**RETASTE Conference Abstracts**
Vol. 3 RETASTE-FWM-446-Poster
Athens, Greece, 27-29 September, 2023


rethink food resources, losses, and waste 2023

# Mapping the Progression of Small-scale Mining into Croplands: a Satellite-driven Perspective

[1]Stella Ofori-Ampofo, [2]Ridvan Salih Kuzu, [1]Xiaoxiang Zhu, [3]Martin Willberg and [3]Peter Schauer

[1]*Technical University of Munich, Germany*
[2]*German Aerospace Center (DLR), Germany*
[3]*IndustrieanlagenBetriebsgesellschaft (IABG), Germany*



## Abstract

More than half of Ghana's land area is covered by agriculture. In the past decade, the proliferation of small-scale mining is progressively impacting the agriculture sector. The regions which serve as agro-ecological zones coincide with large deposits of mineral resources (Gilbert, 2022) driving an agriculture to mining transition and tree cover loss (Nyamekye et al., 2021). Soil mercury concentrations in intensive mining areas has increased, rendering land unfit for cropping and incapable of sustaining plant growth. Such impact also propagates the food-supply chain and evidence reveals the possibility of heavy metals in foodstuff. Despite the economic benefits of mining, small-scale mining (SSM) has reduced agriculture labour and overall agricultural productivity in mining communities Gilbert (2022) raising concerns for food availability and safety. The wisdespread nature of the activity calls for the use of geospatial technologies in mapping and monitoring efforts (Forkuor et al., 2020; Gallwey et al., 2020; Barenblitt et al., 2021) including the assessment of mining expansion after the government of Ghana temporarily banned the activity (Nyamekye et al., 2021). Geospatial technologies allow for a large-scale perspective of earth dynamics through the continuous availability of satellite images, facilitating rapid mapping compared to ground surveys. Although the use of these technologies is precedent in the mapping of mining sites, the focus is often on the spatio-temporal expansion of the menace and less on its impact on agricultural land. Harnessing the availability of open-access satellite imagery, we map the progression of mining sites over time and quantify its expansion into croplands to inform food-security decisions. For this study, satellite images over mining communities are collected for three periods: prior to the enforcement of SSM ban, during the ban period and the present year. As in (Gallwey et al., 2020), artificial intelligence techniques are employed to segment land use classes in selected mining communities. The concept of segmentation is to partition an image into segments based on spectral similarity allowing the reduction of isolated misclassified pixels often associated with pixel-based approaches (Nyamekye et al., 2021). However, (Gallwey et al., 2020) consolidates vegetation cover into one landuse category hindering the separation of croplands and the

evaluation of the impact of SSM expansion on agriculture. Our work in progress overcomes this limitation, by distinguishing cropland area from general vegetation cover.

**Keywords:** food security, mining, remote sensing, machine learning

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**Acknowledgments:** This work is supported by the Munich Aerospace e.V. scholarship under the IMonitor Research Group.