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Knowledge Paper

Released at National Conference on Accelerating Agriculture Insurance, 2018

अशोक दलवाई, भा.प्र.से.
मुख्य कार्यकारी अधिकारी
भारत सरकार,
कृषि एवं किसान कल्याण मंत्रालय
कृषि, सहकारिता एवं किसान कल्याण विभाग
राष्ट्रीय वर्षा सिंचित क्षेत्र प्राधिकरण

सत्यमेव जयते

ASHOK DALWAI, IAS
Chief Executive Officer
Government of India,
Ministry of Agriculture and Farmers Welfare
Department of Agriculture, Cooperation & Farmers Welfare
National Rainfed Area Authority (NRAA)

Message

It's a pleasure to know that the Federation of Indian Chambers of Commerce and Industry (FICCI) is organising a Conference on Accelerating Agriculture Insurance on 21st February, 2018. My heartiest congratulations to FICCI for choosing a contemporary challenge for deliberations.

The most prominent and uncontrollable risk in agricultural production has always been one of weather vagaries. In cognizance of this and committed to the welfare of farmers, the Government of India has rolled out a comprehensive and farmer friendly risk cover intervention through Pradhan Mantri Fasal Bima Yojana (PMFBY).

While it is a market driven scheme, it has been made easy for the farmers, by offering a multi-stage risk cover from pre-production to post-harvest at uniform and low premium obligations. Considering the large volumes of farmers and the vastness of the arable land to be covered, the insurance companies can take advantage of low premium-high volume strategy.

The success of PMFBY/RWBCIS is predicated upon an active and meaningful partnership of the troika-farmers, government and insurance companies. The sustainability can be driven by credibility of data, that is used for loss assessment and claim settlement. It would help to deploy technology to rationalise costs involved, generate data transparently and drive integrity to the satisfaction of all partners.

I am sure, that the Conference would come up with ideas, that would enable coverage of all our farmers and cultivated land growing multiple commodities, to be covered under the insurance scheme.

I wish the Conference a grand success.

A Dalwai

Dated the 15th February, 2018

(Ashok Dalwai)

MESSAGE



Mr. Vinay Mathur

Deputy Secretary General, FICCI

Risk is inherent in agriculture since the production process takes place under the open sky. Crop insurance has of late been found to be more effective way of helping farmers tide over unfavorable weather outcomes, besides reducing the financial burden on the farmer. Government of India has launched the Pradhan Mantri Fasal Bima Yojana (PMFBY) which is more farmer friendly in comparison to earlier versions. Simplified provisions and reduced premium for farmers in PMFBY has resulted in both increased awareness among farmers and increase in coverage of area and crops.

However, a vision to bring about 50 per cent of India's farmers in the crop insurance net is ambitious and need focused approach. To achieve the set objective, deployment of modern technology for rapid assessment of damage to crops for quick payout of compensation is vital to develop the faith of the farming sector in crop insurance products.

The way forward is challenging but achievable using technology and innovative methods and models of business. FICCI would be delighted to play a role of facilitator in realizing the set vision of Government.

We hope that the knowledge paper will encourage more discussion around Government's vision of increasing crop insurance to 50% and provides the readers a futuristic roadmap for the sector.

MESSAGE



Mr. T R Kesavan

Chairman, FICCI National Agriculture Committee &
President & COO, TAFE

In agriculture sector, constant application of latest ideas and better technologies is essential to enhance economic well-being of the farmer. Considering the goal of enabling farmers to double up their income by 2022, Crop Insurance will play a crucial role.

Crop insurance schemes are intended to mitigate crop losses due to natural or man-made causes. The increasing thrust on digitizing India could be leveraged to ensure improvements in settling claims and bringing in transparency. One issue that has affected farmers is that crop insurance schemes assess individual farmer's losses on block/ village level averages. This is perhaps because losses were assessed based on data from revenue officials at the block/ village level. Assessing individual farmers' losses entails large data volumes and manpower. Satellite imaging and GPS positioning, offers an innovative way to assess individual farmer's loss and settle individual claims.

Technology should be leveraged for accelerating the pace of Agri insurance sector.

MESSAGE



Mr. Vijay Kumar V.

Co Chairman, FICCI National Agriculture Committee &
MD & CEO, NCDEX

Farming is a risky activity that is undertaken by farmers to ensure that the entire nation is provided with food and nutrition. In a country of over 1.2 billion people this is a herculean effort undertaken every year by dedicated farmers, on small size farms, across the country.

A wide variety of factors can affect the output quantity and quality adversely. Weather can affect the timing of sowing, any deficit or excess rainfall can lower crop yields, pests may damage perfectly healthy crops on the field and cause significant crop damage. Even with a perfect and large crop, supply/demand factors can lower prices and impact net income to the farmer.

To manage price risks, the use of options can provide the farmer the instrument to lock in prices at least for a portion of his crop, even at the time of sowing. Strengthening of Farmer Producer Organisations will help in extending the use of these tools by aggregating quantities across farmers and helping them with price risk management.

Crop Insurance as a protection against low yields has been growing in its adoption actively supported by the government. The delay in assessing such loss and in compensating farmers reasonably has been a factor that has dampened adoption and satisfaction.

The use of technology in a wide range of tools used for crop insurance promises to significantly change this. Satellite imagery is being supplemented by high resolution drone images of smaller land segments to provide higher accuracy of yield estimates, as well as the nature and extent of the losses.

Data from a wide range of sensors tagged to the location obtained from many sources can be analysed with sophisticated software to provide near real time updates and speed up decisions with respect to compensation. Finally the use of technology with smart mobile apps and linkages to banking services will transform sales of customized crop insurance and speed up the process of speedy credits for compensation

These technological innovations will result in farmer satisfaction during times of adversity and encourage wider adoption of crop insurance.

I hope that the Report will stimulate new ideas and encourage fruitful discussions for the next exciting phase of Pradhan Mantri Fasal Bima Yojana.

Message



Mr. Jatin Singh

CEO, Skymet Weather Services Pvt Ltd.

In a swiftly changing climate scenario, preliminary warning in relation to the adverse weather events approaching becomes even more vital. The altering weather patterns are manifesting themselves in stronger and formidable ways. There has been a massive increase in extreme rainfall events, some of them being the Chennai deluge and Mumbai Monsoon. Moreover, back to back droughts and new heat records each year pose threat of being bigger calamities in the future if Climate Change is not treated as a consequential environmental and humanitarian threat.

Climate change and its associated downsides are also adversely affecting the Indian agriculture along with everything else. While several policies are in place to curb global warming and its effects, in my opinion, climate change's impacts are far from being repaired. The rising rural distress due to repeated droughts are signals to attune ourselves to climate risk.

Even now, at least four out of 10 farmers are directly dependent on farming for their livelihoods. As has been repeatedly stated, agricultural sector has the maximum potential for growth. The only driver it needs is to be financially engineered and technologically advanced to be able to unveil maximum benefit for farmers.

Weather derivatives are also considered as the essential deterrents to climate change. In the past three decades, crop insurance in India has not been able to come out of its incipient stage. Honorable Prime Minister Shri Narendra Modi has promoted the new Pradhan Mantri Fasal Bima Yojana (PMFBY) which sounds a promising scheme. It promises relief to farmers' right from the inception to the conclusion stage of the crop.

Agriculture for me is an avocation turned into a vocation. 13 years ago, I decided to step into the complex business of agriculture which was clearly a hurdle for me, a journalist by profession. One reason for me to take this leap was my profound fascination towards weather forecasting. Thus, in the year 2003, I launched Skymet with the directive to make weather forecasting easily accessible and more reliable. Skymet has successfully leveraged the data availed from the large number of all

weather stations and well utilized the consolidated local inputs over the years. This has been done through integrated use of smart phones and sensors mounted on drones along with cadastral information taken from Government sources. These have been our input for advanced crop simulation models to arrive at very high accuracy yield data that can be adopted for large area studies while maintaining cost advantages.

I am sure deliberations at National conference on "Accelerating Agriculture Insurance" on 21 February'2018 and this report will provide important inputs for policy interventions in the Agriculture insurance sector.

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Executive Summary

Executive Summary

The Indian agriculture is dependent on Monsoon in such a way that any deviation in the onset or departure of monsoon largely affects agricultural productivity in the entire Indian subcontinent by leaving farmers in the lurch. The vagaries of monsoon still decide the fate of farmers across the country, especially in the drought-prone regions. It is estimated that over 50 percent of the total population of the country is engaged in agriculture and a majority of them are still dependent on monsoonal rain for irrigation.

Indian Monsoon has a direct relationship with the global climate change, which is evidently showing impact across the country in forms like the early and the late arrival of monsoon, temporal fluctuation in the onset of seasons, unprecedented rainfall and associated phenomena. Huge variations in the climatic conditions make it challenging to tackle the menace of climate change especially related to key environmental parameters such as temperature and rainfall.

There has been growing consensus among climatologists that global temperature and precipitation patterns are changing. The last three decades have seen a gradual drop in the quantum of precipitation during the Monsoon. The remarkable increase in temperatures and decrease in the amount of rainfall has already started hampering crop production in the country. In addition to this, the number of rainy days has also reduced with the rainfall averages remaining the same, thereby causing uncertainties.

Another impact of climate change hampering the crop production is the increasing incidents of *El Niño* and *La Niña*, which have been having a direct impact on the monsoonal precipitation. El Niño has been proven to have influenced global temperatures besides global warming. The worst part about both these phenomenon is that their earliest indication comes very late.

Era of Crop insurance

In recent years, the erratic and unpredictable behavior of Monsoon, accentuated by Climate Change has caused extensive financial losses in terms of crop failures, damage to agricultural infrastructures, loss of lives and



properties etc. due to natural and manmade disasters and destruction to environment and farmlands. This has aggravated food insecurity in the country.

In order to combat this challenge, there is a need to adopt a strategy which may provide comprehensive solution to farming communities for safeguarding agricultural productivity. Crop Insurance is one such area which is gaining momentum in the contemporary scenario. This is considered as the best option to transfer the cost of potential losses due to disaster or emergency situations. By adopting crop insurance, farmers can also leverage technology & data analysis to monitor, manage, and reduce the impact of those risks.

The Government has taken several initiatives for the overall sustainable development of farmers and cultivators to protect livelihoods and to enhance their agricultural productivity. These may enhance credit flow to farmers and expand the area of crop insurance and irrigation coverage specifically in the era of changing climate.

Pradhan Mantri Fasal Bima Yojana (PMFBY) is one such initiative of crop insurance launched by the Government of India, which is a comprehensive scheme of insurance coverage against crop failures. The Government aims to provide crop insurance for PMFBY to 50% of the total cropped area during 2018-19.

Digital revolution in Agri-risk Insurance

Digital revolution is a well-established concept among the modern agricultural communities. Technology has always been an integral part of agriculture, which has been highly successful in intriguing farmers towards better farming practices and thereby to crop insurance. One of the significant highlights of PMFBY is also to adopt the modern technological innovations.

Agriculture is a highly localized activity and therefore, information must be tailored to specific conditions. Thus, staying abreast with the modern technological innovations like digital sensor-based weather forecasting, GIS-based crop estimation, Drone-based surveillance etc. can maximize the benefits of crop insurance scheme for farmers as well as agricultural output.

Technology interventions play a significant role in agri-risk insurance in the country. The following are few of the prospective areas where these interventions can inculcate a new culture of development and resilience at all level:



- Insurance coverage
- Sowing risk
- Crop mapping
- Price fixing
- Localized risk coverage
- Crop cutting experiment
- Crop failure and damage assessment
- Disaster risk management

Technology-based information products and services are important and relevant inputs for the above mentioned areas in better planning to cover various risks in agricultural productivity.

Weather based Crop Insurance Scheme is also a remarkable insurance solution that is greatly contributing to promote digital revolution in the agriculture sector. This provides protection against crops and agri- losses resulting from the weather adversities. In this scheme, the crop losses are assessed on the basis of actual weather data received from the approved automatic weather stations installed at pre-defined places in different locations. Major weather risks arising out of parameters like rainfall, relative humidity, temperature, wind etc. are covered under the ambit of this scheme.

With the gaining momentum of technological interventions in the agricultural sector, the risk related to agriculture has also increased exponentially. Thus, there is a need to adopt a well-structured strategy to combat the emerging challenge of agri-risk in the country.





Chapter 1
Monsoon Variability amid Climate Change

01 Monsoon Variability amid Climate Change

Indian Monsoon is a complex phenomenon and reportedly climate change has further accentuated the situation, with each year surpassing the earlier records.

The year 2015 was declared as the warmest year on the earth, which was superseded by the subsequent year of 2016. 2017 too could have followed the similar trend but narrowly escaped on the account of La Niña in the last quarter of the year.

The global temperature profile has been showing a rising trend. It is estimated, by 2050, we can anticipate an overall rise by 1°C or more. A combination of Climate Change, Global Warming, and a strong El Niño has created unusually warm weather conditions since records began in the year 1950.

> *"It is estimated, by 2050, we can anticipate an overall rise by 1°C or more"*

Blaming El Niño alone for this unusual rise in temperatures would be unfair. The past 30-year trends clearly indicate that global temperatures spike mostly takes place due to human-induced activities, holding Climate Change for making the world hotter would not be fair enough.

Since Monsoon is a global feature and is largely driven by oceanic temperatures, the arrival, withdrawal, and sustenance of Monsoon are mainly directed by the ocean heat content. The Indian subcontinent has often been described as a 'hot spot' which generally bears a huge impact on account of any significant variation in land-atmospheric interaction.

The precipitation across the country is driven by the Indian Monsoon as over 70% of the annual rainfall is realized during this four-month long season. India records 887 mm of rainfall during the four-month long Monsoon season spanning from June to September. July and August are the wettest months, receiving 2/3rd of the season's rainfall.

The rising global temperatures have resulted in the increase in oceanic temperatures, which has largely affected the pattern of Indian Monsoon. The frequency of extreme weather events has doubled in the last few years; be in



terms of excess rains, heat, drought or floods. All these high impact events have resulted in the enormous variability of Monsoon rains both in terms of time and space.

Earlier the average of drought was 1 in every 15 years, but the last one decade has itself witnessed three droughts. Moreover, rainfall has also been swinging towards below normal. Last three decades have also seen a gradual drop in the quantum of precipitation during Monsoon. Besides this, rainfall statistics from 2011-2017 indicate that this decade may also follow the same pattern.

"Earlier the average of drought was 1 in every 15 years, but the last one decade has itself witnessed three droughts"

Decades	1981-1990	1991-2000	2001-2010	2011-2017
Rainfall in mm	881	877	847	840

Source: Skymet Weather Services Pvt Ltd.

The erratic behavior of Monsoon and its vagaries cannot be taken lightly. The distribution of rainfall during Monsoon has now got distorted, which has been adversely affecting farmers and their livelihood.

Remarkably, the incidents of El Niño and La Niña have also increased, which are having a direct impact on the Monsoon. El Niño has been proved to be one of the major reasons other than Global Warming that influenced Indian Monsoon. The worst part about both these phenomenon is that their earliest indication arrives very late. One remains indecisive till the fag end as reaction time is not very large.

A much talked about ocean-atmospheric phenomenon is El Niño and this has an inverse relationship with the Indian Monsoon precipitation. El Niño is an abnormal warming of equatorial Pacific Ocean and its frequency is once in 2 to 7 years. Though El Niño is not directly an offshoot of global warming but warming of oceans on account of the latter is increasing the intensity, frequency and duration of El Niño events. The El Niño- Southern Oscillation (ENSO) and equatorial Indian Ocean climate anomalies are the main factors that influence the inter-annual variability of the Indian summer Monsoon.

"The ongoing changes in Monsoon patterns have great bearing on farmers, which eventually extends onto the agricultural productivity."

India is an agriculture driven economy, with over 50% of its population engaged in agriculture and related activities. The ongoing changes in Monsoon patterns have great bearing on farmers, which eventually extends onto the agricultural productivity.

In view of the indifferent behavior of Monsoon on account of climate change and global warming, more and more studies are needed to understand its dynamics. As of now, the agri-risk on account of truant nature of Monsoon does not seem to have any substantial mitigation in near future.





Chapter 2
Climate Change Adaptations in Agricultural Practices

02 Climate Change Adaptations in Agricultural Practices

Just as everything else, even Indian agriculture is being adversely affected by climate change and its associated liabilities. Though several policies are strategically being placed to contain global warming, the impact of climate change is believed to be irreparable. Rising rural distress after back-to-back droughts is the universe's call to acclimatize ourselves to climate risk.

A lot has been done on the grave issues of climate change and global warming but a lot more is yet to be explored. So far, there has not been any consensus on the serious measures curtailing the climate change. Moreover, there has been clearly no headway till now.

Going by the scientific logic, if the global temperatures are increasing, then ideally, the heating up of land should have aided in increasing the precipitation. However, this has not been the scenarios, particularly in terms of Indian Monsoon. In fact, precipitation patterns have changed considerably, with the rainfall amounts gradually dropping in the last three decades.

This is an alarming situation for Indian agriculture, which is posing enormous challenges for crop production in India. One believes that there would be no let up from adversities thrown by Climate Change. Both the government and citizens now need to ponder and strategize around this.

In countries like India, the vagaries of Monsoon still decide the fate of farmers. Over 50 percent of the total population of the country is engaged in agriculture and majority of them are still dependent on Monsoon rains. Agriculture and allied sectors contribute to 17% of the GVA and affect 650 million Indians.

Global warming and climate change have not only affected the rainfall patterns but have also altered the process of glacier melt, sea level rise and forest fires. Extreme weather events like floods, drought and hailstorm are on all-time high.

Going by meteorologists, it is extremely hard to make an accurate forecast for weather phenomenon such as hailstorm. Similarly, in terms of temperatures, it is equally difficult to predict the spell and duration of heatwave, cold wave or



frost formation. Some aspects of weather are impeccable and finer aspects of them are still beyond the reach. Although broader predictions can be made but the country now definitely needs to look for technical innovations.

Another impact of climate change that we are perpetually witnessing is the rise in the episodes of El Niño and La Niña in the Pacific. While El Niño is a spoil sport and has a very strong connection with poor Monsoon rains, La Niña is generally associated with either normal or above normal Monsoon rains.

There is a known inverse correlation between El Niño and the Indian Summer Monsoon (ISMR). Between 1900 and 2000, there used to be one drought per decade on an average, while between 2000 and 2017 there have already been five.

India is drying out. In addition, there is an increase in the mean annual air temperature in many regions of the country, which is all set to further aggravate the situation. Summer season in the country has been increasing its ambit, while winter season has shrunk. Thus, the overall temperature has been increasing while the all India Monsoon rainfall has been decreasing from 1960 onward .

"Overall temperature has been increasing while the all India Monsoon rainfall has been decreasing from 1960 onward"

Not only this, rainfall averages are the same but the number of rainy days has reduced. This decrease in precipitation and rise in air temperature could lead to persistent moisture deficit conditions, severely impacting the crop production in India.

With this, stakes are high for the government and farmers as there are risks of floods and droughts within the same season. India has become drought resilient although not drought proof. India withered the storm of two back to back droughts in 2014 and 2015, thanks to better irrigation and robust economy than before. But this fact alone does not put us in a comfortable position for the years ahead.

Kharif season, which is primarily dependent on performance of Monsoon, is not the only sufferer. Over the past few years, the perils of climate change have also extended till Rabi season. The Rabi crop has become vulnerable on account of the unseasonal rain in March and April or deficit winter rains. This is another emerging impact of climate change in Indian agriculture.



Temperature, Rainfall and Agriculture

Studies show that rice crop yield decreases with increase in temperature. For example, an increase in temperature by 2°C decreases the grain yield by 15 to 17 percent.

It's an alarming situation because the paddy and wheat production in Northwest India has already been stagnating or is even declining. Similarly, an increase in temperature may significantly affect the quality of cotton, fruits, vegetables, tea, coffee, and aromatic and medicinal plants. Short-season crops (vegetables and fruits) are the worst affected by changes, particularly during critical periods of their growth. The frequency of hailstorm has also increased which used to be a phenomenon that was experienced mainly in the North but now it is being reported as far south as Karnataka.

Looking at the variability of Monsoon, farmers are exploring different types of farming patterns and cycles. The water needs vary from crop to crop. While the quantum and timings of rain may be beneficial for a particular crop, it may be disastrous for another.

Field experiments have proved that high temperatures around the time of flowering reduce fertility of the pollen grains as well as pollen germination on the stigma of rice and wheat crops. The nutritional quality of cereals and pulses may also be moderately affected. This, in turn, will threaten the nation's nutritional security.

The impact of climate change is irreversible. In that case, financial engineering and transferring of weather risks from around the world is the way to go. Weather derivative is a potent weapon in blunting an adverse impact of climate change. In India, crop insurance is being used as the most widespread tool.





Chapter 3
Era of Crop Insurance

03 *Era of Crop Insurance*

With the substantial population of about 118.7 million farmers and cultivators as well as 144.3 million agricultural labourers (Agriculture census -2010-11), the Indian economy is largely dependent on agriculture, which is considered as the most common occupation of rural Indian families and agrarian communities across the country. Though there has been a remarkable decline of less than 15 % share of agriculture in the Indian economy, the country still depends on agricultural productivity to meet demands of faster growing population.

In recent years, the erratic and unpredictable behavior of Monsoon, accentuated by Climate Change has caused extensive financial losses in terms of crop failures, damage to agricultural infrastructures, loss of lives and properties etc. due to natural and manmade disasters and destruction to environment and farmlands. This has aggravated food insecurity in the country.

"By adopting crop insurance, farmers can leverage technology & data analysis to monitor, manage, and reduce the impact of agricultural risks."

In order to combat this challenge, there is a need to adopt strategy which may provide comprehensive solution to farming communities for safeguarding their agricultural productivity. Crop Insurance is one such area which is gaining momentum in the country. This is considered as the best option to help in transferring the cost of potential losses due to disaster or emergency situations. By adopting crop insurance, farmers can leverage technology & data analysis to monitor, manage, and reduce the impact of agricultural risks.

Crop insurance as a risk mitigation tool in agriculture emerged in India in the beginning of the twentieth century. Ever since its inception to implementation, it has been evolving continuously in terms of scope, methodologies and practices.

The journey of crop insurance in the country began 32 years ago; when government rolled out first scheme namely Comprehensive Crop insurance scheme (CCIS) in 1985. This was followed by the Experimental Crop Insurance Scheme (ECIS) in 1997, the National Agriculture Insurance Scheme (NAIS) in 1999, the Pilot Scheme on Seed Crop Insurance (PSSCI) in 2000, the Farm Income Insurance Scheme (FIIS) in 2003, Weather Based Crop Insurance Scheme (WBCIS) 2007, and the National Crop Insurance Programme (NCIP) in 2013. However, the success of these schemes had been spasmodic.



To overcome this, the Pradhan Mantri Fasal Bima Yojana (PMFBY) finally arrived in 2016. Thereafter, all the aforementioned schemes barring WBCIS were discontinued. WBCIS is still in force but has been renamed as Restructured Weather Based Crop Insurance Scheme (RWBCIS).

1958 Comprehensive Crop Insurance Scheme (CCIS)

1999 National Agriculture Insurance Scheme (NAIS)

2007 Weather Based Crop Insurance Scheme (WBCIS)

2011 Modified National Agriculture Insurance Scheme (MNAIS)

2016 Pradhan Mantri Fasal Bima Yojna (PMFBY)





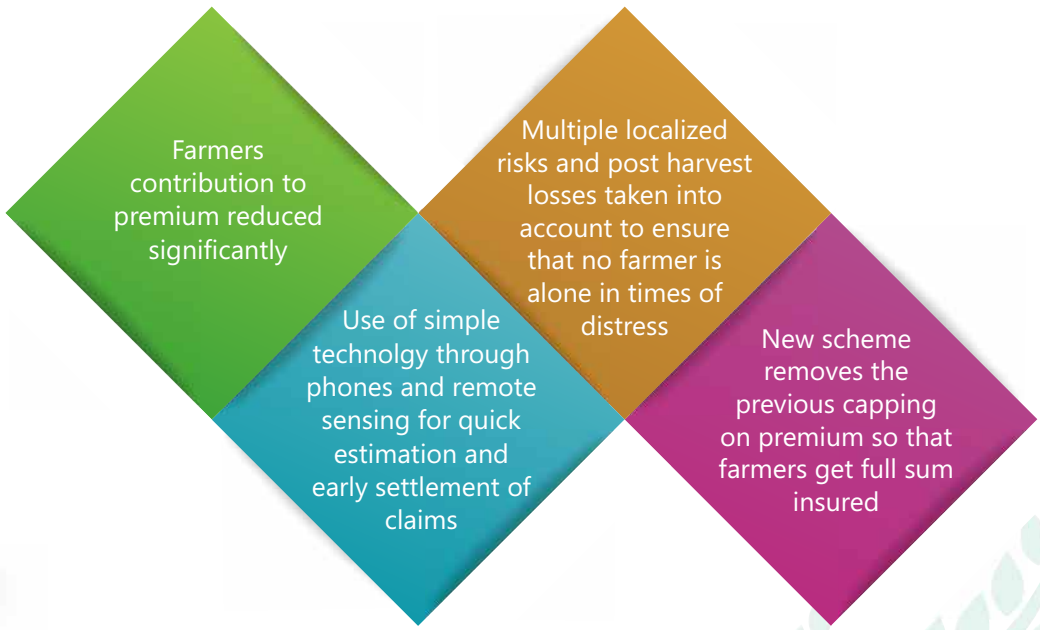
Pradhan Mantri Fasal Bima Yojna (PMFBY) - At a Glance

The flagship crop insurance scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY) was launched by the Government of India in 2016. This scheme has replaced the existing two schemes namely, National Agricultural Insurance Scheme (NAIS) and Modified National Agricultural Insurance Scheme (MNAIS) which had some inherent drawbacks.

PMFBY aims to bring as many farmers as possible in the ambit of crop insurance. The premium rates to be paid by the farmers have been reduced substantially so that more farmers are able to avail insurance cover against crop loss on account of natural calamities.

This scheme would be providing insurance coverage and financial support to farmers in the event of failure of any of the notified crop as a result of natural calamities, pests and diseases. This would also stabilize the income of farmers to ensure their continuance in farming. Accordingly, farmers will be encouraged to invest in the innovative and modern agricultural practices, ensuring flow of credit to the agriculture sector.

Prime highlight of this scheme is the 'enrolment', which is compulsory for the farmers in the notified area who have a crop loan/ Kisan Credit Card (KCC) account. Not only this, the Government is also encouraging coverage of non-loanee farmers as well.



"Farmers will be encouraged to invest in the innovative and modern agricultural practices, ensuring flow of credit to the agriculture sector."

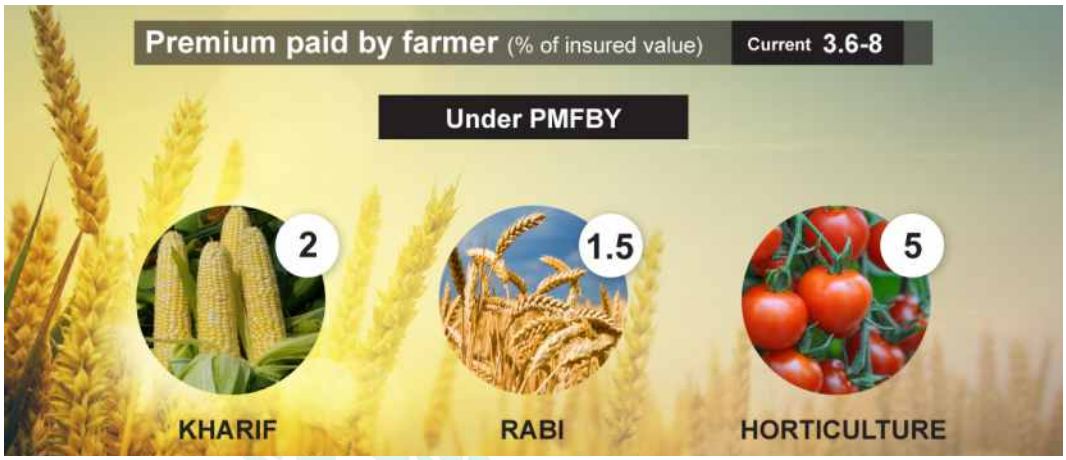




The scheme provides comprehensive insurance to cover yield losses of standing crops due to non-preventable risks, such as natural fire, lightning & thunderstorm, hailstorm, cyclone, drought, floods, landslides, dry spells, pest infestation and disease outbreak.

Premium Rates Under PMFBY

The Actuarial Premium Rate (APR) under PMFBY would be charged by the Implementing Agencies (IA) that are multiple insurance companies, all under the control of the Ministry of Agriculture & Farmers Welfare. The Agriculture Insurance Company of India (AIC) empaneled by the Ministry along with some private insurance companies shall participate in the Government sponsored agriculture /crop insurance schemes. There would be one insurance company for a cluster of districts (approximately 20 districts).



Under this scheme, the premium would be 2% of the sum insured (SI) for Kharif season crops and 1.5% for Rabi season crops. The rates are also applicable for oilseeds. Commercial crops like cotton and other horticultural crops will attract premium rates of 5% of the sum assured.

However, the insurance companies would charge actuarial rates. So, the difference between the premium rates of farmers and premium fixed by the insurance companies would be subsidized. The subsidy shall be borne by both the central and state governments.

In case of catastrophic losses, the Insurance companies shall be liable to pay 350% of total premium collected or 35% of total Sum Insured (SI), whichever is higher. The losses beyond this ceiling will be met by equal contribution from the Central Government and the concerned State Governments.

PMFBY is by far the better scheme. Before the launch of PMFBY, farmers paid premium as high as 15% of the sum insured under the Modified National Agricultural Insurance scheme (MNAIS), which is now discontinued.

Challenges

1. **Coverage of non loanee farmers**: Two years down the line, the coverage of non loanee farmers is still very less in most of the states, which is a matter of great concern. In fact, the enrollment of non loanee farmers can be touted as the biggest challenge. Most of the non loanee farmers belong to small and marginal category or in some cases even landless. Neither they have proper land related documents, nor do they have any agreement of share cropping with the landlords. All this makes it difficult for non loanee farmers to avail the benefits of crop insurance scheme. The government should ease the process so as to increase the reach of PMFBY to the farmers falling under non loanee category.

2. **Lack of awareness**: The awareness campaigns should be designed aggressively to reach these farmers through various means such as radio, spread of mouth, farmer meetings, etc. In fact, strengthening of State Level Coordination Committee on Crop Insurance and District Level Monitoring Committee should be the top priority, so that they can coordinate state-level plans. This would also enable to suggest timely adjustments in implementation schedule for maximum coverage that too in alliance with financial institutions and insurance companies.



3. **Low coverage in rainfed & remote areas**: Crop insurance also needs to be endorsed in rainfed districts to cover risk. There have not been sufficient bidders from the rainfed and remote districts. In the wake of this, the premium rates had shot up as high as 25% in some backward areas of Telangana. This situation arose due to lack of competition among the insurance companies. As a result, the insurers were able to garner huge profits that too purely from subsidy given by the government. Hence, more companies should be encouraged into this so as to increase the competition, which would eventually bring down the premium rates.

4. **Delayed/ non-payment of claims**: Though the PMFBY was successful in achieving the targets in terms of number of farmers and area, but majority of farmers complained about delayed or non-payment of claims. There is a need to emphasize on the timely disbursement of the claim; otherwise, it may be a huge discouraging factor.

Recommendations

Looking at these challenges, the following recommendations may be considered:

1. **Increase Awareness**: The three key stakeholders of the scheme - department of agriculture, financial institutions and insurance providers must work in tandem to increase awareness of PMFBY and its modalities among the farmers. There is a need to increase outreach through advertisements in newspapers, telecasts through audio-visual media, distribution of pamphlets in local languages, organizing kisan melas, trainings, workshops with the help of KVKs, agricultural universities and banks.

2. **Change Agents**: Change agents or the field staffs from the agricultural department, banks and insurance companies hold key role in the implementation of policy. They are the ones who have direct impact on the farmers and thus, they will be the growth drivers for this scheme. First of all they need to educate themselves thoroughly about the minutest modality of the scheme so that they effectively impart the information among farmers, as they are usually not aware of the complexities.

   In addition to this, insurance brokers should be given enough freedom for implementation of the scheme in regard to non loanee farmers.



These change agents should also target input dealers, gram panchayat office bearers, elected representatives and revenue officers as they are the great influencers for farmers in villages and have the capability to convince farmers to take up crop insurance.

3. **Updated Technology**: Although technology has already been an integral part of the scheme but staying abreast to the latest technology is the need of the hour. There is also a need to increase the efficiency of the operations ranging right from the functioning of weather stations to crop-cutting experiments (CCE), use of drones, satellite images and GPS-enabled mobile phones. This would automatically improve proficiency in estimating the yield losses, providing seamless connectivity and transfer of information among farmers, agriculture department, and banks and insurance companies.

   Insurance companies which do not have the required infrastructure and dedicated field to interact with farmers should be strictly barred from bidding.

4. **Farmers Feedback**: Timely feedback is an essential factor for the success of the scheme. This would, in turn, enhance the agricultural productivity as well. Field staff should carry out farmer meetings at regular intervals and address their grievances if any.

5. **Policy Enrollment Dates**: At present, cut-off dates for premium payments are uniform across India, which is not ideal for diverse agro-climatic conditions across all the states. Preferably, each state should have flexibility in determining cut-off dates for premium. Not only this, dates for the release of claims should also be placed in such a manner that they should be completed before the sowing of next season. If this happens, farmers can use the claims money to purchase seeds and other required items for the next cropping season without relying on moneylenders.

"Need to increase the efficiency of the operations ranging right from the functioning of weather stations to crop-cutting experiments (CCE), use of drones, satellite images and GPS-enabled mobile phones."





Chapter 4
Technological Revolution in Managing Crop Risk

04 Technological Revolution in Managing Crop Risk

Pradhan Mantri Fasal Bima Yojana (PMFBY), the flagship program of the Government, is considered to be a game changer and will bring happiness to the life of distressed farmers since it covers a whole gamut of risks and losses at multiple crop stages. 'Nature', that seemingly has significant impact on the crop cycle, largely remains the biggest uncertainty. The still bigger problem of lack of a common technological solution to ascertain whether losses have occurred or not, remains unaddressed. However, PMFBY can help safeguard farmers against foreseeable losses to some extent.

All stakeholders in agriculture sector, be it the farmer himself, Government, agri-insurance companies, agri-business people or local traders to name a few, are always in need of 'information' on accurate estimation and forecast on crops on ground including their health, likelihood of losses, actual losses, etc. to take 'informed decisions' in their domain.

We all are now living in an 'information world' where electronics, computers and mobile phones have changed the way we live, think and act. Integration of satellite, mobile and ground-based information together can resolve the 'information darkness' in agriculture sector and can provide all the information that is sought by different stakeholders. This also helps to create a decision support system, customized to each end.

> *"Integration of satellite, mobile and ground-based information together can resolve the 'information darkness' in agriculture sector and can provide all the information that is sought by different stakeholders."*

Grouping the solutions into logical groups, we can speak of Ground Based, Low altitude, and High altitude systems.

Ground based: a) Mobile, b) Hand held sensors and c) Robotics

Android mobiles and variety of applications developed on that platform are now widely available to address different farmer issues - right from advisories for which crop type to be sown in accord to the ground conditions, to mid-season crop advisories, weather alerts to determine the harvesting timing for best yields and finally marketing information for getting appropriate price for the produce. Hand held sensors readily provide soil parameters, vegetation indices etc. for instantaneous information and remedial measures. Horticulture yield estimation is a tricky subject and efforts are still on by various scientific agencies to reach a less field intensive and more accurate estimation of yield



for plantation crops like oranges, pomegranates, mango etc. Below mentioned are few techniques which are likely to turn out to be helpful in reaching to better estimates.

- Image processing of field photographs to arrive at fruit count and then model the whole area
- Selection of representative trees for sampling through UAVs
- RFID based tagging of plants for monitoring
- Weather and ground based inputs for yield estimation

Fruit counting through advanced image processing techniques known as 'image segmentation' and 'machine vision'

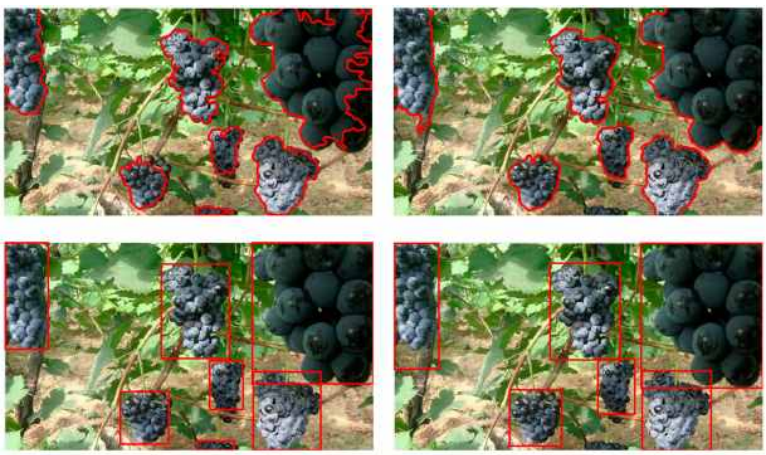


Image processing application, whether captured from ground based hand held cameras or a more innovative approach of capturing whole outer surface of trees through controlled UAV flying around specific tree, holds promising future. A wide range of machine vision applications have been proposed in the field of horticulture including the following:

- Weed identification to guide targeted spraying
- Fruit load estimation
- Autonomous harvesting

Though pretty much of academic interest is there as of now but very innovative techniques which have been operationally tested are tractors that can travel driverless, up and down the rows of trees in an orchard.

- 'Observing' its surroundings and developing a detailed 3D map that shows the position and condition of every tree, every fruit and every inch of ground



- Identifying any disease or deficiencies in each tree
- The ripeness of each fruit
- The condition of the soil

Aerial and ground based RCVs (remote controlled vehicles) for farm automation



Low altitude: DRONES in particular

Low altitude platform-based solutions hold huge potential when it comes to localized problem solving. Prominent among this is UAV or DRONE (**D**ynamic **R**emotely **O**perated **N**avigation **E**quipment) technology that has caught attention of large farmers, crop insurance stakeholders and Government because it can provide 'farm – specific' information on crop condition, losses to farmers and in reaching the right kind of benefits to right people. With flying just at 150 m - 200 m above ground level, this makes it as one unique platform.

The sensors that can be placed on board on any of these three platforms (regular satellite, nano-satellites and Drones) are largely the same and can provide comparable information with varying level of details.



While the medium resolution satellites score on their capabilities of covering large areas, the Nano-satellites and Drones based images capture very detailed pictures of ground.

Following are the areas where Drones can immediately offer solutions:

1. Delayed sowing: Representative flying can reveal whether conditions for delayed sowing prevail on ground or sowing was done based on other sources of irrigation.

2. Area sown validation: Since every farm field can be identified and sown crop can be mapped at crop field level, a 100% correct statistic for sown crops in a village/ multiple villages can be determined and compared with that derived through traditional way (Patwari's assessment).

3. Flood Inundation: UAVs provide a complete perspective view of crop field along with a detailed close-up view, so it becomes quite easy to provide digital proof of whether the field was inundated or not. It also helps in estimating the extent of damage suffered by crop and its spatial extent.

4. Field level data for yield estimation: Crop simulation models require very detailed information of crop fields in order to accurately forecast yield. With UAVs we can get additional information (as compared to satellites) e.g., tentative sowing date, planting density, row spacing, well managed or poorly managed, irrigation source, precise health etc.

5. CCE (Crop Cutting Experiment) location validation: Another major issue faced by insurance companies is the manipulation of CCE location sites wherein the crop cutting experiment is conducted at a different location than selected by random sampling method.

6. Fraud detection in loss reporting: It was often talked about that farmers actually sow different crops than what they had committed to agencies at the time of insurance policy issued to them, but there was no hard evidence to prove the same. Thanks to UAV, GIS and Cadastral map data, it is now possible to correlate every policy to the sown crop and validate whether the compliance level is complete or there are flaws.



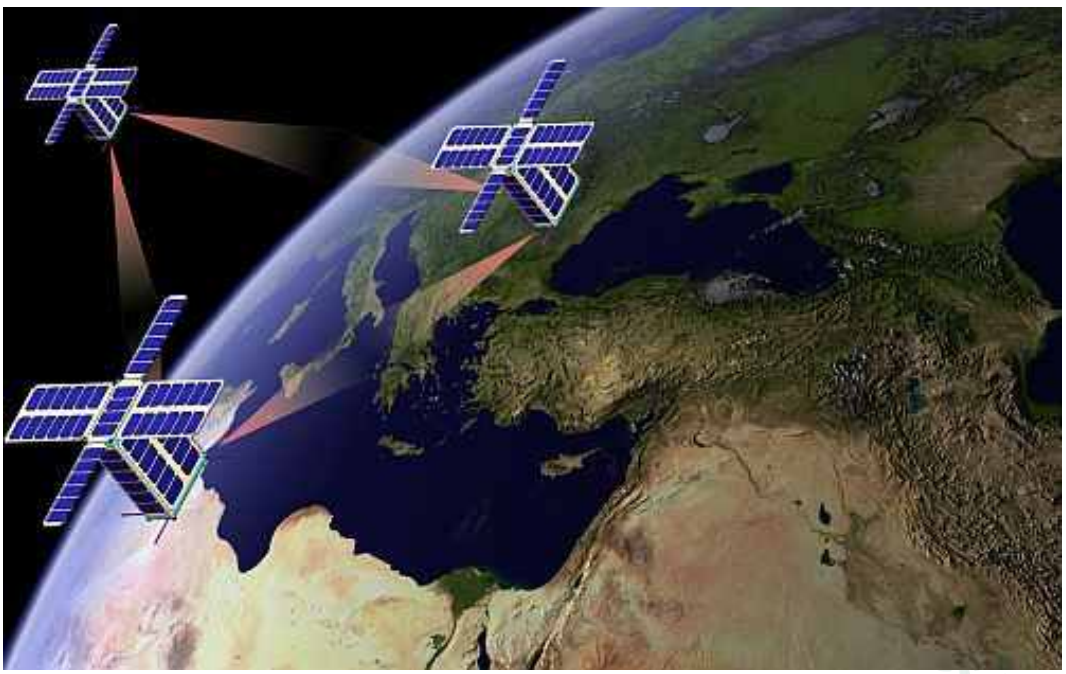
High altitude: Satellite based

Satellite remote sensing is capturing information about different ground features while staying 400+ kms above the ground. A variety of sensors can be placed on board wherein these satellites can gather information. These have proved to be very useful in getting a fairly accurate data on sowing trends, acreages of different crops, stress on crops during mid-season and area affected due to this, harvesting trends, yield and production estimates in a very short time, which otherwise takes months together in collating and compiling using traditional methods.

There are more than 100 different satellites providing range of parameters measured from satellite platforms, allowing high frequency of revisit and continuously improving spatial and spectral resolutions. It is now possible to address all loss assessment issues through affective use of these datasets right from prevented sowing to mid-season adversaries to yield estimation with more accuracy and efficiently.

"It is now possible to address all loss assessment issues through affective use of these datasets right from prevented sowing to mid-season adversaries to yield estimation with more accuracy and efficiently."

Multiple satellite constellation

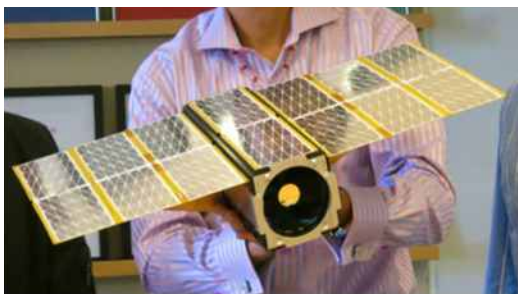


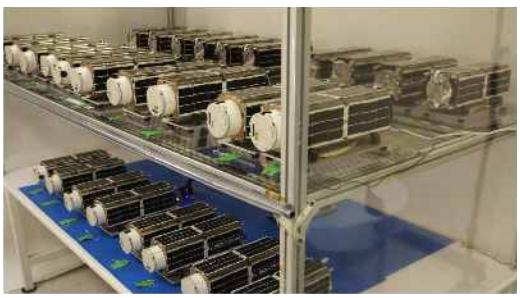
In India, Kharif is the main cropping season because of Monsoon rains. While it is a boon for good crop, remote sensing technology finds it challenging to gather information below cloud cover. In the last few years, a unique method of capturing images has helped in overcoming this challenge to a great



extent. This is by constellation of multiple satellites that can revisit the same area in a very short time, i.e., in a day or two to five days. This has significantly improved the capability of getting cloud free images of the ground that too at high resolution. These are constellation of very small size satellites, which are of the size of a shoe box and weigh only 4-5 kgs. These are termed as 'Nano-Satellites' and already 100s of them are in the sky, delivering usable data for different applications including agriculture.

Nano-satellites- tiny size and light weight





India is quite a different country when compared to developed countries where the crop fields are large and there is uniform crop distribution over large areas. Here we have very small land holdings (to the extent of 10th of an acre too) and this makes cropping pattern and farmer's management very complex. Hence, we need to choose appropriate technology based on our specific needs and its adaptability to our scenario.

"We need to choose appropriate technology based on our specific needs and its adaptability to our scenario."



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