Pest Risk Information SErvice (PRISE): impacts, partnerships and next steps

Key messages

- PRISE is an early-warning information system that helps to reduce farmers' crop losses by utilizing earth observation data to generate location-specific short text message (SMS) alerts on the optimal time to act against pests

- PRISE is embedded in government plant health and agricultural extension systems, with their dissemination platforms used to send farmers PRISE alerts and related agricultural advice

- PRISE has reached over 2 million farmers in Kenya, Ghana, Zambia and Malawi

- A 2024 study among tomato farmers in Kenya found the alerts to have increased yields by 16% and income by 10%

- PRISE helps to reduce pesticide use, with the same study in Kenya finding alerts reduced pesticide spraying by 11% and pesticide costs by 12%

- PRISE is highly scalable to additional countries and can deliver data and advice from field-level to a national scale

PRISE's next steps include:

- partnering with public and private agro-advisory services in existing PRISE countries to integrate PRISE into more dissemination platforms

- working with new dissemination partners to reach more farmers with PRISE alerts

- establishing partnerships to implement PRISE in new countries, particularly in sub-Saharan Africa

- developing new pest models to add further pests to the PRISE portfolio, working alongside national agricultural research partners

- leveraging the PRISE platform and datasets for other applications, such as early warning risk alerts for floods and droughts

Background

The impacts of crop pests are immense: they cause crop losses of up to 40% globally, with huge consequences for food security, supply chains and international trade. Smallholder farmers in sub-Saharan Africa are particularly affected, due to their reliance on crops for their food and livelihoods. Climate change is making this problem worse, as pest migrations, local pest outbreaks and incidence levels are becoming harder to predict – and therefore more difficult to respond to at the correct time. If farmers respond at the wrong time, they waste precious resources and can risk environmental, human and animal health due to unnecessary pesticide use.

This is where the Pest Risk Information SErvice (PRISE) comes in. PRISE is an early-warning information system that provides farmers with alerts on the best time to intervene in a crop for effective and efficient pest management. PRISE brings together biological models, Earth Observation- (EO-) derived weather data, geographic data, and agronomic expertise to generate location-specific alerts on the optimum time to act against pests. Through integration with existing plant health and agricultural extension services, these alerts are sent to farmers together with advice on pest management approaches, enabling farmers to take action when they are most likely to achieve a maximum kill rate of the pest in question. This approach equips farmers with improved decision making, enabling them to efficiently use effective pest control methods and boost incomes.

The PRISE data cube and pest models

At the heart of PRISE is a 'data cube' where large sets of data from various sources – satellite observation, weather patterns, geographic information, details about seasonal occurrence and the biology of pests – are assembled and stored. The data is processed to run algorithms and create pest and disease models to generate timely pest risk forecasts.

The advanced statistical models, driven by EO data, provide targeted predictions for the best timing of pest control. They are guided by the pest's biology, with temperature a key factor in predicting each stage of the pest's life cycle.

PRISE utilizes two primary model types:

- Basic models: Using the relationship between temperatures and pest development, these models predict the occurrence of immature stages and identify the optimum time when pest species are likely to be the most targetable and when the population is at its highest.

- Economic threshold model: Applied to key pests such as the fall armyworm, this model tracks pest development and predicts when pest populations will reach economic thresholds – levels where damage justifies intervention. This helps ensure that pest management strategies are timely, targeted and cost-effective.

Both models can be combined with other pest management strategies including biological or chemical pesticide applications. PRISE does not recommend specific interventions but builds on those recommended by in-country partners.

PRISE currently incorporates models for maize pests (Spotted stem borer; African maize stalk borer; Fall armyworm), bean pests (bean fly, pea leafminer) and tomato pests (*Phthorimaea absoluta*, tobacco whitefly, cotton bollworm). The models have been scientifically validated through field trials in Kenya, Ghana, Zambia and Malawi and during different growing seasons to ensure their robustness and reliability in real-world applications.

Pest alerts

PRISE pest alerts are the key outputs of the PRISE system and are disseminated in two forms: SMS messages sent directly to farmers, and PRISE bulletins – pest alerts in map formats along with country-relevant pest management recommendations – sent to agricultural extension advisors, who then pass on the information to farmers. In the former pathway, bespoke, location-specific and time-specific PRISE alerts on the optimum "time-to-act" (TTA) window are sent via SMS platforms that are already being used to send messages to farmers on good agricultural practices (GAP) such as advice on planting, irrigation, harvesting and storage. An example is PRISE's partnership with the Kenya Agricultural & Livestock Research Organization (KALRO), which sends SMS messages to nearly one million farmers each month containing both PRISE alerts and GAP advice.

Alongside these individual SMS messages to farmers, PRISE bulletins are sent to agricultural extension advisors, who pass on the information to farmers, farmer groups, co-operatives and other groups. This pathway benefits from existing face-to-face relationships that are the most trusted and most relied upon by farmers. By employing both dissemination routes, PRISE achieves both breadth and depth of farmer reach.
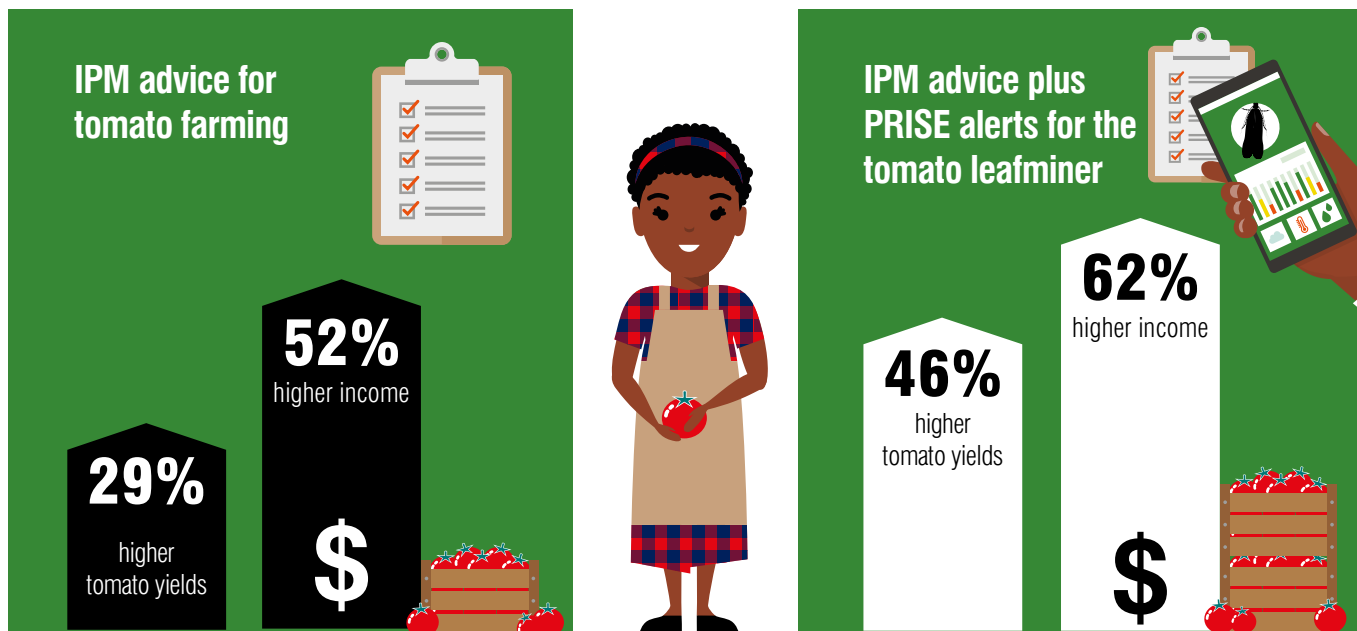
The role of PRISE in government systems

PRISE is a value-addition service that complements and is embedded within existing agricultural extension and plant health systems. Once PRISE is established in a given country, the government's role is to disseminate the PRISE alerts to farmers through the pathways described above. Ministries of agriculture and their extension experts contribute to PRISE by selecting target pests, collecting in-country field data to support PRISE models, and providing feedback for model validation. Current government partners include the Zambia Agriculture Research Institute, the Ministry of Agriculture, Livestock and Fisheries in Kenya, the Kenya Agricultural & Livestock Research Organization (KALRO), the Ministry of Agriculture (MoA) in Malwai and the Plant Protection and Regulatory Services Directorate in Ghana.

Impacts

PRISE alerts have benefited over 2 million farmers in Kenya, Ghana, Zambia and Malawi from 2017 to 2024, and increased their yields by 13% on average. In terms of uptake of PRISE recommendations, 59% of Kenyan maize farmers who received PRISE recommendations for fall armyworm through SMS messages in 2019/2020 reported that they changed their practices based on the recommendations, and the most commonly reported outcomes of this were a reduced population of the pest and an increase in maize harvest.

In 2024, a randomized controlled trial study among 1,306 tomato farmers in Kenya found that while messages on GAP alone increased yields by 29% and income by 52%, compared to a control group, when PRISE alerts were added to the GAP advice, yields increased by 46% (+16%) and income increased by 62% (+10%) relative to the control group. The study also found that GAP advice combined with PRISE alerts reduced pesticide spraying by 11%, frequency of spraying by 14%, and pesticide costs by 12%.

The pathway to impact for PRISE is via the combination of GAP advice and location-specific and time-sensitive PRISE alerts, which leads farmers to adopt improved integrated pest management (IPM) practices that are better timed and targeted. Instead of receiving blanket advice to apply pesticides every other week, for example, PRISE enables more calibrated advice that is location- and time-specific. This reduces the amount of pesticides farmers use, the amount of money they spend on these products, and the amount of time they spend in the field applying them.

IPM advice for tomato farming

29% higher tomato yields

52% higher income

$

IPM advice plus PRISE alerts for the tomato leafminer

46% higher tomato yields

62% higher income

$

Findings from the 2024 PRISE randomized control trial study

Next steps

The aim is now to scale up PRISE, both in current PRISE countries and in new ones, particularly across sub-Saharan Africa. Since partnerships are key to PRISE's delivery and sustainability, this will be done by strengthening existing partnerships, and developing new ones, with the following three stakeholder groups:

1. **Implementers**: We aim to strengthen existing collaborations and establish new partnerships with governments and their agencies. This includes national public and private agro-advisory services who it is hoped will integrate PRISE models into their digital advisory platforms. We stand ready to work with these partners to evaluate their country needs and develop strategies to improve their pest risk alerts and management. We plan to initially focus on East African and Southern African countries, as the current PRISE pest models are well validated for these regions, meaning that less work is required to establish PRISE there.

2. **Disseminators**: We want to extend current PRISE partnerships, and establish new ones, with third-party organizations, extension services and advisors, who it is hoped will demonstrate PRISE to farmers and explore new pathways for sending PRISE alerts to farmers and user communities, helping to increase the reach and impact of PRISE.

3. **Researchers and data partners**: We plan to expand PRISE partnerships with researchers and data partners to:

   • calibrate existing pest models for use in new locations and develop new pest models so that new pests can be added to the PRISE portfolio. This will include training national agriculture researchers to develop models for pests that are of particular concern in their country, covering agricultural and horticultural crops, and both insects and pathogens.

   • boost the provision of input data for both existing and new pest models

   • develop innovative models that go beyond pest control. For example, by using historical climatology data, we can support decision-making throughout the food production process, including beyond the farmgate. This covers issues such as the appropriateness of production sites, drought and flooding risk, input distribution, financial inclusion services, and more.

To find out more and to discuss opportunities to work with us on PRISE, please contact:
Charlotte Day, Project Executive, c.day@cabi.org and **Henry Mibei**, Project Manager, h.mibei@cabi.org

www.cabi.org