IMPLEMENTATION OF YIELD ESTIMATION SYSTEM BASED ON TECHNOLOGY (YES-TECH) IN MADHYA PRADESH

Learnings from select districts towards improved claim settlement against crop losses as part of Pradhan Mantri Fasal Bima Yojana (PMFBY)

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IMPLEMENTATION OF YES-TECH

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IN BRIEF

Historically, crop loss estimation under the Pradhan Mantri Fasal Bima Yojana (PMFBY) relied on manual crop cutting experiments (CCEs) that are resource-intensive, time-consuming, and highly susceptible to errors and manipulation. To overcome these limitations, the Union Ministry of Agriculture introduced YES-TECH in July 2023. YES-TECH is a framework utilising satellite-based remote sensing, weather data, and analytical models for yield estimation. Madhya Pradesh is the only major agrarian state to allocate 100 per cent weightage to YES-TECH for PMFBY claim settlements, building on its 2022 pilot Agri-GIS project (Unnati).

YES-TECH IMPLEMENTATION IN MADHYA PRADESH

Madhya Pradesh rolled out YES-TECH in 2023 primarily for soybean and paddy in the kharif season, and wheat in the rabi season.

- **Key partners:** The Madhya Pradesh Council of Science and Technology (MPCST) serves as the Technology Implementation Partner (TIP), mentored by the National Remote Sensing Centre (NRSC).

- **Operational models:** Yields are estimated using two primary models: Artificial Intelligence/Machine Learning models (which identify patterns between satellite indices, weather, soil, and historical yield data) and semi-physical models (which track crop sunlight absorption and biomass conversion).

- **Data collection and ground truthing (GT):** The models integrate crop mapping, satellite/weather data, and extensive field-based ground truthing. Field agents use mobile applications (like Unnati of Madhya Pradesh and AIC form of Agriculture

Insurance Company) at over 1,30,000 geo-tagged points across the state to validate crop health attributes such as soil moisture and foliage. Data flows into the National Crop Insurance Portal (NCIP) for claim processing by insurance companies.

STAKEHOLDERS' PERSPECTIVES ON IMPLEMENTATION

The transition to YES-TECH has elicited mixed reactions, largely centered around a recent reduction in total claim payouts.

- **Farmers:** Large soybean farmers have expressed growing dissatisfaction, reporting that claim payouts under the new system are substantially lower than those received during the period of manual crop cutting experiments (CCEs), even in seasons marked by significant losses due to unseasonal rainfall or pest attacks. These farmers complain about the system's opacity, missing human interaction (like the local *patwari*), and doubt the satellite's ability to detect granular issues like empty soybean pods or animal damage. Conversely, smallholder farmers note that big farmers historically used local influence to manipulate manual CCEs for hefty payouts. Additionally, many wheat and paddy farmers are satisfied, citing the unprecedented timeliness of claim settlements.

- **Local and district officials:** Officials agree that the system feels opaque to farmers and emphasise their own lack of training, which hinders grievance redressal. While acknowledging technical inconsistencies, they firmly state that farmer agitation stems largely from the inability to manipulate the new technological system, as local claim reporting was frequently manipulated under the old CCE system to inflate losses.

- **Insurance companies:** Insurers strongly support YES-TECH. They explain that lower claim amounts are not a technological flaw but a mathematical consequence of historical CCE manipulation. Because past CCEs falsely reported low actual yields to trigger payouts, the historical baseline—known as the threshold yield (TY)—was artificially depressed. Consequently,

current losses appear mathematically smaller against this lowered TY.

- **State agriculture department:** State officials view farmer dissatisfaction as a localised issue. They note that AI/ML models are trained on historical CCE data, meaning current inaccuracies are inherited from past manual errors. They believe the system will self-correct and become highly accurate as more years of clean, technology-driven data are collected.

CONCLUSION AND WAY-AHEAD

The report concludes that the recent drop in claim amounts is primarily rooted in the historically incorrect reporting of yields under the manual CCE regime, rather than a failure of YES-TECH. By replacing a manipulatable and cumbersome manual process, YES-TECH provides a conceptually sound, efficient, and better alternative. While there are legitimate concerns regarding data granularity (e.g., detecting empty pods) and farmer trust, the implementation has already succeeded in minimising delays and delivering timely payouts to farmers, including some who had never received claims before. However, the immediate challenge lies in addressing the transparency deficit and the 'black box' perception among the farming and agriculture extension community.

To ensure the sustainable scaling of PMFBY through the YES-TECH, the report suggests the following:

For Madhya Pradesh:

- **Improve data validation:** Continue investing in robust ground-truthing and transition to hyper-local, high-resolution satellite infrastructure.

- **Address the 'threshold yield' distortion:** It may be advisable to explore adopting an interim 'ideal yield' benchmark, rather than relying on historically derived threshold yields that may be distorted, until the performance and reliability of technology-based estimation models are sufficiently stabilised.

- **Build trust and transparency:** Actively work to improve stakeholder awareness, train local district officials, and restore farmer confidence through consistent and transparent communication.

- **Expand coverage:** Include more crops under the YES-TECH umbrella beyond soybean, wheat, and paddy, across seasons and guide other states in their YES-TECH rollouts.

At the national level:

- **For states having adopted YES-TECH:** States currently using YES-TECH at lower weightages (e.g., 30-40 per cent) should gradually scale up to 100 per cent using a phased approach based on MP's learnings.

- **For states yet to adopt YES-TECH:** States that have not yet implemented YES-TECH should begin phased adoption for key local crops, gradually replacing manual CCEs while actively consulting with farmers to prevent backlash.

INTRODUCTION: YIELD ESTIMATION SYSTEM BASED ON TECHNOLOGY (YES-TECH) IN MADHYA PRADESH

Crop loss estimation is a key element in agricultural risk management. Under crop insurance schemes such as Pradhan Mantri Fasal Bima Yojana (PMFBY), yield estimation determines crop losses and the commensurate claim settlement for the estimated crop losses. Historically, PMFBY has been relying largely on manual crop cutting experiments (CCEs) for claim settlement, which has been a key reason for farmer dissatisfaction due to perceived inaccuracies and delay in claim payouts. Conducting CCEs across India is also resource-intensive, time-taking, cumbersome and at times susceptible to errors and manipulation.

As a response to the limitations of manual CCEs, in July 2023, the Union Ministry of Agriculture and Farmers Welfare (MoAFW) introduced the 'Yield Estimation System based on Technology (YES-TECH)'[1]. YES-TECH is a framework for estimating crop yield using satellite- based remote sensing, weather data, and analytical models. Since then, 12 states have begun implementing YES-TECH in a phased manner, while giving a minimum 30 per cent weightage to YES-TECH and the remaining to manual CCEs.[2]

IMPLEMENTATION OF YES-TECH

Madhya Pradesh presents a critical case for looking at this transition, being the only major agrarian state to have given 100 per cent weightage to YES-TECH for PMFBY claim settlement.[3] With about 12.5 per cent of total farmers enrolled in PMFBY across the country, Madhya Pradesh is among the top three states. With a pilot Agri GIS Project in 2022 for remote-sensing based yield estimation for claim settlement, it had a headstart.

Recent media reports highlighted that some farmers in a few districts of Madhya Pradesh, predominantly soybean cultivators, are unhappy with the settlement of their crop insurance claims through the YES-TECH and are calling out for its rollback.[4,5,6]

The data from PMFBY dashboard suggests that, by and large, the total amount of claims given to farmers (for all crops) in these three districts has decreased from 2021–24 compared to previous years.[7]

However, we understood YES-TECH as a potential opportunity to improve upon the claim settlement process, making PMFBY a farmer-friendly scheme. But in light of the media reports and preliminary interaction with local stakeholders, we conducted a deep-dive to assess the facts from the ground and identify challenges and opportunities.

This report presents our assessment of the implementation of YES-TECH in selected districts of Madhya Pradesh, drawing on interactions with farmers and other key stakeholders. It examines stakeholder perspectives, identifies key gaps and opportunities in the current implementation, and offers insights to inform more effective rollout at the national level.

SCOPE OF FIELD ASSESSMENT

The field assessment focuses on three districts—Bhopal, Sehore and Vidisha—in the central-western region of Madhya Pradesh. Farmers in these districts have reportedly demanded a rollback of YES-TECH-based claim settlements, citing concerns regarding accuracy and transparency (*see Map 1: Scope of field assessment*).

The research involved engagement with:

- About 50 farmers from 13 villages in these districts who were mainly growing soybean along with wheat and paddy.
- Local and district administrative officials like *patwari*, rural agriculture extension officials, district agriculture officer.
- Civil society and farmer producer organisations in Madhya Pradesh.
- Officials from the State Agriculture Department and Madhya Pradesh Council of Science and Technology (Technology Implementation Partner of YES-TECH in Madhya Pradesh)
- Insurance companies implementing PMFBY in three districts of Madhya Pradesh (Agriculture Insurance Company of India, SBI General Insurance Company) and other areas of Madhya Pradesh (HDFC Ergo) and their remote sensing departments

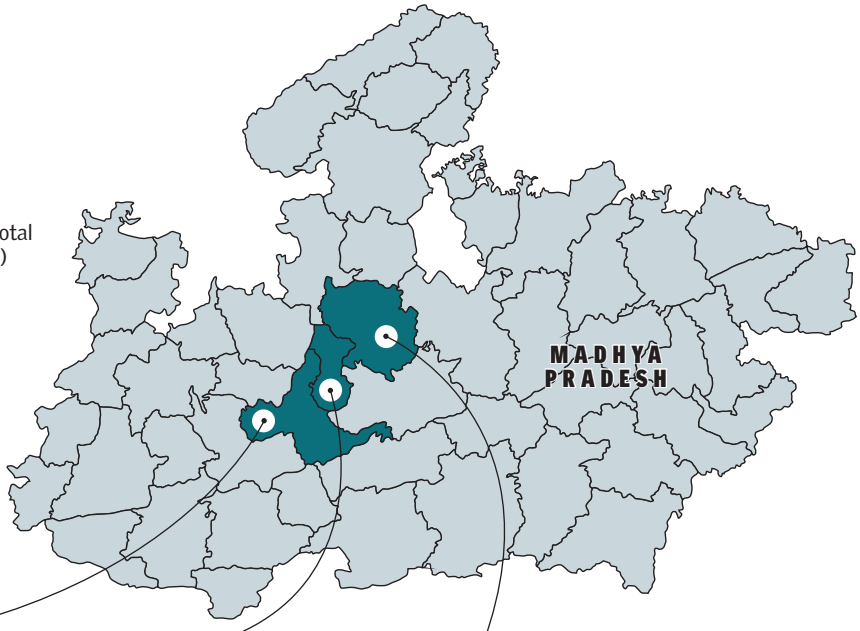
The engagement was largely done through on-field and in-person interaction (individual and group). In some cases, telephonic and online discussions were also conducted.

IMPLEMENTATION OF YES-TECH

MAP 1

SCOPE OF FIELD ASSESSMENT

- Farmers enrolled in PMFBY (percentage of total PMFBY enrolled farmers in Madhya Pradesh)
- Insurance company implementing PMFBY
- Villages (interviewed farmers belong to)



MAJOR CROPS GROWN

Kharif:
major crops-soybean, paddy, maize

Rabi:
major crops-wheat

Other minor crops:
jowar, bajra, tuar, urad, cotton etc.

SEHORE

2,38,498 (5.4%)

- Agriculture Insurance Company of India
- Khamaliya, Narela

BHOPAL

66,793 (1.5%)

- Agriculture Insurance Company of India
- Badjhiri, Phanda Kala, Khajoori Sadak, Int Khedichhap, Teela Khedi and Kodiya

VIDISHA

2,32,103 (5.2%)

- SBI General Insurance Company
- Dhaturia Haveli, Mirzapur, Gulabganj, Saujna, Sorai

Source: PMFBY dashboard (as on 1st March 2026) and primary research inputs

TECHNOLOGY-BASED YIELD ESTIMATION IN MADHYA PRADESH

3.1 AGRI-GIS PROJECT IN MADHYA PRADESH

Technology-based yield estimation began in Madhya Pradesh via its pilot Unnati (Agri-GIS Project) started in 2022, in collaboration with Madhya Pradesh Council of Science and Technology (MPCST), National Remote Sensing Centre (NRSC) Hyderabad and Madhya Pradesh State Electronics Development Corporation (MPSEDC).[8]

The project aimed to reduce the concerns posed by manual CCEs as well as due to human resource limitations during the COVID-19 pandemic. It was implemented for soybean, paddy, maize, arhar and cotton in kharif season and wheat, gram, mustard, lentil and linseed in rabi season. The results were used to disburse PMFBY claims for crop losses. The learnings of the Agri-GIS project fed into the beginning of YES-TECH at the local and national level.

3.2 YES-TECH IMPLEMENTATION IN MADHYA PRADESH

Based on YES-TECH manual, 2023 issued by the Union Agriculture Ministry, Madhya Pradesh began implementing YES-TECH in 2023 for the notified crops – soybean and paddy – in kharif season and wheat in rabi season. Madhya Pradesh was the first state to straight away allocate 100 per cent weightage to YES-TECH for PMFBY claim settlements.[9] However, other states who adopted YES-TECH have given varying

MANUAL CROP CUTTING EXPERIMENTS (CCEs) AND THEIR LIMITATIONS

CCEs are field-based studies carried out to estimate the average yield of a crop in a notified unit, usually a gram panchayat. Fields are chosen at random, a small plot is marked, the crop is harvested and weighed, and the results are recorded. Data from multiple plots is combined to calculate average yield. The value is then compared with the threshold yield (based on historical data). If the average falls below the threshold, farmers in the insurance unit receive claim payouts. Number of CCEs to be conducted are set using statistical principles, depending on crop variability and required accuracy, but generally 8–24 per crops per unit are conducted.

Across India, more than a million CCEs are conducted annually. In recent years PMFBY has introduced mobile applications, geo-tagging and satellite tools to speed up data collection, reduce errors, and make the system transparent.

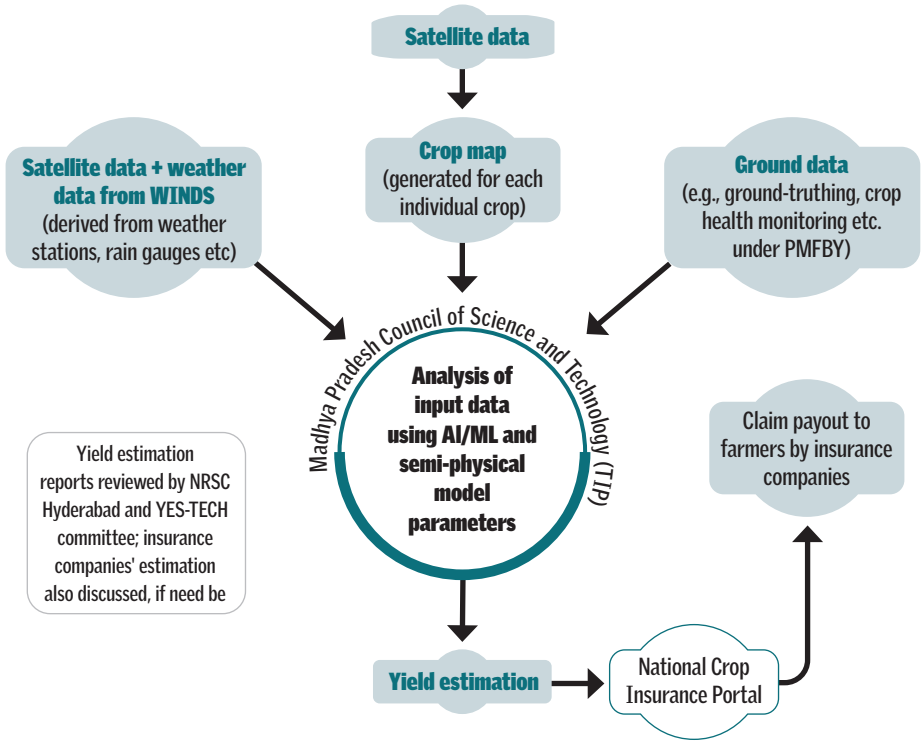
CCEs have historically been subject to errors and/or manipulation. Discrepancies have been reported vis-à-vis identification of the sample plot, measurement of the plot size, and estimation of losses. The number of CCEs required are high and difficult to achieve. They are intensive in labour and time and hence, remain a cause of concern for all stakeholders. Farmers in particular are dissatisfied due to delay and inadequacies in claim payouts based on CCEs. Timely and adequate claim settlement is the key hurdle in scaling up PMFBY.

Source: PMFBY operational guidelines[10]

weightages to it for a gradual transition. For example, Andhra Pradesh, Karnataka, Odisha, Rajasthan and Tamil Nadu have adopted YES-TECH at 30 per cent weightage while the remaining is allocated to manual CCEs. Haryana, Maharashtra and Uttar Pradesh have given 40 per cent weightage to YES-TECH.

For a three-year tenure, Madhya Pradesh Council of Science and Technology (MPCST) was onboarded as the Technology Implementation Partner (TIP). The Mentor Institution for Technology Roll out (MITR) was National Remote Sensing Centre (NRSC) Hyderabad, nominated by the Department of Agriculture and Farmers' Welfare, Government of India.

Figure 1: YES-TECH implementation in Madhya Pradesh



Source: Developed by research team based on YES-TECH manual and primary research inputs

For yield estimation, MPCST conducts crop mapping, data collection, analysis of satellite and weather data and ground truthing. The data is run into the 'AI/ML model' and 'semi-physical model' to estimate the yield or into a set of their merged parameters, if needed. These two models are out of the five prescribed in the YES-TECH manual. The state declares the selected model at the beginning of the crop season as part of the tender notification (*see Figure 1: YES-TECH implementation in Madhya Pradesh*).

The Madhya Pradesh Council of Science and Technology (MPCST) generates periodic reports, which are reviewed by the National Remote Sensing Centre (NRSC), Hyderabad, and discussed within the YES-TECH committee. In cases of discrepancies, estimates submitted by insurance companies are also examined. The validated data is subsequently uploaded to the National Crop Insurance Portal (NCIP) under PMFBY, where access is provided

in varying degrees to relevant stakeholders, including district agriculture departments and insurance companies. This data is then used to process claims, which are disbursed to farmers by the insurance companies.

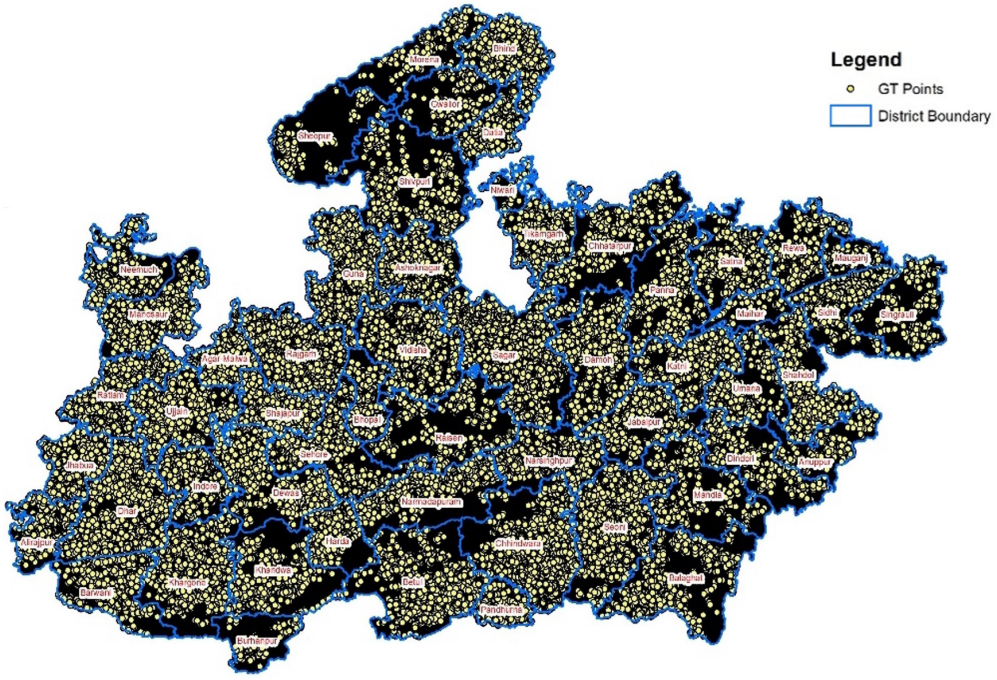
Ground truthing to validate satellite and weather data

Ground truthing (GT) helps validate the data used to model the estimates. Geo-tagged points for GT are set up across the state. Field agents working for the technology implementation partner (TIP) and insurance companies separately conduct their ground truthing studies by filling a list of attributes (in mobile applications such as Unnati of Govt of Madhya Pradesh and AIC's form) at the GT points, which indicate on-ground crop health conditions. A field officer notes these attributes (such as height of crop, foliage, soil moisture status etc.) throughout the crop cycle (*see Map 2: Ground truthing (GT) points of TIP in Madhya Pradesh for kharif 2025*).

As of August 2025, Madhya Pradesh had 130,989 GT points. Of these, 41 per cent (53,714) were allocated to soybean, 23.8 per cent (31,130) to paddy and 20.9 per cent (27,401) to maize. The remaining 14 per cent covered crops such as cotton, groundnut, urad, bajra, arhar, til, moong and jowar. This indicates that soybean, paddy and maize, in particular, benefited from a relatively higher density of ground-validated input data for technology-based yield estimation (*see Figure 2: Mobile applications used for ground truthing in Madhya Pradesh*).

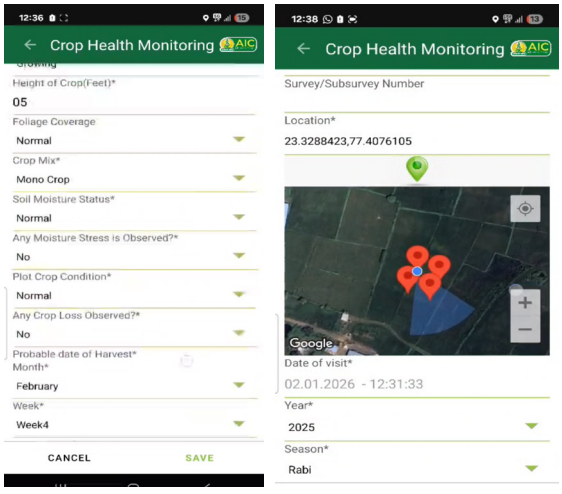
In addition to GT, crop health monitoring also happens through smartphone-based photographs of crops which also get fed into NCIP.

Map 2: Ground truthing (GT) points of TIP in Madhya Pradesh for kharif 2025

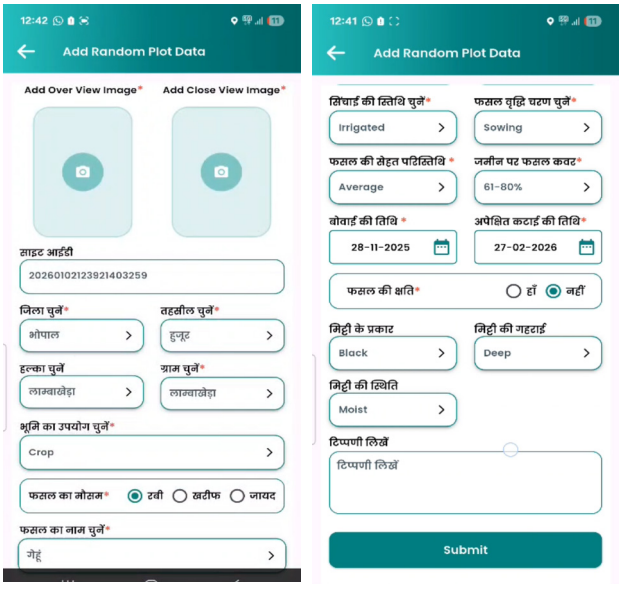


Source: Department of Agriculture, Madhya Pradesh and primary research inputs

Figure 2: Mobile applications used for ground truthing in Madhya Pradesh



AIC form



Unnati

Source: Primary research inputs

3.3. STRENGTHS AND LIMITATIONS OF MODELS ADOPTED IN MADHYA PRADESH AND OTHER STATES

Out of the five prescribed models by YES-TECH manual, 2023 to process the input data and arrive at yield estimation, states follow one or more. Each model has different set of features and therefore strengths and limitations. States typically notify their preferred model at the beginning of the crop season (*see Table 1: Strengths and limitations of models adopted in Madhya Pradesh and other states*).

Table 1: Strengths and limitations of models adopted in Madhya Pradesh and other states

Model and key features[11]	Strengths	Limitations	States
Semi-physical These models use basic crop science to estimate yield and track how much sunlight the crop absorbs, how efficiently it converts this into biomass, and how weather conditions such as rainfall and temperature influence growth. Satellite imagery is used to monitor vegetation indices (e.g., NDVI – Normalised Difference Vegetation Index) over the season, and yield is estimated using crop-specific conversion factors.	Relatively transparent and easier to communicate, relies on established agronomic inputs. Demonstrate strong performance for crops such as wheat and paddy, where canopy growth closely reflects final yield. Lower data intensity compared to simulation models. No dependence on historical yield data.	Constrained by cloud cover in optical data (usually in kharif season). Limited sensitivity to stress factors that do not visibly alter canopy greenness.	Andhra Pradesh, Haryana, Tamil Nadu (kharif), Madhya Pradesh (rabi)
AI/ML (Artificial Intelligence/ Machine Learning) These models identify patterns between yield and inputs such as satellite indices, weather, soil conditions, and historical yield data. Trained to predict yields for the current season using past data.	High predictive power when trained on robust datasets. Capable of integrating diverse and high-dimensional datasets. Adaptive to changing climatic and agronomic conditions.	Quality of historical yield data is critical (often biased due to CCE distortions). Limited explainability ('black box') reduces trust among stakeholders. Requires validation through ground truthing and cross-checks with other models.	Rajasthan, Uttar Pradesh, Madhya Pradesh (kharif)

Model and key features[11]	Strengths	Limitations	States
Crop Health Factor (CHF) - Parametric The parametric index is derived from satellite and weather indicators. Infers performance of the crop based on index behavior (e.g. moisture available for the crop etc.).	Better suited to homogeneous cropping systems. Operationally simple and scalable. Faster claim settlement due to index-based triggers.	Basis risk: Index may not accurately reflect actual yield loss. Limited applicability in diverse cropping systems. Weak sensitivity to localised shocks (e.g. pest outbreaks, micro-climatic variation).	Odisha (high paddy cultivated land), West Bengal (as part of Bangla Shasya Bima Yojana)
Crop simulation These models replicate plant growth processes using daily weather data, soil characteristics, crop calendars, and management practices. Simulate multiple growth scenarios and estimate yield-based on physiological responses to environmental conditions.	Strong theoretical grounding in plant physiology. Capable of scenario analysis (climate variability, input changes). Useful for long-term planning and policy modelling.	Highly data-intensive (requires dense weather station networks and granular soil data). Limited scalability in regions with fragmented landholdings.	Maharashtra, Karnataka, Tamil Nadu (rabi)
Ensemble These models blend any two or more models.	Reduces reliance on single model and improves robustness. Better suited for heterogeneous agro-climatic conditions.	Requires higher system complexity and strong institutional capacity. Difficult to communicate composite outputs.	Assam (combining AI/ML, semi-physical and CHF)

Source: YES-TECH manual 2023 and research inputs

STAKEHOLDERS' PERSPECTIVE ON CROP LOSS ESTIMATION THROUGH YES-TECH

4.1 CROP LOSSES IN SELECT THREE DISTRICTS

State agriculture officials opined that crop losses incurred after 2022 (Agri-GIS project in 2022) were less compared to two to three years earlier. Farmers and local stakeholders however were categorical that substantial crop losses have been happening almost every year, largely due to unseasonal rain. This was particularly in the case of soybean as it is a risky crop. Other reasons for crop losses cited were pest attacks and presence of small/absent bean despite a healthy-looking crop. The crop losses in wheat and paddy were relatively less as they are considered sturdier than soybean.

4.2 FARMERS' PERSPECTIVE

Large soybean farmers across the three districts expressed dissatisfaction with the shift to technology-based claim assessment under YES-TECH, reporting a decline in the claim amounts received compared to the earlier system based on manual Crop Cutting Experiments (CCEs). Many indicated that, in recent years, the compensation received does not adequately reflect the extent of crop losses experienced.

In the case of wheat and paddy, farmers experienced lesser losses as they are seen as sturdier crops against unseasonal rainfall.

However, some small farmers mentioned that they never received adequate claims even when manual CCEs were done.

Smallholder soybean farmers also shared the same. They were clear about the reasons why they did not receive claims earlier in contrast to the big farmers, who could manage to get hefty claim amounts. The small farmers highlighted friendly ties between big farmers and local administration, *patwaris* or political leaders. This influence at the local level was leveraged to secure adequate or even higher claims than the losses faced by big farmers.

At present, many large soybean farmers perceive technology-based crop loss assessment as inaccurate. For instance, farmers in Sehore district reported that despite experiencing similar levels of crop damage in adjacent fields, the claim amounts received varied considerably. Several farmers questioned the ability of satellite-based assessment to capture yield variations at the pod level, citing instances where crops appeared fully mature externally but contained poorly developed or empty beans. Concerns were also raised regarding the adequacy of technology-based methods in assessing crop losses caused by animals and wild animals.

Farmers reported low levels of trust in the new technology-based yield estimation system. Many noted the absence of familiar local officials such as the *patwari* or *tehsildar* visiting their fields, leading to a perception that the human interface in the assessment process is missing. Several farmers indicated that they do not understand the basis on which crop losses are currently assessed and feel uncertain about whom to approach to verify the data used or raise grievances in case of dissatisfaction. Under the earlier CCE-based system, farmers expressed greater confidence as local officials visited their fields, allowing them to directly discuss crop conditions and share concerns.

Some large soybean farmers strongly advocated rolling back technology-based crop loss assessment and reverting to the earlier system of manual crop cutting experiments (CCEs) for determining

FARMERS' PERSPECTIVE – SELECT EXCERPTS

'I have suffered losses in soybean as well as wheat and paddy in multiple cropping seasons. Despite this, I have not received claims for not just one, but several cropping season losses. At the same time, year after year, I have witnessed farmers related to the *patwari* receiving claims for their losses. Manual CCEs allowed the *patwari* to note and average out losses. However, they have not reported our losses accurately. Even with the advent of technology I have not received my claims. Small and marginal farmers will always remain at a disadvantage.'

—Farmer from Dhaturia Haveli, Vidisha

'I have not received any claims in the last four years, despite suffering more than 60 per cent loss in my soybean crop in at least two of those years. Earlier, I used to receive some compensation. Now, with the shift to technology-based assessment, I am not receiving the claims I am entitled to.'

—Farmer from Khamaliya, Sehore

'Earlier, we could talk to our *patwari* to understand our claim settlement. Now, technology has made that process completely opaque. We do not know when the satellite went from above us and took a photograph of our fields. When we cannot see the satellite, how do we trust that it has correctly noted all our losses?'

—Farmer from Gulabganj, Vidisha

'Merely a few days ago, an entire herd of deer ruined our crops. What will the satellite do in that case? We have no trust in satellite.'

—Farmer from Khamaliya, Sehore

'Technology has not been able to successfully capture the losses we have incurred. There have been instances when the soybean crop stood in the field ready for harvest, appearing lush and healthy. But when we harvested it, the pods were empty, without the beans inside. How can a satellite capture what is happening inside the pod? If it could, why are commensurate claims for these losses still not reaching us?'

—Farmer from Badjhiri, Bhopal

claims. Their concerns centred on perceived lack of transparency, potential inaccuracies in calculations, and the absence of direct human interaction in the assessment process.

In contrast, a section of farmers expressed satisfaction with the technology-based claim settlement process. These farmers, who

cultivated wheat, paddy and other crops in addition to soybean, appreciated the timeliness of claim disbursement, which had been a major concern under the earlier manual CCE-based system.

Many farmers are shifting towards wheat and paddy, as the soybean varieties they have been cultivating (e.g., JS 9305, JS 9560) are perceived to be becoming less productive over time, while indigenous seed varieties are seen as more resilient. They have also moved away from wheat varieties such as Sharbati, which are no longer as productive as they used to be.

Some farmers who were not enrolled in PMFBY stated that they do not intend to enroll in the future, citing uncertainties surrounding the claim settlement process.

4.3 PERSPECTIVE OF LOCAL AND DISTRICT OFFICIALS

Local and district level authorities also agreed to some of the concerns raised by the disgruntled farmers. For example, a rural agriculture extension officer highlighted multiple cases in Bhopal where soybean crops appeared ready for harvest, but the pods were found to be empty, with the beans absent inside.

In addition to endorsing the testimonies of rural agriculture extension officials, the district officers also stated that they are often left unaware about the details of yield assessment. This makes it difficult for them to address farmers' grievances and frustration. They felt that the technology-based process is opaque due to the way data is collected and processed. They added that administrative staff would benefit from training on these processes to improve understanding and respond more effectively to farmers' grievances.

They also highlighted gross inconsistencies in the amount of claims received against similar crop losses in nearby areas and shared an example of how two farmers owning same-size fields adjacent to each other received Rs 40,000 and Rs 60,000

as claim amounts respectively. Such instances have also been reported by farmer leaders and may have contributed to the agitation demanding a rollback of YES-TECH implementation. District officials added that ground-truthing, at times, becomes a procedural exercise carried out largely to meet targets mandated under the scheme, rather than to accurately capture crop conditions on the ground.

District officials categorically stated that the real reason for the farmers' agitation is not gaps in the technology. Instead, it is the manipulation that has occurred during the claim settlement process at the local level. Often the yields reported were lower than the actual yields to show high losses for hefty claims. There were also instances cited where claims were disbursed despite the absence of any crop loss. Interestingly, they noted that some farmers report yields higher than the actual output in order to avail benefits under the state's Bhavantar scheme, which compensates farmers when market prices fall below the Minimum Support Price.

They acknowledged that with the introduction of technology, such inconsistencies have reduced. Although the claim amounts may at times be perceived as lower, they are now disbursed in a timely manner, unlike earlier instances when claims reached farmers' bank accounts after several years. They also noted that claim ratios, defined as the total amount of claims paid out against the gross premium collected, have also improved.

However, they remained unsure whether satellites can adequately capture the reality of crop yield, particularly given the high density at which soybean is often cultivated. They cited instances where farmers sow at nearly double the recommended seed rate (the quantity of seeds sown in a unit area), making it difficult for remote sensing to accurately assess the actual condition and productivity of the crop.

4.4 PERSPECTIVE OF INSURANCE COMPANIES

Representatives of the insurance companies that are directly involved in claim settlement in the three districts believed that the technology-based yield estimation is a better alternative than manual CCEs. These companies, which are key implementers of PMFBY, are of the view that while YES-TECH may have certain technical limitations that can be improved, it remains a useful tool overall.

They suggested that farmers' perception of reduced claims may stem not from technological errors, but from comparatively lower yield estimates recorded through manual CCEs. Large and powerful soybean farmers were able to shape outcomes of manual CCEs by influencing local administrative processes, resulting in yield estimates lower than actual production and consequently higher claim payouts.

This is because the formula to arrive at the claims is dependent upon the difference between the actual yield (AY) of any year and the average yield of the past several years known as threshold yield (TY). The lesser the actual yield shown, the higher the claim received by the farmer.

While farmers were able to receive money at the time, the situation has now shifted. Firstly, because of the lower yield values reported previously (showing more crop loss to receive higher claims), the threshold yield values have now been reduced (the average yield

PERSPECTIVE OF INSURANCE COMPANY FIELD OFFICERS

Their perspective focused on examining the underlying factors contributing to reduced yields, which, they argued, should be assessed before questioning the credibility of the technology.

They highlighted issues related to decreasing seed productivity, reduced yield due to monocropping and farm management practices that are not in line with traditional crop and soil health management practices, poor price realization of produce, and additional burden due to increasing climate variability.

THRESHOLD YIELD AND ITS INFLUENCE ON CLAIMS (AN ILLUSTRATION)

Claims = [(TY – AY)/TY] x SI
Threshold yield (TY): Average of the best five out of the last seven years' yield multiplied by an indemnity notified by the state for the respective season and crop. It is usually the benchmark for a good yield.

Actual yield (AY): Yield of a particular season in context, arrived at because of estimation (via manual CCEs or remote sensing).

Sum insured (SI): Maximum amount assured to farmer in the event of losses.

For example, if the AY of an insurance unit (typically a village or gram panchayat) for soybean across the last seven kharif years are as follows:

	2019	2020	2021	2022	2023	2024	2025
AY (Kg/ha)	1,050	1,100	800	1,000	1,150	1,250	750

TY based on average of the best five years and an indemnity of 90 per cent, will be:
TY = {(1050+1100+1000+1150+1250)/5} *90 = **999 Kg/ha**

Assuming the sum insured of Rs 42,000 per ha (in 2025), the claim generated will be about **Rs 10,468** per ha {(999-750)/999} *42,000

The following example illustrates low claims received in the event of lower actual yields reported in earlier years.

	2019	2020	2021	2022	2023	2024	2025
AY (Kg/ha)	750	850	810	825	850	900	750

In this case, TY = {(850+810+825+850+900)/5} *90 = **762.3 Kg/ha**

Assuming the sum insured of Rs 42,000 per ha, the claim generated will be about **Rs 677** per ha {(762.3-750)/762.3} *42,000

Source: Developed by research team based on PMFBY operational guidelines and primary research inputs

of past several years). Secondly, because of no manual interface, farmers are not able to influence the yield values. Thirdly, the technology is poised (if not now, then in the future) to capture yield values more accurately. This means that estimated yields will be closer to reality in the future.

The remote sensing teams of insurance companies shared that they also run yield estimation models in parallel and their results are factored in TIP's results, if need be, after discussions. They added that concerns around exact accuracy and granularity remain and there was room for 20–30 per cent error. They clarified that it would take a few seasons for the AY and TY values to find better stability. With further layers of checks and balances (such as ground truthing), the trends are certain to move towards better accuracy.

As a potential solution to the problem of inaccurately recorded historical yields, it was suggested that insurance units could move beyond threshold yield values and instead adopt benchmark 'ideal' yield values that more closely reflect long-term yield realities.

4.5 PERSPECTIVE OF TECHNOLOGY IMPLEMENTATION PARTNER

The Madhya Pradesh Council of Science and Technology (MPCST) is the technology implementing body in the state. Representatives of the TIP opined that their key job is to estimate actual yield as mandated in YES-TECH guidelines by using remote sensing and modelling. However, they too shared that the inaccuracies in documenting historical yield have led to a threshold yield that could be the reason for no or low claims received by farmers.

They added that in the next few years, the threshold yield would be rectified and be closer to actual figures and appropriate claim settlements would be ensured in the event of losses. They also highlighted that continuous validation through ground-data, and checks and balances, are being maintained. As a whole, this

practice will improve over the years as the indices level out, and it will move towards accuracy as the values become more granular.

They agreed that the satellite data used in the models to estimate yield could be more granular and have better resolution. Currently, such information is obtained from open-source data (such as Sentinel-1, European Space Agency) and not Indian satellites. Weather datasets include those sourced from automatic weather stations (AWS) and automatic rain gauges (ARG) of government and private sectors.

4.6 PERSPECTIVE OF STATE AGRICULTURE DEPARTMENT

The state agriculture department officials opined that the issue of technology-driven claim settlements appears more as a localised phenomenon rather than deficits in the technology. This inference is based on the view that the situation does not reflect the experience of all farmers across the state, particularly as recent years have been relatively favourable, with limited crop losses.

They also mentioned that the YES-TECH models in use have been trained on historical CCE data, as is the case for training any model. As a result, accuracy is dependent on the accuracy of historical yield data. Ground truthing is also occurring in parallel to validate the input data. Farmers' perception that some soybean pods were empty cannot be attributed to a technological flaw; rather, it is more likely linked to farm management practices and the specific crop or seed varieties used.

Hence, claims are commensurate with the losses. Technology-based yield estimation and claim settlement overcomes the earlier constraints of manual CCEs for all stakeholders involved in the processes. In the next few years, as the models become trained on technology-based yield values, the claims will be even more accurate.

With the introduction of technology-based yield estimation and claim settlement, farmers in these districts who previously received higher claim payouts are now receiving comparatively lower amounts. Conversely, in paddy-growing regions such as Jabalpur district, farmers have begun receiving claims after several years in which no payouts were made.

Improved access of data to stakeholders will help address data transparency concerns and technology is the way forward for the otherwise tedious CCEs.

CONCLUSION AND WAY-AHEAD

Based on research and insights gathered from a diverse set of experts and stakeholders, particularly across three districts of Madhya Pradesh, the following conclusions can be drawn regarding the current state of YES-TECH implementation, along with key considerations for the way forward:

- At present, crop losses are a reality for multiple reasons. However, the last couple of years have yielded better results than previous years. The claims received by big soybean farmers based on YES-TECH seem to be lower compared to those received earlier which were based on manual CCEs.

- The main reason for such hefty claims in the past was incorrect reporting (during the times of manual CCEs) to show lower yields and thereby higher losses. Lower claims in recent years are also rooted in historically under-reported yields. Because the average yield is calculated on the basis of past data, lower values recorded earlier reduce the benchmark against which current yields are assessed. This narrows the difference between current and average yields, making present crop losses appear smaller. The core issue, therefore, lies in the historically inaccurate reporting of yields.

- At the conceptual level, YES-TECH involves high-end technology such as the AI/ML, remote sensing through satellite imaging etc. and no-minimal human interface. It can be expected to be effective, efficient and prove to be a better alternative than manual CCEs for yield estimation, which in addition to being resource-intensive and cumbersome, can be erroneous and

subject to manipulation. Of course, YES-TECH would need a carefully considered phased implementation in line with the local situation and incorporate the learnings and feedback from the ground to keep improving, until it becomes a robust and near-perfect approach.

- While the quantum of claims through YES-TECH implementation in three districts of Madhya Pradesh appear to have reduced and may not be in line with the crop losses faced by farmers, the timeliness of claim payouts has improved significantly. The delays are minimal and there are some farmers who are satisfied with the claims received. In addition, there are instances (such as of paddy farmers in Jabalpur, Madhya Pradesh), wherein claims against crop losses have been received after YES-TECH implementation, for the first time.

- As the YES-TECH implementation is in its early years, it can be expected that the currently observed concerns over lack of granularity and absolute accuracy will be worked upon and improved going forward. Over time, with better recording of actual yields, the estimated losses and claims in future can be expected to be closer to reality. In the interim, if needed, an ideal value of yield can be developed and adopted (instead of the threshold yield which is based on historically incorrect reporting of actual yield).

- Farmers' lack of trust in YES-TECH appears to be a localised phenomenon, observed particularly among large soybean farmers in select districts in this case. However, it warrants attention alongside concerns raised by district and state-level stakeholders regarding limited awareness of YES-TECH implementation in their respective areas and restricted access to data specifics. Restoring stakeholder confidence will also require greater transparency around the validation of input data used in the models.

WAY-AHEAD

Across India, a robust crop insurance scheme can provide the required safety net against the vagaries of extreme weather events, which are increasing. It will add to farmers' resilience and contribute to sustainable food systems in the country.

While PMFBY adoption has increased over the years its overall coverage remains limited in the country (about two crores farmers are enrolled as of kharif season in 2025). Timely and satisfactory claim settlement is a critical bottleneck in the desired scale up of PMFBY.

In this regard, YES-TECH is potentially a promising alternative to address the concerns with manual CCEs. The ongoing adoption by different states reflects a good move in this direction. With the allocated 100 per cent weightage to YES-TECH in Madhya Pradesh, the early years of implementation provide rich learnings for a wider scale-up based on which, the following can be considered going forward:

Madhya Pradesh should consider/continue to:

- Invest in/adopt robust validation of input data such as in the case of ground truthing, currently done by different stakeholders.
- Invest in building/using technology infrastructure for hyper-local and accurate input data and training models for yield estimation.
- Improve stakeholder awareness and build capacity, while addressing concerns around transparency and strengthening communication to foster greater confidence and trust among farmers.
- Include more crops in YES-TECH in addition to soybean, wheat and paddy.

- Continue to guide and help other states towards adopting/ scaling up YES-TECH implementation.

At the national level:

- **States that so far have adopted the YES-TECH** should consider adding the weightage given to it compared to manual CCEs with an aim to move towards 100 per cent over time. These states should also work towards including more crops under YES-TECH and with time increase weightage to 100 per cent. All this should be done through a phased-approach incorporating learnings developed in initial years and also in consultation with local stakeholders (including farmers) to build trust and confidence.

- **States that have not yet adopted the YES-TECH** should consider doing so starting with one or more key crops based on the local situation and gradually increasing the weightage given to YES-TECH over manual CCEs. It would be useful to coordinate with Madhya Pradesh to incorporate their learnings in the beginning. Here too, it should be a phased approach, in line with the local context and taking along farmers and other stakeholders to build confidence.

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Effective agricultural risk management relies on accurate crop loss estimation, yet traditional Crop Cutting Experiments (CCEs) are often resource-intensive and prone to error. To modernise this process, India introduced the Yield Estimation System based on Technology (YES-TECH).

Madhya Pradesh serves as a primary case study, being the first state to rely fully on this technology for insurance claims. However, local feedback reveals emerging challenges and calls for its rollback.

This report evaluates the implementation of YES-TECH across selected districts, identifying critical gaps and stakeholder concerns to provide a roadmap for a more effective national rollout.

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