



SMARTAGRI
—CAMBODIA—

SmartAgriCambodia: Advancing Sustainable Agriculture in Battambang

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How to Use Digital Maps in Agriculture **A Simple Guide for Beginners**

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1. What Digital Maps Are and Why They Matter

Digital maps in agriculture are special map products that show what is really happening in a field or orchard. They are not just ordinary field maps, but information about crop condition, soil and water, obtained using satellites and drones.

Unlike simple visual observation, digital maps provide objective and repeatable information that is not influenced by personal experience or momentary impressions. Farmers, therefore, gain data that can be stored, compared over time and used for better decision-making.

Thanks to digital maps, a farmer or agronomist can:

- see differences in crop condition within a single field,
- detect problems early, even before they are visible to the naked eye,
- make better decisions about fertilisation, irrigation or crop protection,
- reduce costs while maintaining or increasing yields.

Digital maps are one of the basic tools of precision (smart) agriculture and represent the first step toward modern, data-driven farming.

2. How Digital Maps Are Created

Digital maps are created from images acquired by:

- satellites – providing regular coverage of large areas,
- drones (UAVs) – enabling very detailed imaging of specific fields or orchards.

Satellite imagery is particularly suitable for long-term monitoring of crop development throughout the season, while drones are used where high spatial resolution and detailed analysis are required.

Satellites and drones capture crops in different parts of the electromagnetic spectrum (visible light and infrared radiation). From these images, so-called vegetation indices are calculated, describing crop vitality, health status or water stress.

The result is a digital map where different colours have a clear meaning, for example:

- green indicates healthy vegetation,
- yellow or orange highlights weakened areas,
- red marks problematic zones.

3. The Most Common Types of Digital Maps

Digital maps are designed to make complex information easy to understand and use in everyday farming practice. Each type of map highlights a different aspect of crop or field conditions, and none of them should be viewed in isolation. When used together, these maps provide a comprehensive overview of the field, helping farmers understand where a problem is located, how serious it is, and what type of action may be needed. For beginners, it is recommended to start with simple RGB maps and gradually combine them with crop vitality and water stress maps as confidence and experience grow.

In practice, several basic types of digital maps are used. Each type serves a different purpose and supports different farming decisions.

RGB Map (Colour Image)

An RGB map is a standard colour image, similar to an aerial photograph. It is mainly used for:

- basic orientation within the field,
- identification of tracks, machinery paths or bare soil,
- checking crop uniformity.

Example from Battambang province:

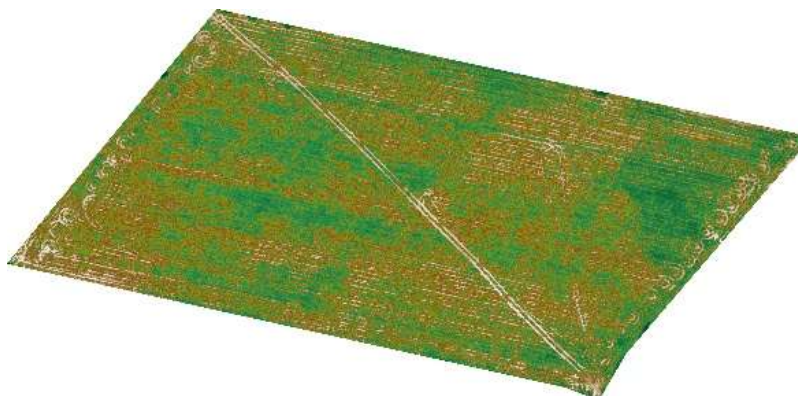


Figure 1: RGB map of a rice field (Rice, Battambang) – basic visual overview of the field and crop distribution (SmartAgri Cambodia 2025).

RGB maps are the most intuitive type of digital map because they look very similar to what a farmer sees from above. They help users quickly understand the layout of the field, identify boundaries, paths, irrigation channels, bare soil or damaged areas. RGB maps are also very

useful for verifying whether machinery has traversed the field evenly and for identifying areas that should be inspected directly in the field. For beginners, RGB maps serve as a natural starting point before moving on to more advanced analytical maps.

It is usually the first map a beginner should start with.

Crop Vitality Maps (e.g. NDVI, GNDVI)

These maps show **how healthy and vigorous the crops are**. They help to:

- identify weak or stressed zones,
- compare different parts of the same field,
- monitor crop development over time.

Examples from Battambang province:

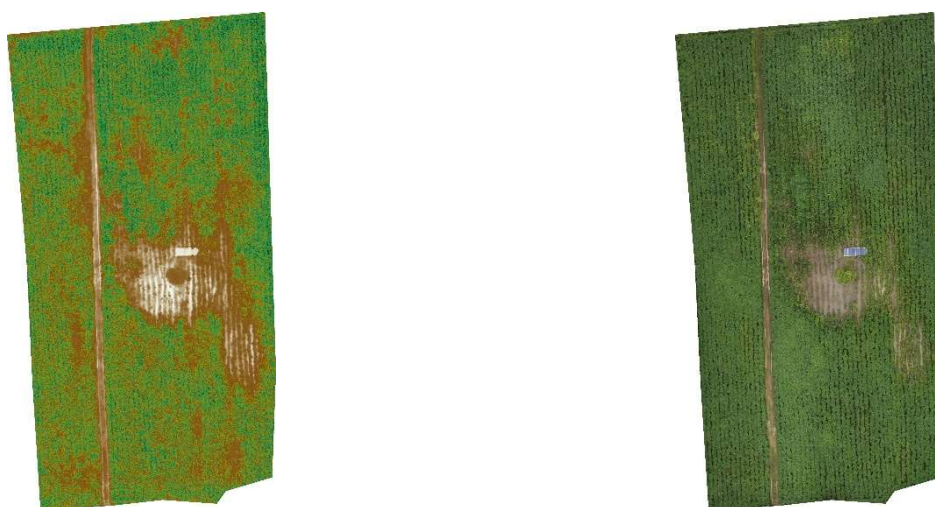


Figure 2: RGB map (left) and GNDVI map (right) of the same field (Cassava, Battambang) – clear spatial differences in crop vitality (SmartAgri Cambodia 2025).

Differences in colour often reveal problems long before visible damage appears.

Crop vitality maps go beyond visual appearance and provide information about how plants are actually performing. They reveal differences in plant health that may not yet be visible to the eye, such as nutrient deficiencies, uneven growth or early stress. These maps are particularly useful for identifying zones with lower yield potential and for planning targeted actions such as variable fertilisation or selective crop protection. Over time, vitality maps also allow farmers to compare seasons and evaluate whether applied measures have improved crop condition.

Water Stress Maps

Water stress maps show where crops suffer from a lack of water or, conversely, from excessive moisture. They are especially important for:

- irrigation management,
- prevention of root damage,
- saving water and energy.

Example from Battambang province:

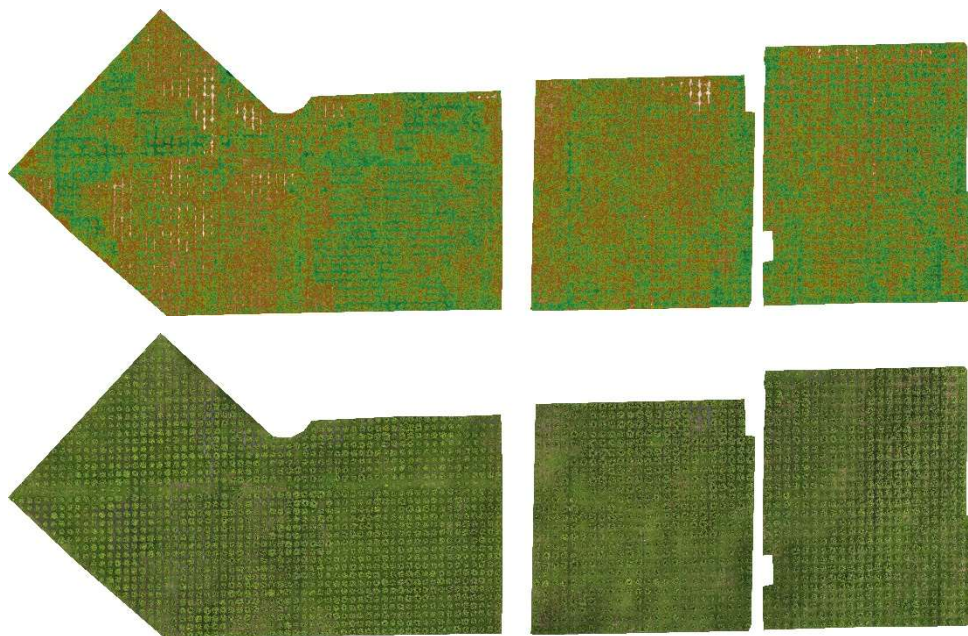


Figure 3: Water stress map of an orchard (Orchard – Mango/Longan, Battambang), highlighting areas with different water availability and potential crop water stress (SmartAgri Cambodia 2025).

Water stress maps focus specifically on the relationship between crops and water availability. They help identify areas where plants suffer from drought stress, as well as zones where excess water may cause root damage or disease. This type of map is especially valuable in regions with irregular rainfall or limited water resources. By using water-stress maps, farmers can manage irrigation more efficiently, avoid unnecessary watering, and better adapt to changing climatic conditions.

4. How to Use Digital Maps in Practice – Step by Step

Using digital maps is not complicated and does not require advanced technical knowledge. The key is to follow a simple and systematic approach.

1. Look at the entire field map
Start by viewing the whole field and observing overall colour patterns and differences.
2. Identify problem zones
Focus on areas that differ from the majority of the field (different colour, irregular shape).
3. Compare the map with reality in the field
Suspected areas should be checked directly in the field to confirm the actual condition.
4. Decide on corrective actions
Based on the findings, it is possible to:
 - fertilise only part of the field,
 - adjust irrigation,
 - apply crop protection only where necessary.
5. Monitor changes over time
6. Repeated mapping helps to verify whether the applied measures were effective.

5. Main Benefits of Digital Maps for Farmers

The use of digital maps brings several practical and economic benefits:

- Cost savings – inputs (fertilisers, water, pesticides) are applied only where needed.
- Higher yields – problems are detected early and addressed in time.
- Better field overview – decisions are based on data rather than estimates.
- Environmental protection – reduced unnecessary applications.
- Easier decision-making – maps provide clear and visual guidance.

Digital maps, therefore, support more efficient and sustainable farming.

6. Field Blocks – The Basis of Working with Digital Maps

What Is a Field Block

A field block is a clearly defined part of agricultural land that is managed as a single unit. It can be an entire field, part of a field or an orchard. Each field block has clearly defined boundaries that are stored in a digital map.

Without field blocks, digital maps cannot be correctly analysed or compared.

How Field Blocks Are Created

Field blocks are created by:

- drawing boundaries directly in a digital map,
- using existing boundaries provided by farmers or cooperatives,
- combining field boundaries with GPS and drone data.

Boundaries reflect real conditions in the field and can be updated over time.

Why Field Blocks Are Important

Dividing land into field blocks provides:

- better clarity and organisation,
- higher analytical accuracy,
- the ability to evaluate each block individually.

Field Blocks and Targeted Actions

Thanks to field blocks, it is possible to:

- prepare application maps for specific parts of a field,
- divide large fields into smaller management zones,
- evaluate the effectiveness of fertilisation or irrigation for each block.

Field blocks, therefore, represent the link between a digital map and real field operations.

7. Other Applications of Digital Maps in Agriculture

Digital maps can be used for many practical purposes beyond basic crop monitoring. Once farmers become familiar with map interpretation, the same data can support a wide range of daily management decisions.

One important application is planning field operations. Digital maps help identify uneven terrain, frequently trafficked areas, or zones with repeated damage from machinery. This information can be used to optimise driving routes, reduce soil compaction and minimise non-productive areas within the field.

Another key application is monitoring field changes over time. By comparing maps from different dates or seasons, farmers can track how fields respond to fertilisation, irrigation or changes in management practices. This makes it easier to learn from previous seasons and gradually improve farming strategies.

Digital maps are also useful for communication and knowledge sharing. They provide a clear visual tool for discussions between farmers, cooperatives, advisors and extension services. Instead of describing problems verbally, maps allow all parties to see the same information and agree on appropriate actions.

Finally, digital maps support long-term planning and sustainability. They help identify consistently weak areas of fields, zones prone to drought or waterlogging, and areas that may benefit from land improvement measures. In this way, digital maps contribute not only to short-term decisions but also to more resilient and sustainable agricultural systems.

8. Digital Maps as a Tool for the Future

Digital maps are not a complex technology reserved only for experts. When properly explained and gradually introduced, they become a practical everyday tool for farmers. They represent a first step toward modern, efficient and sustainable agriculture that can better respond to climate change, water scarcity and rising production costs. Digital maps help farmers make better decisions – simply, clearly and based on data.