Theorising Indigenous Farmers’ Utilisation of Climate Services: Lessons from the Oil-Rich Niger Delta

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Abstract: In the wake of a rapidly changing climate, climate services have enabled farmers in developing countries to make informed decisions, necessary for efficient food production. Climate services denote the timely production, translation, delivery and use of climate information to enhance decision-making. However, studies have failed to analyse the extent to which Indigenous farmers residing and producing their food in an environment degraded by multinational corporations (MNCs) utilise climate services. This study addresses this gap by analysing Indigenous farmers’ utilisation of climate services in Igbide, Olomoro and Uzere communities, in the oil-rich Niger Delta region of Nigeria. Focus group discussions and semi-structured interviews were used to obtain primary data. Findings suggest that although the activities of Shell British petroleum, a MNC, have compromised food production, other factors have fuelled farmers’ unwillingness to utilise climate services. These include their inability to access assets that can significantly scale up food production and lack of weather stations close to their communities needed to generate downscaled forecasts, amongst others. This paper argues that failure to address these issues may stifle the chances of actualising the first and second sustainable development goals (no poverty and zero hunger) by 2030 in the aforementioned communities.

Keywords: climate services; indigenous farmers; multinational corporations; systems thinking; Nigeria; sub-Saharan Africa

1. Introduction

Evidence in the literature suggests that climate variability and change have significantly compromised effective food production in sub-Saharan Africa (SSA) [1–3]. The radical transformation of a region once able to ensure that farmers could produce their food efficiently, to one where food productivity and output can no longer be guaranteed, due to climate variability and change, is partly responsible for the increased food and nutrition insecurity in SSA [4–6]. This has set in motion numerous unwanted responses in farming communities. These include climate-induced migration [3,7], engaging in more off-farm activities [8] and heavy reliance on government’s food aid stamps [1], among others. These unwanted responses will likely be worsened, in part, by the aggravated difficulties expected to be associated with future food production due to increased occurrences of climate variability and change. Climate projections for SSA indicate that increased and unprecedented occurrences of extreme weathers will become the new normal by 2050 [9].
The growing concerns around SSA farmers’ increased susceptibility to current and future climate variability and change have catalysed investments in climate services [2]. Climate services refer to the ‘timely production, translation, delivery and use of climate data and information to enhance decision-making’ [10] (p. 1). A huge wave of optimism exists within the scientific community about the capability of climate services to facilitate informed decisions, necessary to enhance food production among farmers [11,12]. Several studies underline the significance of climate services in scaling-up food production in the face of increased climate variability [2,13–15]. Yet, to our knowledge, no study has analysed the extent to which Indigenous farmers residing in communities with a history of fierce contestations with multinational corporations (MNCs) utilise climate services. By Indigenous, we mean ‘those communities that claim a historical continuity with their traditional territories’ [16] (p. 290). Indigenous people possess a peculiar culture and knowledge distinct to their community that have been tried and tested with real-life scenarios [17–19]. It is usually passed on from one generation to the next through oral communication and repetitive engagement [18].

MNCs, in their quest to exploit rich natural resources, have aggressively degraded the immediate environment that Indigenous farmers rely on to produce their food [20,21]. As highlighted in the Niger Delta region of Nigeria [22,23], Katanga in the Democratic Republic of Congo [24], Western Ghana [25] and Limpopo, South Africa [26], the activities of MNCs have adversely compromised farm yields and productivity. It is, therefore, crucial to ascertain if these cohorts of farmers trust and utilise climate services disseminated by government institutions. As Dutfield [19] (p. 24) argues, the exploitation of natural resources occurs through an ‘unholy alliance of corporations with governments.’

Failure to deeply analyse the extent to which farmers, residing in regions where the activities of MNCs have degraded their natural environment, utilise climate services may undermine the actualisation of both the first and second sustainable development goals (SDGs) (no poverty and zero hunger) by 2030. This is especially if such farmers fail to utilise climate services to make informed farming decisions. Arguably, providers of climate services may be unaware of several underlying issues in communities affected by natural resources exploitation that may have been lingering for decades, which limits farmers’ ability to produce food efficiently e.g., see [27–29]. This, in turn, may fuel scepticism among farmers regarding their respective government’s agenda to invest in climate services over addressing the underlying issues that have negatively impacted food production, and consequently, undermine the use of such services.

Against this background, this paper investigates Indigenous farmers’ perception of climate services. Also, it unpacks how the negative impacts of MNC activities influence Indigenous farmers’ use of climate services. Further, it demystifies the attributes of those receptive to climate services. This paper analyses primary data obtained from the oil-rich Niger Delta region of Nigeria. The Niger Delta serves as an important case study especially since the region has been besieged by land degradation, for decades, due to crude oil exploration and exploitation by MNCs [19,22,30], which, in turn, has severely compromised food production [4,31]. Also, ‘since 1970, oil revenues from Niger Delta have contributed over $350 billion to Nigeria while the region remained one of the most impoverished parts of the country’ [32] (p. 221). It is hoped that this paper will trigger discussions regarding factors that deter Indigenous farmers, whose livelihood activities and way of life have been adversely affected by the activities of MNCs, from utilising climate services. Such discussions are desperately needed to unravel effective interventions necessary to build the trust and confidence of Indigenous farmers in climate services.

This paper proceeds in five parts. The first provides a snapshot of existing literature regarding the role of climate services in upscaling food production. The second part succinctly illustrates how oil exploration activities by Shell British petroleum, a MNC, which results in oil spillages and gas flaring, have compromised food production and quality of crops harvested in the study areas, situated in the Niger Delta. It also highlights the frustrations of the people as they have not been beneficiaries of resources that can enable them produce food effectively as well as improve their quality of life. The third part provides a synopsis of the study areas and how primary data were obtained. The fourth part
brings to the fore the results. It aptly underlines the various factors responsible for the non-utilisation of climate services by Indigenous farmers. It also showcases the attributes of those willing to rely on climate services, if the factors undermining its use are decisively addressed. The final part discusses the implication of the findings.

2. The Role of Climate Services in Scaling-Up Food Production

A climate service is a decision aide that supports ex-ante climate risk management in agriculture, health, water, transport and other vulnerable sectors of the global economy [33]. The endorsement of the global framework for climate services, whose mission is ‘to strengthen the production, availability, delivery and application of science-based climate prediction and services,’ by delegates of 155 countries at the 2009 World Climate Conference III buttresses this point [34]. In SSA, the erratic and unprecedented occurrences of extreme weather conditions, especially in the last two decades, have crystallised the need for farmers to rely on climate services to make informed farming decisions [2,5,14,15]. Also, the drive to utilise climate services has been fuelled by the increased unreliability of Indigenous meteorological forecasts in some locations. e.g., see [35,36]. As Ouédraogo et al. [15] argue, climate services can assist farmers in reducing uncertainty and taking advantage of favourable weather information by planting intensively, and thus, minimise loss during unfavourable weather forecasts. In the case of extreme weather predictions, several pieces of literature have shown that climate services empower local and Indigenous farmers by allowing them to take measures aimed at protecting lives, livelihoods and household properties [37–39]. Climate services, therefore, support climate-resilient development.

In a simulation exercise conducted in Senegal, West Africa, Roudier et al. [2] found that farmers who used climate forecasts maximised benefits from predicted favourable conditions. In Burkina Faso, ‘farmers exposed to climate information changed their farm practices based on the information they received, and that translated into better management of inputs to increase their farm productivity and improve their resilience to climate variability’ [40] (p. 4). Somewhat similar findings have emerged from studies conducted in the Republic of Benin [41], India [42] and Uganda [14] respectively. Arguably, just when the future of food production seemed bleak for smallholder farmers due to the rapidly changing climate coupled with the increasing unreliability of Indigenous meteorological forecasts in some locations, climate services have rekindled farmers’ hope to obtaining a meaningful livelihood. To substantiate this point, farmers in some SSA countries are now willing to pay for climate services [15,36]. This reinforces the World Meteorological Organization’s [43] standpoint that the benefits of investments in climate services for agriculture and food security greatly outweigh the cost.

It is, however, noteworthy that the studies cited above were conducted in areas without substantial abundance of natural resources to trigger the influx of MNCs into such locations. If the theorisation of message interpretation by Sellnow et al. [44] is anything to go by, the chances of Indigenous farmers—who have and continue to be victims of the negative effects of the activities of MNCs—relying on climate services to make an informed decision will be slim. The reason for this, according to Sellnow et al. [44], is that for every message received, the audience draws conclusion by interpreting the conveyed message using availability heuristic, among others. Availability heuristic refers to ‘a rule of thumb that allows people to solve problems based on what they remember and how easily their memory is retrieved, and how readily available that memory is’ [45] (p. 54). The ease of retrievability is closely linked to significant landmarks in a person’s life and could create signposts in one’s memory, thereby making an experience easy to retrieve [46]. Thus, availability heuristic, which influences trust and credibility [47,48], may negatively impact the adoption and utilisation of climate services by Indigenous farmers whose livelihoods have been compromised by the activities of MNCs.

3. The Delta State: Background Information

The Delta state comprises one of the nine states in Nigeria that make up the oil-rich Niger Delta region. Crude oil—the mainstay of the nation’s foreign reserves and GDP—is mainly obtained from the Niger-Delta [23,27], a region which constitutes approximately 8% of the nation’s total landmass
Anecdotal evidence suggests that the second crude oil discovery happened in Uzere in 1958, after the first discovery was made in Oloibiri, Bayelsa state, in 1956 [49]. Igbide, Uzere and Olomoro communities have approximately 62 oil wells between them. The aforementioned communities, as well as the entire Niger Delta region, have contributed immensely to Nigeria’s gross domestic product (GDP) due to no less than four decades of consistent oil exploration and exploitation activities, amounting to 90,000 barrels of oil daily [50,51]. However, these communities have gained a global reputation for the negative impacts that crude oil exploration has had on the livelihoods and general welfare of its inhabitants [23]. Specifically, oil spillages and gas flaring, which have adversely compromised the health of local people, their ability to produce food effectively and the nutritional quality of crops harvested, have consistently made headlines. Consequently, this has metamorphosed a relatively tranquil region, in the 1960s, to one prone to conflicts with MNCs, since the 1990s.

![Map of the Niger-Delta region in Southern Nigeria.](image)

Figure 1. Map of the Niger-Delta region in Southern Nigeria.

No fewer than 30 protests and demonstrations against MNCs (some relatively peaceful and others extremely violent) as well as intermittent disruption of oil exploration in all three communities have been recorded since the 1990s [32,51,52]. According to the president-general of Isoko Development Monitoring Group (IDMG):

‘Oil exploration has literally killed the fruitfulness of Isokoland. Our farmers are crying, lamenting their ordeal in the hands of the oil companies in their lands that have refused to pay them meaningful compensations’ [53] (p. 1).

Compounding the woes of farmers is their inability to easily access fundamental assets that can significantly improve their welfare. This is a factor at play due to corrupt practices among government officials. Fundamental assets refer to the financial, natural, social, human and natural assets or capital (Table 1). As a result, these communities, including their community members, continue to live in abject poverty without basic infrastructures such as good roads, potable water and constant power supply [23]. Hence, these communities and the entire Niger Delta are classified as a paradox; oil-rich but impoverished [30].
Table 1. Definition of the fundamental bundle of assets or asset portfolio.

| Asset or Capital | Definition |
|------------------|------------|
| Physical         | This includes equipment and infrastructures such as road networks and other productive resources owned by individuals, households, communities or the country itself. |
| Financial        | This refers to financial resources available and easily accessible to individuals that include loans, access to credit and savings in a bank or any other financial institutions. |
| Human            | This refers to the level of education, skills, health status and nutrition of individuals. Labour is closely associated with human capital investments. The health status of individuals impact either positively or negatively on their ability to work, while skills, including their local and indigenous knowledge systems (LIKS), and level of education are crucial because it influences the return individuals derive from labour. |
| Social           | This refers to the norms, rules, obligations, mutuality and trust embedded in social relations, social structures and societies’ institutional disposition. |
| Natural          | This refers to the atmosphere, land, minerals, forests, water and wetlands. For the rural poor, land is an essential asset. |

Sources: Bebbington [54]; Thornton et al. [55]; Moser and Satterthwaite [56]; Moser [57].

4. Materials and Methods

4.1. Study Area

Igbide, Uzere and Olomoro communities are located in Isoko south local government area (ISLGA) in the Delta state of Nigeria (Figure 2). Isoko is the local dialect spoken in these areas. The region has a mean annual precipitation of 2500–3000 mm [4]. The weather patterns can be categorised into rainy and dry seasons [58]. Normally, the rainy season commences fully in June and lasts until October. This is closely followed by the dry season which commences in November until early March. In the dry season, dry and dusty conditions known as harmattan occur between mid-December and late January.

Small-scale farming is the primary economic driver in these three communities. Cassava (manihot esculenta) and groundnuts (arachis hypogea) are the major crops produced annually together with okra, pepper, sweet potatoes, yam and plantain. Cassava constitutes 60% of calories consumed. With the exception of cassava, the crops produced depend predominantly on the early rains. Groundnuts, however, are highly sensitive to rising temperatures. Some elderly farmers (above 50 years old) lamented about how the scorching sun, between February and April, has significantly reduced the crop’s output by nearly 50% in comparison to the bountiful harvests they were used to in the 1960s. Presently, when they harvest, some of the groundnuts are empty pods. The farmers’ explained that reduced groundnut output, which has become the norm, started from the 1990s.

The farmlands in Igbide and Uzere are low-lying, while Olomoro comprises both low and high-lying farmlands. The low-lying farmlands in each of the study areas experience seasonal flooding from mid-June, at the earliest, to the last week in October every year. In extreme conditions, the low-lying farmlands remain inundated until the third week in November. Thus, cassava, which requires a minimum of six months to attain maturity, is usually planted in December and harvested between June and August each year on the low-lying farmlands.
4.2. Methodology

Qualitative methods were adopted to offer deep insights usually hidden from statistical analysis. The study on which this article is based, formed part of a larger undertaking comprising 35 focus group discussions (FGDs) and 14 one-on-one semi-structured interviews, conducted between June and October 2015. Follow up interviews were conducted in July 2016. These discussions explored the participants’ perceptions of climate-related threats to food production, how they adapt to such threats, and the extent to which they use government-issued seasonal forecasts, among other issues. Each focus group comprised between three and twelve participants. Two-thirds of the participants were between the ages of 42 and 85 (median = 64) and had no formal education. This article draws on 22 FGDs and five one-on-one, semi-structured interviews where participants provided valuable insights regarding their perception of climate-related threats to food production, how they adapt to such threats, and the extent to which climate services influence their farming decisions, among other issues. Key questions asked include do you have any local sign(s) that you rely on to know when the early rainfall or rainy season is about to start so that you can start preparations for production or the best time to
start planting? How accurate has the local sign(s) been in predicting the weather? Have you ever relied on weather information from NIMET when preparing and planning for a planting season? Did you receive the 2012 flood warning by NIMET? Did you receive the 2013 flood warning predicted by NIMET? If yes, how did it influence your farming decisions? And how willing are you to rely on scientific weather predictions in the future? Some FGDs and semi-structured interviews were conducted in Isoko and translated to Pidgin English by field assistants to enable the first author to understand their responses. Other interviews were conducted in Pidgin English. Both the FGDs and interviews were edited to formal English during transcription of the audio recordings and have been presented as edited.

Eligible participants were selected based on the following criteria: the individuals had to have been farming in one of the study areas for a minimum of ten years, gender (both had to be represented), their household assets and livelihoods had to have been adversely affected by the 2012 flood disaster, those who produced most of their food on low-lying farmlands, and their willingness to participate in the study. The low-lying farmlands are usually inundated around June to October annually.

The qualitative data obtained were analysed using thematic analysis.

5. Results

5.1. Perception of Climate Services

When participants were asked if they relied on climate services to make farming decisions, they explicitly highlighted that they do not utilise the information. When probed as to why they do not utilise such information, most revealed that they rely on their local and indigenous knowledge systems (LIKS). These include in-depth historical knowledge of the weather patterns, croaking of frogs and appearance of red-like millipedes. Others include the flowering of rubber trees (ficus elastic decora), greening of cassava leaves, lunar observation in December, and the height at which the weaver bird constructs its nest on a tree [59,60]. These Indigenous meteorological indicators help to forecast the commencement of the rainy season, as well as the anticipated total rainfall in a farming season. While the participants acknowledged that their LIKS have not always been entirely accurate, the majority, however, revealed that they are not keen to switch to utilising climate services for the following reasons:

5.1.1. ‘Suffering in the Midst of Plenty’ Syndrome

For the majority, it defied human comprehension for the Nigerian government to invest in climate services when households continue to live in abject poverty in the midst of plenty. Despite consistent exploitation of crude oil for over four decades, their communities have remained inconceivably underdeveloped due to a dearth of communal physical assets. Because they practice annual cropping, harvesting of cassava coincides with the rainy season. Thus, it is exasperating and expensive for households to transport their produce to neighbouring communities to sell as transport drivers are forced to take alternative routes that take much longer. This is due to the numerous potholes on the roads that are tantamount to death traps during the rainy season when they are filled with rainwater. Also, constant power supply is non-existent in ISLGA. This has resulted in the few privileged farmers—who own refrigerators—not being able to cultivate perishable crops like okra and pepper in large quantities, as they cannot prevent most of the produce from rotting away. Furthermore, farmers’ inability to access financial assets is a major deterring factor in their struggle to live above the global poverty line of USD 2 daily.

While participants’ acknowledged that the government occasionally made provisions to furnish farmers with farm loans and other incentives, such as fertilizers and farm machinery, the majority stated that they have never been beneficiaries. Some argued that they only became aware of such opportunities after the disbursement process was over. Others revealed that the loan distribution process is marred by corruption and that the key beneficiaries were ‘ghost’ farmers and relatives of those in charge of disbursing the loans. In venting his frustration, one participant between the ages of 40 and 50 lamented:
'Government is not helping anybody from this area despite being an oil producing community … We only hear it on the radio of the various incentives given to assist farmers, but it is not getting to those on the grassroots. Instead, the beneficiaries are those in the hierarchy such as the executives of small-scale farmers’ group association who use it for their private farms.’

It is important to note that some of the participants skilled in generating Indigenous weather forecasts attributed the increased anomalies of their LIKS to gas flaring in Oleh, a community approximately 20 km away from the study areas. An elderly participant, aged between 60 and 70 years, revealed:

‘Gas exploration and flaring have seriously affected the trees we use to predict the weather because they do not grow well as they are supposed to. It becomes difficult for our predictions to be correct.’

Also, another elderly participant aged between 70 and 80 years asserted that gas flaring impairs her vision, which is critical to predicting if it would rain or not, through cloud observation. However, an elderly participant also aged between 70 and 80 years argued that gas flaring could not be the reason for the inconsistencies of their LIKS, but admitted that it kills their crops and damages the land. She further pointed out that the quality of garri produced has declined because the soil nutrients have been compromised due to oil exploitation activities, a viewpoint shared all the study participants. A few participants, however, added that farmers’ inability to practice bush fallowing, due to sporadic increase in population, is also a contributing factor. In this regard, an elderly participant between the ages of 60 and 70 years argued:

‘Before Shell commenced oil exploration activities, we were told that at a particular stage, they would fertilise the whole land … They said they would inject the land for them so that it will replenish the soil. The aim was to ensure that the soil will always be fertile for agricultural production … But up till date, this has not been carried out.’

Also, focus group participants in Igbide revealed that gas flaring expedites the corrosion and decay of zinc roofing sheets—the most affordable materials—used by households to roof their houses. A participant between the ages of 50 and 60 years categorically stated:

‘If you roof your house with iron zinc, within 4 to 6 years, it will start decaying. When it starts raining, the roofs start leaking, and then you have no option but to change the roof. This is causing people economic setback because the money they are supposed to use for other things are now used to repair or replace their damaged roofs. If you don’t have money to buy the aluminium Cameroon zinc, before you leave this world you will probably have to roof your house for about seven times.’

The adverse effects of oil exploration activities on food production (Figure 3) coupled with the history of neglect by various government regimes inter alia made most of the participants question the rationale behind investing in climate services. They cannot reconcile how their region can be endowed with huge reservoirs of crude oil and yet the indigenes continue to live in abject poverty. From the participants’ perspective, providing and ensuring easy accessibility to assets should be the first step to enhancing food production for farmers because they understand the weather patterns in their community. In this regard, a participant between the ages of 40 and 50 years stated:

‘It is only a foolish person that does not understand the terrain. When you plant cassava on 10 plots, like me, as from next month [referring to July] I will start to harvest my cassava. I will not wait till August when the flood usually inundates the farmlands, that is how we cope. A wise person will remove his/her cassava from the farmland before that time.’
5.1.2. Doubts Surrounding the Accuracy of Meteorological Forecasts

The credibility of meteorologists in accurately predicting useful weather information was severely questioned in the aftermath of the 2013 floods that never made landfall in the Delta state as forecasted by the Nigerian meteorological agency (NIMET). In the seasonal climate outlook for 2013, NIMET stated that 31 states were likely to be hit with the same magnitude of flood that occurred in 2012. The 2012 floods wreaked devastating havoc in 31 states of the federation, that was accurately predicted [61,62]. The 2013 flood forecast pinpointed the Delta state as one of the hotspots where the worst impact of the looming disaster would occur. The forecast spread like wildfire in Igbide, Uzere and Olomoro communities, where the 2012 flood wreaked devastating havoc partly because most participants did not receive any warning due to the government’s overwhelming reliance on radio and television broadcasts, which was a gross mismatch for the farmers.

This time around, participants became aware of the 2013 forecast through word of mouth from relatives living in urban areas as well as fellow villagers. Consequently, the majority embarked on the inconvenient but inevitable task of adopting proactive measures as they were determined not to be caught unawares again, as they were in 2012. Thus, most participants completely abandoned their farmlands in the low-lying regions for fear of their produce being destroyed by floodwaters. They also sought high-lying farmlands in locations both within and outside their communities that were unaffected by the 2012 floods. The quest to hire or lease viable farmlands in high-lying areas resulted in the sporadic hike in rental price. A few participants, however, produced food on their low-lying farmlands, but in negligible quantities and focused more on crops that matured early. As one participant between the ages of 50 and 60 years explained:

Figure 3. Causal loop diagram illustrating how oil exploration compromises food production (B = balancing feedback loop). N.B. If an increase in one variable leads to an increase in another variable, it is denoted by ‘+’ close to the arrow head, while if it results in a decrease in another variable, it is denoted by ‘−’ close to the arrow head. The double parallel red lines indicate a delay between cause and effect.
Farmers who used to cultivate in farmlands close to Urie Lake [farmlands in this region are inundated to about 2–2.5 m between August and October annually] were afraid of planting when they heard that another flood was coming. They left Igbide to neighbouring communities that were unaffected by the 2012 floods looking for farmlands to grow their food. Some were already contemplating relocating from the community. Others planted on their low-lying farmlands but in small quantities. The sudden panic amongst farmers made it extremely costly to plant during that period.

However, the participants’ decision to adopt several pro-active measures was met with unpleasant consequences (Table 2), which had severe implications for their livelihoods as the flood did not occur, at least in the Delta state. To compound their woes, farmers were neither provided with an explanation why the forecast was imprecise nor given relief measures to minimise the hardship brought about by ‘inaccurate forecast-induced food insecurity.’ In narrating the impact that the wrong forecast had on household food security, a participant between the ages of 50 and 60 years stated:

Table 2. Proactive measures adopted by farmers in response to the seasonal climate forecast in 2013.

| Assets | Planned Adaptation Measures Adopted | Implications for the Farmers’ Asset Portfolio |
|--------|-------------------------------------|---------------------------------------------|
| Natural | Most farmers completely abandoned the farmlands in the low-lying region. Nonetheless, a few cultivated crops like maize and groundnut that mature within four months on the low-lying farmlands but, in negligible quantities. | Inability to produce adequate food meant increased risk of malnutrition and undernourishment, which in turn can increase susceptibility to illnesses because of reduced immunity especially among children. In order words, the meagre food production has huge implications for the human capital of farmers and their households. |
| Financial | Constructed ‘sophisticated’ wooden platforms in their houses in order to preserve household assets when the flood arrives. Some farmers hired high-lying farmlands in spaces unaffected by the flood disaster in 2012 in order to continue in food production. Even after securing high-lying farmlands, the majority refused to cultivate cassava in large quantities because the impacts of the 2012 flood disaster were still clearly visible in the respective communities. | Inability to meet other livelihood objectives such as paying children’s tuition fees and paying dues for other social obligations, which can implicitly and explicitly erode social capital. Due to inability to secure government loans because of inadequate assets, among others, they are constrained to borrow funds from money lenders and social clubs to engage effectively in food production and address other pertinent issues such as paying children’s tuition fees. However, the loans are usually at astronomical interest rates (about 40% interest over six months). Inability of some farmers to continue with their monthly monetary contributions (Osusu). This is an agreed upon sum of money which is given to a trustworthy person every week. At the end of each month, the lump sum is given to a member of the scheme based on prior arrangement. Osusu tends to alleviate their financial woes by ensuring that they are able to continue to produce food annually. |
| Social | Searched for high-lying farmlands in neighbouring communities and farmlands in areas unaffected by the 2012 floods in their communities. | Increased outward migration can undermine social cohesion among community members. Weakened social capital is also likely to arise when privileged owners of farmlands in high-lying areas exploit vulnerable farmers by abruptly increasing the price to hire a plot of farmland. |
| Human | Increased migration to other communities in order to produce food. Engaging more intensively in off-farm activities such as brick-laying and bush clearing. | Engaging intensively in off-farm activities can compromise the health of an individual. |
‘As a result of the news, people refused to go and plant. This resulted in severe hunger for a lot of people in the community. Me, myself, I did not plant because of the news.’

In the same vein, another participant between the ages of 40 and 50 years explained:

‘We use to supply garri (processed cassava) to Bayelsa and Edo states prior to that 2013 forecast. Because we adhered to the rumour, we were now the ones going to those states to buy garri. The painful part was that the cost to purchase the produce was extremely expensive. So this time around, if the government distributes any forecast that says there will be extreme flooding, I will ignore the forecast and plant normally.’

The experience has instilled in the minds of the people that their welfare is of little or no concern to the government, and consequently, has eroded their trust in climate services.

5.1.3. Mediums of Disseminating Weather Information

The channel of communication used to disseminate weather and climate information to households in the Delta state may be a factor undermining its use to make informed farming decisions. Radio and television broadcasts are the mediums used to convey weather information to households. This may arguably be the reason why nearly all the participants, with the exception of one person, did not receive the 2012 flood warning, although it is not entirely clear if they would have adopted pro-active behaviours as their LIKS did not predict that such event would occur. With the exception of Sundays when they attend church services and social gatherings as well as market days—once in four days—when they sell their crops, the farmers’ typical daily routine entails leaving their homes before 7 a.m. for their respective farmlands. This is to ensure that as much work as possible is done before the scorching noonday and afternoon sun emerges. Thereafter, they seek shade to get a reprieve from the heat before continuing their work. Consequently, the farmers usually return home late in the afternoons or evenings extremely fatigued, and thus, barely have any iota of strength left in them to listen to both radio and television broadcasts.

Also, the lack of constant power supply is another factor that compromises the effectiveness of radio and television broadcasts in the region. In lamenting on the despicable state of power supply in the region, a participant aged between 60 and 70 years argued:

‘We are just paying for ordinary power cables that do not provide us with electricity. For more than four days now, there has been no electricity.’

In terms of the most effective channels for communicating important information to households, the participants unequivocally argued that the use of community town-criers and town-hall meetings remain the most effective mediums of communication in their respective communities. In addition, a participant from Uzere, in his early 80s, recommended that local people should be trained on how to interpret weather information. This is because:

‘NIMET and agricultural extension workers will not have the time to go round the nooks and cranny of the community to inform people of what the weather outlook for the forthcoming farming season will be like, as against their people that reside in the community.’

5.1.4. Absence of Weather Stations

At the time of data collection, the closest weather station to the study areas was located in Warri, a city approximately 60 km away from the study sites. The other station was in Asaba, about 140 km away from the study sites. The implication is that the forecasts that were generated were not tailored to ISLGA. It is, therefore, not inconceivable to argue that the lack of downscaled forecasts may have deterred some farmers from listening to both radio and television broadcasts for weather-related information. Also, this may partly explain why the participant (a woman from Igbide, in her 50s) who heard the flood warning over the radio failed to act proactively. She remarked:

‘Before the flood occurred, it was announced on the radio that there was going to be a flood incident, which would affect most parts of the nation. However, due to a lack of scientific understanding of the message’s content and not being certain that Igbide will be affected, I ignored the warning.’
It is, however, noteworthy that a small minority was open to the idea of using climate services to inform farming decisions.

5.2. Characteristics of Participants Willing to Utilise Climate Services

Two groups of participants were open to using climate services to make farming decisions. The first group open to the idea of utilising climate services were young male participants (under 40 years) who had obtained at least a high school education. The young male participants assisted their parents in their respective fields while being actively involved in off-farm activities, such as electronics repairs, carpentry and welding. With regards to the perceived role climate services can play in facilitating effective food production, a participant, in his early 30s, commented:

‘If farmers in this community can be getting the seasonal rainfall predictions, it will be extremely helpful in protecting our crops and other livelihood assets . . . serious farmers will need this sort of information.’

The next group of farmers that were willing to utilise climate services to make informed farming decisions were the elderly people (above 50 years old) that were educated and had a viable alternative source of livelihood. Nonetheless, an individual that fell within this bracket sounded disinterested. The elderly participants interested in climate services were retired civil servants who received a regular monthly pension. They had properties such as vast hectares of farmlands, houses and fishing boats they leased out to earn regular income. In this regard, a pensioner from Uzere aged between 60 and 70 years, who had obtained a university degree, expressed his willingness to utilise climate information by stating that:

‘If farmers can get the meteorological information before the planting season (November), it will play a significant role in protecting the assets of the small-scale farmers. If I can get the weather information for this community, I will take full advantage of it.’

6. Discussion

In the wake of a rapidly changing climate, local farmers’ utilisation of climate services in SSA is crucial to facilitating informed farming decisions necessary to scale-up food production [2,14,41,42]. In contrast to their counterparts in various SSA countries that have embraced this technology, local and indigenous farmers in the Delta state are yet to adopt climate services, with the majority not keen to do so. The indigenous farmers are disillusioned that despite their communities’ significant contribution to Nigeria’s GDP, basic amenities and infrastructures—consistent power supply, potable water and good roads—are virtually non-existent. Also, despite the farmers’ overwhelming dependence on food production to obtain a livelihood, the majority have never been beneficiaries of vital assets such as farm loans and machinery. This is against the backdrop of the Delta state government and federal government making such schemes readily available [23,63,64]. Thus, the notion that climate services—an ‘abstract entity’—can scale-up food production seems utopic. From the farmers’ viewpoint, their community symbolises an express tunnel for capital accumulation, with MNCs and government being the sole beneficiaries. Also, the fact that their LIKS used in predicting weather conditions have been negatively affected by oil exploration and exploitation activities, as well as farmers being the victims of a wrong forecast cast further doubt on the efficacy of climate services to upscale food production.

Studies conducted in various developing countries that acknowledge indigenous farmers’ willingness to rely on [33,65] and actual utilisation [14,15,36] of climate services, the environment they depend upon to generate indigenous meteorological forecasts have not been exploited by MNCs. As studies in Thailand [66], Ethiopia [67] and Nigeria [68] show, a catalyst to a decline and or loss of LIKS is anthropogenically-induced modification of the environment due to natural resources exploitation. Nonetheless, the indigenous farmers in the Delta state may change their current standpoint of not being willing to utilise climate services if access to fundamental assets that can significantly improve their welfare are made readily available. This hinges on the fact that, despite lack of trust in the
government coupled with inability to access capital assets, they still relied on the 2013 forecast to make farming decisions.

As documented by Singh et al. [46] (p. 2428), people’s memories give ‘weightage to recent events because the consequences are perceived more strongly than those in the distant past’. Thus, easy access to assets, coupled with situating weather stations in ISLGA that are 30 km² apart (recommended guideline to generate accurate local downscaled forecasts [69]), may cause farmers to recalibrate the incorrect 2013 forecast experience signpost in their memory as a one-time event with a low probability of recurrence. To advance the adoption of climate services, it might be necessary to work closely with those willing to utilise climate services, perhaps through pilot studies as a useful starting point. Showcasing the effectiveness of climate services in upscaling food production versus relying solely on LIKS might be the propelling force that will get other farmers to change their standpoint. Such pilot studies will address Serra and McKune’s [70] (p. 4) concern that, ‘while much attention has focused on improving coverage of climate services, we should equally invest resources and efforts in tackling the complex domain of individual and collective perception of information, and consequent behavioural change.’

If and after succeeding in convincing farmers on the effectiveness of climate services, and in the eventuality of another wrong future forecast, although rare if downscaled forecasts are produced but not entirely inevitable, see [71], government must realise that the adverse impacts of such occurrence on farmers’ livelihood almost mirrors the consequences of an extreme weather disaster. Therefore, such occurrences should be handled in similar magnitude as an extreme weather event, which often triggers government’s immediate response in mobilising resources to assist victims. If farmers are convinced that there will be a safety net in the aftermath of an erroneous forecast, the likelihood that they will utilise climate services may be high.

However, caution should be exercised when interpreting the findings of this study because the farmers’ advocacy for assets over climate services may be attributed to the fact that only groundnut production has been adversely affected by climate variability and change. Thus, they may have become accustomed to the shock, especially since the reduction in groundnut production has occurred for over three decades. The regular occurrences of low groundnut outputs, which have reduced the monetary income received from its sale, may have desensitized farmers to the shock. This experience is in stark contrast to cassava—the main staple consumed by farmers—whose production has not been aggressively impacted by climate variability and change. The major deterrent to maximising cassava production is the annual seasonal flooding (mid-June to last week in October) of their low-lying farmlands, which is not perceived as a challenge because it has been the norm in the respective communities [4]. This may provide a valuable justification why they are not keen to utilise climate services, unlike farmers in India and Bangladesh [39] where the major staples consumed are highly sensitive to climate variability and change. As a result, these farmers rely on the technology to improve farming decisions. Nonetheless, this study offers valuable insights into factors that may undermine the use of climate services in areas that have been exploited by MNCs.

7. Conclusions

In the face of increasingly palpable impacts of climate variability and change amongst farmers in developing nations, climate services are regarded as essential to such farmers making informed decision for efficient food production. Moreover, climate services have recorded tremendous success to the point that farmers are now willing to pay for such services. Despite this development, studies have failed to understand the extent to which Indigenous farmers residing in communities with a history of fierce contestations with MNCs utilise climate services to increase agricultural productivity. It has been observed that MNCs, in their quest to exploit rich natural resources, aggressively degrade the immediate environment that Indigenous farmers rely on for food production. Since the exploitation of natural resources by MNCs occur through an alliance with a country’s government, it is necessary to
ascertain how the negative impacts of MNC activities influence Indigenous farmers’ perception and utilisation of climate services.

The findings of this study suggest that indigenous farmers in the research sites where data for this study was collected do not rely on climate services but on their LIKS such as the croaking of frogs, and lunar observation in December amongst others. Although these farmers do acknowledge that their LIKS have not always been entirely accurate, the majority suggested that they were not keen on utilising climate services. A reason for this standpoint is because the participants continue to be victims of what we refer to as ‘suffering in the midst of plenty’ syndrome. They cannot reconcile how people continue to live in abject poverty, and their communities have remained underdeveloped despite the significant contributions crude oil explored from their locality make to Nigeria’s GDP. While the farmers acknowledge that the government occasionally made provisions to provide farmers with farm loans and other assets like farm machinery, most have never been beneficiaries. Also, participants asserted that the quality of garri produced has declined because the soil nutrients have been compromised due to oil exploitation activities. Thus, the adverse effects of oil exploration activities on food production and the influence it has on the accuracy of their LIKS (Figure 3) coupled with the history of neglect by various government regimes inter alia made most participants question the rationale behind investing in climate services.

Furthermore, other factors beyond the activities of MNCs have fuelled farmers’ unwillingness to utilise climate services. These include non-usage of their local channels of communication—town-hall meetings and town-criers—to disseminate weather information, lack of weather station close to the communities to generate accurate downscaled forecasts and being victims of an erroneous scientific forecast in 2013. Notwithstanding, the study finds that young males (under 40 years) and a few older adults (over 50 years old) are willing to utilise climate services if the factors undermining the production of accurate forecasts are addressed. The commonalities among these cohorts of farmers are that they have obtained at least a high school education and have viable alternative sources of livelihood outside of farming. Given this scenario, addressing the challenges that hamper farmers’ utilisation of climate services in Igbide, Olomoro and Uzere communities is now a matter of urgency especially if the Nigerian government is keen on actualising the first and second SDG goals by 2030. Failure to address these issues will be a massive blow for the incumbent government that has been investing heavily in agriculture, deemed a viable alternative to successfully diversify Nigeria’s economy from its extensive reliance on crude oil for most of its foreign exchange. Besides erecting weather stations in ISLGA that are 30 km apart, a useful starting point will be to conduct pilot studies with those willing to utilise climate services. Highlighting the effectiveness of climate services in upscaling food production versus relying solely on LIKS might be a catalyst that will convince other farmers to use climate services in making informed farming decisions.

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