Biofuels: Beneficial or Bad? Should a Ghanaian Chief Sell His Land for Biofuel Crop Cultivation?

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Background

Michigan Sustainability Cases (MSC) is an initiative funded by the University of Michigan's Transforming Learning in the Third Century Initiative and the School for Environment & Sustainability (SEAS) that is creating case studies for sustainability education. MSC is writing and piloting initial cases throughout the U-M campus from its current home in SEAS. For over 30 years, SEAS professors have successfully taught with case-based learning in their classrooms, which has proved more effective than lectures. MSC is reimagining this technique, while drawing from decades of in-house experience.

MSC also refers to the individual case products generated by the initiative. MSCs are modular multimedia sustainability case studies developed through partnerships with practitioners, teachers, and students. MSCs present actual experiences or experiences inspired by real circumstances of key "decision makers" through a digital platform. Like the traditional case method, MSCs present students with a case, a decision maker, and various stakeholders, allowing students to analyze priorities and tradeoffs in reaching a recommendation. Unlike the traditional case method, each MSC is accompanied by multimedia Edgenotes, a podcast, and an interactive learning exercise. Together, these bring greater depth to the case, producing more engaged, participatory learning. MSCs impart critical interdisciplinary competencies, for stronger sustainability leaders of the future.

Introduction

Biofuels have been touted as one promising solution for reducing carbon dioxide (CO_2) emissions worldwide. These products take many forms, but all share an origin in plants grown and processed specifically to meet energy needs. Because plants absorb CO_2 and convert it to organic matter as they grow, the assumption has followed that when biofuel plants are burned, net CO_2 emissions should be zero. However, as biofuels have made their way into the world's energy mix, questions have arisen not only about the actual environmental impacts, but social and economic impacts as well.

Amid this backdrop, this case focuses on biofuels as a potential partial solution to the energy crisis in Ghana. For years, Ghana's industrial development and economic growth have been slowed by energy shortages. Despite these energy concerns, Ghana still has a goal of universal access to energy and use of renewable energy sources for 10 percent of all electricity by 2020. Biofuels are one potential way for Ghana to meet this goal, and this case focuses on the sale of land for growing a biofuel crop.

The two primary stakeholders Chief Ofori and NalOil are fictional characters, but they are based on real life actors. NalOil wishes to grow *Jatropha curcas*, a shrub with high oil content in its seeds that can be used to produce biofuel. Growing this crop will have economic, social, and environmental impacts on Chief Ofori's community and land, which must be considered when making his decision. In many regions of Ghana, especially in more rural areas, traditional leaders maintain sole authority to make land use decisions, including selling their land. For Chief Ofori, the decision about the future of his people and his land is his alone.

This case study is designed to be supplemental material for classes

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that explore energy consumption, land use development, or the global supply chain. Students will gain a better understanding of stakeholder considerations and the complexity of sustainability issues. Many countries aim to reduce their carbon footprint, but the route to do that is not clear. This case study highlights the tension created by biofuels, which offer economic opportunities for locals, but have the potential for negative effects on the people, economy, and environment.

Throughout this case, students perform quantitative and qualitative assessments of the effects of growing this biofuel crop. In the engaged learning activity, students calculate the water consumption required by *Jatropha curcas* plants. In the written case, students must consider the effects this decision will have on local school quality and individual land owners. Students will weigh different stakeholder opinions and the effects of selling land for *Jatropha curcas* cultivation before coming to a conclusion about what they would do if they were in Chief Ofori's position. Through this case, students will be exposed to stakeholder analysis as well as elements of Ghanaian culture such as *fufu*, a traditional soup. This case study focuses on the Ghanaian biofuel crop *Jatropha curcas*, but biofuels are a universal issue. By being able to analyze sustainability issues from abroad, students will be better equipped to answer sustainability questions at home.

The Story

Blackout

The lights flickered throughout the room, and then darkness. No one knew when the lights would come back on. It could be five minutes, or it could be a whole day, but until then the residents of Accra, Ghana, would live in darkness or have to rely on expensive backup generators. This was the reality of the energy crisis in Ghana: rolling blackouts lasting anywhere from hours to days, lack of universal electricity access, and a national economy hindered by a shortage of power that was having consequences for urban and rural residents alike.

Miles away from Accra, in the Agogo traditional area of Ghana, a local chief confronted the energy crisis in his community. It was somewhat cool and awfully humid in the early light of day. Sitting back in his chair, hands folded on his lap, Chief Ofori stared out the window as the sun climbed over the horizon. His relaxed posture belied internal turmoil as he labored over a decision that could mark a new era for his people: Should he sell his land to the Norwegian company NalOil for the cultivation of *Jatropha curcas,* a biofuel crop?

An expected knock on the door prompted a hasty retreat from his ruminations, and he beckoned his guests inside. Two men entered. His first impression was that their professional attire was not really suited to the warm weather, but they were putting on an admirable performance in not betraying discomfort. He stood to greet them from behind his desk, and they both came forward and took their turns in shaking his hand before they all proceeded to sit. The man to his left, who had blonde hair and appeared to be in his forties, began speaking.

"So, Chief Ofori, I expect you have made your decision?" He spoke with a thick Norwegian accent, but slowly and in a manner that suggested that he believed the chief's English to be poor. "NalOil is convinced that it has made you an offer that you can't refuse." He chuckled to himself, probably convinced that the chief had not caught the reference to *The Godfather.*

But he had.

The other man, who appeared to be much older, gave his partner a scolding look, sighed under his breath, and leaned across the table to bring his face closer to the chief's. "Look, let's just finish with this business," he said, speaking at a faster pace than his colleague. He leaned back again to reach for his suitcase on the floor and pulled out several sheets of paper, all of which had two lines for signatures at the bottom. One line on each page had already been signed. "If you would kindly sign these forms, we can finalize this land sale. We believe we have given you an ample amount of time to come to a decision."

He pushed the papers toward the chief, who slowly looked them over despite being very familiar with the text—32,100 acres, about one-sixth of his land, were literally on the table. The chief had thought that he was prepared to settle the matter, but at this crucial moment, with the decision requiring only his signature on those contracts, he hesitated. Was he making a grave mistake in selling this much land for the cultivation of *Jatropha curcas*, a biofuel crop he had never even heard of before this offer was presented to him? Despite having convinced himself that exchanging the land for increased development opportunities and economic activity was the right choice, he could not shake his lingering doubts.

Drawing on all his will to assert an outward appearance of calm, Chief

Ofori resolutely pushed the papers back toward the men.

"Gentlemen, I sincerely apologize, but I need some more time. I will get back to you with my decision tomorrow." He mustered a smile as the men glanced at one another, clearly displeased. However, they quickly changed their expressions and nodded amicably at the chief. After brief farewells, the men headed toward the door, the older man hollering over his shoulder that they would be back first thing in the morning.

Kwadwo Ampah Ofori was the paramount chief of the Agogo traditional area in Ashanti, a land of over 30,000 people, and he had to decide their future.

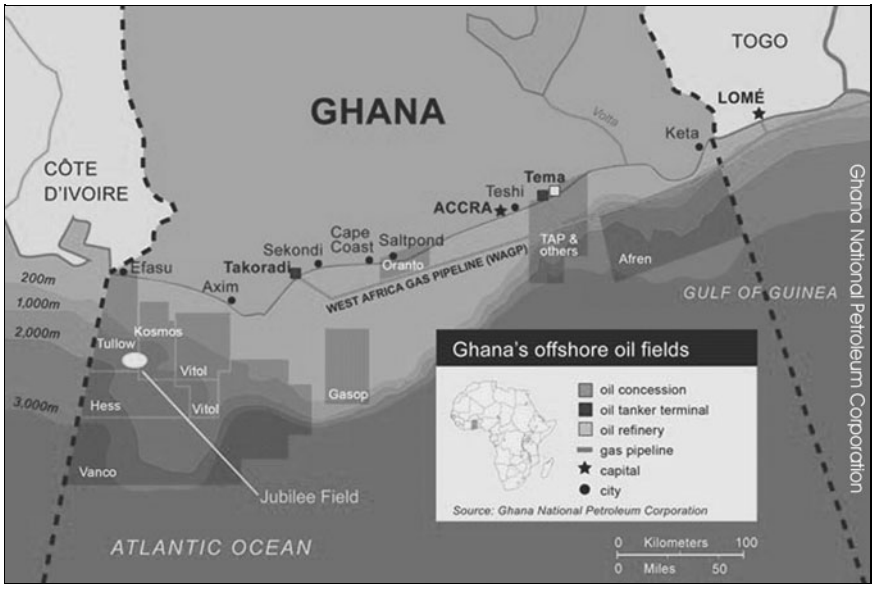
The Energy Crisis in Ghana

The energy crisis in Ghana began in 2012 and only worsened due to erratic gas supplies from foreign countries, intermittent rainfall that had made hydropower less reliable, and rising energy demand. In 2015, Ghana had a total installed power capacity of 2,450 MW, but average available energy hovered around 2,000 MW, as most power plants did not operate consistently at full capacity. However, with the total energy demand over 2,500 MW, even if these plants always ran at full capacity, they still would not be able to meet demand.

Ghana has several major hydropower plants, including Akosombo, Bui, and Kpong, that produce a significant portion of its electricity. Hydropower dams depend on having a sufficiently high water level behind the dam to run. If water levels drop too low, the turbines in a hydroplant can be damaged or become unable to produce energy. Due to irregular and sparse rainfall in Ghana, some of these plants are now at risk of shutting down. Akosombo, the largest hydropower plant in Ghana, operated at a water level of 277 feet—an all-time high—in 2010. However, in December 2015, the water level dropped to 244 feet, dangerously near the 240-foot threshold that would force a total shutdown.[1] One more year of drought could push these plants past the tipping point.

Ghana also relies heavily on both domestic and imported oil and gas for energy production. In 2010, Ghana began producing oil following the 2007 discovery of oil in the Jubilee oil field, located about 60 kilometers off the Ashantiland Peninsula in western Ghana.

By 2016, Ghana was producing over 100,000 barrels of oil per day, mostly from this field,[2] with 5.21 million metric tons of crude oil exported in 2015.[3] While the oil field has the capacity to produce much more oil, this effort was constrained by the fact that Ghana has only one petroleum refinery plant. In 2015, this refinery produced 89,100 metric tons of petroleum products, but Ghana imported 3.65 million metric tons, mostly from neighboring Nigeria. This meant that Ghana was heavily dependent on Nigerian oil and gas, but that supply has been subject to disruption. In 2015, there was a 60 percent reduction in the imported volume of gas supplied to thermal electric plants from Nigeria through the West African Pipeline Project. This reduction was attributed mostly to debt accumulated by the Ghanaian government and attacks on pipelines and facilities by a militant group calling themselves the Niger Delta Avengers. Even with this reduction, however, a hefty 44 percent of Ghana's natural gas in 2015 was imported from Nigeria, compared to the 56 percent that was produced domestically. Then, in June 2016, Nigeria cut off Ghana's natural gas supply entirely, due to Ghana's accumulated debt and Nigeria's need to use the fuel within their country. Because of these supply issues, the government expressed firm desires to reduce its dependence on imported oil and gas, as well as for



Location of the Jubilee oil field, located about 60 kilometers off the Ashantiland Peninsula in western Ghana

MARY ANN LIEBERT, INC. • Vol. 11 No. 1 • February 2018 • DOI: 10.1089/sus.2018.29121.eo

Ghana to eventually become a prominent international exporter of oil, gas, and electricity. This would happen, however, only if Ghana could overcome the limited productivity of its domestic plants and oil fields.

The energy crisis had countrywide economic effects, with the GDP growth rate slowing from 7.3 percent in 2013 to 3.9 percent in 2015.[4] Underscoring these effects, the Minister of Energy and Petroleum, Emmanuel Armah-Kofi Buah, stated that electricity supply and its shortfalls were the "nerve center of our economy, the critical constraint to our economy's growth." To address this issue head-on, Ghana set ambitious goals for the year 2020, including universal access to electricity, 5,000 MW of generation capacity, access to liquid petroleum gas for 50 percent of the population, and the generation of 10 percent of domestic electricity from renewable sources. Grid expansion projects were already underway, and by early 2018 the Sankofa Gas Project, which would generate 1,000 MW of clean power, was expected to be completed.

In 2016, Ghana was generating only 0.04 percent of domestic energy from renewables, so reaching the 10 percent goal would be a challenge. But the country had invested $230 million into the Scaling Up Renewable Energy Plan (SREP). This plan invested in four project areas: renewable energy mini-grids and stand-alone solar photovoltaic systems, solar photovoltaic-based net metering with storage, utility-scale solar/wind power generation, and technical assistance. In addition, foreign investors saw Ghana as a prime location for the cultivation of biofuel crops, and since 2007 have been pushing for biofuel production as a way to increase the availability of renewable fuels and reduce Ghana's reliance on foreign oil.

Three main types of biofuel cultivation projects operating at different scales were developed in Ghana over the past couple of decades. One was cultivation by small-scale farmers, or out-growers, who were linked to commercial biofuel production or processing. Another was large industrial farms (about 250 acres or larger) that cultivated and produced biofuel for local consumption. The third—which pertained to NalOil and its proposition—was large industrial farms for national and international consumption.

If Chief Ofori sold his land for biofuel crop cultivation, would it provide new opportunities for his people, or would he be sealing their fate by sacrificing a significant amount of productive land to a foolish venture?

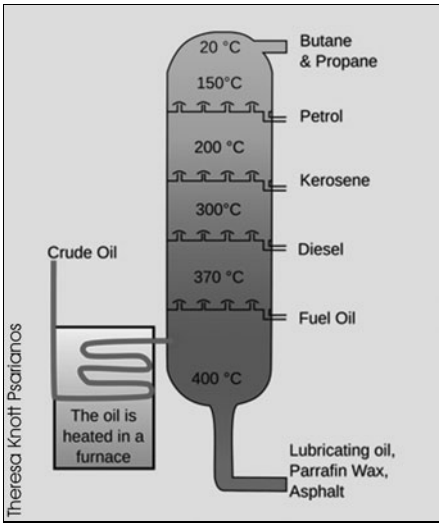
An Overview of Diesel

After a filling lunch of *fufu in nkatekwan* (peanut soup), Chief Ofori returned to his desk to pore over, for the final time, the months of research he had naively convinced himself would practically make his decision for him. Before starting his research, he had possessed only the faintest notion of the difference between conventional fuels and biofuels and had not been especially knowledgeable about the pros and cons of cultivating biofuel-producing crops.

His starting point had been educating himself about diesel and biodiesel. Diesel is used for car, aircraft, truck, and railroad fuel. In the United States in 2015, it made up 21 percent of petroleum fuel consumption in the transportation sector, and worldwide its consumption was actually higher than that of gasoline. In Ghana, diesel generators had become common due to the ongoing power crisis. Many companies had to rely on these generators to stay open and productive during long electricity shortages. Learning this had made him consider the potential for his people to use some of the biodiesel produced from *Jatropha curcas* to fuel their own generators. More reliable access to power and electricity would greatly improve the quality of life for many of his people.

Although both diesel and gasoline are derived from petroleum, they have different properties and serve different purposes. When crude oil is distilled, it separates into heavier and lighter components. Gasoline and jet fuel are two examples of lighter distillates, while diesel and fuel oil are on the intermediate-to-heavy side.

Diesel's higher density explains why it contains 18 to 30 percent more energy per gallon than regular gasoline.[5] However, its low volatility means a gas engine cannot not run on diesel. In a typical gas engine, fuel is mixed with air before being compressed and ignited by a spark. In a diesel engine, the air is compressed



Distilling crude oil yields multiple oil products of varying densities

first, producing enough heat to ignite the fuel when it is added.

Alternative Sources for a More Sustainable Future?

Chief Ofori had also learned that biofuels are acquired from organic matter such as animal waste or plant matter. They are, in theory, carbon neutral due to the fact that plants take in carbon during photosynthesis, and this same carbon is returned to the atmosphere when fuels derived from these plants are burned. This is different from traditional fossil fuels that have been buried beneath Earth's surface for millions of years. When burned, fossil fuels release carbon dioxide and other greenhouse gases into the atmosphere. The burning of fossil fuels has been a major contributor to global climate change over the last two centuries. Oil is also a finite resource, and the Earth's current supply will be used up before it can be replenished. Therefore biofuels are more renewable on a human time scale.

However, in reality biofuels are not completely carbon neutral due to the energy required to transport materials and power the facilities used to produce biofuels from organic matter. Additionally, there are concerns about prioritizing land use for biofuel crop cultivation instead of food crops, and about the environmental impact biofuel crops could have.

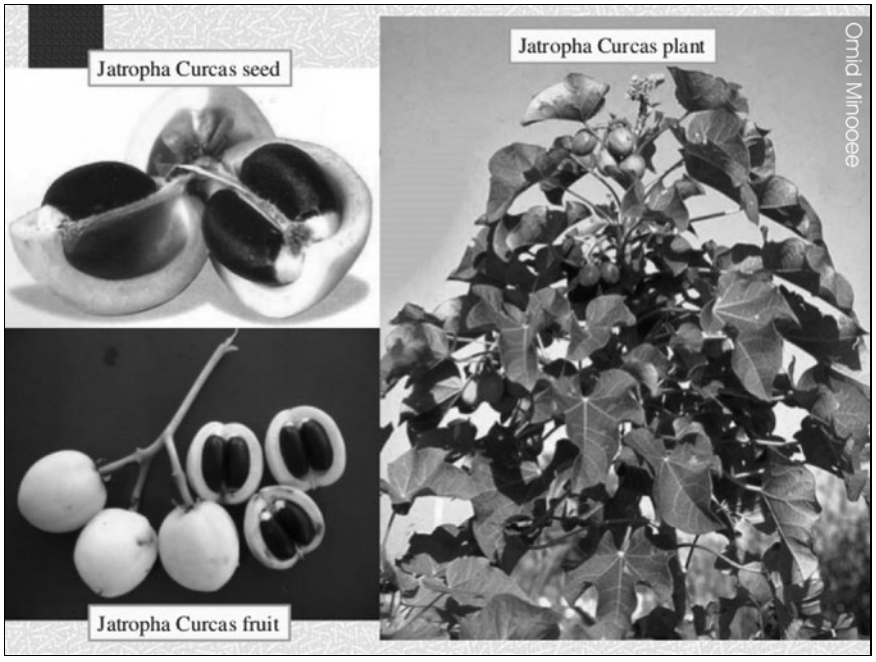
Despite these concerns, biofuel is viewed by many as an efficient means of producing energy sustainably, and as a result, 10 percent of the world's total energy demand is being met using bioenergy. In 2005, the Strategic National Energy Policy of Ghana called for 20 percent of gasoline consumption to be replaced with biofuels and for 30 percent of kerosene to be replaced with *Jatropha curcas* oil by 2015.

As a political figure in the area, Chief Ofori has a lot of influence, so if he supported and promoted the cultivation of biofuels, others might be inspired to follow suit. If any of the biodiesel crops cultivated on his land were to be used domestically, it would aid in Ghana's effort to secure cheaper and more reliable domestic sources of energy. Additionally, biofuel seems to be a growing market that could bring economic opportunities to his people.

There are two types of biofuel: primary and secondary. Primary biofuel, such as firewood, charcoal, and animal dung, is unprocessed and used in its natural form. Secondary biofuel involves processing. The two most common secondary biofuels are ethanol and biodiesel. Ethanol is created from any raw material with a significant amount of starch or sugar that can be fermented and distilled, and is commonly mixed in with gasoline to reduce air pollution. However, concerns have been raised about possible negative environmental effects of corn ethanol. Biodiesel is primarily used for trucks and jet fuel, and comes from vegetable oil or animal fat mixed with alcohol. Some plants that produce oil that could be turned into biodiesel include palm, soybean, coconut, and *Jatropha curcas*, which is the crop that NalOil wants to grow on Chief Ofori's land.

Ja-tro-wha…?

Chief Ofori had never even heard of a *Jatropha curcas* plant prior to NalOil's proposition. He learned that *Jatropha* was a shrub or small tree farmed around the world. While there are around 170 species of *Jatropha curcas,* only one can be used to produce biodiesel. This species is *Jatropha curcas,* used for its seed content of 30 to 45 percent oil. It is native to Mexico and other parts of Central America, but can grow in many tropical and subtropical



A close-up look at the *Jatropha curcas* plant

MARY ANN LIEBERT, INC. • Vol. 11 No. 1 • February 2018 • DOI: 10.1089/sus.2018.29121.eo

regions. When Ofori discovered the geographical conditions necessary for its growth, he realized why Agogo and the whole of rural Ghana had been targeted so intensely by companies like NalOil: The climate and altitude are ideal, the temperatures just right, and the rainfall patterns more than adequate.

Jatropha curcas was originally cultivated to harvest its oil for soap. Additionally, it was sometimes grown as a hedge for keeping animals out of farm plots due to its height and slight toxicity. *Jatropha curcas*'s toxicity is negligible to humans, but it did keep insects away, which could reduce the need for pesticides.

Chief Ofori had been very pleased to learn that *Jatropha curcas* is not harvested for food. In his relatively poor community, hunger is widespread, and using food crops for fuel would surely inspire anger and backlash. In fact, one of the reasons that this plant seems so desirable as a biofuel crop is that it does not have the potential to be used in competing ways. However, while it is not a potential food source, the plant would still compete with food crops for land and resources.

Another trait Ofori found desirable is that the plant bears fruit after nine months. This is important because a *Jatropha curcas* plantation could therefore make money within the first year. In wetter climates, moreover, harvesting could occur year-round, meaning plantation workers would have a continuous source of income.

Annually, individual plants on average produce 3.5 kg of seeds, and 4 kg of seeds are required to produce one liter of biodiesel. This means, on average, that one hectare of *Jatropha curcas* yields about 2 tons of biodiesel. The process of extracting oil for biodiesel also results in byproducts such as seed cake that could be used for fertilizer or animal feed.

Chief Ofori also learned as much as he could about the process of creating biodiesel from *Jatropha curcas* oil. To begin, oil can be extracted from *Jatropha* seeds through a variety of methods such as using solvents or manual pressing. This produces crude *Jatropha* oil, which can then be processed through a transesterification reactor to create crude biodiesel.

The *Jatropha curcas* cultivation boom in Ghana began in late 2004 due to rising oil prices and a concurrent push by many nations to invest in cleaner energy sources. At that time, land owned by foreign investors for biofuel production represented 37 percent of Ghana's farmland. Though oil prices have since fallen, and oil was discovered in Ghana in 2007—leading to a sharp decline in the *Jatropha curcas* market—many biofuel plantations still operated in Ghana, and NalOil was intent on adding Agogo to this number.

Impacts on the Land He Called Home

Chief Ofori learned that there were also clear downsides to the cultivation of *Jatropha curcas,* with the most important and worrisome, from his perspective, being its high water consumption. His region would require extensive irrigation to accommodate *Jatropha curcas* cultivation because its farms only used wells and shallow aquifers for water. One concern was that the water needed by a *Jatropha curcas* plantation could otherwise be used by his people for growing their own food, drinking, or bathing. His region could support these water needs now, but with climate change, water supply in the coming decades was uncertain.

Research from the University of Twente in the Netherlands concluded that *Jatropha curcas* required five times as much water per unit of energy produced (20,000 liters of water per liter of biodiesel) as the common biofuel crops sugarcane and corn, and nearly ten times as much water per unit of energy produced as sugar beets, which were the most water-efficient biofuel crop in use. Chief Ofori knew that one of the most serious issues facing Ghana is irregular rainfall leading to low water levels at locations that produce hydropower, which in turn contribute to the energy shortage. So using water for biofuel crop production, particularly for *Jatropha curcas*, could place further strain on Ghana's water resources at a time when they were being increasingly stretched thin.

Another worrisome downside is that there are numerous examples of *Jatropha curcas* operations that had negatively impacted surrounding agriculture. *Jatropha curcas* cultivation reduces the land available for other crops, forcing farmers to employ shorter fallow periods to compensate for smaller plot sizes. Fallow periods allow land to lie seedless for a time and are necessary to restore nutrients to the soil in between periods of crop cultivation. Following the loss of land to *Jatropha curcas* operations, the number of farmers using fallow periods of less than one year had increased and the number of farmers using fallow periods of more than three years had decreased. This trend could lead to annually decreasing crop yields and eventually to land that no longer yielded sufficient crops for food needs.

Alternatively, to prevent the conversion of agricultural land to *Jatropha curcas* plantations, *Jatropha curcas* could be grown on degraded land.

Cultivating *Jatropha curcas* on degraded land could also increase carbon sequestration, given that the *Jatropha curcas* would be growing where other plants could not. However, some of the land included in the potential deal with NalOil is productive farming land, meaning that Chief Ofori not only had to contend with the potential loss of land for food crops but would also have to evict the land's tenants.

Finally, *Jatropha curcas* can be an aggressive, invasive species. This is especially problematic when combined with the negative impacts of deforestation and of monocropping typically associated with *Jatropha curcas* plantations.

Sitting back for a moment, Chief Ofori took stock of everything he had reviewed.

Assessing the Impact on the Local Population

Throughout Ghana, the commercial production of *Jatropha curcas* requires companies such as NalOil to make large acquisitions of land. Selling this land would have significant impacts on the livelihoods of local communities and farmers. Chief Ofori had learned of a study conducted by the Renewable Natural Resources department at Kwame Nkrumah University of Science and Technology in which 54 percent of the study's 234 respondents reported having lost land to *Jatropha curcas*-producing plantations, and 15 percent reported having lost over 10 acres of land. Ten acres was probably nothing to a company like NalOil, but it was a tremendous amount of land for a small farmer.

Although *Jatropha curcas* could be grown on marginalized lands, the land acquired for its production was often productive land used for cultivating crops such as maize, yam, plantain, and cocoa. In many cases, such acquisition had forced farmers onto less fertile lands where their crops did not grow as plentifully. These land issues had in some instances led to violent conflicts, both between locals and company officials and among locals themselves due to the clearing of boundary markers between previously locally owned lands.

Chiefs such as Chief Ofori had the authority to sell land without consulting their people, so many never did. In fact, 94 percent of the respondents in the Kwame Nkrumah University study reported this to have been the case. Even Chief Ofori, when he had met with the men from NalOil earlier that day, had been a mere signature away from selling a significant portion of his people's land and had not consulted his people. He had considered opening the decision-making process to the community, but ultimately the decision and the responsibility for that decision fell on his shoulders.

The same study indicated that many locals had been either inadequately compensated or not compensated at all for land lost: 85 percent reported that they had received no compensation for their lost land, and 66 percent of those who had received something claimed it was inadequate or forced upon them. Additionally, the loss of land decreased food security in affected communities due in part to the decrease in fallow periods that led to sharp declines in farm yields. Households reported that loss of land had greatly decreased their ability to meet their own needs for food. Representatives from NalOil had promised Chief Ofori that compensation for all land lost would be given. However, he had serious reservations about trusting the company, given stories he'd read about locals not getting properly paid.

Chief Ofori had also tried to compile information about possible positive impacts on the community, which NalOil's representatives had gone out of their way to emphasize to him. For example, *Jatropha curcas* plantations often did create additional employment opportunities for communities. A significant proportion of plantation workers were employed from local communities, and of the employed respondents in the aforementioned Dutch study, 78 percent claimed to work full time, and the other 22 percent worked part time, seasonally, intermittently, or as a one-time activity. Pay depended on whether workers were casual or permanent, on whether they were part- or full-time, and on their occupations (field worker, machine operator, field manager, etc.). However, salaries generally needed to be supplemented with fishing and/or farming to provide a sufficient annual income. Still, despite the additional wages, locals generally reported feeling less well-off financially after the establishment of *Jatropha curcas* plantations. This decline was attributed once again to the large swaths of land lost.

The Dutch research also highlighted many other impacts on local infrastructures and economies from *Jatropha curcas* plantations. For instance, 15 percent of respondents reported that the activities of *Jatropha curcas* companies had provided their communities with wells, boreholes, and dugouts for water. In some instances, the *Jatropha curcas* companies had contributed to the building of schools and clinics, and to road maintenance. However, while

MARY ANN LIEBERT, INC. • Vol. 11 No. 1 • February 2018 • DOI: 10.1089/sus.2018.29121.eo

development projects were almost always promised to communities and chiefs before land purchases were made (hence giving the chief further incentive to sell the land), the companies rarely followed through on these promises. In many cases, even if a company intended to complete these projects, the plantation could be shut down and the community abandoned by the company before the projects were completed.

Another possible benefit Ofori had considered was increased access to biofuel for generators. Generators powered by *Jatropha curcas* biodiesel produced in the community could substantially increase access to electricity, meaning more time for kids to study at night as well as access to power for refrigeration. The ability to employ biofuel generators could have far-reaching effects in his community.

NalOil had assured Chief Ofori that they would acknowledge their responsibilities to his community, and that they would strive to exceed national and international regulations and standards regarding these responsibilities. But when broken promises were the precedent, he wondered how he could trust NalOil to follow through on those words.

A Decision to Be Made

After spending the majority of the day reviewing his research, Chief Ofori retired to his bed, burdened still by the decision he had not yet made. He contemplated the potential benefits of agreeing to this deal. It would bring money to the community immediately. Employment could boom. Schools could be built and could improve education in the community. New investments and development could revitalize local infrastructure. Access to power in Agogo was limited, so the potential for local *Jatropha curcas* biodiesel to power generators in the community could increase the quality of life immensely. If the deal with NalOil resulted in even one or two of these outcomes, it would be a boon to Agogo and all who inhabited it.

There were potential downsides to consider as well. Could he trust this company to carry out its promises? From what he had read, the answer was ambiguous. Some of his people might be pushed from their land, and would they receive just compensation? Some might be forced to cultivate infertile land, which would put their ability to make a living in great jeopardy. The plantations might degrade the surrounding environment if the company did not follow the strict policies that it claimed it would.

This was the dilemma. There was so much uncertainty as to what outcomes would result from his decision, but he had to choose: take the risk of making this deal, or let it slip away.

He knew that no matter what he decided the next day, the most important thing to consider was the impact of his actions on all those who relied on him to guide their community. It was a tremendous responsibility. He closed his eyes, settling in for what would surely be a fitful sleep.

To access the podcast and further materials on this case and other Michigan Sustainability Cases, visit: http://www.learngala.com

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