

An aerial photograph of a lush green agroforestry landscape. The image shows a dense canopy of various trees and plants, including palm trees and other tropical species. A small, simple building with a white roof and a dirt path are visible in the upper right quadrant. The overall scene is vibrant and healthy, illustrating the concept of agroforestry. Two white curved lines are overlaid on the image, one framing the top left and another framing the bottom right.

The impact of uncertainty: Agroforestry Carbon Projects

Agroforestry Carbon Removal Units (CRUs)
for the Organic Restoration of Nature

Dr. Mila Luleva, Head of Remote Sensing

Why does Rabobank have interest in the carbon market: aligning business strategy, sustainability goals and client interests

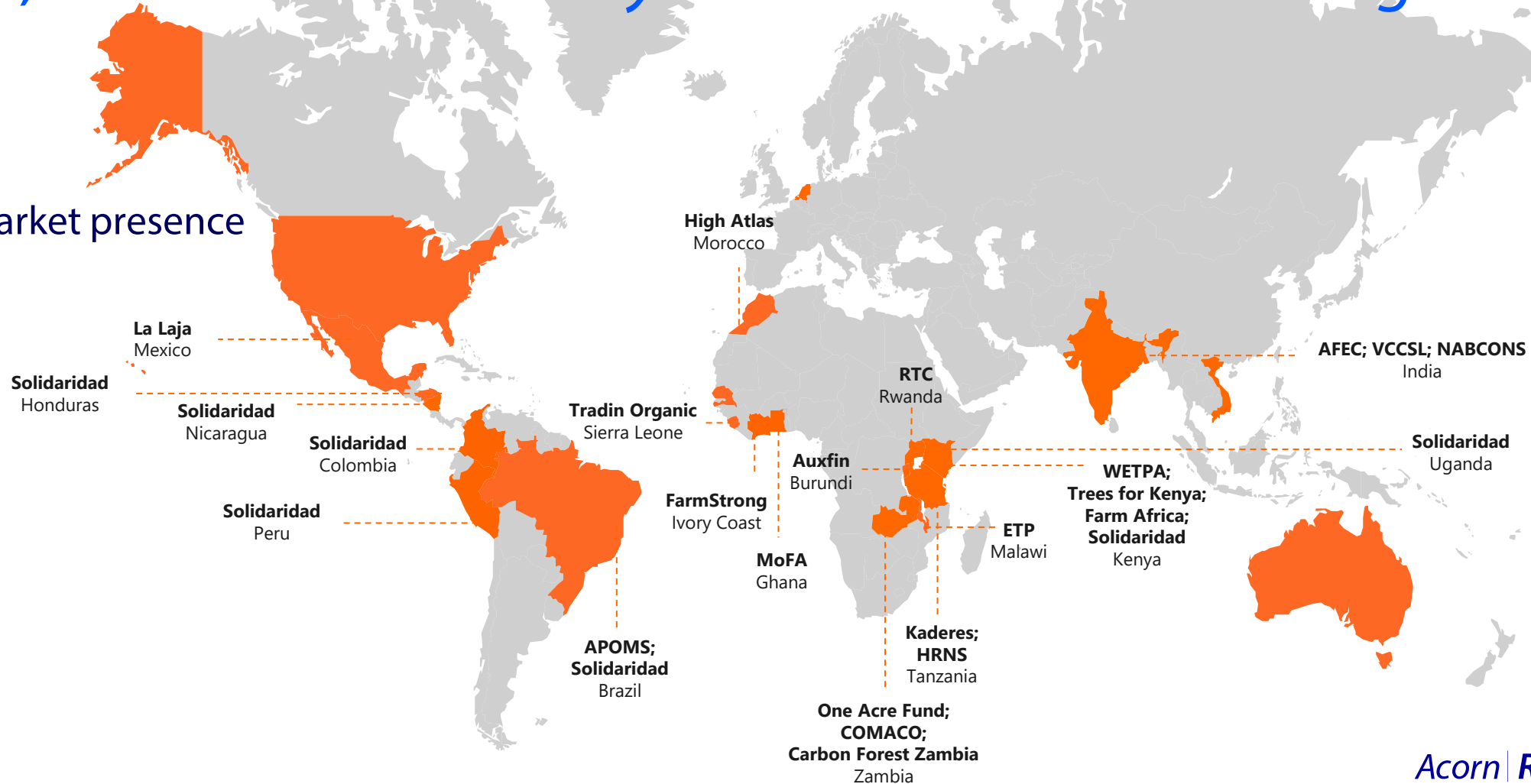
- Supporting farmers in their transition to sustainable practices
- Generating additional revenue for farmers
- “Sustainable farmer is a less risky farmer”- help farmers meet their net zero goals
- Risk management and securing climate resilient portfolio
- Innovation and competitive advantage via leveraging data, partnerships and financial products



*Ensures a fair share of
income for smallholder
farmers*

We are currently active in 15+ countries across the major continents and continuously expanding with almost 500,000 farmers currently active in our Carbon Programs

Carbon market presence



Acorn

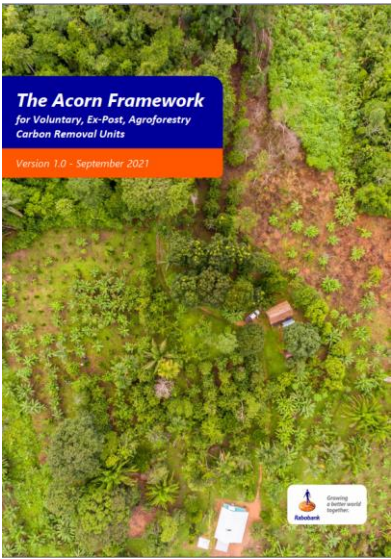
Planting a better future



Acorn has built a global, trustworthy, technology-enabled and fair marketplace for carbon sequestration

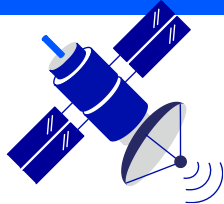
USPs

Pragmatic and cost-efficient certification



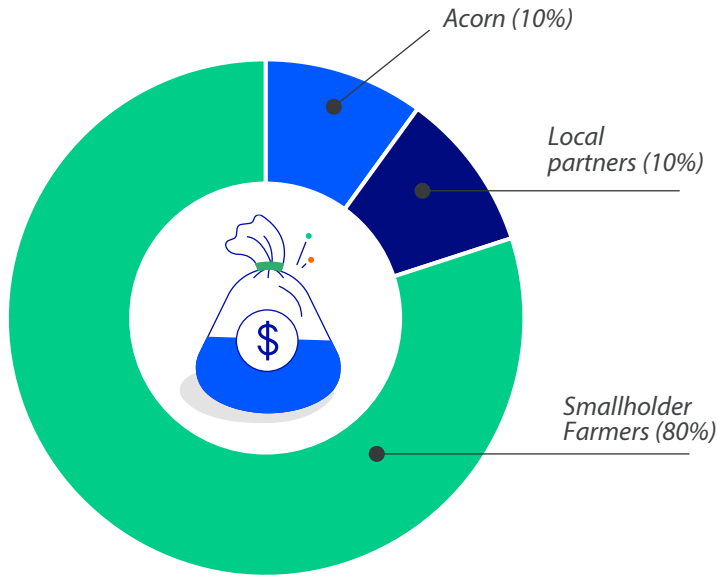
Tailored and trustworthy

Traceable satellite based remote sensing monitoring



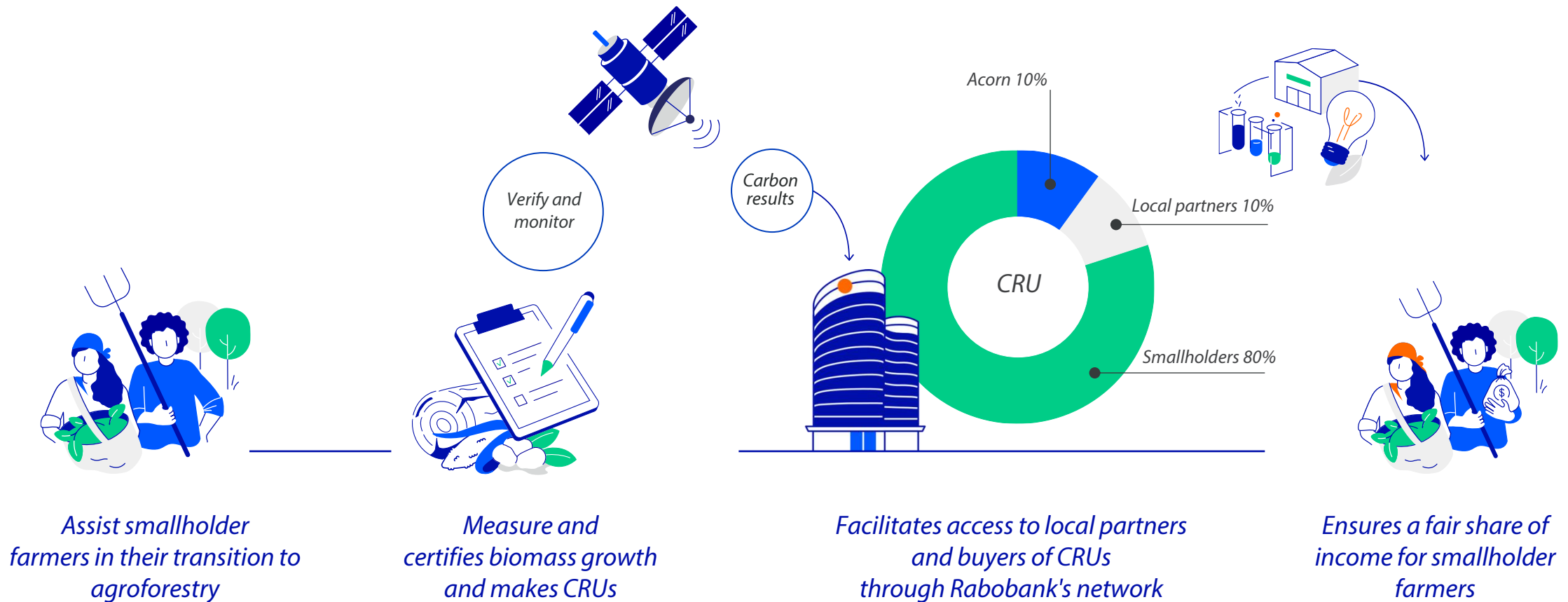
Technology and transparency

High quality carbon removal units



Ecosystem and fair

Acorn sequesters CO2 from the air by helping smallholder farmers transition from monoculture to agroforestry

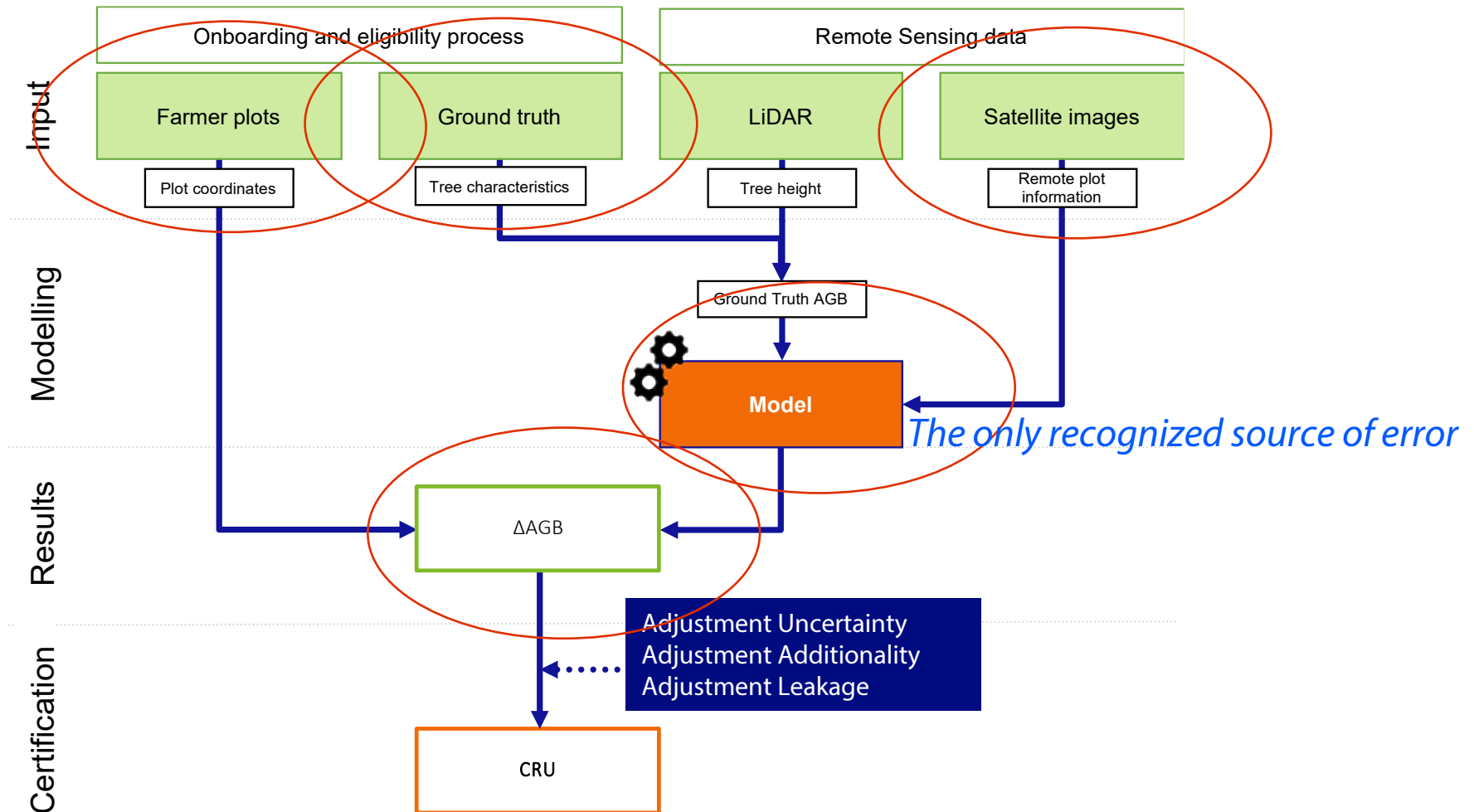


Sources of uncertainty



The Measurement Process

Five points where uncertainty plays a role where decisions are made by data delivery parties with no guidance or acceptance criteria

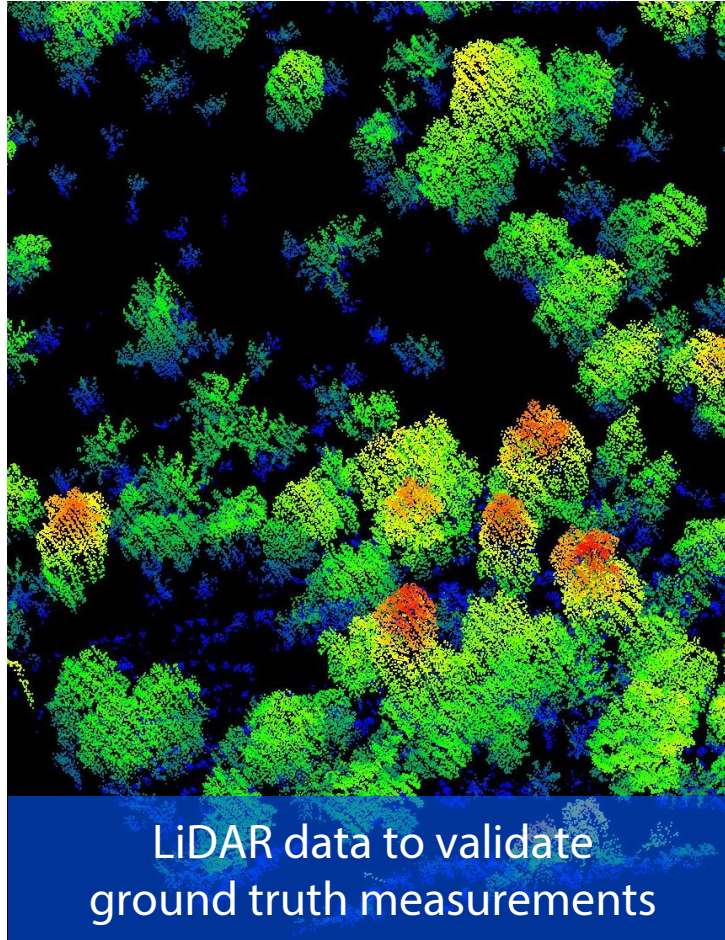


Ground Truth and Farmer Data

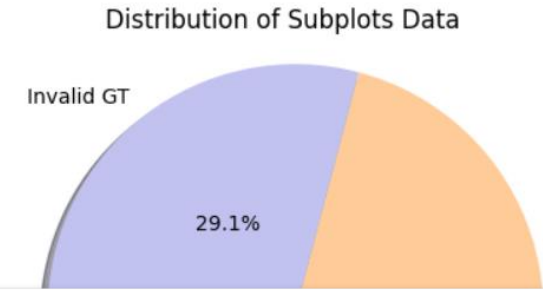


Ground truth data, validated by LiDAR (when available), to train, validate and perform scalable models

Remote sensing



Sources of Error at Ground Truth Data collection



White support

White support tree

White supporter

White supporters

Casimiroa edulis

Casimiroa edulis

Casimiroa edulis

Casimiroa edulis

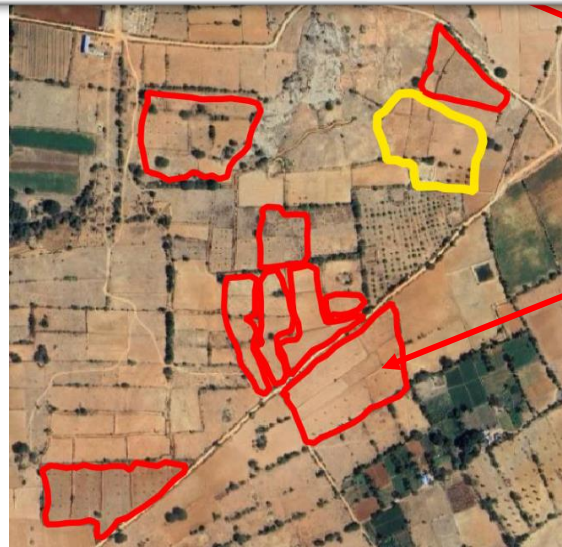
Should be "White sapote"

Should be "White sapote"

Should be "White sapote"

Should be "White sapote"

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Geometry

Number of trees

Data collection choices

DBH

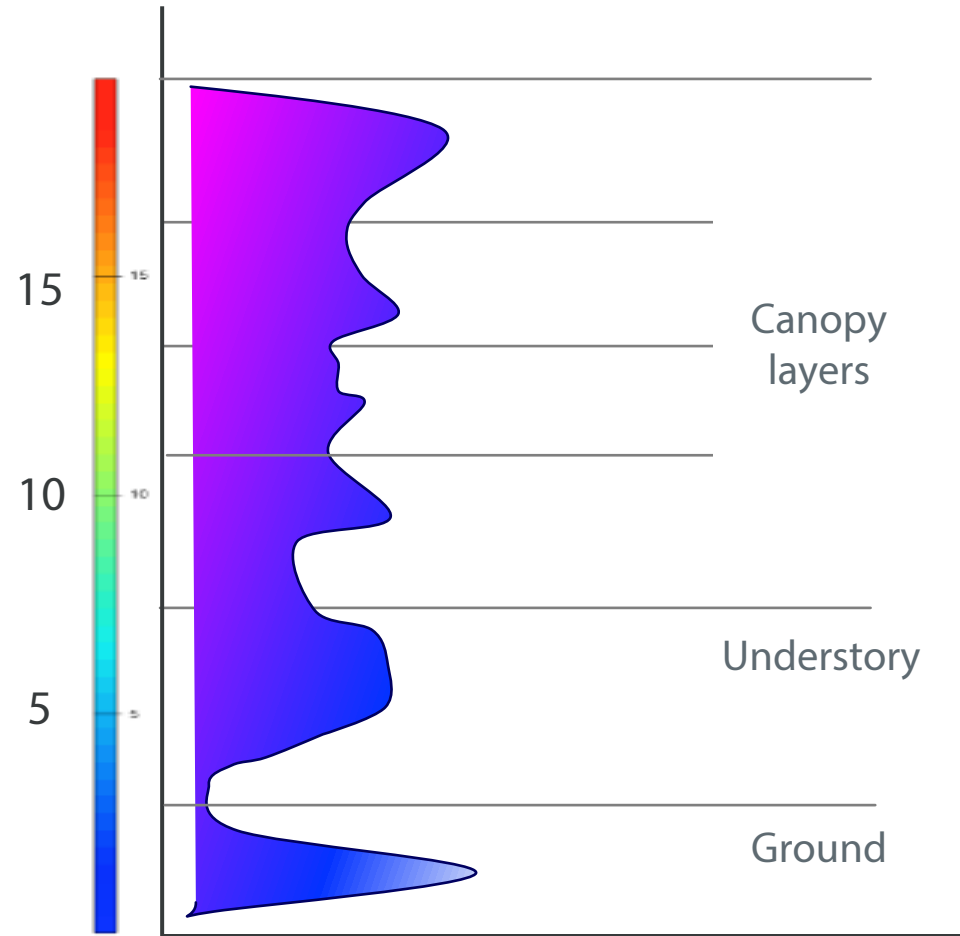
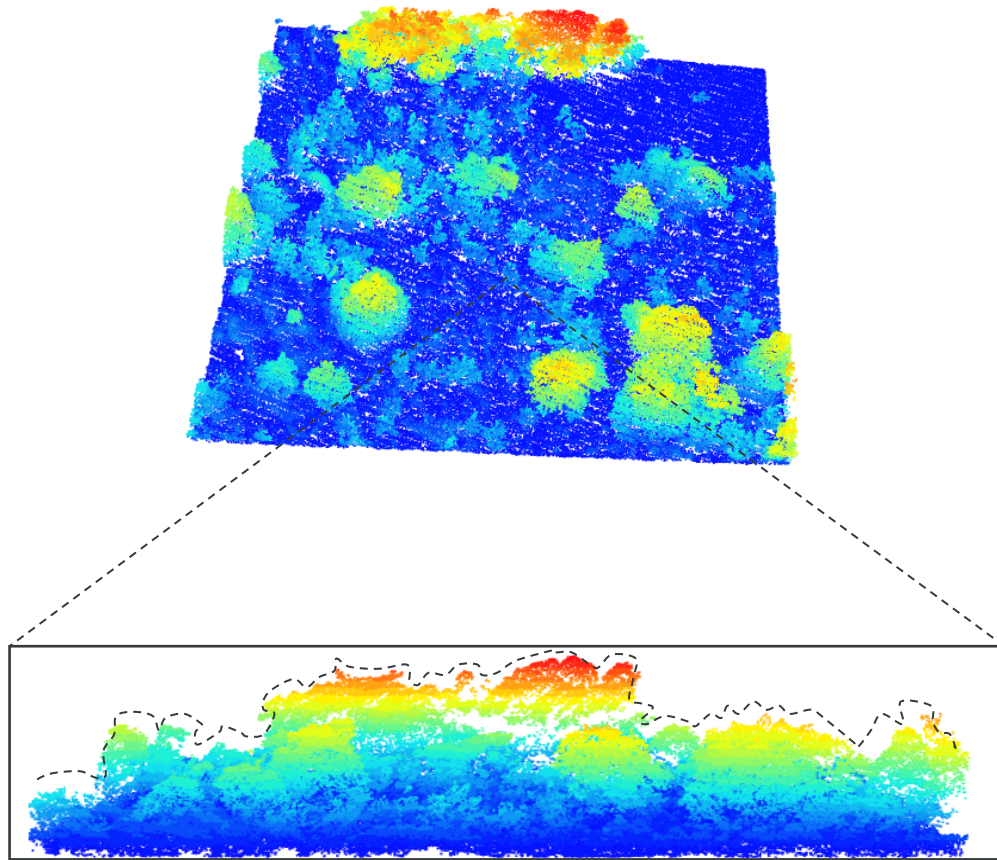
Height

Species names

We are lacking:

- Uniform protocols
- Uniform data acceptance and quality criteria
- Uniform data collection strategies
- Not all "open data" is "good data"

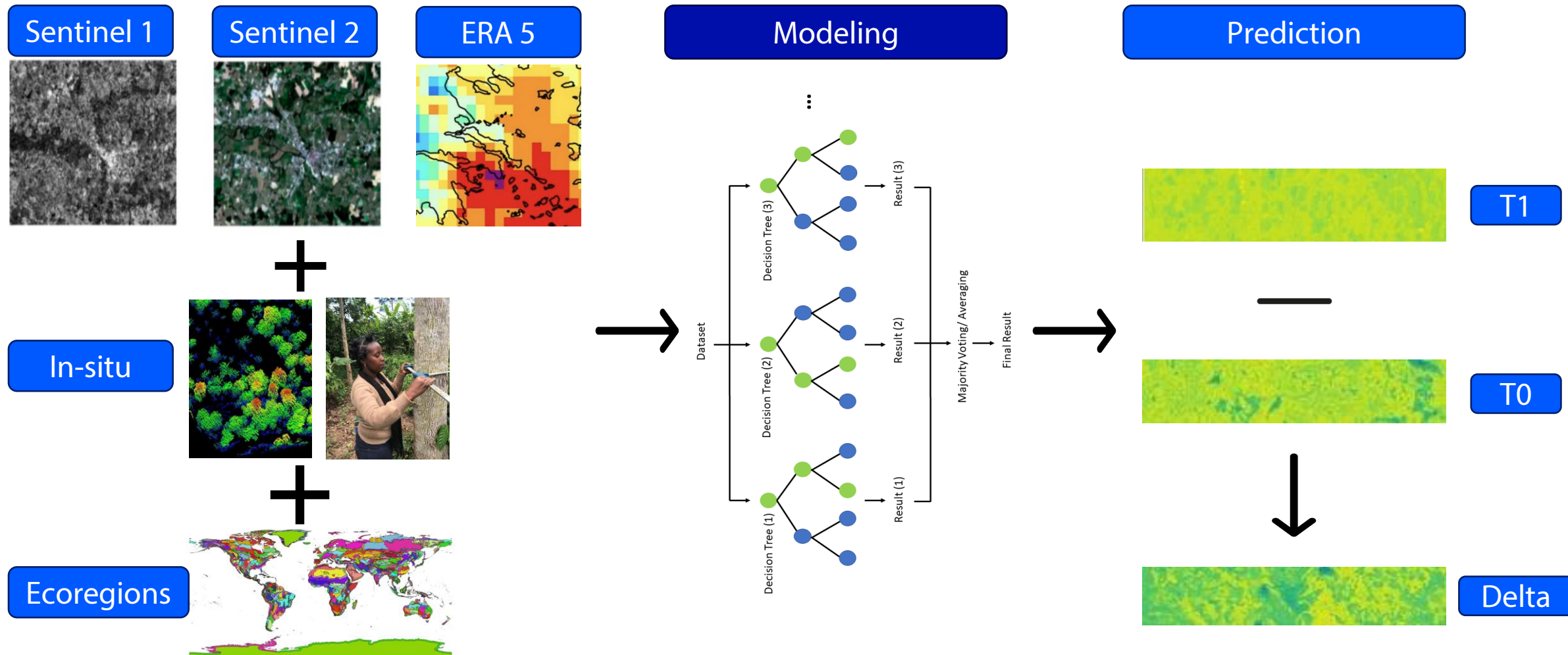
LiDAR estimates plant vertical profile, and height heterogeneity (layer)



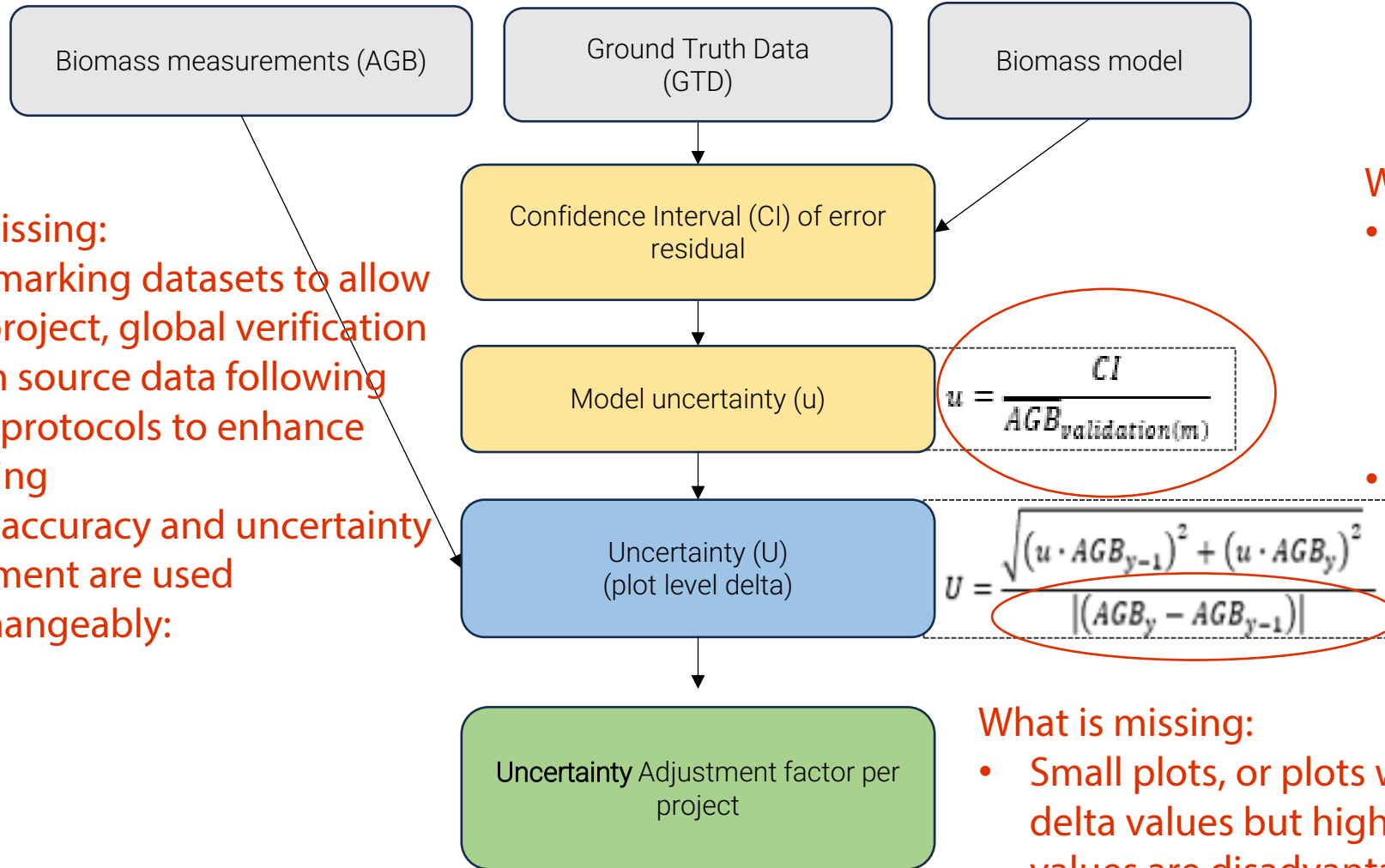
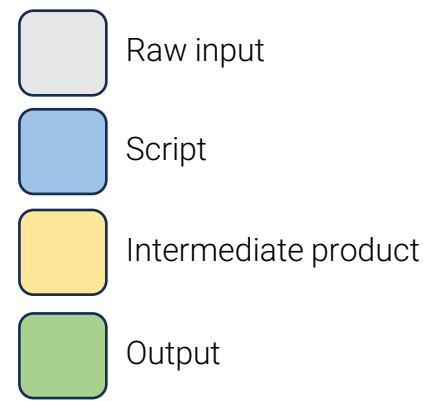
Modeling and Error Propagation

An aerial photograph of a lush tropical forest. The forest is dense with various shades of green, including palm trees and other tropical vegetation. In the upper right quadrant, there is a small settlement with several buildings, including a prominent white structure with a blue roof. A dirt road or path winds through the forest. The title 'Modeling and Error Propagation' is overlaid in white, italicized text at the top left. A large white circle is drawn around the settlement area, and a white arc is visible at the bottom of the image.

The AGB, combined with satellite imagery and ecoregions, are used to train the biomass-prediction model.



Adjusting for model and sample uncertainty



What is missing:

- Benchmarking datasets to allow cross project, global verification
- Golden source data following global protocols to enhance modeling
- Model accuracy and uncertainty adjustment are used interchangeably:

What is missing:

- Methods for calculating the model uncertainty component to align with methodology requirements- adjustment on measured value vs delta
- Methods to differentiate between random error and bias (i.e bootstrap) are currently not part of existing methodologies for biomass

What is missing:

- Small plots, or plots with small delta values but high biomass values are disadvantaged, although models are much more accurate at high ranges

*Thank you for
your attention*

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Rabobank