



Aerial Surveys with Drones within NBPOL

A Story of Innovation

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New Britain
Palm Oil
Limited

DAMI
PNG



- Precision Agriculture
- Ensures that our inputs (labour, machinery, etc.) to the plantation are exactly as required
 - Excess is a waste
 - Inadequate is a loss
- Precision avoids waste while optimizing outputs (crop)

- Innovations

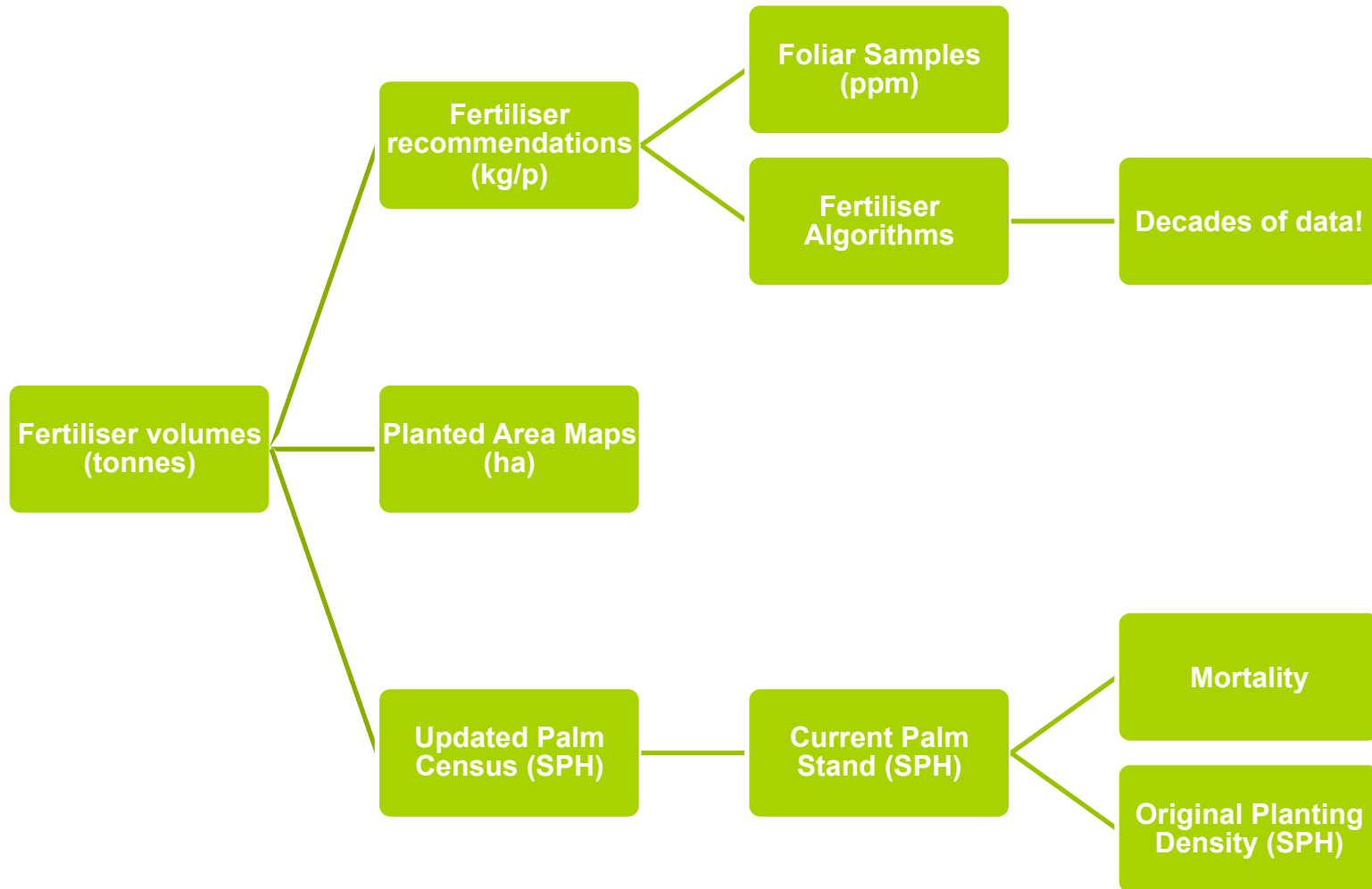
- A new approach to collect data
- A new approach to processing data
- A new approach to reporting data
- A new approach to using data

- Respect to the original innovators!

- William Griffiths
- David Mather
- Mike Jackson
- Brian Cazalet
- Richard Tiamu
- Dr Luc Bonneau
- Solomon Sar



Fertiliser Planning



Kg/p	Stems Per Hectare (SPH)	Required Kg of Fertiliser	
1.5	128	192	
1.5	120	180	Excess supply (6%)
1.5	135	202.5	Short supply (5%)

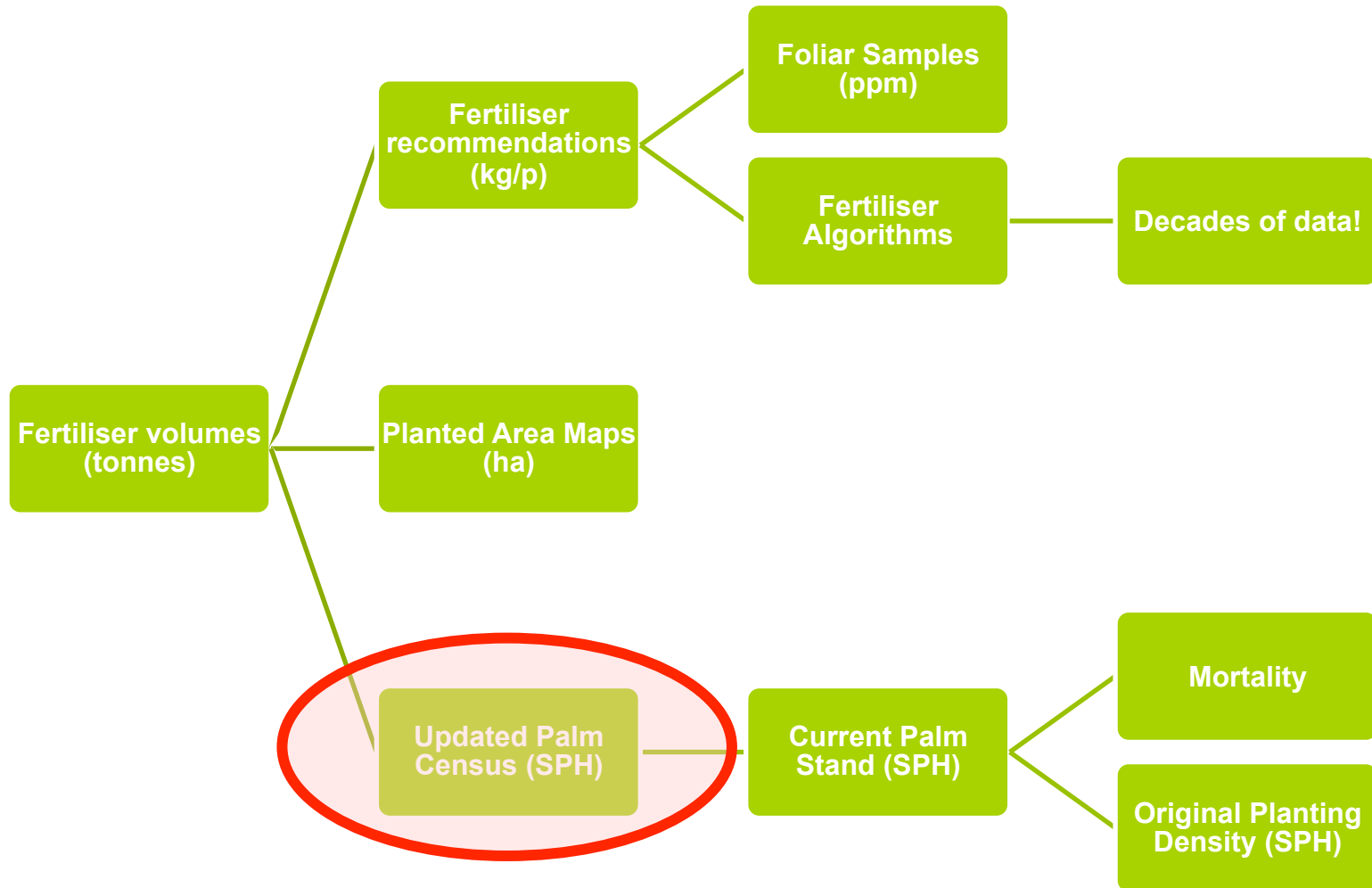
- Cost of over-ordering
 - High stock levels
 - Storage costs
 - Double handling
 - Losses (Spoilage and Theft)
- Costs of under-ordering
 - Under-fed palms
 - Yield losses
 - Additional orders
 - Opportunity costs of inputs

Straightforwards

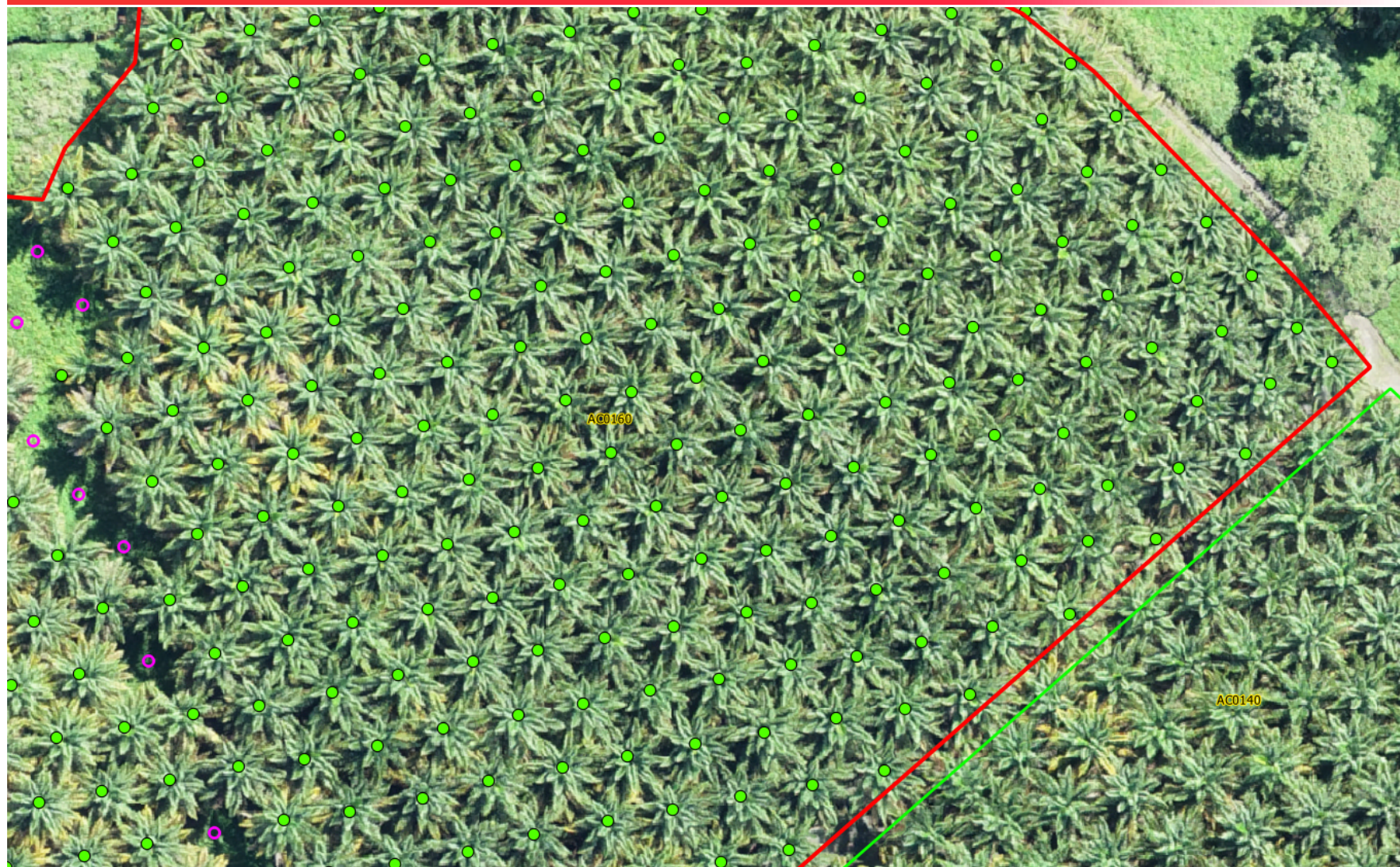
Harder to quantify

- NBPOL
 - 91,081 ha of Oil Palm in PNG and SI (31 Dec 2018)
 - 11,361,688 palms in PNG and SI
 - 4.41kg/palm (2018 average for all palms)
 - 50,100 tonnes of fertiliser (2018)
 - ~USD 20 million per year in fertiliser expenditure

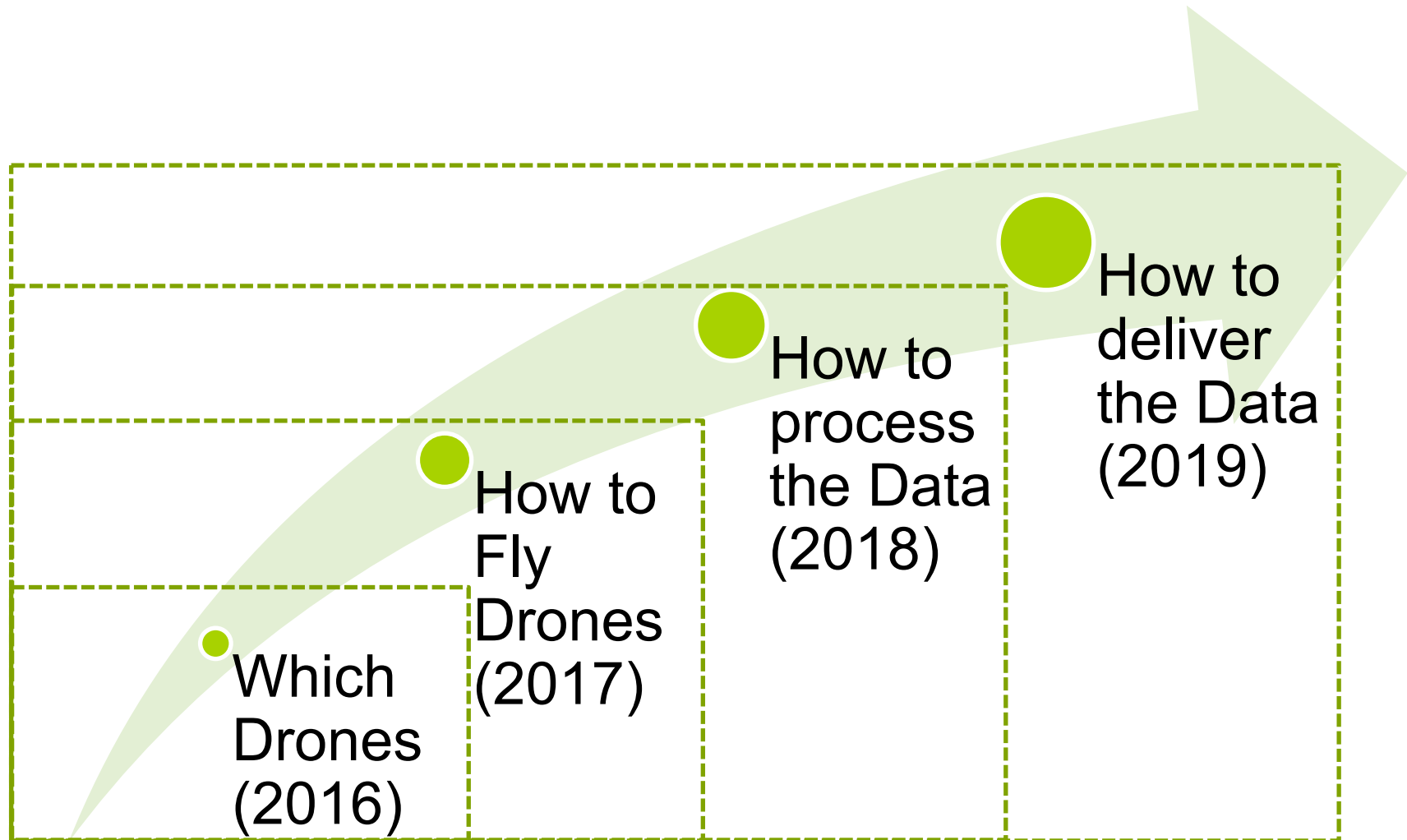
Fertiliser Planning



- Utilise drones to generate aerial imagery of the plantations and allow for computer based counting of in-field palms
- Generate an accurate palm stand census to ensure that the correct fertiliser volumes are ordered



Progress To Date



Which Drones?

- The first overwhelming option (even several years ago) was which way to go first. Two broad options were available



- Fortunately, there were differing opinions, and 2 groups went with different options

- Drones were selected based on
 - Cost
 - Support and Training
 - Processing capabilities
 - Perceived quality of product
- Most of our expectations were wrong
 - Technology moved around us
 - Reliance on others could not be sustained

- Again, 2 groups went in different directions
- Proprietary Flight Planning Software
 - Single package of software, but multiple internal modules for each stage of the process
- Open Source Flight Planning Software
 - Multiple software packages with links and conversions in-between
- Both suffered from continuous updates, in areas with limited internet access this cost a LOT of time

How to Fly Drones?

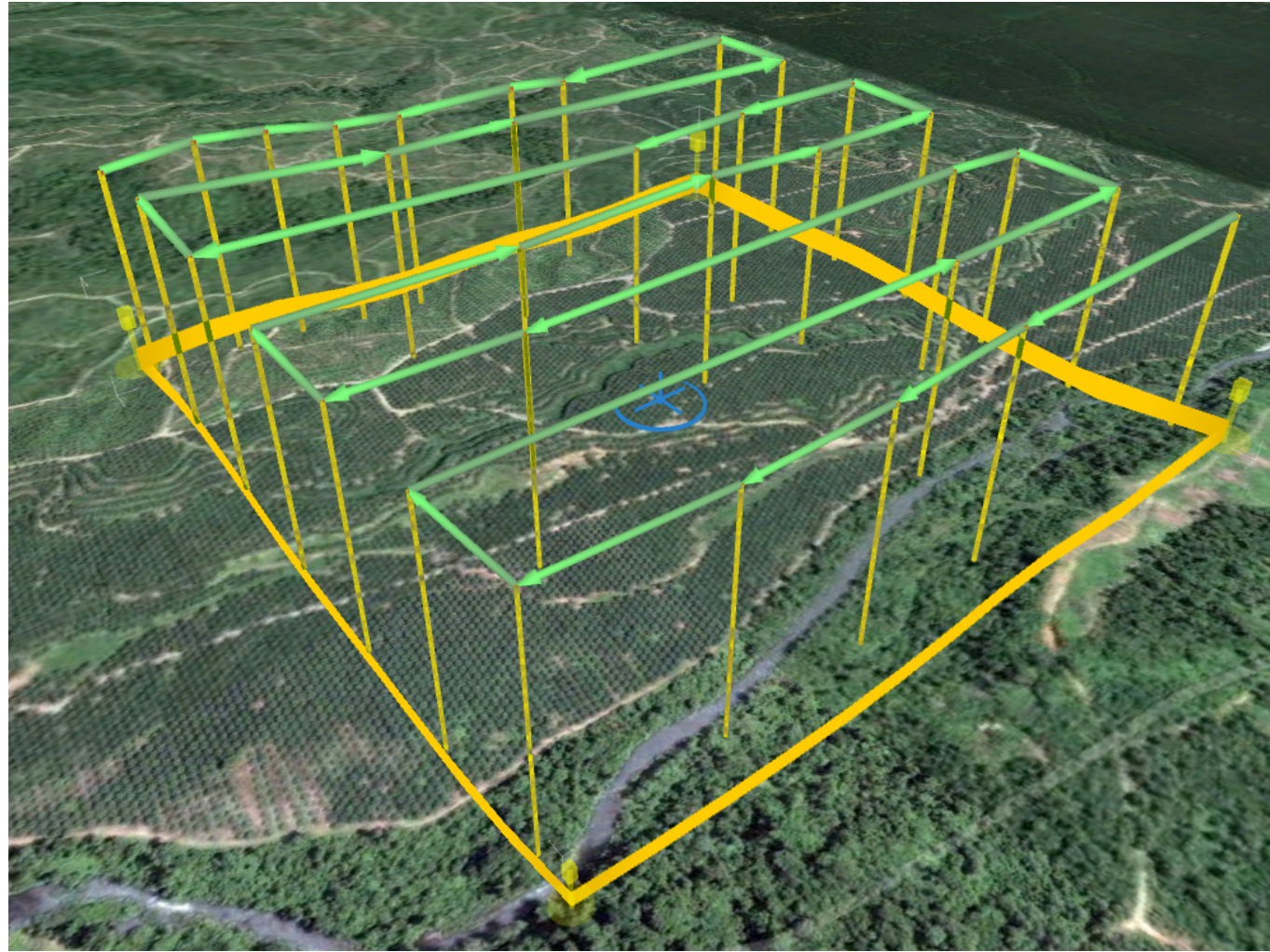
Optimum height for drone operations



How to Fly Drones?

One Survey

- 30-1,000 ha
- 1-20 flights
- 400-500 photos per flight



How to Process the Data?



- Similarly to the flight planning, we used one system tied to the drone manufacturer, and one off-the-shelf graphics program for stitching together images
- One site worked on their desktops
- One site invested in a high-spec workstation for data processing

How to Process the Data?



- One site used the proprietary automated (image recognition) palm counting software
- One site hired a team to manually count palms on-screen with large screens and even touch screens
- Both require immense amounts of checking and double checking. False positives, false negatives, whoopsies and do-overs

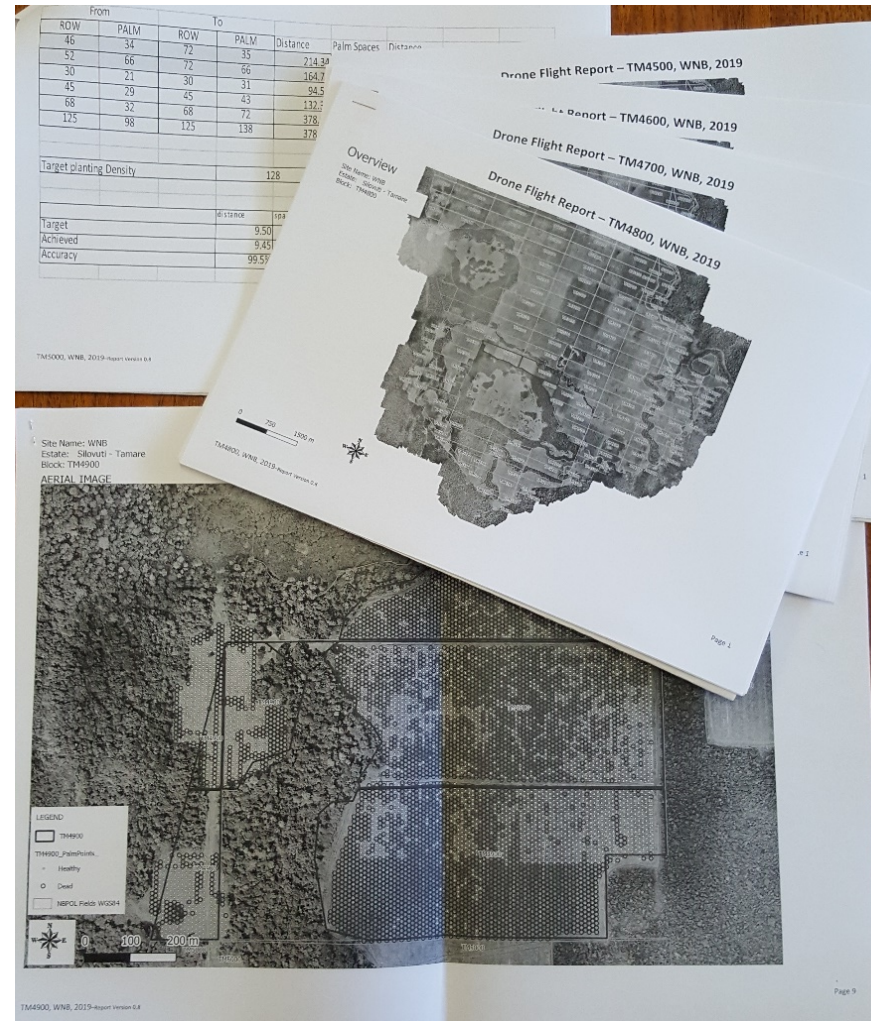
Which Systems Work?

Team 1	The 'A' Team	Team 2
Quad Copter	→	← Fixed Wing
Recreational Drone	→	Commercial Drone
Open Source flight planning software	→	Proprietary flight planning software
Manual Palm Counts	3 rd Way	← Automatic Counts
Workstation	→	Desktop Computer

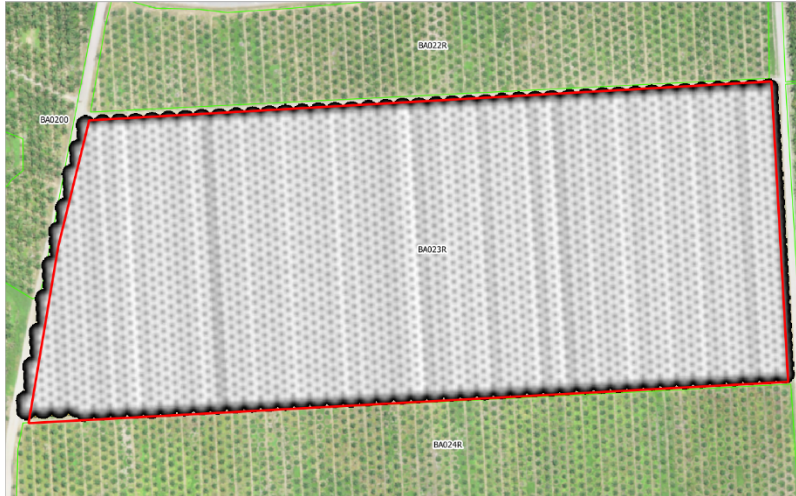
- Finally, we have
 - A stitched ortho-photo of a block (6GB)
 - A series of points on a map
 - A number (number of palms)
 - A number (palm density)
- We have data (which we love)
- But not information yet (that our managers are waiting for)

How to Deliver the Data

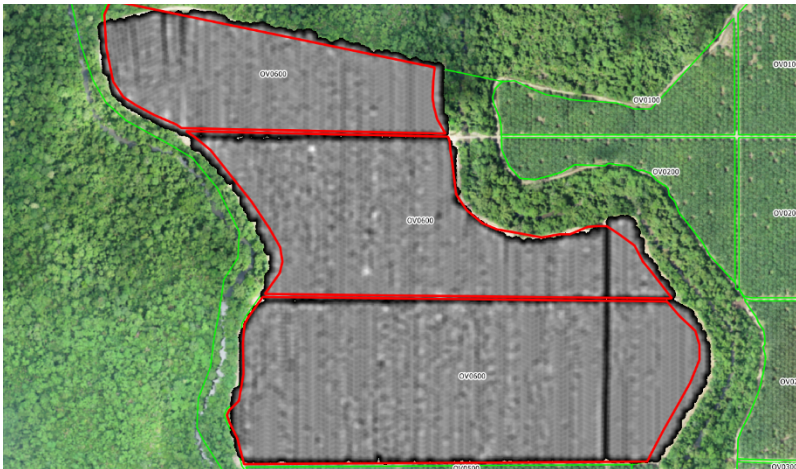
- Reports
- Data delivery through file sharing
- Conversion into Google Earth for ease of access



How to Deliver the Data

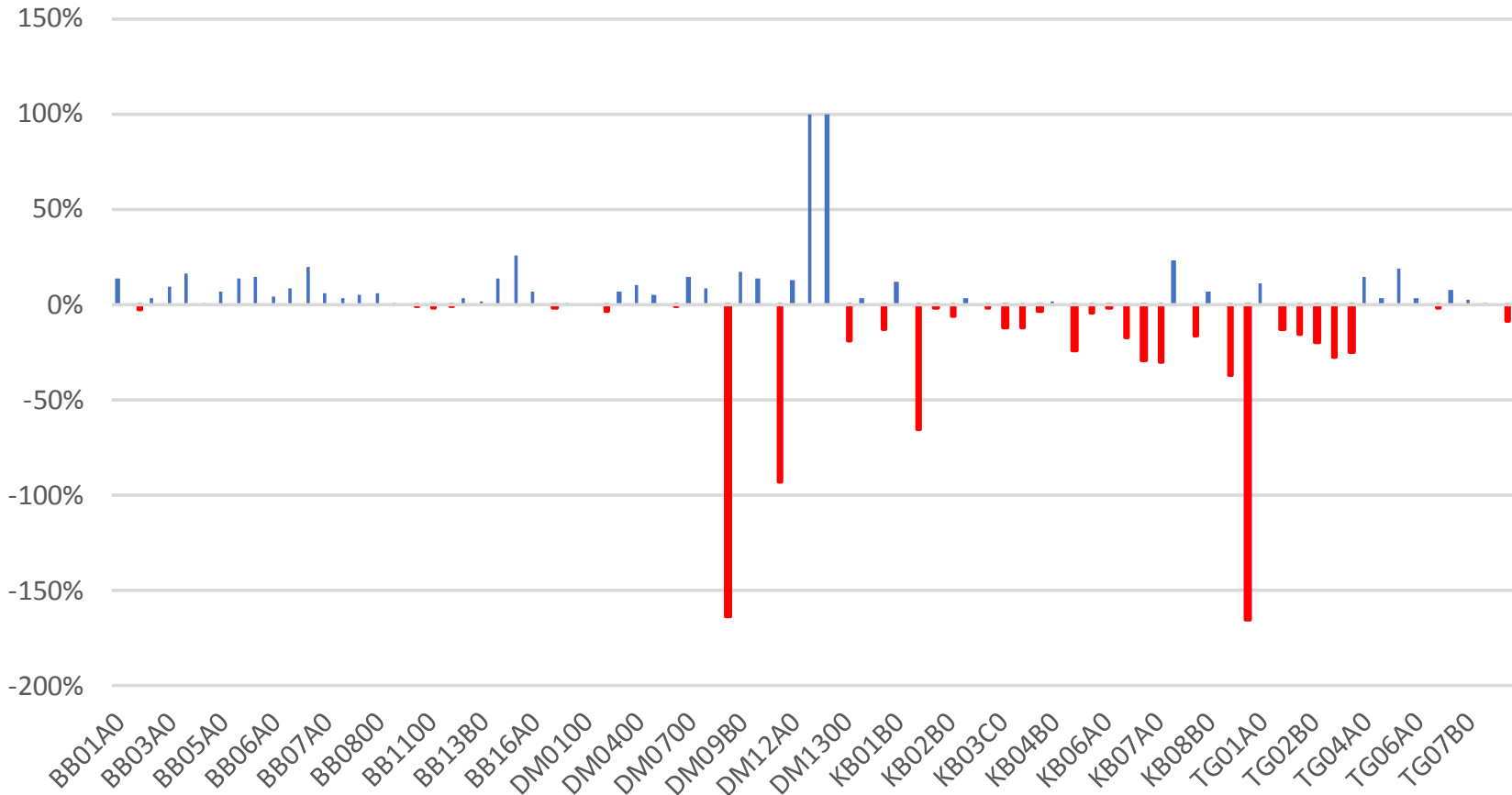


- Heat Maps to show consistency of planting

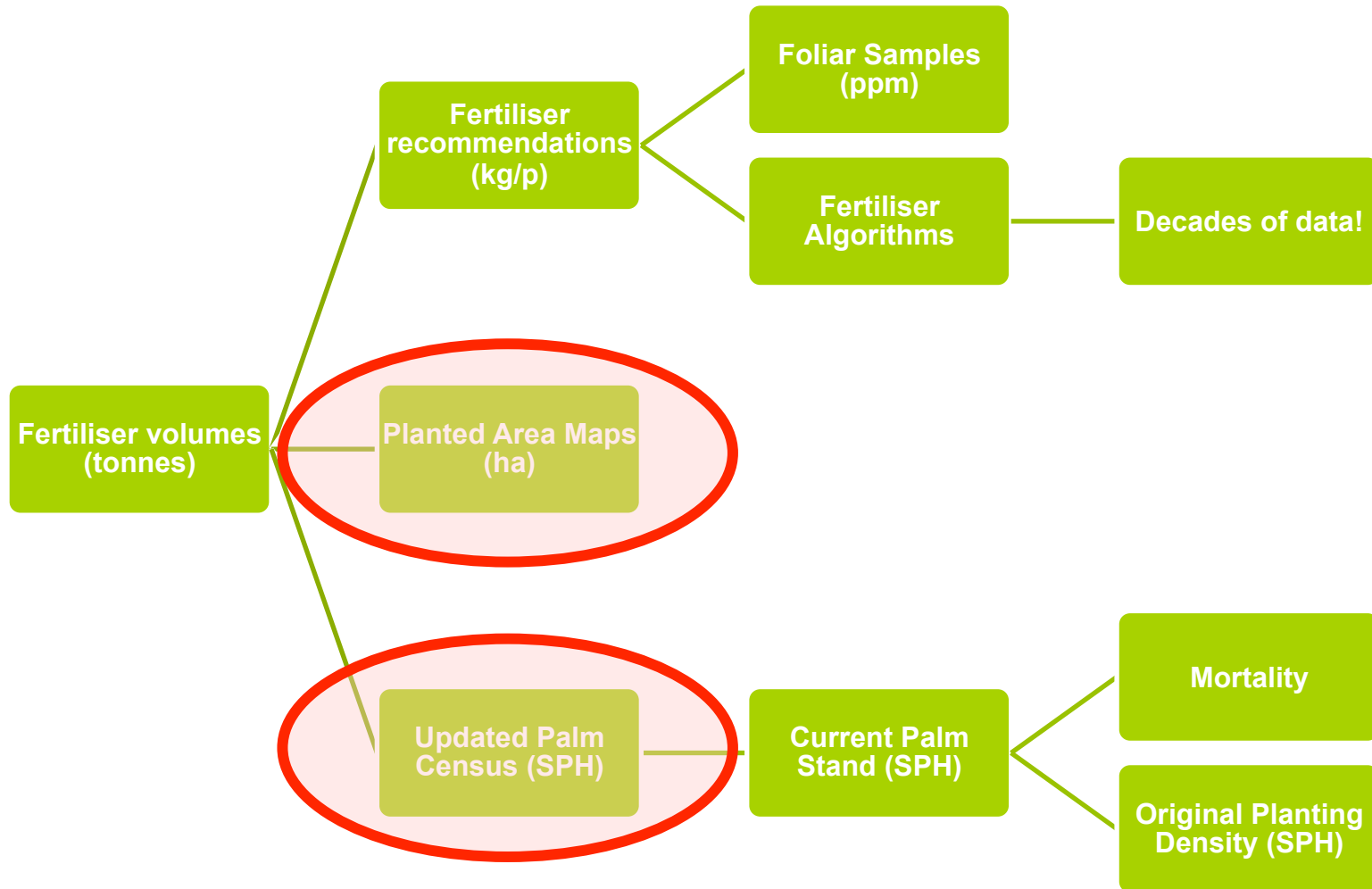


- Using measurements to develop indexes to reduce the amount reporting

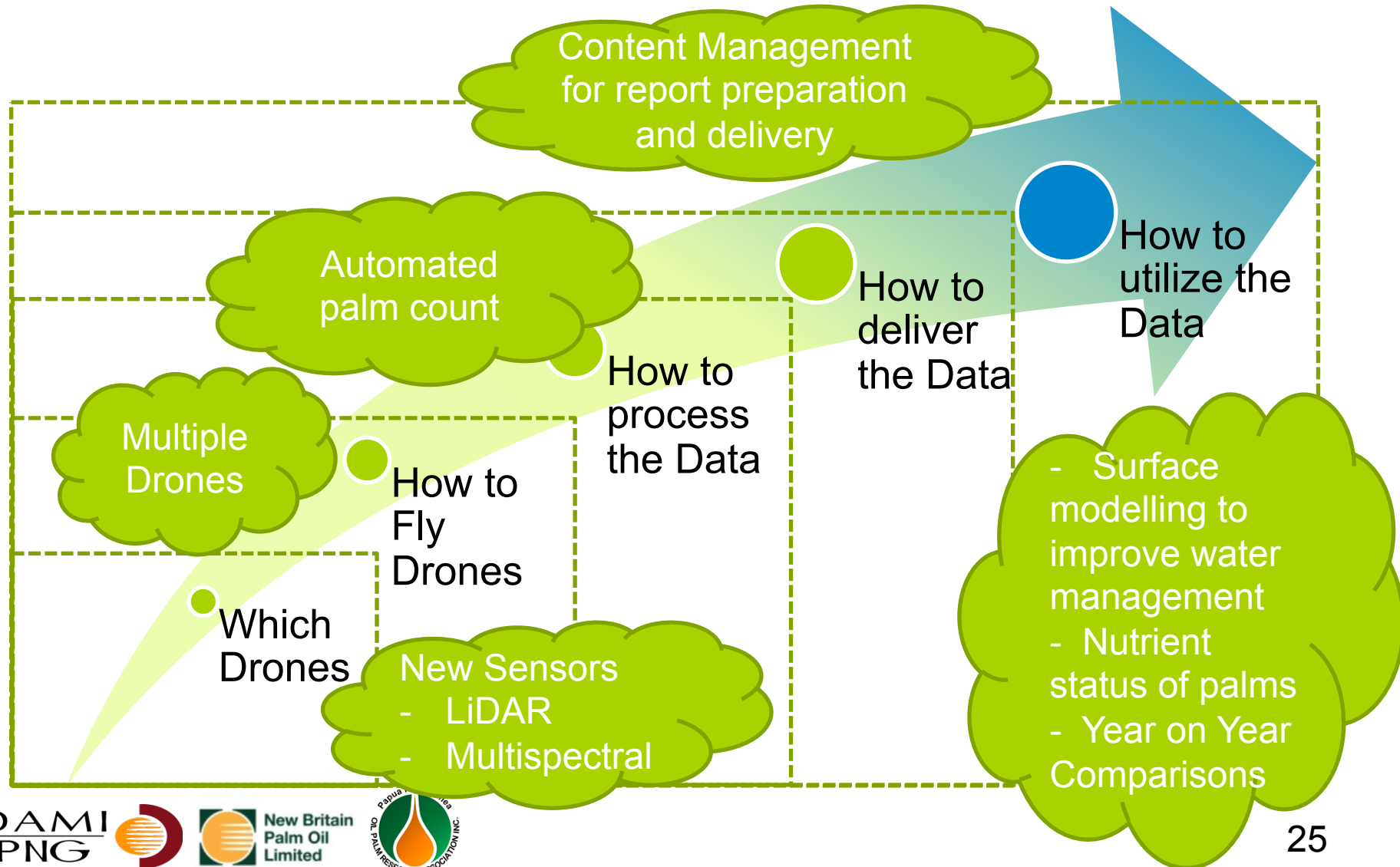
Mismatch in palm numbers



Findings



What is Next?



Thank you

DAMI
PNG



New Britain
Palm Oil
Limited

