compared to Sentinel 2, which is an open-source data colllection hub. Drones can vastly vary depending on the quality and the number of drones in a single fleet.

In conclusion, while drones have a very accurate precision and detailed imaging, and Sentinel-2 offers cost-free large-scale data, SSD-Sat 1 provides a well balanced resolution, high revisit frequency, and scalability. For modern technologies of monitring crop farms in large-scale agricultural operations, SSD-Sat 1 presents an important solution with timely, data-driven decisions for improved crop management and yields.

References

1. Bol Thon M.N. Разработка Проектного Облика Наноспутника для Мониторинга Сельскохозяйственного Культура В Южном Судане, 2024 – 55 pages.
2. Zhang Q. Precision Agriculture Technology for Crop Farming, 2021, 382 pages. https://www.routledge.com/Precision-Agriculture-Technology-for-Crop-Farming/Zhang/p/book/9781032098272
3. Saalami E., Mustapja A. Advances in Agricultureal UAV Technologies, 2021, 280 pages.

CURRENT STATE OF AGRICULTURE IN UGANDA: PROBLEMS AND WAYS TO SOLVE THEM

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Agriculture simply means the practice of growing plants and raising animals to produce food, clothing, and other essential products [1]. It includes activities like farming crops, raising livestock, and sometimes fishing or forestry. Essentially, agriculture is how people use the land and natural resources to provide for their basic needs. This has become the backbone of Uganda's economy, contributing approximately 24% to the Gross Domestic Product (GDP) and employing over 70% of the population. 80% of the total land is arable, only 35% is being cultivated; its fertile agricultural land has the potential to feed 200 million people [2].

Uganda's advantages such as its endowment with fertile soils, favorable climatic conditions, and a wide range of crops, including coffee, bananas, maize, and tea, which are the country's key agricultural products has created great opportunities for its agricultural growth.Productivity is limited by reliance on natural weather conditions and the still widespread use of traditional methods and equipment. The Government is pushing for greater commercialization of agriculture by encouraging the use of irrigation and mechanized farming [2].

A research shows Uganda's economic structure with all its statistics below in (Figure 1) [2].

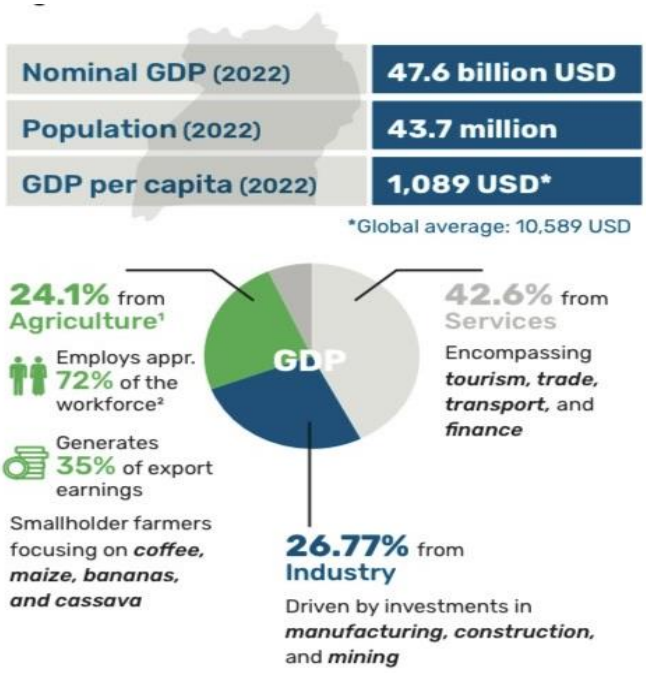

Figure 1. Uganda's Economic Structure

Uganda's agricultural sector is predominantly subsistence-based, with the majority of farmers cultivating small plots of land primarily for household consumption. Smallholder farmers, theyaccount for over 80% of agricultural production. Main crops include coffee, which remains Uganda's leading export commodity, as well as bananas, maize, beans, and cassava. Livestock farming and fishing are also significant contributors to the agricultural sector in (Figure 2) [2].

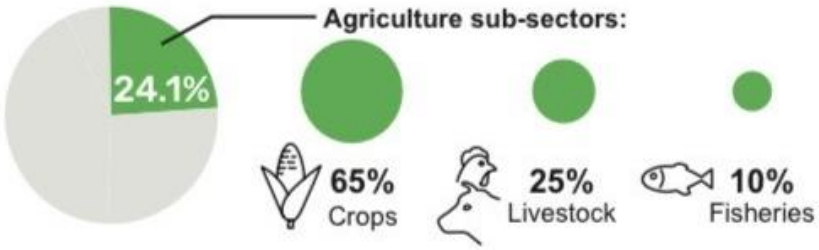

Figure 2. Overall contribution to GDP

Despite its potential, the sector faces numerous challenges that hinder its ability to achieve optimal productivity and sustainable growth. This article explores the current state of agriculture in Uganda, identifies the pressing problems affecting the sector, and proposes practical solutions to address them.

The government has also implemented initiatives like the National Agricultural Advisory Services (NAADS) and Operation Wealth Creation (OWC) to improve productivity and increase household incomes [3]. These programs focus on providing inputs like seeds, fertilizers, and offering extension services to farmers. However, the adoption of modern farming techniques remains low, and the sector is largely rain-fed, leaving it vulnerable to climate variability. The following are some of the problems that have affected the agricultural sector:

*Climate Change and Environmental Degradation.*Unpredictable rainfall patterns such as prolonged droughts, and floods due to rapid climate change have significantly disrupted agricultural activities.Forexample soil degradation from over-cultivation, deforestation, and poor land management practices further exacerbates the problem, reducing agricultural productivity.

*Limited Access to Agricultural Inputs.*Many farmers struggle to access quality seeds, fertilizers, and pesticides because of the high costs and inadequate distribution networks available. Due to this, crop yields are always low, and farmers are unable to compete in local and international markets effectively.

Inadequate Agricultural Financing. Main of the farmers are smallholder who lack access to affordable credit and in addition financial institutions are often reluctant to lend to farmers due to the perceived high risks associated with the sector, such as unpredictable weather conditions and market fluctuations.

Poor Infrastructure.Unfavorable rural roads, inadequate storage facilities, and irrigation systems hinder the efficient production and distribution of agricultural produce. Poor roads lead to post-harvest losses as farmers struggle to transport their products to markets in time.

Limited Access to Markets.Most of the farmers sell their produce at low prices to middle-class men due to a lack of access to reliable markets and without proper market linkages, farmers often do not benefit fully from their labor, which discourages investment in agriculture.

Addressing issues such as climate change, limited access to inputs and markets, inadequate infrastructure, and low adoption of modern practices will unlock the sector's potential [4]. By implementing the proposed solutions, Uganda can transform its agricultural sector into a sustainable and profitable industry, ensuring food security and economic growth for its people. The following are some of the proposed solutions to the above problems:

*Climate Adaptation Strategies.*The government and stakeholders should promote climate-smart agriculture, such as agroforestry, conservation farming, and introduction of drought-resistant crops. Investing in irrigation systems will reduce reliance on rain-fed agriculture, ensuring consistent production even during dry spells.

*Improved Access to Agricultural Inputs.*Subsidizing agricultural inputs and establishing better distribution networks can ensure that farmers access affordable and high-quality seeds, fertilizers, and pesticides. Public-private partnerships can play a crucial role in achieving this.

*Enhancing Agricultural Financing.*Establishing agricultural credit schemes and cooperatives can provide farmers with affordable loans. In addition, creating insurance products tailored to smallholder farmers will mitigate risks associated with unpredictable weather and market conditions, encouraging financial institutions to lend to the sector.

*Infrastructure Development.*Improving rural road networks, constructing modern storage facilities, and investing in cold storage systems will minimize post-harvest losses. Expanding irrigation infrastructure will further enhance productivity by ensuring year-round farming.

Strengthening Market Linkages. Creating platforms for farmers to access reliable markets, such as cooperatives or digital marketplaces, will help eliminate exploitative middle-class men. In addition, promoting value addition through agro-processing will enable farmers to earn more from their produce.

*Promoting Technology and Education.*Introducing affordable technologies, such as mobile apps for weather forecasting and pest management, can improve decision-making among farmers. Extending training on modern farming practices through extension services will boost productivity and efficiency.

*Pest and Disease Management.*Strengthening research and development in agriculture will help identify effective solutions for pests and diseases. Investing in local production of pesticides and vaccines for livestock diseases will reduce dependency on imports and enhance accessibility.

References

1. Ministry of Agriculture (through National Irrigation Policy). [Electronic Resource]. URL: https://www.mwe.go.ug/sites/default/files/library/Uganda National Irrigation Policy.pdf. (accessed 24.11.2024).

2. World Bank Uganda Overview. [Electronic Resource]. URL: https://www.worldbank.org/en/country/uganda (accessed 24.11.2024).

3. A review of some aspects of Uganda's crop agriculture: Challenges and opportunities for diversified sector output and food security.Working paper, Published in Working Paper 26, 2021 [Electronic Resource]. URL: https://dx.doi.org/10.1079/CABICOMM-62-8161 (accessed 22.11.2024).

4. Kraybill, D., Bashaasha, B., Betz, M. (2012) Production and Marketed Surplus of Crops in Uganda, 1999-2006. Volume IFPRI Working paperno. USSP 08. [Electronic Resource]: https://scholar.google.fr/citations?view_op=view_citation&hl=en&user=1jgQzJkAAAAJ&citation_for_view=1jgQzJkAAAAJ:4OULZ7Gr8RgC (accessed 24.11.2024).

OIL THEFT PREVENTION USING BLOCKCHAIN AND AI

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Siphoning of oil and pipeline sabotage have effects on environment and the economy of the country; this paper focuses on oil theft especially in Nigeria particularly the Niger Delta region. Applying the Academic state of art of using Blockchain technology integrated with Artificial Intelligence (AI) to manage this important problem, allow for safe and effective control over Pipe lines and supply chains in the oil industries.

The Problem: Oil Theft and Environmental Impact

This act leads to economical loss because Nigeria's major source of revenue is oil but this is hindered due to cases of pipeline vandalism which causes spills (Figure 1).

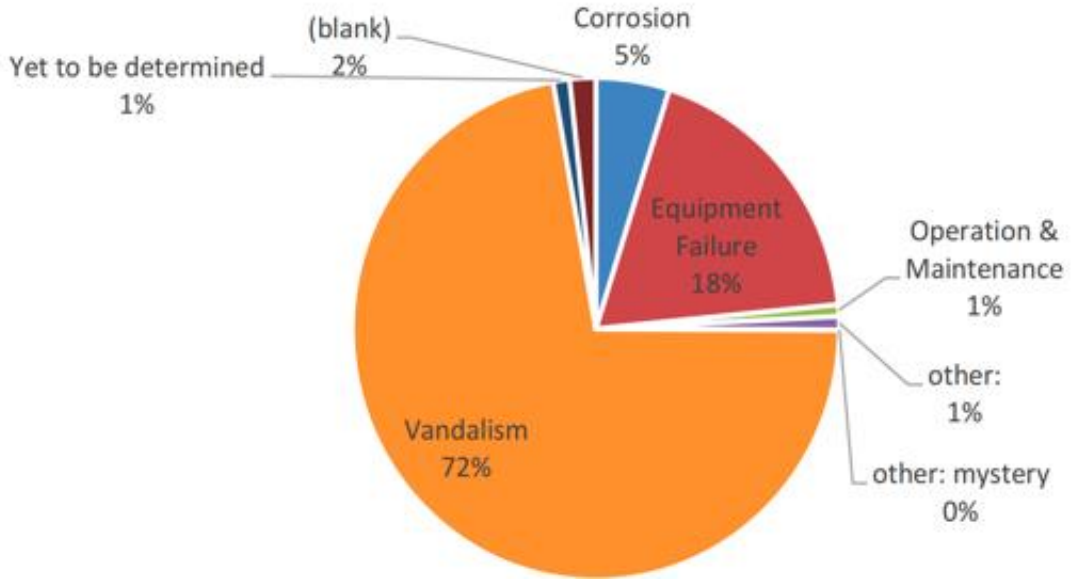

Figure 1. Causes of total Oil spillage in Nigeria in 2022

Besides, the money realized from the stolen oil is channeled to unlawful activities, which contributes to insecurity on the area. Others such as physical patrols and use of manual checklists offer no solution to some of challenges facing the system such as inefficiency, corruptions and monitoring of giant pipeline networks. It is clearly time for a technology solution that is based on, and that integrates these principles of transparency, accountability and proactive monitoring.

Blockchain Technology in Oil Theft Prevention

Blockchain technology, a decentralized and unalterable digital ledger, and is ideal for ensuring transparency and accountability in the oil supply chain.

1. *Tracking Oil Movement:* Every barrel of the oil is labelled with a unique digital code that is placed on the blockchain. The IoT sensors mounted at extraction sites therefore capture some