

OKO Forests



&



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OKO Forests (OKO) is a for profit organization focused on regenerative agroforestry systems based in Ghana. They aim to create socio-economic opportunities for communities living near protected areas, such as the Kogyae Strict Nature Reserve (KSNR). OKO began development on a forty hectare farm, where reforestry will be combined with economic fruiting trees, agricultural crops, and high value commercial timber products to serve as a buffer zone with the KSNR.

Ghana's economy relies heavily on cocoa farming; approximately 60% of the agricultural base in Ghana is made up of 800,000 small scale cocoa farmers, the majority of which are self-employed operating in farmland of 5 hectares or less. These small farms typically produce an average of 0.42 tonnes per acre of cocoa, limiting the earning potential of Ghanaian farmers and preventing farmers from accruing savings.¹

Ghana's Economy Relies Heavily on Cocoa Farming



Cocoa farming makes up 60% of the agricultural base in Ghana.

800,000

Small-scale cocoa farms typically produce .42 tonnes per acre on 5 hectares of land or less.



But Galamsey Threatens Local Economies & the Environment

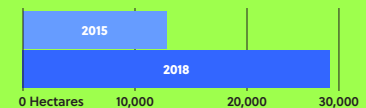
3.2%

Annual deforestation rate

\$2.3B

Lost revenue

Deforestation from Galamsey



→ Galamsey

(noun) | /ˌɡæləmˈseɪ/

Galamsey, derived from the phrase "gather them and sell," is a Ghanaian term which refers to illegal small-scale gold mining in Ghana.

In recent years, the cocoa industry has been significantly impacted by illegal gold mining operations, referred to as **galamsey**. Galamsey mining is largely unregulated and has seen an influx of foreign investors. The effects of galamsey mining have included both deforestation and contamination of water supply. In 2014, a cocoa shortage was predicted by 2020; while the actual crop yields of cocoa have been unpredictable based on rainy seasons, the cocoa crop did drop from one million tonnes in 2011 to seven hundred and forty thousand tonnes in 2014. Subsequently, a surplus of cocoa crop in 2015-2016 attributed to increased rainfall, which caused the cocoa bean price to plummet on the commodities exchange.² Galamsey was responsible for an estimated \$2.3 billion in lost revenue in 2016.³

The deforestation impacts of galamsey are significant. From 2015 to 2018, deforestation attributed to galamsey increased from 13,456 hectares up to 29,275 hectares. As of 2018, 1,058 hectares of forest degradation have occurred in protected forest reserves.⁴ While cocoa farming is a key contributor to Ghana's economy and has seen negative impacts from galamsey, cocoa farming and the expansion of the cocoa agricultural footprint in Ghana has negatively impacted the forest reserves with one of the highest deforestation rates in Africa at 3.2% annually.⁵ Organizations like OKO are seeking to solve the deforestation challenges in Ghana while providing new socio-economic opportunities through agroforestry.



“I started OKO Forests because I was alarmed at the rate of deforestation in Ghana. Our long term goal is to create an agroforestry buffer zone to not only protect the Kogyae Strict Nature Reserve, but to also increase the incomes of the communities that surround it.”

KOFI DEBRAH, CO-FOUNDER & PARTNER, OKO FORESTS

→ Partnerships



OKO was created to serve a dual purpose in providing opportunities and educational outreach to the local communities. Many similar organizations are structured as non-profits, however, OKO was created as a for profit organization, which helps facilitate long term scalability and success of farmers. By acting as a for profit entity, the organization will not have to spend a portion of its time seeking grants or other means of funding, rather they can focus on managing a successful agroforestry and farming business.

OKO's initial project has focused on creating a buffer zone adjacent to the KSNR to protect and enhance biodiversity through a traditional agroforestry approach. As deforestation wreaks havoc on Ghana's natural resources, this project seeks to provide a protected area and useful area between the community and the KSNR. OKO has partnerships with the Forestry Commission of Ghana, the Forestry Research

Institute of Ghana, the Centre for No-Till Agriculture, Ghana Permaculture, the Kokrobitey Institute, Bamboo for Integrated Development Ghana, and the King of Ashanti. These partnerships serve many purposes including research, education, outreach, and bureaucratic support.

Currently, OKO is in the process of creating a Community Resource Management Area (CREMA) as well as a potential co-op to organize and sell their crops to ensure long-term sustainability in farming and opportunities for farmers, businesses, government and non-governmental actors. The CREMA will allow the farmers to organize their crops in a shareholder fashion, increasing opportunities for selling their products at higher prices and in long-term contracts. The co-op will focus on OKO partnering with external farmers and other producers to sell larger quantities of crops such as cashews for local markets and to export.

Agroforestry Scope

The project is meant to act in a three step process to ensure developmental success. Initially they seek to increase crop yields and food security. Secondly, they aim to diversify the agroecosystem and tree products. Lastly, they are focused on value adding through their products. OKO seeks to increase agricultural biodiversity and sustainability while creating improved nutrition and health as well as employment opportunities, entrepreneurship, and improved infrastructure. These lead to: increased income, empowerment, gender equity, and increased education.

A key challenge OKO faces is education; farmers are currently overusing harmful fertilizers instead

of well-known organic methods that regenerate the soil and increase crop yields as well as prevent farmers from cutting down existing trees. In many cases, farmers are unaware of alternative or organic fertilizer methods. OKO is determined to empower the farmers by meeting them where they are and working with them over time. For OKO, this means walking farmers through two developed agroforestry methods while educating them on the benefits each plant can provide to the soil or surrounding crops in addition to the use of cover crops to reduce the risk of bushfires and in the use of agrochemicals to improve harvesting outcomes.

Benefits of Agroforestry



Increased crop yields and food security



Diversified agroecosystem and tree products



Product processing and value adding



Ofram seedling, planted May 2021

OKO's Farming Methods

OKO has identified natural pesticide and fungicide inputs that will be used to increase crop yields and control pests and diseases. Based on the educational investments surrounding using natural inputs, the farmers can expect a higher crop yield and higher quality product. This is expected to provide a higher income for the farmers over time, which directly correlates to the empowerment of the farmers and provides additional education opportunities as they continue to work with OKO.

The positive environmental impacts of agroforestry include improved soil quality through soil regeneration and improved air quality through carbon sequestration.⁶ Both agroforestry methods include crop

rotation and diversification as the age of mature fruiting and value of crops varies. This prevents issues associated with monoculture while increasing the number of harvests each year. Soil erosion is reduced as the agroforestry methods provide an even demand in planting and growth throughout the year, simultaneously regenerating soil over time. Additionally, a huge piece of OKO's educational outreach incentivizes farmers to not cut down existing trees. As less trees are cut down, more will be planted and crops are rotated, the presence of trees and crops will serve as a wind barrier to protect the soil. These combined efforts will increase carbon sequestration.



OKO's Crops

In evaluating crop selection, OKO has completed multiple rounds of tree modeling, including experimenting with different combinations and spacing of cover crops and trees. Drought resistance played a key role in crop selection to work with the Ghanaian climate. OKO embraces the permaculture ethos of working with nature rather than against it and even has a permaculture certified farmer on staff.⁷ OKO is passionate about incorporating permaculture principles into their plant selection as they continue to expand and refine their crop choices. The below table summarizes the trees, root crops, vegetables and cover crops and corresponding quantities OKO planned for the planting periods from Fall 2020 through Summer 2021:

Tree Crops	Units
Acacia	1,658
Avocado	50
Coconut	14
Palm	8
Cashew	8,570
Moringa	200
Mahogany	500
Oprono	5,550
Miracle Berries	350
Chenchen	250
Emere	6,150
Ofram	2,100
Bird of Paradise	750

Root crops	Units
Cassava	3,000
Yam	2,700

Vegetable crops	Units
Hot pepper	4,250
Garden Eggs	2,400
Okra	1,833

Cover Crops	Units
Pigeon Pea	140
Canavalia	3,000

Priority crops moving forward include, but are not limited to, acacia trees, cashew trees, and the root crop cassava.



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Acacia

Acacias are evergreen trees that are nitrogen-fixing, which helps rehabilitate degraded soils and increase soil fertility, thus supporting the growth of OKO's other plants.⁸ The farmers will control the acacia canopy through pruning, which will increase root activity and photosynthesis, simultaneously increasing carbon sequestration.⁹ Biomass cut down from pruning will be used for mulching to reduce waste. Farmers will plant two types of Acacia:

- *Acacia polyacantha* or *sieberiana* is for production of gum, after a gestation period of 15 years, which gets used in the food industry, and
- *Faidherbia albida*, indigenous to West Africa and drought resistant, which is a leguminous tree producing high-protein edible seeds¹⁰



Cassava

Cassava has been established as a crop that can be intercropped with yam, allowing farmers to take advantage of cassava planting opportunities on established yam farms to help prevent relocating farmers or the abandonment of existing yam plots. Cassava is a plant proven to produce high yields with limited water resources, making it an ideal plant choice for the Ghanaian climate. Realizing Increased Photosynthetic Efficiency (RISE), an international research group focused on sustainable increase in crop yields, has been researching the impacts of increased atmospheric carbon dioxide (CO₂) on cassava production and their study found that when CO₂ levels increase from 400 to 600 parts per million, cassava leaves were able to conserve 58 percent more water on average.¹¹ Yams and cassava are important food crops in Ghana and globally, thus intercropping with yam was a priority for OKO. In addition to the efforts of RISE, the Cassava Source-Sink (CASS), with funding from the Bill and Melinda Gates foundation, is working to improve the yield of cassava in sub-Saharan Africa.¹² OKO has a cassava facility, which can process cassava into both gari and cassava dough.



Cashew

Cashew has been chosen as a priority tree crop for OKO as it is a major cash crop in Ghana, both for export and in the local market. The nut can be exported internationally while the cashew apple can be used to produce fruit juice or be fermented to produce local beer. Through research initiatives, Ghana has developed unique polyclonal varieties of cashew that begin to produce cashew nuts three to four years after planting and can eventually yield up to twenty kilograms of raw cashew nuts per tree upon maturation, at approximately nine to ten years of growth.¹³ In addition to the financial potential of cashew crops; cashew trees play an important carbon sequestration role in OKO's agroforestry efforts. Research conducted on carbon sequestration capacity of cashew trees has demonstrated that under high-density planting, cashew trees can store an estimated 32.25 tons of CO₂ per hectare at five years of growth and 59.22 tons of CO₂ at seven years of growth.¹⁴



Creating Opportunities

Gender equality is a challenge in Ghana's labor force. While women in Ghana do have autonomy and contribute to the local community, they have lower rates of literacy and lower rates of tertiary education than Ghanaian males, with males participating in tertiary education at 2.5 times the rate of women's participation. Decreased educational opportunities ultimately yield lower participation in professional occupations.¹⁵

OKO is focused on providing opportunities for gender equality with their current farming efforts as well as additional opportunities in combination with other partners such as the Kokrobitey Institute. The Kokrobitey Institute has years of experience in working with women and men on a range of projects to provide economically viable and sustainable opportunities to help the community succeed. This includes, but is not limited to, educational outreach and creating projects that improve livelihood and access for women to participate in earning an income. Leveraging their experience with educational outreach, OKO has partnered with the Kokrobitey Institute to develop and distribute educational materials to help teach locals about the impacts of deforestation as well as the benefits of OKO's crops and farming opportunities. Training materials will also provide guidance on farming from preparation of the soil through planting, growing and eventually harvesting. OKO sees value in providing additional opportunities for both men and women to participate in

“Respect for and empowerment of women goes hand in hand with our entrepreneurship model. Through agricultural training, communal planning, and regenerative business education workshops, we make it clear all are valued for their contributions and equal in their potential.”

ELISE MCMAHON, KOKROBITEY INSTITUTE



Pastoralists passing through, April 2021

the project as a whole and will continue to work with their existing partnerships as well as find new opportunities to increase opportunities for all.

OKO firmly believes in maintaining and improving their partnerships with local and regional governments alongside non-government actors such as the King of Ashanti. Ghana's government is structured very differently than the U.S., and support from native organizations are crucial for long term success within the government and with regional non-government actors such as other organizations or non-profits. Support from the King of Ashanti will also ensure OKO the opportunity to seek registration for carbon credits due to the complicated nature of land ownership laws in Ghana.

Additional educational and community outreach programs are expected to include ways to address challenges associated with cattle herders, referred to as pastoralists. There are an estimated 268 million pastoralists who migrate throughout Africa in search of limited natural resources.¹⁶ As climate change reduces availability of resources, pastoralists herd cattle through farmland, destroying crops and trees which can lead to conflict over access to land resources. This contributes to the increases in deforestation and will continue to impact the agroforestry efforts in the region.^{17, 18}

Lessons Learned



Dam construction, July 2021

OKO has taken a pilot phase approach to species selection and planting, with both tree and crop production in play. In Fall 2020, OKO completed an initial pilot phase of planting, which included 5,000 tree seedlings and seeds alongside various intercropping and cover crops including, but not limited to yams, okra, pigeon peas, and mucuna. In the early phase of the pilot study, OKO received a batch of bad seedlings and discovered the need for a more organized nursery.

Over the past few years, rainy seasons in Ghana have shifted both in duration and timing. During OKO's initial Fall 2020 planting, unexpected weather patterns ultimately contributed to a yield of less than 3% plant survival rate.

OKO continued into Phase 1a of planting in April 2021 with roughly 17,000 tree seedlings being planted, focusing on trees with a simultaneously higher crop production and carbon sequestration such as cashews and acacia trees. However, the Spring 2021 rainy season has been compressed, shortening the opportunity for planting. Planting is expected to continue with Phase 1b in the fall of 2021 with another 8,000 seedlings. In their efforts to address deforestation and ultimately climate change, OKO's efforts have been challenged by changing climate patterns and unpredictable rainy season conditions. To supplement irrigation and mitigate rainfall uncertainty, OKO is investing in water infrastructure, including building a dam and drilling four water wells. Additional concerns stemming from the impact of pastoralists on land availability are at the forefront of OKO's planning process. As pastoralists continue to migrate and compete for limited natural resources, OKO's planting was directly impacted. Moving forward, OKO seeks to work with pastoralists through educational outreach and provide new economic opportunities for them to be a part of.

Continued Growth



Spring planting of seedlings, May 2021

After diving into the benefits of global cashew exporting and regional opportunities for co-ops, OKO intends to continue developing their CREMA as well as a firm co-op program combined with other regions within Ghana and neighboring countries. From a planning perspective, OKO is focused on learning from farming practices over time and is committed to evolving their practices to meet demand as well as addressing any impacts from climate change.

OKO has additional plans for expansion of their farms and hopes to expand socio-economic opportunities for additional gender equity in the region. After their pilot in Fall 2020, OKO spent additional time and resources to learn how to improve planting and farming practices for their Phase 1a planting in April 2021. Due to the challenges with changing climate patterns and rainfall uncertainty during the growing season, OKO will continue to refine their planning and growing practices as they move into Phase 1b.

OKO plans to certify their project and is currently working with an internationally recognized certification firm which specializes in land-use projects, generating carbon credits. The ability for OKO to sell or market carbon credits for the estimated carbon they are sequestering is incredibly beneficial for the future of the project from an investment and sustainability perspective. Certification allows the project to serve a dual purpose for the carbon credit purchasers - investors purchase credits for the greater good while making a meaningful investment. OKO's project certification is critical to provide the farmers the economic incentive needed to continue to care for the trees as they sequester carbon.

→ Footnotes

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