

Briefing paper – Drone use in land use planning

Reflections on advantages and limitations from the GIZ Land Programme Laos

Introduction

Land use planning has been supported in combination with agricultural management at village level by the GIZ Land Programme since 2016, with the approach of Participatory Land Use Planning and Participatory Agricultural Management (PLUP/PALM). The government counterparts are the Ministry of Natural Resources and Environment (MONRE) and the Ministry of Agriculture and Forestry (MAF), with their respective provincial departments. Recently, drones were introduced into the elaboration process and for monitoring & review of the land use plans after 2-3 years. This briefing paper reflects on the experiences in the Land Programme in Laos and examines the scope of application and its limitations. In addition, advantages of drone use for land use planning and monitoring of land use are compared to other technical solutions like satellite images, so as to provide practical recommendations for the introduction of drones in land use planning processes in other countries.

Experiences with drone use in land use planning

Before the introduction of drones, governmental partners in Laos used satellite images (Sentinel 2) and GPS devices to acquire spatial data as a base for mapping of the current land use zones in the land use planning process.



Photo: Bart Verweij

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

of time and cost efficiency as well as required precision. Additionally, the pilot included the effectiveness of drone use for monitoring land use compliance.

Scope of application, conditions and limitations

For the majority of villages most village areas the freely accessible recent satellite images of Sentinel 2 in combination with the use of GPS devices are a solid spatial data source, which is precise and clear enough for mapping of the current land use zones.

Due to technical characteristics of the drone models used in the pilot (run-time of the battery 15 minutes, covers around 20-25 ha) and the size of villages in rural target areas in Laos (on average: 3500 ha), it was not attempted to cover the entire village areas.
Instead the added value of drone use for specific purposes and areas was tested:

- in mountainous sectors difficult to access on foot
- on land plots under agricultural use to deliver information on crop specificity and accurate boundary delineation
- for cases of boundary conflicts and land use compliance monitoring

Pre-conditions need to take into account, that a comprehensive and continuous capacity development of the drone users (here the governmental partners) is required for handling drones, flight planning, processing and data management. A sustainable maintenance scheme must be put into place, and insurance against drone accidents needs to be considered. Furthermore, how long-term costs like regular exchange of hardware and continuous updating of knowledge may pay off, requires further re-evaluation after a longer time span. For processing of spatial data, an OpenSource software was tested and revealed limitations in terms of ease of handling and functions. Depending on the country and area, drones

need to be registered and flights need a permission, which based on the experiences in Laos can be rather difficult close to national boundaries. This requires timely preparation and involvement of the national security entities. In addition, stable weather conditions are required for planning drone flights (no rain, storm, strong sunshine or fog).

Advantages of drone use

Even though the experiences of drone use in land use planning are still in a pilot phase, first lessons learned highlight advantages of drone use in land use planning and monitoring of land use compliance:

- *time and cost efficiency* – if the scope of application, user group and technology are selected appropriately, the relatively high investment costs in equipment, maintenance and capacity development can be profitable in view of saving fieldwork days of the technical team, coupled with the increase in quality data
- *precise spatial data in areas with difficult access* – for agricultural areas in mountainous zones, satellite images do not provide sufficient accuracy for boundary data. And where the use of GPS devices is limited and includes time consuming walks or are hardly possible, drones can provide the needed data
- *increase in information detail* - for agricultural plots additional information about the type of crops can be provided for further agricultural statistics and planning
- *aerial photos facilitate participatory processes* - compared to satellite images, drone aerial photos taken from a side view are easier to interpret and understand by the local population and can therefore facilitate the communication and agreement in conflictive situations like boundary conflicts or non-compliance with agreed land use, such as agricultural activities in forest areas

Recommendations for the introduction of drone use

In summary, the introduction of drone use in land use planning can be a beneficial in other country contexts too. The following points should be considered at the time the use of drones is planned:



Photo: Bart Verweij

- *scope of application* – define a useful, feasible and cost-efficient scope of application
- *selection of drone users* – reflect on the skills and responsibilities of the future drone users and consider costs as well as efforts of capacity development and maintenance, then select users according to scope of application
- *systematic capacity development* – plan a sound introduction process & training for all process steps and establish a system for continuous data updates
- *maintenance and replacement scheme* – establish a sustainable mechanism with required personnel and financial resources, and even possibly accident insurance. If sustainable maintenance and replacement cannot be assured due to missing budgets, the introduction of drones needs to be reconsidered if they are suitable at all.
- *technical considerations* – select the drone model and further accessories according to the purpose and scope of application (simple is sometimes better)
- *data processing*: consider licensed software for easier use and more options of data processing and ensure a regular update of software
- *registration and flight permissions* – review national and regional regulations on drone registration and flight permissions and zones, and favor general permissions instead of one-by-one permissions
- *planning drone flights* - plan drone flights in seasons with stable weather conditions
- *data management*: establish a sustainable data storage and management scheme, and provide access to spatial data to other institutions and different sectors too, as well as the public for further use.

Impressum

Herausgeber:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices, Germany
Bonn and Eschborn

Friedrich-Ebert-Allee 32+36
53113 Bonn, Germany
E info@giz.de
I www.giz.de

Bonn, 2023

Author:
Eva Prediger, eva.prediger@giz.de

Contributions: Sangthong Phatsalin, Bounyong Thongmalayvong, Alexander Strunck

Design/layout:
Eva Prediger

Photo credits/sources:
Bart Verweij