisalabad based on the importance and significance of the program. During this season 41,375 Wheat growers of nine districts were provided the yield protection. The insured yield level was 90% of the last 10 years' average yield. However, despite of abrupt weather and untimely rains just before the harvesting season, no claims were registered in any of the district because Wheat is relatively much stable crop and its yield has an increasing trend due to better seed quality.

Going further, for the Kharif 2019, the program was extended to nine more districts (Bahawalpur, Bahawalnagar, Khanewal, Dera Ghazi Khan, Layyah, Mandi Bahauddin, Okara, Kasur and Bhakkar) of the Punjab in addition to already nine districts and 226,832 Cotton &

Rice growers were insured to provide yield protection in the eighteen districts as a risk management tool against abrupt climatic changes. The summary of season is give in Table VI.

Table 6 Crop Wise Summary of Insured Farmers For Kharif 2019 Season

Crop	Insured Farmers	Area Insured (Acres)	Sum Insured (mln)	Premium Paid (mln)
Cotton	153,973	293,837.43	14,691.87	370.99
Rice	72,859	136,300.96	6,815.05	29.50
Total	226,832.00	430,138.39	21,506.92	400.49

Based on the yield estimation results conducted by the Crop Reporting Service, an important wing of Agriculture Department Punjab, Cotton crop yield in Tehsil Rajanpur of district Rajanpur and Tehsil Kabirwala of district Khanewal declined due to harsh weather conditions, untimely rains during the maturity of crop, pink worm attack and abrupt hot weather significantly affect the crop. This triggered a claim payout of PKR. 98.9 million among 4,958 farmers to compensate them for their losses under this program.

Table 7 Claim compensation to the affected farmers for the Kharif 2019 season

Tehsil	No. of Farmers	Total Area Insured (acres)	Threshold Yield (kg/acre)	Actual Yield (Kg/Acre)	Difference (Kg/Acre)	Claim Amount Rs./Acre	Total Claim Amount (mln)
Rajanpur	3862.00	9599.16	678.70	560.00	118.70	8744.65	83.94
Kabirwala	1096.00	2118.37	575.60	494.00	81.60	7088.25	15.02
Total	4958.00	11717.53	1254.30	1054.00	200.30	15832.90	98.96

Source: Crop Insurance Unit, Agriculture Department Punjab

The affected farmers at the time of compensation were interviewed regarding the impact of claim payout and its outcome. All the farmers were of the view that crop insurance has proved to be an effective risk management tool that has reduced the financial burden on them. Before that farmers were not compensated and all the losses due to climate change were to be faced by the farmers only. Similarly, most of the affected farmers said that with crop insurance support program, they have been able to sustain themselves for the upcoming season and can invest the claim money in buying inputs for the next season. It means they do not have to rush for the agriculture credit from the financial institutions for lending as this compensation has provided them leverage not to opt for agriculture credit unnecessarily.

4. FUTURE IMPLICATIONS & SUSTAINABILITY OF THE PROGRAM

From the learnings of the pilot project it is very much evident that to safeguard small and subsistence farmers from the cruelties of the climate change, crop insurance is a potential risk management tool for largely vulnerable and uncertain agriculture sector. In case of Punjab-Pakistan, farming community has largely applauded this initiative and shown great zeal and interest to opt crop insurance. But at the same time, to make such a beneficial initiative sustainable government support is very necessary since the crop insurance market in Pakistan is bleak.

Subsidized crop insurance for very small farmers as a social protection against climate change would be required along with offering this product with partial subsidy to medium and large farm land holding farmers. At the same time, other 3 provinces of Pakistan shall also be encouraged to introduce crop insurance for the farmers to uniformly administer this important program.

The experience of the Punjab Agriculture crop insurance initiative can be of great help to other countries in the subcontinent and regions where climate change is adversely affecting agriculture sector and jeopardizing national food security.

Further, to minimize the Basis Risk, the Agriculture Department is working on reducing the Unit Area of Insurance (UAI) from Tehsil level to lower administrative unit and increasing the number of crop cuts in each UAI. This will not only enhance the accuracy of the yield data collected but will increase the confidence of all the important stakeholders.

Moreover, it is suggested that, through the use of satellite imagery, yields of each UAI can be estimated to ascertain the accuracy of the crops yields calculated through experiments in the fields. Going further, a crop insurance model similar to life insurance is under process and its legal and practical aspects are being analyzed. With this intervention, developing countries like Pakistan could save hefty public money by creating a win-win situation for all the stakeholders.

For academia, more research is required in exploring more avenue in the domain of risk management tools for agriculture sector, which largely remains unnoticed and prone to vulnerability in the context of climate change, to ensure food security and sustainability of the poor farming community.

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NOTES

- (1) Kharif season crops are those which are cultivated from 1st April to 30th September; usually Cotton & Rice
- (2) District is one of the administrative units of the province in Punjab having defined geographical boundaries
- (3) The team comprised of three, Mr. Kamran Akram, (Ex-Officer at State Bank of Pakistan), Director Crop Reporting Service and the author himself

- (4) Crop Loan Insurance Scheme (CLIS) is a Federal Government of Pakistan supported program which provides credit facility to farmers for five major crops, namely, wheat, rice, sugarcane, cotton and maize. This is accompanied with insurance of loan against natural disasters like flood, drought, hailstorm, pest attack and fire damage. With support of the government, the insurance premium is subsidized for subsistence farmers, defined as those having up to 25 acres of land for cultivation. This scheme basically provide protection to banks' credit or lending agency
- (5) Tehsil is the first lower administrative tier of a district with a well-defined geographical boundary. Each district comprised of several Tehsils
- (6) Rabi season in Pakistan starts from 1st October to 31st March each year. Wheat is the major crop for this season