

Evaluating the Success of 3 R-Gene late blight resistant potatoes in the diverse agricultural landscapes of Indonesia.



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The Feed the Future Global Biotech Potato Partnership (GBPP)

- **Partnership:** A five-year multi-institution cooperative agreement between USAID, MSU, the International Potato Center (CIP) and the University of Idaho in partnership with leading international research institutions.
- **Target countries:** Bangladesh, Indonesia, Kenya and Nigeria
- **Product:** Late Blight Resistant Potato



Global Biotech Potato Partnership Objectives:

1. Demonstrate commercial potential of 3 R-gene LBR potato technology with field trials in target countries.
2. Regulatory submission for general release of the 3 R-gene LBR potato.
3. Product deployment through biotech seed system and stewardship.
4. Second-generation disease resistant (DR) potato.
5. Communication and Advocacy.

GBPP 3R-Gene Late Blight Resistance Technology

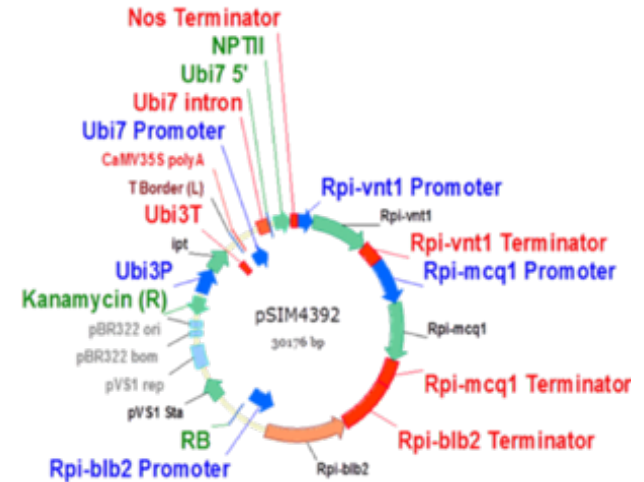
Simplot Plant Sciences 3R-gene T-DNA (Diamant and Granola)

3 Rpi-genes with highest resistance levels

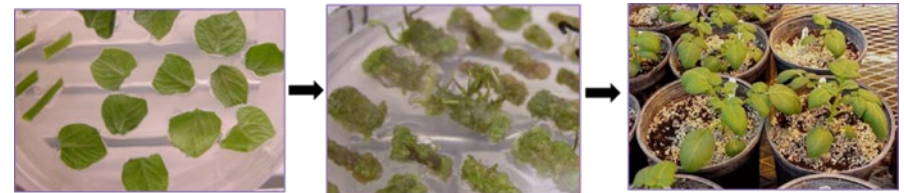
Rpi-vnt1.1 from *Solanum venturii*

Rpi-mcq1 from *Solanum mochiquense*

Rpi-blb2 from *Solanum bulbocastanum*

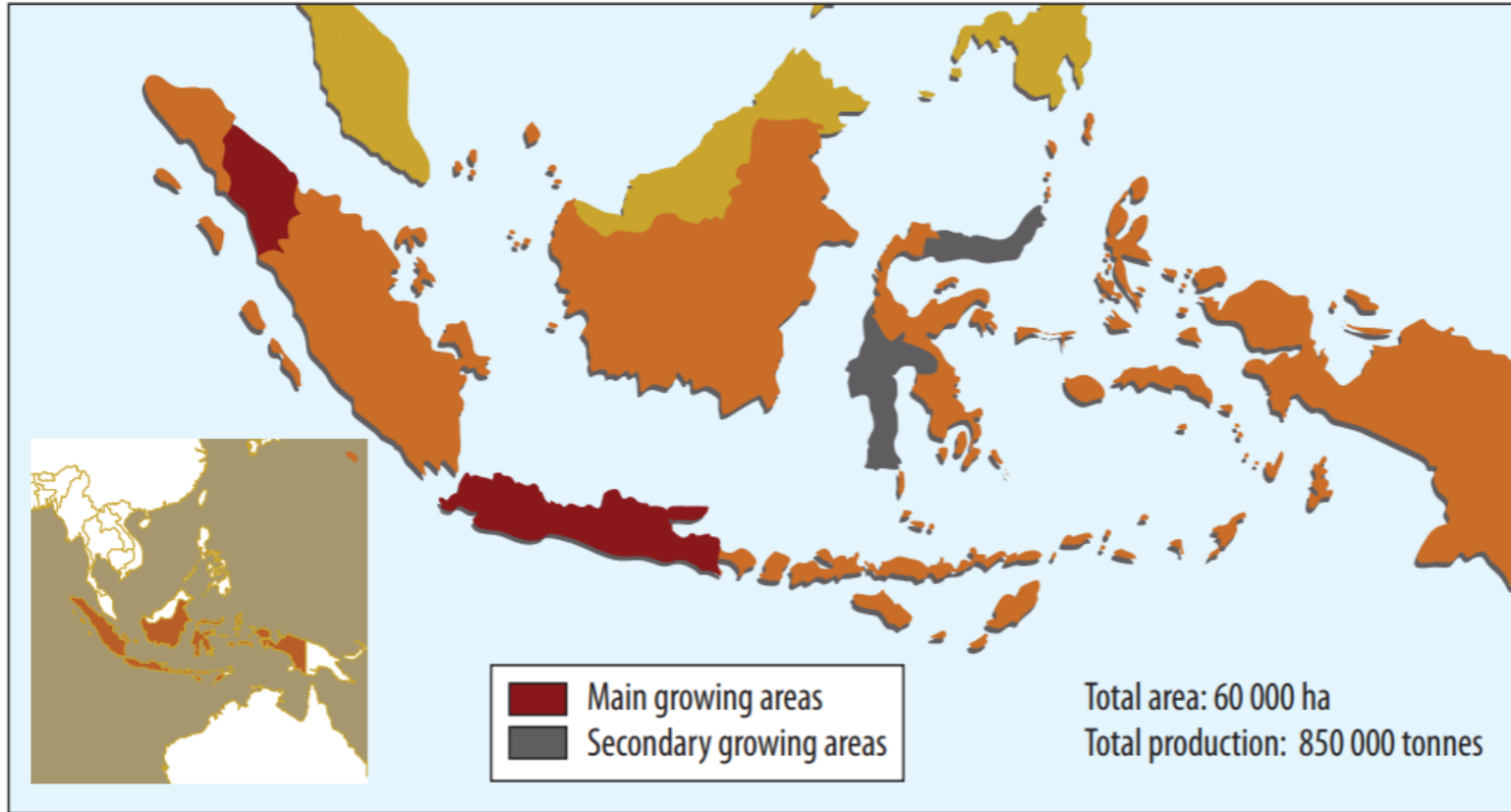


MSU: pSIM4392



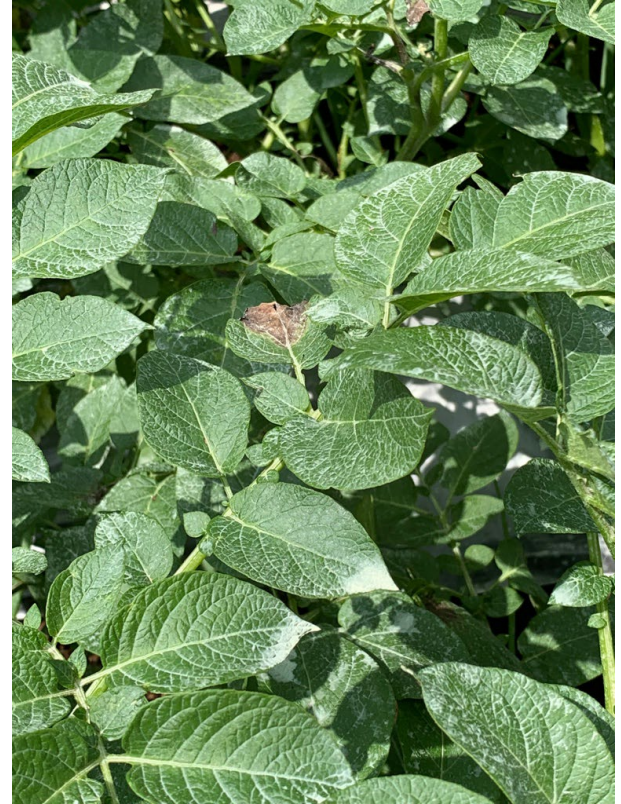
Agrobacterium Potato Transformation

Potato producing regions in Indonesia



Late blight impact in Indonesia

- Most growers spray at least every 2 days to keep late blight under control.
- This amounts to more than 20 sprays per season.
- Fungicide costs per year may be up to 40% of production costs.
- If growers do not spray the disease can decimate a field in less than 2 weeks.



Southeast Asia Target Country: Indonesia

Why Indonesia?

- small holder farmers
- high cost of inputs (up to 40% of production costs)
- terraced (all land is utilized)
- extremely high late blight disease (infection starts just after emergence)



Indonesia LBR products:

- Granola farmer preferred variety
- Granola 3R-gene LBR events
UG234, UG265



Confined field trial setup

- To test the efficacy of the 3-R-gene construct in the potato varieties for Indonesia
- Test lines and non-gm cultivars were tested in a factorial randomized complete block design fungicide x cultivar trial.
- In Indonesia trials were carried out in Pangalengan and Lembang, West Java and Kledung, Central Java from April to June 2024 and in Tosari, East Java in from November 2024 – January 2025.
- Agronomy data, (emergence, plant height and width, stem number etc) and late blight incidence and severity, were rated during the season and tuber weight and number were assessed at harvest.

Indonesia Confined Field trials (60 days after planting)



Sprayed Plots



Non-GM Granola (sprayed)

Pangalengan, W. Java

Indonesia Confined Field trials (60 days after planting)



Non-Sprayed Plots

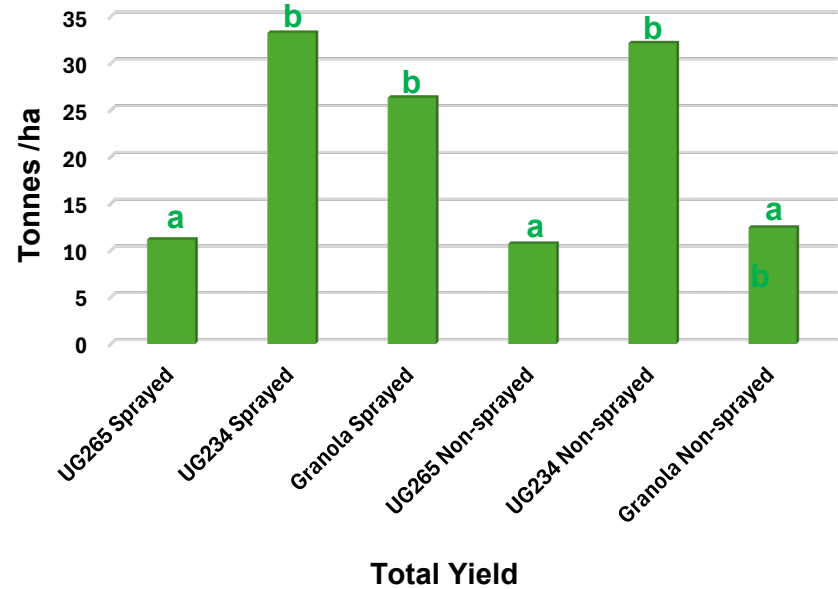
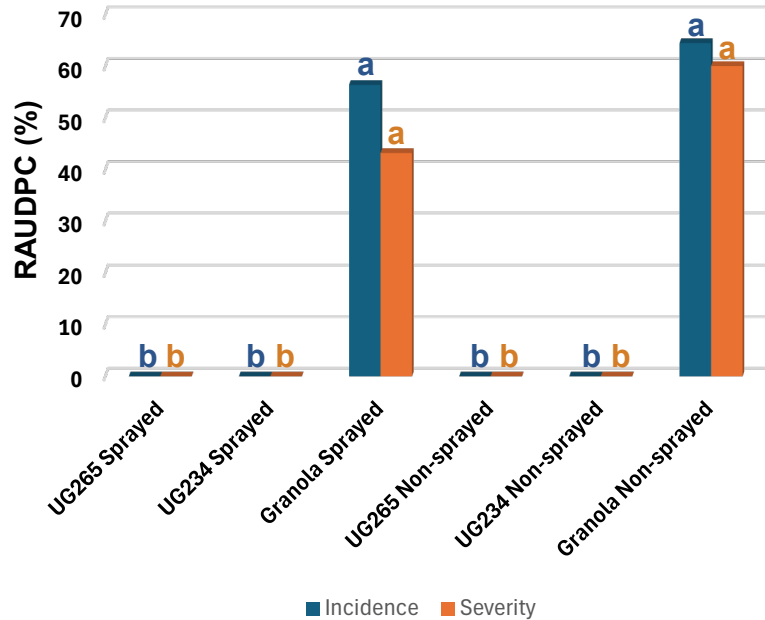


Non-Sprayed Granola

Non-Sprayed UG234

Pangalengan, W. Java

Pangalengan Results



Data for the different coloured columns were analysed separately. Columns of the same colour with the same letters are not significantly different at $P = 0.05$ (Tukey multiple comparison method).

Indonesia Confined Field trials (60 dap)



UG234 (sprayed)



Non-GM Granola (sprayed)

Lembang, W. Java

Indonesia Confined Field trials (60 dap)



Non-Sprayed
Granola

Non-Sprayed UG234

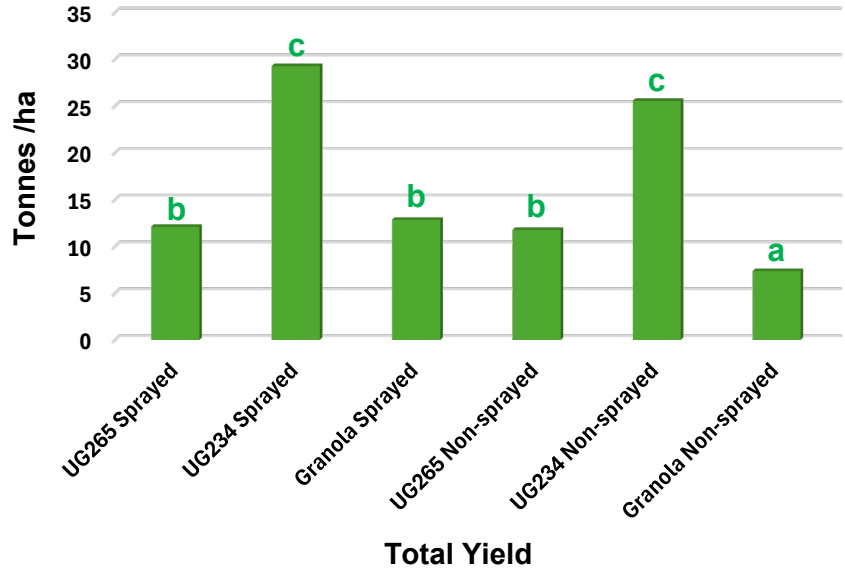
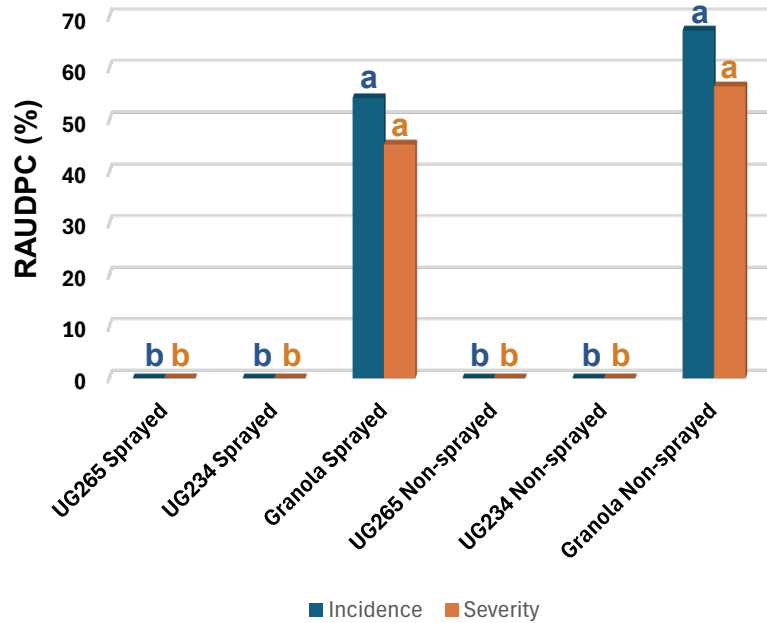


Non-Sprayed
Granola

Non-Sprayed UG234

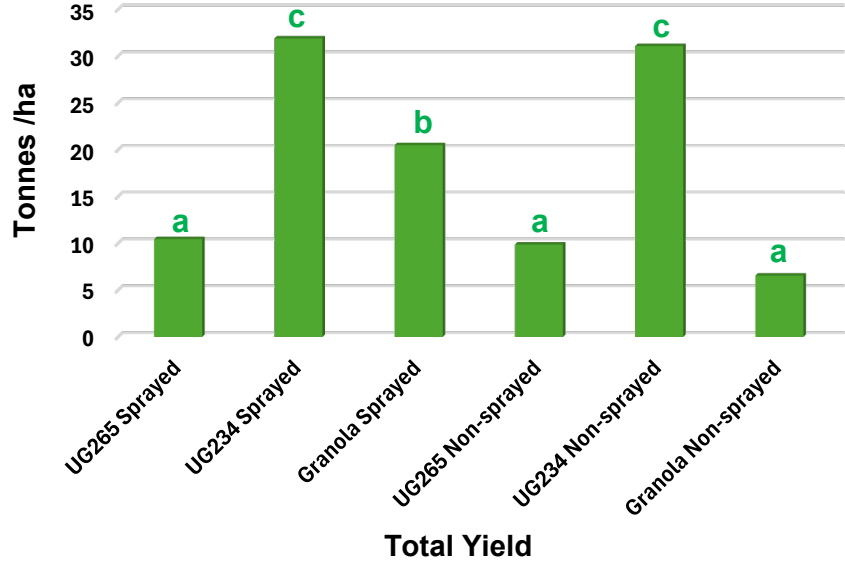
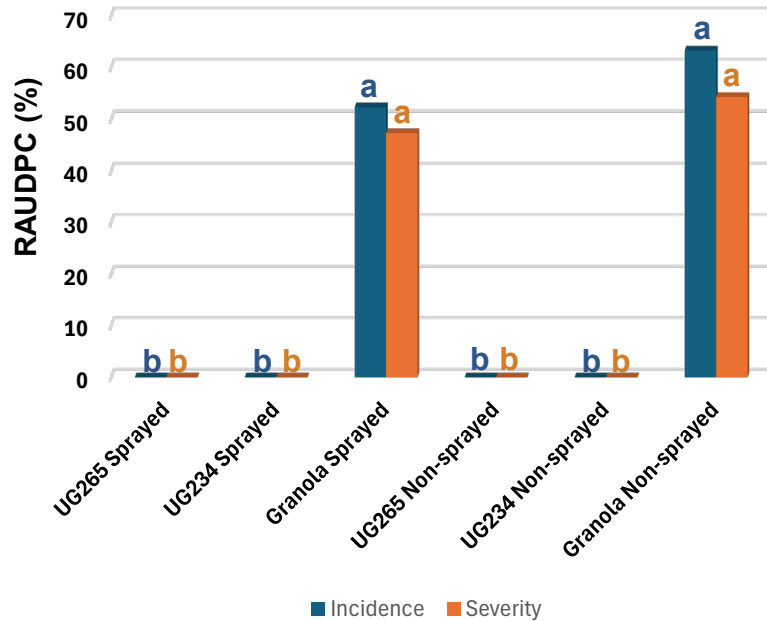
Lembang, W. Java

Lembang Results



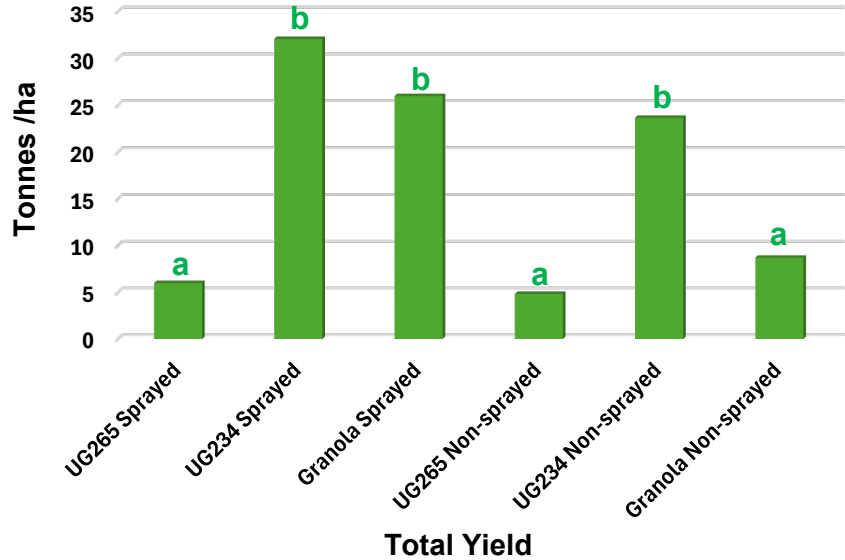
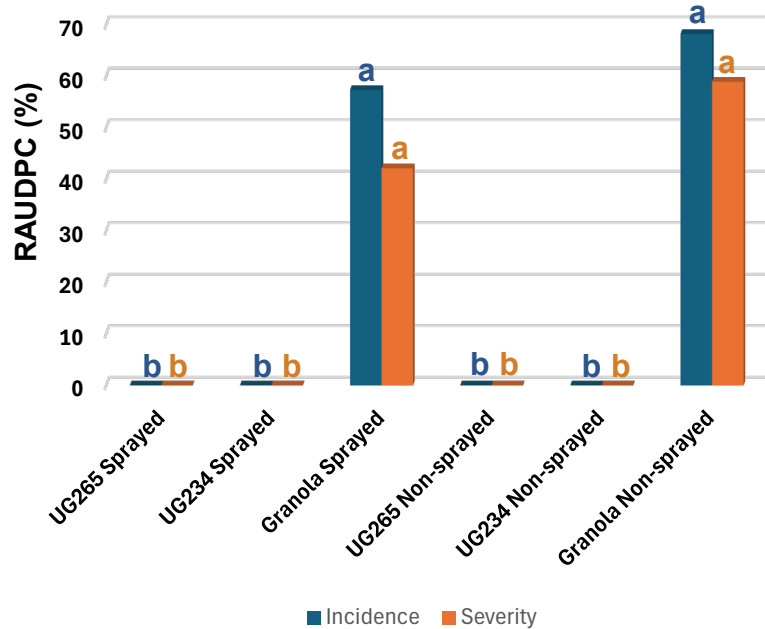
Data for the different coloured columns were analysed separately. Columns of the same colour with the same letters are not significantly different at $P = 0.05$ (Tukey multiple comparison method).

Kledung Results



Data for the different coloured columns were analysed separately. Columns of the same colour with the same letters are not significantly different at $P = 0.05$ (Tukey multiple comparison method).

Tosari Results



Data for the different coloured columns were analysed separately. Columns of the same colour with the same letters are not significantly different at $P = 0.05$ (Tukey multiple comparison method).

Indonesia Summary

- No late blight was found in any of the 3 R-gene plots at Pangalengan, Lembang, Kledung or Tosari.
- Yields in non-sprayed UG234 were significantly higher than UG265.
- Yields in sprayed and non-sprayed GM lines were not significantly different.
- Yields of sprayed, Granola (Non-GM), were generally not significantly different to those of UG234.
- Non-sprayed Granola had significantly lower yields than non-sprayed UG234.
- The UG265 line in all trials appeared stunted and weaker than the UG234 line, and although the 3 R-genes protected UG265 against late blight yields were very poor. The line was discontinued.

Next steps

- Drop UG265 and proceed with variety registration trials with UG234.
- Compile the registration dossier for variety approval/ deregulation of 3 R-gene variety.
- USAID was disbanded by the Trump administration in February 2025 and remnants folded into the Department of State.
- All work is on hold while we seek new funding.
- In March 2026, Department of State sent out a notice of intent to fund Feed the Future Innovation Labs.
- We have submitted a proposal for a Biotechnology Innovation Lab. This project would revive bio-engineered potato work in Indonesia and Kenya and initiate work on cereals and forage in Latin America, with a budget of \$5 million a year for 5 years.

QUESTIONS?



LATE BLIGHT
Phytophthora infestans

Global Biotech Potato Partnership

This work was funded by the United States Agency for International Development (USAID) as part of the Feed the Future Global Biotech Potato Partnership. Any opinions, findings, conclusions, or recommendations expressed here are those of the authors alone.





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