Enhancing technology use in agriculture insurance

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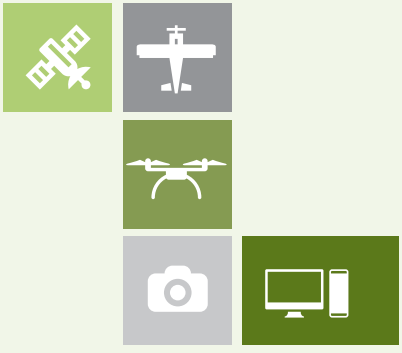
Enhancing technology use in agriculture insurance



National Institute for Transforming India (NITI) Aayog
Government of India

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Abbreviations

AFMU	Agriculture Field Monitoring Units
AIC/ AICI	Agriculture Insurance Company of India Limited
AMIS	Alliance Marketing and Insurance Services
App	Mobile-Based Application
CBS	Core Banking Solution
CCE	Crop Cutting Experiments
CCIS	Comprehensive Crop Insurance Scheme
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CIMMYT	International Maize and Wheat Improvement Center
DAC&FW	Department of Agriculture, Cooperation and Farmers Welfare
DAH,D&F	Department of Animal Husbandry, Dairying & Fisheries
DCCB	District Central Cooperative Bank
EEZ	Exclusive Economic Zone
FASAL	Forecasting Agricultural output using Space, Agro meteorology and Land based observations
FEWS NET	Famine Early Warning Systems Network
GEOGLAM	Group on Earth Observations Global Agricultural Monitoring Initiative
GIC	General Insurance Corporation of India
GIS	Geographic Information Systems
GPS	Global Positioning System
IARI	Indian Agricultural Research Institute
ICAR	Indian Council of Agricultural Research

ICAR-CIFE	ICAR-Central Institute of Fisheries Education
ICAR-IASRI	ICAR-Indian Agricultural Statistics Research Institute
IMD	India Meteorological Department
IRCTC	Indian Railway Catering & Tourism Corporation Ltd
ISRO	Indian Space Research Organisation
IT/ICT	Information Technology and Information and Communications Technology
IVRS	Interactive Voice Response System
KISAN	Crop Insurance using Space Technology and Geo informatics
KVK	Krishi Vigyan Kendra
MARS	Monitoring Agricultural Resources
MNAIS	Modified NAIS
MNCFC	Mahalanobis National Crop Forecast Centre
NABARD	National Bank for Agriculture and Rural Development
NAIS	National Agricultural Insurance Scheme
NCAER	National Council of Applied Economic Research
NCIP	National Crop Insurance Programme
NDDB	National Dairy Development Board
NDVI	Normalized Difference Vegetation Index
NRSC	National Remote Sensing Centre
PMFBY	Pradhan Mantri Fasal Bima Yojana
RFID	Radio-Frequency Identification
RS	Remote Sensing
SAC	Space Applications Centre
SAU	State Agricultural University
SMS	Short Message Service
UAV	Unmanned Aerial Vehicles
VMS	Vessel Monitoring Systems
WBCIS	Weather Based Crop Insurance Scheme

Preface

Pradhan Mantri Fasal Bima Yojana (PMFBY) is a flagship scheme of the Government of India to provide insurance coverage and financial support to farmers in the event of failure of any of the notified crops, unsown area and damage to harvest produce as a result of natural calamities, pests and diseases to stabilise the income of farmers, and to encourage them to adopt modern agricultural practices. The scheme is a considerable improvement over all previous insurance schemes in India and is heavily subsidised by the state and central governments. The scheme aims to cover 50 percent of the farming households within next 3 years.

During its implementation in the last one season, several challenges relating to enrolment, yield estimation, loss assessment, and claim settlement were reported by farmers, insurance companies as well as the state governments. It was also noted that several technological opportunities existed for possibly leveraging support to the Indian crop insurance program for enhanced efficiency and effectiveness. NITI Aayog of the Government of India, therefore, constituted a Task Force to deliberate on this subject and identify such potential opportunities. This report summarises the recommendations of the Task Force.

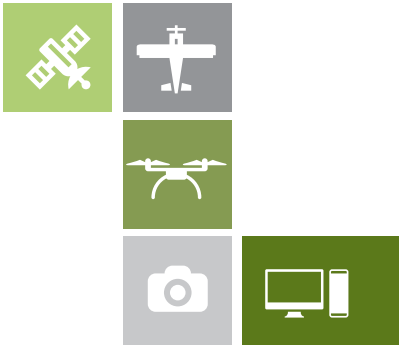
The Task Force constituted to address the issue of technology support to crop insurance comprised the following 5 sub-groups: (1) Remote Sensing & Drones; (2) Decision Support Systems, Crop Modelling & Integrated Approaches; (3) IT/ICT in Insurance; (4) Crop Cutting Experiments (CCEs); and (5) Technologies for Livestock and Aquaculture Insurance. Each sub-group had several discussions with experts in the respective areas, and submitted draft reports. More than 100 experts related to professional research agencies, insurance industry, banks, and the government contributed to these discussions. Technological options available in the country and abroad were considered by all groups. The Task Force together with the sub-groups then deliberated on key issues and formulated its recommendations as presented in this report. During the discussions it was realised that there were many administrative and institutional issues that needed to be addressed in PMFBY. However, the focus of the Task Force was on its main mandate, technology use in crop insurance. We hope these recommendations would help the Indian crop insurance sector take full advantage of the technological options suggested so as to increase its efficacy and effectiveness leading to reduced agrarian distress in the country.

The Task Force is grateful to Dr. Arvind Panagariya, Vice Chairman, Dr. Ramesh Chand, Member and Shri Amitabh Kant, CEO of NITI Aayog for constituting this Task Force, and to Dr. Ashish Bhutani of the Ministry of Agriculture & Farmers' Welfare for providing the government's point of view. The Task Force is also grateful to Dr. Sudhir Goel, former Additional Chief Secretary, Government of Maharashtra, Mr. Vijay Kumar, former Additional Chief Secretary, Government of Andhra Pradesh, Dr. Alok Sikka, South Asia Director of the International Water Management Institute, Dr. YVN Krishna Murthy, Director of the National Remote Sensing Centre, and Dr. Dilip Kumar, former Director/Vice Chancellor of ICAR-CIFE for chairing the sub-groups and advising the Task Force.

Executive Summary

The Pradhan Mantri Fasal Bima Yojana (PMFBY) is a transformative scheme of the Government of India to provide insurance coverage and financial support to farmers in the event of failure of any of the notified crops, unsown area and loss of harvested produce as a result of natural calamities, pests and diseases to stabilise the income of farmers, and to encourage them to adopt modern agricultural practices. The scheme recognises the need for technological interventions in crop insurance to make the insurance mechanism more efficient, transparent and farmer-friendly. Considering the complexities associated with Indian agriculture such as small and scattered land holdings, very high eco-geographical variability, yield variability and weather aberrations, it is imperative that technologies are effectively used to increase the efficacy and effectiveness of the insurance sector.

For effective implementation of the PMFBY several technological options have been proposed such as remote sensing technologies (satellite and Unmanned Aerial Vehicles – UAVs), smart-phones, digital photography, new statistical techniques and modelling approaches, and IT/ICTs. Currently, there is a modest use of IT/ICT in the insurance sector for enrolment and other operational issues. There have been only some piecemeal studies on the use of technologies in other arenas like yield estimation, loss assessment and product design despite the country having a large agriculture and space research program, which has many potential technologies suitable for the insurance sector. However, the evidence base of these technologies, under diverse agro-ecological regions of the country, is limited to support their nationwide implementation in crop insurance program. A comparative evaluation of different technologies has not been done so far and often the states, researchers and insurance players have diverse views on their use. The key technology providers for remote sensing are research and academic organisations and private companies whereas IT/ICT and UAV technology suppliers are largely private players. Other technologies such as integrated assessment modelling, and statistics are still in the domain of national and international research institutes.



The Task Force on “Use of Technology for Agriculture Insurance” constituted by the NITI Aayog deliberated on this subject with almost 100 leading experts

from research organisations, universities, insurance industry, the government, banks and other stakeholders to recommend the key technologies for effective implementation of the PMFBY. The Task Force noted several administrative and institutional challenges beyond its mandate that needed to be addressed for effective implementation of the PMFBY apart from the use of technology. The Task Force constituted five sub-groups to do a detailed assessment of technological options and to obtain stakeholders' feedback on various issues. The sub-groups were on: (1) Remote Sensing & Drones; (2) Decision Support Systems, Crop Modelling & Integrated Approaches; (3) IT/ICT in Insurance; (4) Crop Cutting Experiments (CCEs); and (5) Technologies for Livestock & Aquaculture Insurance. After deliberating the reports from the five thematic sub-groups, the following recommendations on enhancing technology use in agricultural insurance were made by the Task Force largely targeted to the concerned ministries of state and central governments for action besides the crop insurance industry, which needs to act on some of the recommendations and share the costs of implementation:

1. To increase insurance literacy, the state governments should urgently commission the development of a comprehensive mobile-based application (App) that has 24x7 links with the payment gateways/e-wallets to facilitate ease of registration, online payment of premium and issue of instant e-receipts. This should have links with the National Crop Insurance Portal available at www.agri-insurance.gov.in. This data should be simultaneously accessible to insurance companies, bankers and the state government departments.
2. The states should commission major campaigns during the enrolment period in every crop season using participatory videos, and other ICT tools such as voice blasts, IVRS and SMS, to increase awareness and insurance literacy. Together with related banks and insurance industry they should simultaneously arrange for on-the-spot enrolment in crop insurance using the customised mobile App.
3. To reduce farmers' discomfort with the enrolment process, PMFBY guidelines should be relaxed to accept geo-tagged and time-stamped digital photographs of land to establish the insurable interest instead of manual certificates. Such photographs submitted by the farmers should be accepted as sowing certificates if the declared crop is changed after the payment of premium.
4. Digitising geo-referenced records of land holding is critical for reducing moral hazards in crop insurance. This work is currently being done in the states at a varied pace. Development of a strong geo-referenced and regularly updated cadastral map base and its linkage with different land records should be accelerated and completed in a time-bound manner. Bhumi project of Karnataka government has shown considerable progress in this aspect and could provide lessons for other states.
5. The Task Force is of the view that although CCEs are central to the insurance scheme, they are not serving much purpose in their present form because of the financial, scientific, institutional and operational challenges associated with them. Moreover, they do not necessarily provide good

estimates of yield loss over insurance units in a timely manner. It was noted that a combination of these options - remote sensing, digital photography, statistical methods, and integrated crop modelling- can provide an objective and unbiased assessment of crop yield losses well in-time at a fraction of the current CCE costs. There is an urgent need to identify the most suitable technology option and associated operational guidelines for every state. Capacity to undertake such work in India is available with institutes/centres of ISRO, ICAR, and IMD, MNCFC, IT/ICT agencies, state agricultural universities, state remote sensing centres, CGIAR research centres, and private companies. The Task Force, therefore, recommends that CCEs in their present form must be replaced in a phased manner with technological solutions for crop loss assessment. The following approach is proposed for developing protocols for loss assessment:

a. All state governments with a large stake in crop insurance should immediately commission a 12-month project for a comparative evaluation and deciding on the suitability of technological options for agro-ecological diversity in the state. The project should propose the most suitable approach to provide robust estimates of crop yields at individual village/ village panchayat level along with cost-benefit analysis of the operations, and assessment of technical capacity to implement this in an operational manner. For this work, the state governments and insurance industry should allocate 0.20 percent premium.

b. The project should also propose a scientifically designed sampling strategy for a few very high quality CCEs at block/tehsil/district/agro-ecological zones level in the state which can be independently used to supplement/calibrate/validate/verify the technology proposed for loss assessment.

c. Conducting these few and high quality CCEs should be the responsibility of the state government and should be guided and monitored by independent experts from state agricultural universities (SAUs) and their associated Krishi Vigyan Kendras (KVKs)/reputed agricultural NGOs. The entire CCE must be digitally recorded so that it can be witnessed by anyone, and be publicly available.

d. The above approach should be tested in at least 10 percent districts in Rabi 2017-18 and Kharif 2018. Subsequently, the whole experience should be reviewed, calibrated, and applied in the entire state from Rabi 2018-19.

e. For the time being, all CCEs should be witnessed, monitored and reported using mobile Apps involving the staff of SAUs/KVKs, farmers, agriculture departments and insurance companies.

6. Although there are several satellites today that can support crop insurance sector, it is recommended that a dedicated constellation of 3-4 satellites of high to moderate resolution (10-30 m) with 10-days frequency and with multispectral optical sensors, two microwave satellites, and one hyper-spectral satellite may be deployed to increase the precision of crop yield estimates/loss assessment at the village scale.

7. Crop losses due to localised climatic events such as hailstorms, landslides, small floods and post-harvest losses, where CCE data do not play a role, need to be supported by a mobile based App. A separate mechanism for such data collection, visualisation and customisation needs to be developed. The experience of the Karnataka Government for mango and grape could provide lessons for such an App.

8. The Ministry of Agriculture and Farmers' Welfare should expand their mobile App - CCE Agri - to process CCEs' data and weather data to calculate the loss and claim estimation in real-time. On completion of the risk phase, the trigger and claim calculation should be done on the portal itself; an SMS notification should be sent to the insured farmer and the claim due credited to his bank account directly.

9. Historical yields at the desired insurable yields are needed for calculating the risk profile and premiums. This data is generally not available at the desired scale. Depending upon the need and urgency, the state governments in collaboration with AICI should commission projects to develop such estimates of threshold yields of major crops at the desired insurable unit scale for the past 10 years. Both agencies should make data of CCEs and block/tehsil yields available for this purpose. The approach used should be the same as finalised for CCEs (see earlier recommendation #5) in order to have consistency in the process for generating threshold yields and premium rates.

10. Wherever WBCIS is to be implemented, agro-ecological region-specific weather triggers should be redeveloped using integrated approach of statistics, historical weather data, crop models and remote sensing data that can maximise the farmer's satisfaction, and optimise the loss ratio while keeping premiums within limit.

11. The state governments in collaboration with AICI and research institutes having understanding of crop-weather relations should scientifically delineate clusters of districts/blocks with equitable business opportunities for the insurance industry based on climatic risk profiles of the regions together with the number of potential farmers to be insured, crops to be insured and infrastructure available in the region. Basic premium rates for various clusters should also be identified to eliminate the issues of over and under-pricing. An application/module for automated premium calculation framework (yield index schemes) should be developed and tested for a few districts and crops on a pilot mode.

12. An independent tool that uses seasonal and short-term weather forecasts, historical databases, satellite images, and current weather data should be developed to provide a double trigger product for mid-season claim calculation and 'on-account' payment to the insured as well as a yield index for final loss assessment and claim settlement. The Ministry of Agriculture and Farmers' Welfare should explore expanding the scope of its FASAL program for this purpose.

13. The importance of livestock and aquaculture in Indian economy is growing and hence we need to have effective insurance policies for them. There are several technologies that have become available in recent times that can be used to increase livestock insurance. The use of RFID technology, for example, can replace retagging of animals at policy renewal. Portability of tag number across insurers can be operationalized for continuation of insurance. Index based insurance schemes and ICT technologies can be piloted in livestock as well as fishery sectors. There are, however, several institutional and policy issues related to livestock and fisheries insurance sector which need to be addressed simultaneously. The Task Force recommends that two independent groups be established on (a) livestock and (b) fisheries and aquaculture, to develop comprehensive insurance plans for the respective sectors.

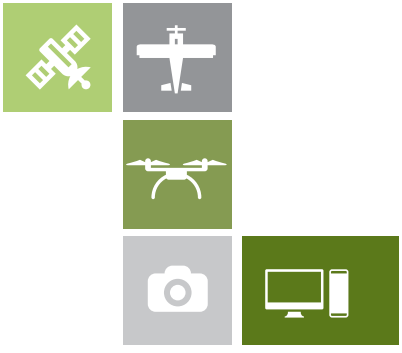
14. The central government should consider urgently establishing a dedicated mechanism either within the existing institutions or by creating a new autonomous agency to coordinate among various stakeholders including farmer groups, industry, different government ministries and departments, banks and technology providers related to insurance in agriculture and allied sectors. The same agency should also be mandated to support, monitor and improve insurance services at the national scale. This could also include efficient data collection, storage, and transfer between the stakeholders of different agencies. Similarly, the state governments should consider establishing formal or informal units for crop insurance purpose where experts from agriculture, remote sensing, ICT and insurance industry can come together to deliberate on issues related to crop insurance in the state and advise the government and other stakeholders on all related issues.

15. Developing innovative insurance products as well as greater use of technology in implementing and monitoring crop insurance would need budget. It is recommended that a sum of 0.25 percent of the premium collected every year should be made available for such purpose and should be contributed by the central government, state government and insurance industry.

1. Introduction

1.1 Despite impressive development of agricultural infrastructure and irrigation potential, a large part of Indian agriculture still remains exposed to climatic risks. Crop insurance provides a safety-net for farmers to mitigate losses arising from climatic shocks and also encourages them to continue to invest in inputs and technology to increase yields and household income.

1.2 Although the need for crop insurance in India was debated since India became independent, no serious efforts were made to implement it. Between 1947 and 1985, there were isolated schemes of crop insurance. These pilot schemes were generally crop or location specific. In 1979, a scheme based on area approach as suggested by V.M. Dandekar, linking crop insurance with credit, was implemented by the General Insurance Corporation of India (GIC). Under this scheme, the farmer was to be compensated in case of a shortfall in yield in the area. The central government decided to introduce a country-wide crop insurance scheme commencing from Kharif season of 1985 called Comprehensive Crop Insurance Scheme (CCIS). The CCIS was also based on the approach described by Dandekar (1979). This approach was 'Area' based and the farmer was liable for compensation if there was a short-fall in the actual average yield per hectare in the area as compared to the threshold yield as obtained on the basis of normal yield. A few modifications and improvements were made to this Scheme and subsequently the National Agricultural Insurance Scheme (NAIS) was launched from Rabi 1999. This was further improved and the Modified NAIS (MNAIS) was launched on a pilot basis from Rabi 2010-11. It remained a pilot scheme till Kharif 2014. Subsequently it became a full-fledged scheme under the National Crop Insurance Programme (NCIP). Full details of these schemes, their operational details and challenges can be found in the 2014 PK Mishra Committee Report of the Government of India (www.http://agricoop.nic.in/Admin_Agricoop/Uploaded_File/Rpt_pkm2.pdf).



1.3 A revamped, comprehensive and transformative insurance scheme called Pradhan Mantri Fasal Bima Yojana (PMFBY) has been launched by the Government of India from Kharif 2016. The PMFBY aims at supporting sustainable production in agriculture sector through (a) financial support to farmers suffering crop loss/damage arising out of unforeseen events, (b) stabilization of farmers' income to ensure continuity in farming, (c) encouragement to farmers to adopt innovative and modern agricultural practices, and (d) ensuring flow of credit to the agriculture sector, which will contribute to food security, crop diversification, growth enhancement and competitiveness of agriculture sector besides protecting farmers from production risks. It has been conceptualised to address the operational and implementation problems of previous schemes and incorporate various recommendations of Mishra Committee. The new scheme will cover both yield losses and farm harvest losses, and also provide farm level assessment for calamities. It is designed to operate across an insurable unit (village/Gram Panchayat) and aims to double the coverage of farmers across the country from the current 23 percent of total farming households to 50 percent in the next few years.

1.4 Use of technology has been proposed as a major input in the operations considering the large diversity in climate, crops, cropping practices, agriculture infrastructure across the country, and the limited capacity across government departments and implementing insurance companies to effectively manage and monitor the scheme. However, guidelines on what technologies to use for various insurance processes are not clearly specified in the PMFBY and as a result not well-understood by relevant stakeholders. Several states had requested for clarifications and guidance from the NITI Aayog to improve this understanding and facilitate the development and implementation of relevant tools and instruments under the PMFBY program. A Task Force was, therefore, constituted by the NITI Aayog under the Chairmanship of Prof. Pramod K. Aggarwal of the CGIAR Research Program on Climate Change, Agriculture and Food Security, Borlaug Institute for South Asia, CIMMYT, and under the overall guidance of Prof. Ramesh Chand, Member, NITI Aayog to address the issues related to the use of technology for agriculture insurance. The composition of the Task Force is attached as Appendix A. To address the issue of technology support in crop insurance, the Task Force constituted 5 sub-groups: 1. Remote Sensing & Drones; 2. Decision Support Systems, Crop Modelling & Integrated Approaches; 3. IT/ICT in Insurance; 4. Crop Cutting Experiments; and 5. Technologies for Livestock and Aquaculture Insurance. Each sub-group had several discussions together with experts in the fields and submitted draft reports. More than 100 experts related to professional research agencies, insurance industry, banks, and the government contributed to these discussions. Technological options available in the country and abroad were considered by all groups.

1.5 The Task Force concluded that several opportunities exist for applying technologies to increase the efficacy and efficiency of the crop insurance program particularly in the process of

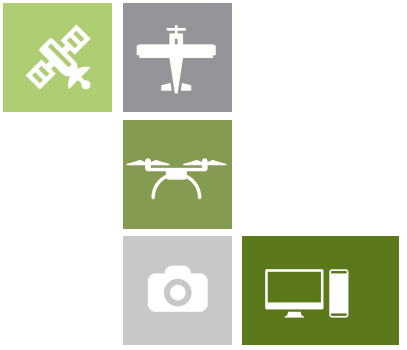
farmers' enrolment, objective and convenient way of establishing insurable interest, developing scientific weather triggers for WBCIS product development, data sharing among farmers and insurers, banks and insurers and insurers and banks/farmers, and objective as well as real-time assessment of crop yields and loss assessment due to various perils. These technologies besides bringing objectivity to the insurance process would also increase its efficiency and cost effectiveness. In the following sections of the document, solutions have been identified for key challenges of the insurance sector and appropriate recommendations have been made keeping in mind a clear focus on operational implementation. Some recommendations simplify or facilitate the operational processes that can be implemented directly while other recommendations propose mechanisms for establishing a stronger evidence base for technology use through rapid but rigorous analyses.

2. Enrolment in Crop Insurance

2.1 KEY CHALLENGES

2.1.1 Almost 30 million farmers (25 percent of households) are covered today by the Indian crop insurance program. The PMFBY aims to expand the coverage of farmers across the country to 50 percent of farming households in the span of next 2 to 3 years. However, even today, the insurance cover is largely availed by the loanee-farmers for whom this is compulsory. There is a need to increase awareness among farmers, especially in climatic risk prone regions, and also among non-loanee farmers, about crop insurance, risks covered, government schemes and subsidies available and their benefits. To ensure retention of farmers in crop insurance program on a sustained basis, satisfaction of the farmers with scheme implementation is critical. Farmers' satisfaction is linked to the information available to them during enrolment about the availability of scientifically designed products, quick enrolment process and more importantly about the claim settlement process that is simple, quick and linked to the actual damage. A large number of co-operative banks, which are often in the fore-front of the enrolment process, are not yet computerised. The hard copy data flow to the banking and insurance industry is sluggish and therefore limits enrolment as well as claim settlement.

2.2 TECHNOLOGY SOLUTIONS



2.2.1 There are several technological opportunities today, especially in ICT/IT sector, that can be used to accelerate the process of enrolment in the crop insurance program. Besides conventional extension mechanisms such as radio, television and newspapers, IT and ICT technologies such as mobile applications, Kisan Call Centres, voice blasts, IVRS and SMS

can be used to raise the awareness of farmers about the insurance products. Further, IT infrastructure of Gram Panchayat, Common Service Centres and internet café, etc., can be used as insurance information centres. Participatory videos/films, where farmers record their own experiences, and showing them to a large number of other farmer groups is becoming a very powerful and effective tool in agricultural extension. This simple participatory process, if linked with enrolment process, could significantly raise participation in the insurance programs. In the near future, an insurance service on the lines of 139 by IRCTC may be started for crop insurance.

2.2.2 Several portals have already been developed for the implementation of crop insurance; however, none of them include holistic approaches covering all processes from customer enrolment to claim settlement. The portals also lack connectivity with CBS, and the payment gateway is still to be integrated. ICT can help to reach the farmers at the grass roots and assist them in overcoming the challenges currently posed in the manual registration process. Mobile/tablet based applications can ensure ease of registration, payment of premium and issuance of e-receipts. A mobile App for dissemination of crop insurance has already been developed. The mobile App facilities should be extended to enrol non-loanee farmers with payment gateways. Further, the enrolment process with banks and national portal should be available 24×7 till the cut-off date.

2.2.3 In respect of loanee-farmers, the insurance portal's bulk uploading facilities should be improved. The National Crop Insurance Portal available at www.agri-insurance.gov.in has been designed as an integrated platform for all stakeholders – states, insurance companies, banks and farmers. Different states have different hierarchies and they need to be integrated with the portal so that all missing links like the Revenue Circle in Maharashtra, Firka in Tamil Nadu, and Nyaya Panchayat in Uttar Pradesh, etc., can be covered. The codes and fields of CBS and the National Portal also need to be matched so as to facilitate seamless flow of data. Banks with CBS capability already have the details of loanee-farmers opting for agricultural credit and that information can be directly transferred to the National Portal for their enrolment. Online web-form or excel sheets uploaded with correct codes could be used till the time CBS is connected.

2.2.4 The absence of digitized land records and cadastral maps creates big hurdles in the enrolment process. A strong geo-referenced cadastral map base and its linkage with details of the land records will help in controlling the menace of over reporting of the insured area and easing the enrolment process. The responsibility of providing land records should be given to the concerned government department instead of the farmers. Lessons from the Bhumi project of the Karnataka could be very educative. Database protocols of using

standard coding patterns for the land records should be followed by every state for seamless integration into the National portal.

2.2.5 As per the present guidelines of the PMFBY, a sowing certificate is required if declared crop is changed after the enrolment, sometimes necessitated by various exigencies. This causes confusion, increases administrative load and discourages farmers from enrolment in the insurance program.

2.3 RECOMMENDATIONS

2.3.1 To increase insurance literacy, the state governments should urgently commission the development of a comprehensive mobile-based application (App) that has 24x7 links with the payment gateways/e-wallets to facilitate ease of registration, online payment of premium and issuance of instant e-receipts. This should have links with the National Crop Insurance Portal available at www.agri-insurance.gov.in. This data should be simultaneously accessible to insurance companies, bankers and state government departments.

2.3.2 The states should commission major campaigns during the enrolment period in every crop season by using participatory videos, and other ICT tools such as voice blasts, IVRS and SMS, to increase awareness and insurance literacy. Together with related banks and insurance industry they should simultaneously arrange for on-the-spot enrolment in crop insurance with the use of customised mobile App.

2.3.3. To reduce farmers' discomfort with the enrolment process, PMFBY guidelines should be relaxed to accept geo-tagged and time-stamped digital photographs of land to establish the insurable interest instead of manual certificates. Such photographs submitted by the farmers should be accepted as sowing certificates if the declared crop is changed after the payment of premium.

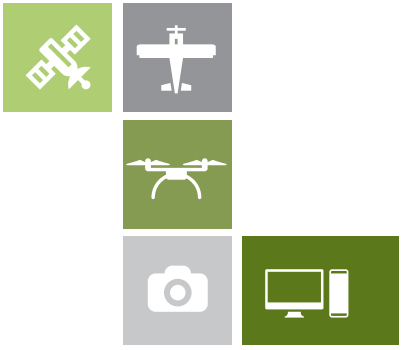
2.3.4. Digitising geo-referenced records of land holding is critical for reducing moral hazards in crop insurance. This work is currently being done in the states at a varied pace. Development of a strong geo-referenced and regularly updated cadastral map base and its linkage with different land records should be accelerated and completed in a time-bound manner. Bhumi project of Karnataka government has shown considerable progress in this aspect and could provide lessons for other states.

3. Crop Loss Assessment

3.1 KEY CHALLENGES

3.1.1 Accurate loss or damage assessment is the most important component of an insurance scheme for all stakeholders. This assessment is currently done using either a weather index (for WBCIS) or a stratified CCE when yield is used as an index. Weather indices have not worked well in the past due to limited density of weather stations, their maintenance, and large spatial and temporal variability in weather.

3.1.2 Currently in the country around 9 lakh CCEs are being conducted for General Crop Estimation Survey. With the requirement of carrying out at least 4 CCEs per insurable unit of village/village panchayat for each crop, this number may become very large considering there are around 2.3 lakh village panchayats in the country. Assuming that 40 lakh CCEs would need to be done and each CCE costs a minimum of 1000 rupees, it would cost more than Rs. 400 crore every year to conduct CCEs. Since CCEs need to be generally conducted within a time frame of 15-20 days in a season, there will be a massive need of trained manpower to manage, monitor and report them in time. Carrying out so many CCEs rigorously is extremely difficult and time consuming. Over the years CCEs have lost their credibility owing to such complexities, human bias, measuring errors, high labour, time and cost intensive design, and their limitation in covering spatial and temporal basis risks, objective monitoring, reporting and verification process. It is also noted that the states often have two sets of yield estimates - one for production statistics and the other for payment of crop insurance claims. This brings further confusion and subjectivity in the estimates of crop yield and losses.



3.1.3 Localised calamities such as hailstorms, flash floods, and post-harvest rains have increasingly become a source of concern. In the last few years, we have witnessed widespread hailstorms in some villages of Maharashtra, localised floods in some parts of Rajasthan and unseasonal rainfalls after harvest of crops in many states. Loss assessment due to these remains a challenge because of verification methods.

3.2 TECHNOLOGY SOLUTIONS

3.2.1 Fortunately, there are a number of technological solutions available today that can support objective assessment of crop losses at the desired scale. These include satellite based remote sensing (RS), Unmanned Aerial Vehicles (UAVs), digital geo-referenced photographs, integrated crop yield assessment models, and statistical sampling techniques. Remote sensing technique is rapid and the technology is used routinely for acreage estimation and in combination with regression/crop models to estimate yields in many parts of the world, especially in non-cloudy (such as Rabi) seasons. UAVs appear to be promising, especially under cloud (Kharif) conditions, but there are many key challenges with linking their signals with crop performance, possible interference with national security guidelines, and their costs-benefits, which are not yet fully understood. There are as yet no clear success stories with UAVs for crop loss assessment in India although they can play a critical role for the assessment of localised perils such as hailstorms and flood related damages. More research is needed to fully understand their scope and limitations before they can be employed for crop loss assessment. Similar are the limitations of the picture based technologies where loss libraries are yet to be developed based on systematic and rigorous scientific experiments. An integrated approach linking RS signals and crowd-sourced agronomic inputs with crop models can provide a very suitable tool for loss assessment. Initial experiments done by the Maharashtra Government, KISAN project of the Ministry of Agriculture and many other independent agencies in this respect appear to be promising. Small area statistical sampling design approach is another promising approach to reduce the number of CCEs if suitable and easily measurable yield proxies could be identified.

3.2.2 However, all these tools have been tested in research mode or in small pilots in a few states. There is an urgent need to examine their suitability for operational purpose on a large-scale, which should include understanding the scope, limitations in loss assessment, costs-benefits, technical capacity in different regions to implement, monitor, report and verify in a given time frame and developing protocols to be followed. This has to be complemented by a scientifically designed CCE sampling strategy where a small number of high quality CCEs are conducted, monitored and reported by experts from SAUs, KVKs or other competent agencies. These institutions have large scientific and technical capacity and routinely do

such sampling for their own purposes. Such CCEs can be used to calibrate/validate/verify/ supplement various technological solutions.

3.3 RECOMMENDATIONS

3.3.1 The Task Force is of the view that although CCEs are central to the insurance scheme, they are not serving much purpose in their present form because of the financial, scientific, institutional and operational challenges associated with them. Moreover, they do not necessarily provide good estimates of yield loss over insurance units in a timely manner. It was noted that remote sensing, digital photography, statistical methods, integrated crop modelling, and a combination of these options can provide an objective and unbiased assessment of crop yield losses well in-time and at a fraction of the current CCE costs. There is an urgent need to identify the most suitable technology option for every state and associated operational guidelines. Capacity to undertake such work in India is available with institutes/centres of ISRO, ICAR, and IMD, MNCFC, IT/ICT agencies, state agricultural universities, state remote sensing centres, CGIAR research centres, and private companies. The Task Force, therefore, recommends that CCEs in their present form must be replaced in a phased manner with technological solutions for crop loss assessment. The following approach is proposed for developing protocols for loss assessment:

a. All state governments with a large stake in crop insurance should immediately commission a 12-month project for a comparative evaluation and deciding on the suitability of technological options for agro-ecological diversity in the state. The project should propose the most suitable approach to provide robust estimates of crop yields at individual village/ village panchayat level along with cost-benefit analysis of the operations, and assessment of technical capacity to implement this in an operational manner. For this work, the state governments and insurance industry should allocate 0.20 percent premium.

b. The project should also propose a scientifically designed sampling strategy for a few very high quality CCEs at block/tehsil/district/agro-ecological zones level in the state which can be independently used to supplement/calibrate/validate/verify the technology proposed for loss assessment.

c. Conducting these few and high quality CCEs should be the responsibility of the state government and should be guided and monitored by independent experts from state agricultural universities and their associated Krishi Vigyan Kendras/reputed agricultural NGOs. The entire CCE must be digitally recorded so that it can be witnessed by anyone, and be publicly available.

d. The above approach should be tested in at least 10 percent districts in Rabi 2017-18 and Kharif 2018. Subsequently, the whole experience should be reviewed, calibrated, and applied in the entire state from Rabi 2018-19.

e. For the time being, all CCEs should be witnessed, monitored and reported using mobile Apps involving the staff of SAUs/KVKs, farmers, agriculture departments and insurance companies.

3.3.2 Although there are several satellites today that can support crop insurance sector, it is recommended that a dedicated constellation of 3-4 satellites of high to moderate resolution (10-30 m) with 10-days frequency and with multispectral optical sensors and two microwave satellites and one hyper-spectral satellite may be deployed to increase the precision of crop yield estimates/loss assessment at the village scale.

3.3.3 Crop losses due to localised climatic events such as hailstorms, landslides, small floods and post-harvest losses, where CCE data do not play a role, need to be supported by a mobile based App. A separate mechanism for such data collection, visualisation and customisation needs to be developed. The experience of the Karnataka Government for mango and grape could provide lessons for such an App

4. Claim Settlement

4.1 KEY CHALLENGES

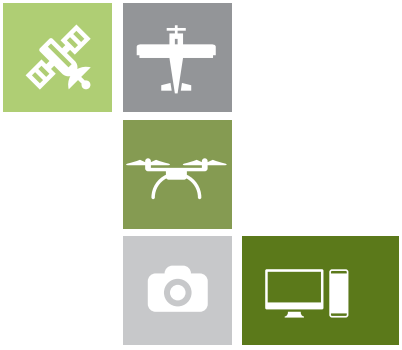
4.1.1 Accurate loss assessment and its timely reporting are prerequisites for faster and accurate claim settlement. Satisfaction of farmers with insurance is mainly associated with quick claim settlements. Owing to the complex nature of loss assessment associated with CCEs, large delays running into 6-12 months have been observed in the process of claim settlement and transfer of money to the farmers. Normally, the cut-off date for data (yield/weather) submission of CCEs is fixed at one/two months from harvesting time but this is not always followed. Sometimes, the submission of yield data by the various agencies involved in the process is done in a piece-meal manner. There are quality issues as well with the submitted data. Submitted data may not be acceptable to the industry since it is based on less than the requisite number of CCEs. Occasionally the submitted CCE data is also revised.

4.1.2 Although the process of submission of weather data in WBCIS is much easier, but certification, data quality checks and replacement of missing datasets take time and cause delayed submission.

4.1.3 Claims are also partially delayed by the lack of automation in claim calculation and direct transfer of the payments to the insured farmer.

4.2 TECHNOLOGY SOLUTIONS

4.2.1 The efficiency of the claim settlement process can be considerably enhanced by automation. A mobile App (CCE-Agri) has already been developed by the Ministry of Agriculture and Farmers' Welfare to digitize and witness the CCEs. The CCEs data through this App is directly uploaded to the web portal. Protocols further



need to be developed to process CCEs data and calculate loss and claim estimation. For weather index insurance scheme, the weather data flow should be assured to the portal on a real-time basis. On completion of the risk phase, the trigger and claim calculation should be done on the portal itself and accordingly a notification should be sent to the farmer about the claim. Once the claim is assessed based on the crop loss or weather index, it should instantly be directly credited to the bank account of the insured farmer. The entire process of claim settlement and transfer of money has to be shared with the insured farmer through the SMS alert at each stage.

4.3 RECOMMENDATIONS

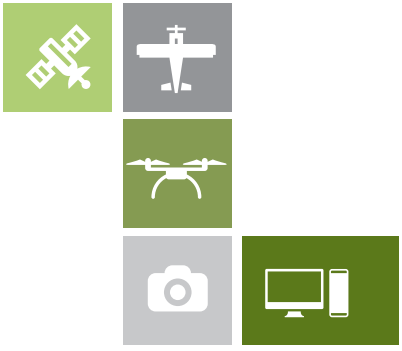
4.3.1 The Ministry of Agriculture and Farmers' Welfare should expand their mobile App - CCE-Agri - to process CCEs data and weather data to calculate the loss and claim estimation in real-time. On completion of the risk phase, the trigger and claim calculation should be done on the portal itself and an SMS notification be sent to the insured farmer and the claim due credited directly to his bank account.

5. Product Design and Development

5.1 KEY CHALLENGES

5.1.1 Designing an appropriate insurance product and suitably pricing it require a good analysis of available crop yield data, threshold yields (based on the last 7 years) and various other factors at the village/panchayat level in PMFBY. Such data is normally available only at district level and at block level in some states. For some minor crops, such yield series do not exist. This causes problems in designing a suitable product. Even for WBCIS, triggers are often used without a scientific basis resulting in payments when risks and consequent yield losses are minimal or vice-versa.

5.1.2 PMFBY is implemented in the states by insurance companies who compete for business by quoting their premium rates. These companies quote premium rates based on their business strategy. It was informed to the Task Force that the rates quoted in the last season for the same crop in the same state/district sometimes varied by 8 times. In the absence of any mechanism with the governments to calculate the burning cost or loss cost for addressing the issues of over and under- pricing by the insurance providers and its relation with the climatic risks in the region, the decision making by the state government becomes difficult.



5.1.3 The states are currently using a cluster approach where several districts are pooled and given to one insurance company for business over a period of time. This is perhaps done based on administrative convenience for providing sufficient long-term business to companies. However, since this does not have a link to climatic risks and volume of business, such clusters become

unequal leading to unfair competition. Small companies may often find it difficult to participate in large clusters with large insurable risks.

5.2 TECHNOLOGY SOLUTIONS

5.2.1 Several statistical, remote sensing and modelling approaches have the potential to generate yield series at the insurable units by using proxies of historical weather, crop management details, NDVIs, and district/block level crop yields. However, they have not yet been applied for this purpose in our country. If data on block level yields of high quality CCEs done in past is made available, it should be possible for practitioners familiar with the above tools to construct such historical yield series with some confidence.

5.2.2 Integrated approach of using statistics, dynamic weather and satellite data and crop growth models has been shown to result in scientifically designed agro-ecological region- specific weather triggers that can maximise farmers' satisfaction and optimise loss ratio while keeping premiums within limit. Such methodologies need to be encouraged. For some crops, if the yield and weather relationship is not clearly established, pilot projects can be undertaken on the lines of the All India Coordinated Research Projects for identification of WBCIS triggers.

5.2.3 Various tools and products are available that characterise climatic risks of India even by cropping season. Gridded weather data has also been made available by the IMD and various other global agencies that can support such characterisation. Such data on climatic risks together with the number of potential farmers to be insured, crops to be insured and infrastructure available in the region should be used to scientifically delineate clusters with equitable business opportunities for the insurance industry.

5.3 RECOMMENDATIONS

5.3.1 Historical yields at the desired insurable yields are needed for calculating risk profile and premiums. This data is generally not available at the desired scale. Depending upon the need and urgency, the state governments in collaboration with AICI should commission projects to develop such estimates of threshold yields of major crops at the desired insurable unit scale for the past 10 years. Both agencies should make the data of CCEs and block/tehsil yields available for this purpose. The approach used should be the same as finalised for CCEs (see earlier recommendation #5) in order to have consistency in the process for generating threshold yields and premium rates.

5.3.2 Wherever WBCIS is to be implemented, agro-ecological region-specific weather triggers should be redeveloped using integrated approach of statistics, historical weather data, crop models and remote sensing data that can maximise farmers' satisfaction and optimise the loss ratio while keeping premiums within limit.

5.3.3 The state governments in collaboration with AICI and research institutes having understanding of crop-weather relations should scientifically delineate clusters of districts/blocks with equitable business opportunities for the insurance industry based on climatic risk profiles of the regions together with the number of potential farmers to be insured, crops to be insured and infrastructure available in the region. Basic premium rates for various clusters should also be identified to eliminate the issues of over and under-pricing. An application/module for automated premium calculation framework (yield index schemes) should be developed and tested for a few districts and crops on a pilot mode.

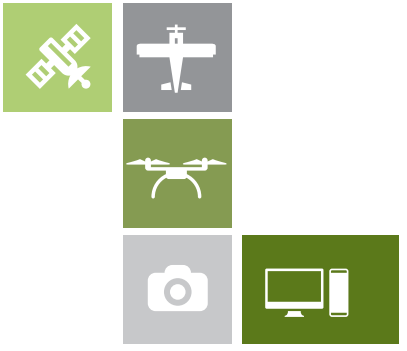
6. In-season Crop Yield Loss Assessment
(on Account Payment)

6.1 KEY CHALLENGES

6.1.1 For the government as well as insurance industry it is important to keep track of disaggregated crop conditions and losses on a real-time basis. It serves several purposes such as satisfying demands from reinsurance industry about the probable losses, targeting of CCEs for better loss assessment, making informed decisions and planning for claim volume, and better preparedness for settling claims after crop harvest. Such information is also very useful for making mid-season on-account payments to the insured when they need compensation the most rather than waiting for the claim settlement after the harvest of the crop.

6.2 TECHNOLOGY SOLUTIONS

6.2.1 India has a system of crop yield estimation which is based on traditional crop cuts, surveys and reports from the District Agricultural Offices. Additionally, many agencies undertake field verifications and consultations to collect additional information on crop performance. Many agencies like MNCFC, IMD, SAC, ICAR, IARI, NCAER, etc., provide aggregated crop outlooks to the government. FASAL programme of the Ministry of Agriculture and Farmers' Welfare is worth mentioning in this context. It uses remote sensing inputs, crop models and government statistics to develop crop outlooks.



Globally there are many such tools as FEWS NET in Africa and Caribbean, MARS in Europe, Cropland Data Layer in USA, AMIS Crop Monitor of GEOGLAM and CropWatch of China. With some modifications, such tools can be tailored to meet the requirements of estimating probable crop yield losses at a disaggregated scale for the crop insurance sector.

6.2.2 Satellite weather data is now easily available. Though there are some issues about its accuracy and the scale for final claim payment, it is of sufficient accuracy, once corrected for bias with in situ data, to make a preliminary estimate of crop losses during the crop season. This could be used mid-season to make initial 25-50 percent of the claim payment to the insured pending his full settlement based on a yield index after the harvest of the crop. Such a double trigger product would help the insured farmer in time to address his agrarian distress.

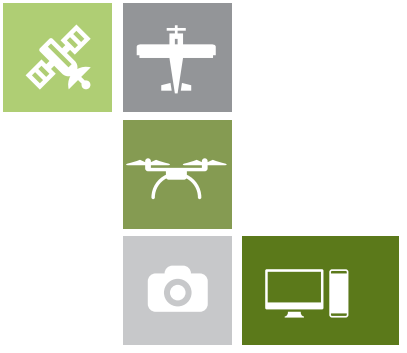
6.3 RECOMMENDATIONS

6.3.1 An independent tool that uses seasonal and short-term weather forecasts, historical databases, satellite images, and current weather data should be developed to provide a double trigger product for mid-season claim calculation and 'on-account' payment to the insured as well as a yield index for final loss assessment and claim settlement. The Ministry of Agriculture and Farmers' Welfare should explore expanding the scope of its FASAL program for this purpose.

7. Livestock and Aquaculture Insurance

7.1 KEY CHALLENGES

7.1.1 India has 56.7 percent of world's buffaloes and 12.5 percent of world's cows and bullocks. Besides, fisheries and aquaculture is one of the fast growing sub-sectors that contributes to nearly 4.8 percent of value of output from agriculture and allied sectors in India. India is, however, far behind in insuring its huge livestock population as only 6 percent of the cattle population and less than 0.6 percent of the cattle owners in India are insured. Since farmers depend a lot on livestock when crops suffer losses due to climatic stresses, it is critical that they are provided the benefits of livestock insurance. Cattle insurance is mandatory for availing bank credit for dairying activities. More than 90 percent of cattle insurance premium underwritten is through this model. The different methods used for animal identification are ear tagging, ear notching, freeze band numbering, muzzle printing, etc. 'No tag no claim' is a general principle followed by all the insurance companies. Insurance as a risk transfer mechanism is by far under-utilized in the fishery sector also. Except for the presence of a few public sector insurance companies and cooperative bodies at the local levels whose scale of operation and coverage is abysmally low, the sector has received little attention either at the central or state levels. The private sector operation in this arena is also limited to a few cases scattered over time and space.



7.2 TECHNOLOGY SOLUTIONS

7.2.1 The painful process of tagging can be replaced with the use of new technologies such as RFID, Genome Tagging

or DNA testing, ZigBee mobile technology, etc. Mobile phone based technologies can be effectively used in reducing policy inception and claim settlement time.

7.2.2 Technology can play a vital role in improving efficiency, bringing transparency and reducing moral hazards in fishery insurance. Advanced ICT tools and GIS platforms for developing inventory data base (on variables such as locations with GPS coordinates, date of stocking, stock sizes, and progress of the crop; hydro-acoustics and digital video survey can be used for assessing the crop loss, etc.) of insured farmers could be put to use, which would not only simplify monitoring procedures but also make them transparent and the farming practice more technology oriented. Innovative products such as weather-index and yield-index based insurance schemes in crop sector can be extended to fisheries sector as well, to harness the potential of technology for increasing efficiency and simplifying procedures.

7.2.3 The Government of India is presently working on mechanisms to track vessels operating in India's Exclusive Economic Zone (EEZ). Advanced Vessel Monitoring Systems (VMS) could be made use of to track the fishing vessels and assess incidents such as mid-sea capsizing and collisions. Awareness among fishermen and aqua-farmers needs to be created about various insurance programs and the provisions involved.

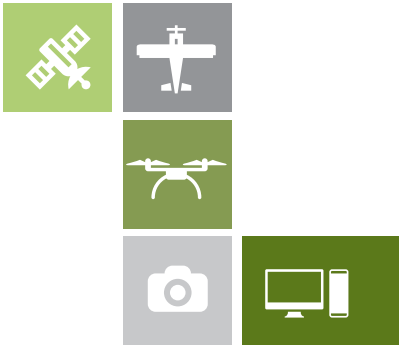
7.3 RECOMMENDATIONS

7.3.1 The importance of livestock and aquaculture in Indian economy is growing and hence we need to have effective insurance policies for them. There are several technologies that have become available in recent times that can be used to increase livestock insurance. Use of RFID technology, for example, can replace retagging of animals at policy renewal. Portability of tag number across insurers can be operationalized for continuation of insurance. Index based insurance schemes and ICT technologies can be piloted in livestock as well as fishery sector. There are, however, several institutional and policy issues related to livestock and fisheries insurance sector which need to be addressed simultaneously. The Task Force recommends that two independent groups be established on (a) livestock and (b) fisheries and aquaculture, to develop comprehensive insurance plans for the respective sectors.

8. Institutional Mechanisms for Technology Use in Crop Insurance

8.1 KEY CHALLENGES

8.1.1 Agricultural insurance sector is complicated because of a very large and dispersed population of smallholder farmers who practice agriculture in different agro-ecologies with varying climates, farming systems, and agronomic management. These diversities linked with weather adversities result in crop losses of large magnitude every year at least in some states. Climate change is likely to further increase such risks. Technology use for enrolment, loss assessment and claim settlement is therefore a must. However, there is no formal institutional mechanism in Indian agricultural insurance sector to develop, manage and operationalise these technological opportunities. It is felt that a centralised agency is needed to coordinate among various stakeholders including farmer groups, insurance industry, government, banks, and technology providers. The same agency should also be mandated to support, monitor and improve insurance services at the national scale.



8.1.2 There is also a need for some sort of coordination between stakeholders even at the state level, especially

for making technology recommendations. Every state has the related expertise in their agricultural universities, regional/state remote sensing centres, IT agencies, and private sector. India Meteorology Department has in every agro-ecological region a relatively 'informal' AFMU (Agriculture Field Monitoring Unit) that synthesises all agricultural information related to climatic events and provides value-added information to all stakeholders including farmers using ICT mechanisms. The state governments should consider establishing similar formal or informal units for crop insurance purpose where experts from agriculture, remote sensing, ICT and insurance industry can come together to deliberate on issues related to crop insurance in the state and advise the government and other stakeholders on all related issues.

8.2 RECOMMENDATIONS

8.2.1 The central government should consider urgently establishing a dedicated mechanism either within the existing institutions or by creating a new autonomous agency to coordinate among various stakeholders including farmer groups, industry, different government ministries and departments, banks and technology providers related to insurance in agriculture and allied sectors. The same agency should also be mandated to support, monitor and improve insurance services at the national scale. This could also include efficient data collection, storage, and transfer between the stakeholders of different agencies. Similarly, the state governments should consider establishing formal or informal units for crop insurance purpose where experts from agriculture, remote sensing, ICT and insurance industry can come together to deliberate on issues related to crop insurance in the state and advise the government and other stakeholders on all related issues.

8.2.2 Developing innovative insurance products as well as greater use of technology in implementing and monitoring crop insurance would need budget. It is recommended that a sum of 0.25 percent of the premium every year should be made available for such purpose and should be contributed by the central government, state government and insurance industry.

Annexure-I

CONSTITUTION OF THE TASK FORCE

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Annexure-II

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Government of India