

# Aligning Rayuwa with the **SUSTAINABLE DEVELOPMENT GOALS (SDGs)**

To improve the livelihoods and resilience of smallholder Nigerian farmers and their communities.



# Program Overview

John Deere, PYXERA Global, smallholder farmers, and the Government of Nigeria share a common vision—to achieve an economically stable, food secure, and prosperous Nigeria. Rayuwa, which means “life” in Hausa, is a holistic, demand-driven community development program co-created by the partners to strengthen Nigeria’s agriculture and education systems and bring this shared vision to life.

Rayuwa’s mission is to improve the livelihoods and resilience of Nigerian smallholder farmers—by investing in the farmers of “today and tomorrow.” Its pillars—resilient agriculture, quality education, and leveraged talent from John Deere—are grounded in nine years of partnership, collaboration, learning, and adaptation between John Deere and PYXERA Global on the JIVA project, in Rajasthan, India. Rayuwa’s four objectives are to:

- Increase agricultural production, farmer income, and farmer resilience to market and climate shocks
- Commercialize the farm by enhancing farmers’ capability to manage the farm as a business
- Reduce drudgery on the farm by promoting the use of technologies that increase labor efficiency
- Cultivate the next generation of farmers by strengthening access to accountable, high-quality, and equitable education

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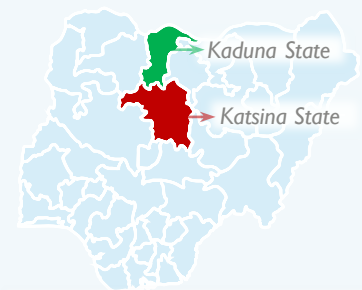
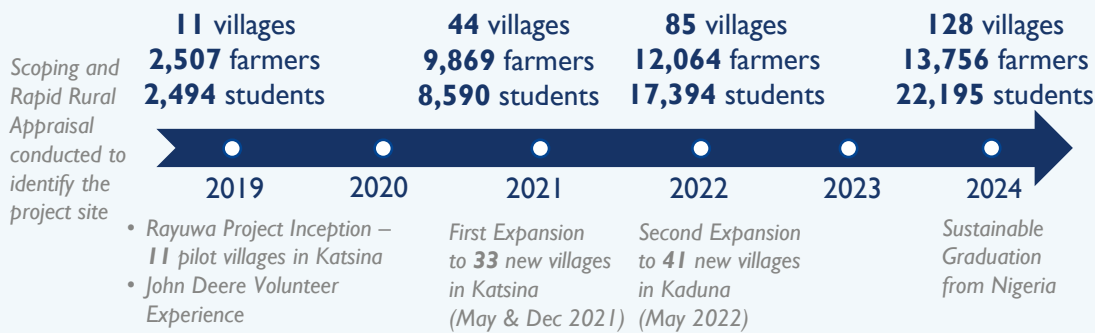
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## Executive Summary

# Amplifying and Sustaining Rayuwa's Impact

### RAYUWA: Deeply Rooted – Leaping Forward

The heart and strength of Rayuwa lies in its partnership with the Nigerian smallholder farmers it serves. Together with the farming communities, John Deere and Pyxera Global co-create holistic and durable solutions that respond to farmers' daily realities. In 2023, amidst the many unprecedented challenges impacting agriculture, food security, and education, John Deere and Pyxera Global, in collaboration with local communities, continue to make giant strides towards achieving sustainable food security and economic prosperity. The trust established by Rayuwa since its inception, demonstrated through tangible outcomes and unwavering support to communities during the COVID-19 lockdowns and many other challenges, laid the foundation for a successful expansion. Starting with **11** villages in 2019, the program grew to encompass **44** villages in 2021, **85** villages in 2022, and reached **128** villages in 2023. Presently, Rayuwa is positively impacting the lives of **13,756** farmers.



Disclaimer: Map of Nigeria is used only for a visual depiction and may not be accurate.

*Achieving Rayuwa's key objectives and milestones in 2023 encountered numerous hurdles.* The Russia invasion and war in Ukraine, the sudden initiation and implementation of a cashless policy by the Nigerian government during the elections, the closure of Nigeria's borders due to the military intervention in Niger Republic (which borders Katsina state), and other geopolitical events collectively contributed to a record-high inflation rate of **28.92%** in Nigeria. These challenges left the Nigerian agricultural landscape grappling with the aftermath of soaring prices for essential farm inputs. Compounding supply chain shocks due to the impact of government policies, such as the removal of subsidies on petrol among others also limited the availability of essential goods during the cropping season, such as fertilizer and other inputs, resulting in price increases in northern Nigeria as high as 150%. Government teachers also went on strike to protest unpaid salaries and other working conditions.

Consequently, food security declined, and inequality rose. The Food and Agriculture Organization (FAO) expected nearly **25.3 million** Nigerians (13% of the population) to experience food security crises or emergency in 2023. Equally concerning, according to the United Nations Children's Fund (UNICEF), **one in three** children in Nigeria is out of school, totaling **10.2 million** at the primary level and **8.1 million** at the junior secondary school (JSS) level.

*In the face of challenges and uncertainties in Nigeria and globally, smallholder farmers within the Rayuwa project areas are shaping a distinct narrative.* Guided and inspired by a skilled and devoted

team, Rayuwa farmers persistently implement good agricultural practices, secure access to finance and quality inputs, and enhance their productivity. Notably, female farmers and entrepreneurs play pivotal roles in spearheading initiatives to save and invest their resources in both their businesses and the potential of their community members, contributing to a more collectively prosperous future.

As household agricultural production and incomes witness growth, these communities are progressively overcoming the challenges of the hunger season. Additionally, community members are making investments in the education of their children, ensuring that the benefits derived from Rayuwa, and their current efforts will extend into the next generation.

*As Rayuwa enters its final year of implementation, this report contextualizes Rayuwa's 2023 achievements in relation to the Sustainable Development Goals (SDGs).* Rayuwa views the SDGs as interwoven. The project's two thematic intervention areas of resilient agriculture and accountable education align directly with **SDG 2, SDG 4, and SDG 8. SDG 5, SDG 13, and SDG 17** cut across all aspects of the project.

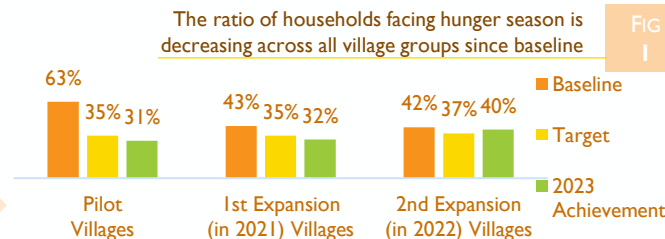


# FIGHTING HUNGER WITH SUSTAINABLE AND RESILIENT AGRICULTURE

The value of Rayuwa’s holistic, community-based approach to resilient agriculture is most effectively demonstrated by the change in “hunger season,” incomes, and farmer classifications—in the context of community environments.

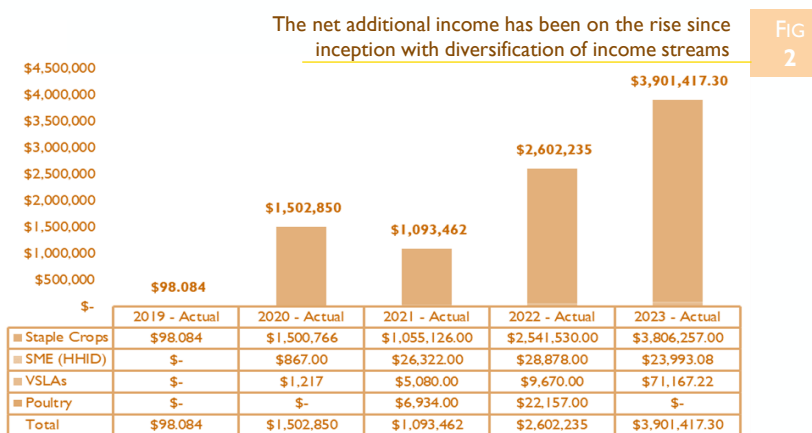
Fewer households are experiencing hunger season due to improved agricultural productivity and profitability.

In 2023, Nigerian smallholder farmers faced numerous challenges and adversities, yet they persisted. The percentage of households experiencing hunger dropped by **51%** in the pilot villages, **26%** in the 74 villages expanded in 2021, and **5%** in the 43 villages expanded in 2022. The pilot and first expansion villages have already surpassed their targets, while second and third expansion villages are expected to attain the target by the end of 2024.



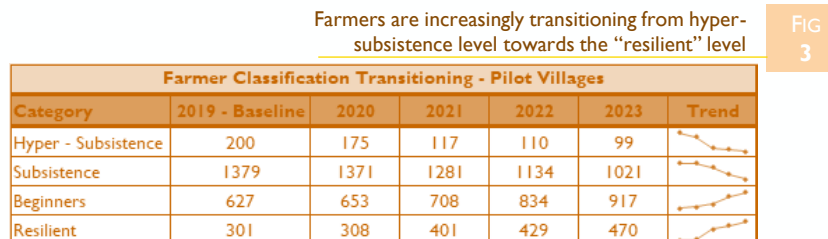
Farmers have increased their income from staple crops while building greater resiliency through income diversification & savings.

Due to the adoption of good agricultural practices, farmers earned **\$3.8 million** in additional income from staple crops (such as maize, rice, soybean, sorghum, and cowpea) in 2023. Further, by diversifying their income streams through small businesses and saving money through the Village Savings and Loans Association (VSLA) farmers earned additional **\$3.9 million** – a **50%** increase compared to the \$2.6 million income in 2022.



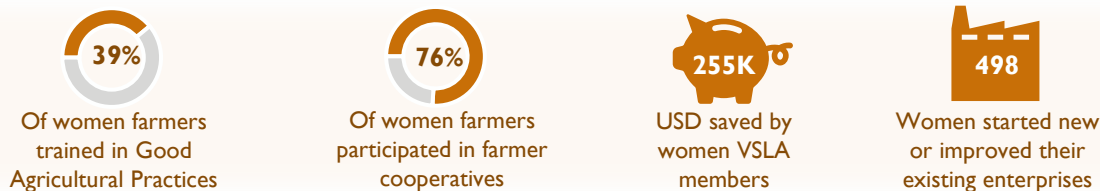
Farmers are moving up the resiliency scale, as more farmers are equipped to better combat market and climatic shocks.

Rayuwa uses a farmer classification model to effectively target interventions and monitor and evaluate farmers’ progress towards resilient farming. In 2023 in pilot villages, an additional **9%** of ‘Beginner Farmers’ graduated to Resilient Farmers, while in the first expansion areas the graduation rate was **20%**. Since inception, the number of hyper-subsistence farmers has been halved in pilot villages, while reduced by **11%** in first expansion villages, despite the nationwide increase in hunger due to inflation and other economic shocks.



Women farmers gained equitable access to farming knowledge and finance to enhance farm productivity, income resiliency, and decision-making power.

Integral to improving agricultural profitability and economic resiliency is the full and equitable participation of women. Rayuwa worked with all stakeholders in the project area to identify and implement locally appropriate solutions that ensure men and women have equal access to opportunity. Some of the key achievements include the following:



Farmers have increasingly adopted climate-smart and eco-friendly agricultural practices, reducing farms’ environmental impact & enhancing resiliency against climate-related shocks.

Rayuwa integrates climate-smart agricultural practices into its trainings to ensure smallholder farmers are equipped to mitigate and adapt to climate change while sustainably increasing farm yields and profitability. Some key highlights are below:



To enhance the market-linkages and integration of rural farmers, Rayuwa has made major achievements in 2023. It has established offtake agreements between two farmers’ unions and Alana Green for **200 metric tons** of maize. Likewise, it has facilitated the supply of **26 metric tons** of NPK fertilizer from Flour Mills Golden Penny amidst supply chain shocks. In addition, it fostered the relationship between cooperatives and seed suppliers, resulting in the supply of **4.3 metric tons** of maize and **0.05 tons** of rice seeds from Basamukh Seeds for the 2023 rainy season production. It has also secured a linkage agreement with machine suppliers to guarantee price discounts for participating farmers.

Rayuwa has started advising the government of Katsina state to scale-up Rayuwa interventions across the whole state, which will amplify Rayuwa’s impact tenfold – from current **13,756** farmers to **140,000** farmers!

Rayuwa nurtured partnerships with the government, input suppliers, banks, and farmer cooperatives to integrate farmers with the market and government services.



## Investing in the Potential of Today and Tomorrow

Rayuwa integrates two pivotal interventions crucial for the immediate and long-term success of farmers. These include agricultural initiatives aimed at fostering sustainable improvements in food security, farm productivity, and profitability, alongside youth and adult education initiatives designed to ignite opportunities and promote equity.

Recognizing the positive correlation between education and enhanced productivity, profitability, adaptability, and resilience among farmers, Rayuwa not only collaborates with farmers to enhance agricultural practices and bolster profitability, savings, and reinvestment into the farm, but also strategically invests in the educational development of both the current and future generations of farmers. This entails ensuring the availability and accessibility of sustainable, high-quality education.

50% (8,214) more students benefited from Rayuwa's education interventions after successful expansion to Kaduna State in 2023.

The supported schools are reporting elevated learning outcomes as more students transition from low to high performers in key subject areas.

Rayuwa catalyzed critical improvements in the quality of instruction in government schools, with modernization of learning curriculum & pedagogic approaches.

Rayuwa enhanced the communities' role in and accountability for the education system by strengthening SBMCs, empowering parents, and mobilizing community leaders and government officials.

Through its adult education initiative, Rayuwa enhanced the literacy & numeracy skills of women farmers to enhance their strategy & management of farms & enterprises.

In 2023, Rayuwa partnered with **44** government schools, serving **128** villages and **22,159** students — **48%** of whom are girls. Particularly, the expansion in Kaduna State scaled literacy and numeracy enhancing interventions across **17** new schools in 2023. Building on the lessons and goodwill from pilot and first expansion villages, the education team partnered with educators, community leaders, and parents to foster pedagogic innovation.

In the six pilot schools of Katsina state, the ratio of low-performers declined on average by **64** percentage points (pp), while the ratio for high-performers increased by **23** pp. All schools have met or surpassed the set targets for reducing the low-performers ratio and are on track to meet the targets for high-performers ratio in the new year.

Similarly, 21 schools from first expansion villages have also reduced the low-performers ratio by **38** pp, surpassing the set targets. The schools have also increased the high-performers ratio by **18** pp and are on track to meet the targets by 2024. After just one year of support, 17 schools in second expansion villages have already met the targets for reducing the low-performers ratio, with an average decline of **31** pp, and they are on track to meet the targets for increasing the high performers ratio, with an average decline of **16** pp over the year.

To sustainably cultivate the next generation of problem-solvers and innovators, Rayuwa worked with the schools to increase the quality of instruction by adopting participatory and engaging teaching approaches. Rayuwa equipped schools with teaching aids and teaching and learning materials to support teachers and enhance the effectiveness of instruction.

**296** teachers (25% female) were trained in effective class management and pedagogic innovation



**20K**

Students taught using improved teaching and learning materials



Students (54% girls) enrolled in homeschooling remedial centers for supplemental education support

Rayuwa partnered with parents, community leaders, and the local government to increase the communities' involvement in and accountability for the education system, strengthening the functioning of **44** School-based Management Committees (SBMCs). Rayuwa delivered periodic trainings and facilitated meetings for **177** (21% female) officials, enabling SBMCs to catalyze and measure improvements, particularly by discharging standardized roles and responsibilities of SBMC members, which includes coordinating education stakeholders, reviewing school finances, and mobilizing resources. In 2023, to help SBMCs become financially independent, Rayuwa collaborated with them to start fruit orchards in each school. The SBMCs provided land for the orchard and the Project contributed **3,066** (2,518 mangoes & 548 oranges) fruit tree seedlings. The SBMCs are also leading the engagement between Rayuwa, out-of-school children, and community leaders to encourage the children to participate in remedial education that prepares them to enroll in formal schools.

The adult education program launched in 2023 and successfully graduated its third cohort of **201** female learners. This program covers the equivalent of the first 6 years of primary school and equips farmers with the literacy and numeracy skills needed to understand farming concepts and practices. The acquired knowledge was applied to maintaining basic farm records, reading agriculture extension services flyers, and comprehending agricultural instructions on right usage of farm inputs, such as fertilizers, seeds, and agrochemicals.

Increase in high performers and reduction in low performers from all project villages, across all subject areas

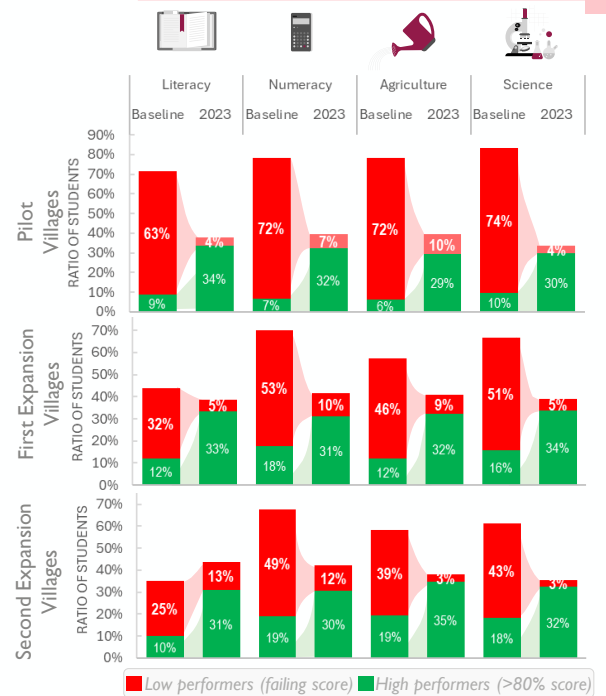


FIG 4

## Sustaining and Amplifying Impact: The Project Sunset & Beyond

The Sustainable Graduation strategy relies on three levers: (a) strengthening community ownership to sustain Rayuwa-promoted practices (b) integrating communities with the market; and (c) building relationships between communities and government agencies, while advising and advocating for wider scaling-up of Rayuwa interventions and insights.



### COMMUNITY OWNERSHIP

**Rayuwa's sustainability is based on its dedication to providing training and services that align with community needs, fostering increased efficiency, effectiveness, and community-driven ownership of changes in agricultural and educational practices.** Rayuwa has empowered a network of community champions that are already driving change with Rayuwa's minimal support, either as volunteer & role models or by transitioning to fee-for-service providers (FSP). The agriculture & income generation champions include **36** agriculture village extension agents (VEAs) (31% FSPs), **332** lead farmers (5% FSPs), **1,660** cooperative and union leaders, and **22** field agents (18% FSPs) of the VSLA groups and HHID activities. In education, the champions include **35** Community Education Workers (CEWs). 6% of CEWs are already offering affordable education services, such as private reading clubs and tutoring services, while **308** SBMC leaders and members are carrying out capital-intensive projects in schools and provide advisory support to school management, with Rayuwa's minimal support.



### MARKET INTEGRATION

**The lasting impact of Rayuwa hinges on integrating and strengthening linkages of farmers with critical value-chain actors.** Rayuwa has bolstered the governance and functioning of **332** farmer cooperatives and unions as a platform for collective negotiation with financial service providers, input suppliers, and off-takers. As a result, in 2023, the cooperatives secured a bank loan for farm inputs covering **172** hectares of maize and **2** hectares of rice in the project areas. Likewise, Rayuwa has also facilitated the cooperatives' business relationships with various input suppliers for fertilizers, improved seed varieties, and agro-chemicals. For instance, the team is facilitating a partnership between the cooperatives and Alana Green Ltd & Ahalson Enterprise Ltd to supply inputs to farmers during the planting season in exchange for equivalent amounts of grains at harvest – a kind of 'out-grower scheme.' In addition, Rayuwa has trained a cadre of **260** entrepreneurship trainers and role models, who will continue to support **7,119** entrepreneurs and mentor new entrepreneurs each year locally, while the VSLAs are expected to continue to provide necessary capital for growth and innovation.



### GOVERNMENT LINKAGES

**Rayuwa strengthens farmers' ties with government services and advises the government to scale-up Rayuwa's insights and impact.** Recognizing the Project's potential, the State Government Ministries have already stepped in to provide crucial support to their constituents, including access to agricultural extension services, resource sharing, and mobilizing resources. Together they are in the process of establishing training workshops, demonstration farms, and distributing improved seeds and micro-mechanization equipment to farmers. One monumental achievement of 2023 was the invitation of the Commissioner of Katsina State for Rayuwa to help scale-up project's activities across the whole state, which would amount to a tenfold amplification of Rayuwa's impact, from **13,756** farmers to over **140,000** farmers.

Rayuwa's vision is to graduate the communities in an impactful, responsible, and sustainable manner so that current and future generations of farmers continue to reap the benefits from a partnership – built on mutual trust and respect. Building on the remarkable achievements as highlighted in this report, Rayuwa looks forward to an even more impactful and transformative year of project sunseting.



Mallam Garba Surajo's farm-based enterprise continued to flourish with impressive farm yields, both from his on-season and off-season farming activities. Since engaging in Rayuwa's activities in 2019, Garba diversified his crops, adopted Good Agricultural Practices (GAPs), and integrated new income-generating activities into his farming practices.

**Garba Surajo's grain production increased from 1.5 tons in 2019 to 14.8 tons in 2023.** His irrigation farms of okra, millet, watermelon, pepper, potato, guava, and tiger nuts yielded bountifully. To effectively monitor this expansion and growth, Garba Surajo established robust record-keeping practices to meticulously document his sales of farm produce and expenditures.

**The first all-male Village Savings and Loan Association (VSLA), spearheaded by Garba Surajo in his community, conducted its fourth circle share-out, distributing ₦367,500 (\$867) among its members, with an average payout of ₦24,500 (\$58) per individual.** Most members used the money to provide food for their families and to procure inputs in preparation for the upcoming farming season.



Twelve-year-old Jamila Yusuf is the fifth child among her siblings. Unfortunately, a significant life change occurred in her family, prompting them to relocate to another community. This transition affected Jamila psychosocially and had an impact on her educational progress.

Despite the challenges, Jamila's determination for education led her to enroll in the Rayuwa homeschooling program in Kafur, her new home. Recognizing her uneasiness, the Community Education Worker (CEW) managing the homeschooling center applied play-way pedagogic methods of learning, which helped boost Jamila's self-esteem and encouraged peer interaction. This resulted in significant improvements in her ability to recognize numbers and alphabets, as well as in her reading and writing skills. Jamila exhibited increased interest in learning, improved attendance, and enhanced engagement in the classroom.

In 2023, Jamila was enrolled in a formal school. **Jamila ranked 3<sup>rd</sup> out of 33 classmates and improved her performance in English and STEM subjects.** She now envisions a future where education becomes a source of empowerment, transcending challenges posed by circumstances.

## Sustainable Development Goal #2



# ZERO HUNGER

End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.



**Mallam Garba Surajo**

### NIGERIA AT A GLANCE

- Nigeria ranks **107th** out of 113 countries on the Global Food Security Index (GFSI), and the level of hunger in Nigeria remains considerably high, as Nigeria also ranks **109th** out of 125 countries in the 2023 Global Hunger Index (GHI).
- In 2023, around **12** percent of the world population in extreme poverty live in Nigeria, with the poverty threshold at \$1.90 U.S. dollars a day.
- While Nigeria makes up less than 3% of the world's total population, **3.8%** of the world's undernourished people live in Nigeria.
- About 29.6% of the global population – 2.4 billion people – were moderately or severely food insecure in 2022, of which 11.3% of people in the world were severely food insecure. The World Bank says poverty rate in Nigeria has increased to **46 percent** in 2023, representing **104 million** poor Nigerians.
- In Katsina State, more than **75%** of the population are farmers and largely small-scale farmers. Agriculture is the primary source of income. According to UNICEF, of the **1.6 million** Katsina residents suffering from hunger, **63,000** are currently battling with acute food insecurity, implying that a substantial percentage of the State's population is food insecure.

Mallam Garba Surajo's farm-based enterprise continued to flourish with impressive farm yields, both from his on-season and off-season farming activities. Since engaging in Rayuwa's activities in 2019 at the age of 69, Garba Surajo diversified his crops, adopted Good Agricultural Practices (GAPs), and integrated new income-generating activities into his farming practices. These efforts were aimed at improving farm productivity, increasing household income, ensuring food security, and building resilience against various shocks. Mallam Garba Surajo and his family are no longer faced with challenges of food insecurity as he is no longer experiencing "hunger season."

**Garba Surajo's grain production increased from 1.5 tons in 2019 to 14.8 tons in 2023.** His irrigation farms of okra, millet, watermelon, pepper, potato, guava, and tiger nuts experienced significant yield growth. To effectively monitor this expansion and growth, Garba Surajo established robust record-keeping practices to meticulously document his sales of farm produce and expenditures.

**The first all-male Village Savings and Loan Association (VSLA), spearheaded by Garba Surajo in his community, conducted its fourth circle share-out,** distributing ₦367,500 (\$867) among its members, with an average payout of ₦24,500 (\$58) per individual. Most members use the money to provide food for their families and to procure inputs in preparation for the upcoming farming season.

*"The Rayuwa Project has been a beacon of hope for me and my family. Their expertise and guidance have empowered us to overcome obstacles and thrive in our farming endeavors."*

”



# PROGRAM STRATEGY & IMPACT

Freedom from hunger is a human right. Hunger negatively impacts farmers' productivity, children's full participation in school, and community health. Rayuwa targets the food insecurity of smallholder farmers by transferring knowledge that increases the household food supply of staple crops—sustainably.

Key objectives to eliminate the hunger season are:

- Increase agricultural productivity and profitability.
- Increase farm-based household income.
- Encourage the adoption of practices that build resiliency against climate shocks and are good for health and the environment.
- Cultivate the next generation of farmers.

In 2023, 76% of farmers in the pilot project area adopted good agricultural practices (GAP) such as plant spacing, improved fertilizer application methods, use of improved seed varieties, integrated pest and disease management, and crop rotation.

## SDG TARGETS



End hunger and ensure consistent access to safe, nutritious, and sufficient food supplies for all



Double smallholder farmers' agricultural productivity and incomes through land access, inputs, knowledge, financial services, markets, value-addition, and non-farm employment opportunities



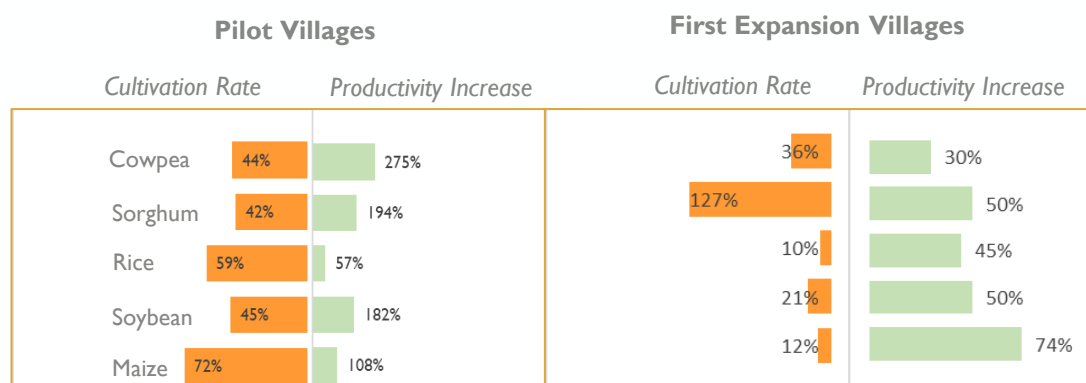
Ensure sustainable food production and implement good agricultural practices that increase productivity, boost production, maintain ecosystems, strengthen climate change resiliency, and improve land quality



Leverage partnerships to increase investment in agriculture infrastructure, research, extension, and technology

FIG  
5

Increase in crop productivity from all project villages, across all staple crops



The average productivity of staple crops has increased by **163%** in the pilot villages, by **50%** in the first expansion area, and by **9%** in the second expansion area, compared to baseline data.

In 2023, amidst rising food insecurity, Rayuwa reduced the prevalence of the hunger season in the pilot project area to 31% - down from 63% in 2019 and surpassing the target of 35%. In just two years, the hunger season reduced from 43% to 34% in the first expansion area and was equally reduced from 42% to 40% in the second expansion area.

Additional achievements include the following:

- Increase in the farmers' combined average agricultural productivity in the pilot project area and first expansion area by 26% from 2022.
- Agricultural incomes of farmers from staple crops increased by an aggregate of 20% in the pilot project area and by 19% in the first expansion area.
- In the second expansion area, the agricultural income from staple crops was also increased by an aggregate of 9% in 2023.





## Sustainable Development Goal #4

# QUALITY EDUCATION

Ensure inclusive, equitable, and high-quality education and promote lifelong learning opportunities for all.



### NIGERIA AT A GLANCE

**One in five** of the world's out-of-school children is in Nigeria. About **10.5 million** of the country's children aged 5-14 years are not in school. Only **61%** of 6–11 year-olds regularly attend primary school and only **35.6%** of children aged 36-59 months receive early childhood education.

About **7.6 million girls** are out-of-school in Nigeria: 3.9 million at the primary and 3.7 million at the junior secondary level. More than **50%** of girls are not attending school at the basic education level. In each cohort, **1 million** girls drop out between the first and last year of primary school, and **0.6 million** between Primary 6 and JSS1.

The literacy rate in Katsina State is **32.6%**—it is rising, but still one of the lowest rates in the country.

“*Rayuwa's homeschooling initiative reignited my passion for learning and subsequent enrollment in the formal school system. I am happy that my ambition to become a nurse is on track. I now see a brighter future ahead.*”

### Jamila Yusuf

Twelve-year-old Jamila Yusuf is the fifth child among her siblings. Unfortunately, a significant life change occurred in her family, prompting them to relocate to another community. This transition affected Jamila psychosocially and had an impact on her educational progress. Despite the challenges, Jamila's determination for education led her to enroll in the Rayuwa homeschooling program in the Unguwan Zaki community of Kafur, her new location.

Recognizing her uneasiness, the Community Education Worker (CEW) managing the center applied and implemented play-way pedagogic methods of learning, which helped boost Jamila's self-esteem and encouraged peer interaction. This resulted in significant improvements in her ability to recognize numbers and alphabets, as well as in her reading and writing skills. Jamila exhibited increased interest in learning, improved punctuality in attendance, and demonstrated enhanced engagement in the classroom activities of the homeschooling program.

In 2023, Jamila was enrolled in a formal school. She envisions a future where education becomes a source of empowerment, transcending challenges posed by circumstances. **Jamila ranked 3<sup>rd</sup> out of 33 classmates and improved her performance in English and STEM subjects.**

Jamila is a member of the school's social club, illustrating her commitment to personal growth and community engagement.



# PROGRAM STRATEGY & IMPACT

The education of the next generation of farmers is guided by the positive relationship between education and agricultural productivity and the belief that schools belong to their communities. Rayuwa works with key stakeholders of the local school system to ensure high-quality education is accessible and remains accessible beyond the lifetime of the project.

Rayuwa's key objectives to enhance human capital are:

- Elevate the literacy and numeracy levels of all children to their assigned class level—including drop-outs.
- Strategically reduce barriers to attending school and learning.
- Increase the capacity and capability of community-based educators.
- Strengthen the capacity and engagement of local governments, parents, teachers, and students to manage their schools effectively.
- Support the holistic development of students—especially in critical thinking and through STEM.

**In 2023, Rayuwa partnered with 44 government schools, serving 128 villages and 22,159 students — 48% of whom are girls. Particularly in 2023, the expansion in Kaduna State (second expansion) scaled literacy and numeracy enhancing interventions across 17 new schools.**

*To sustainably cultivate the next generation of problem-solvers and innovators, Rayuwa worked with the schools to increase the quality of instruction by adopting participatory and engaging teaching approaches.*

- Rayuwa equipped schools with teaching, learning materials, and teaching aids to support teachers and enhance the effectiveness of instruction.
- A total of **296** teachers were trained in effective class management and pedagogy in numeracy, literacy, and STEM as well as the effective use of teaching and learning materials (TLMs).

*Rayuwa worked with parents, community leaders, and the local government to increase the communities' involvement in and accountability for the education system.*

- Rayuwa facilitated periodic trainings and meetings for the School-Based Management Committees (SBMCs) to measure progress and make improvements where necessary using the already developed manual on the standardized roles and responsibilities of SBMC members as well as on coordination, managing school finances, and resource mobilization.
- In 2023, to help SBMCs become financially independent, Rayuwa worked with them to start fruit orchards in each school. The SBMCs provided land for the orchard and the Project contributed **3,066** (2,518 mangoes & 548 oranges) fruit tree seedlings.
- The SBMCs are also leading the engagement between Rayuwa, out-of-school children, and community leaders to encourage the children to participate in remedial education that prepares them to enroll in formal schools.

**Finally, the adult literacy and numeracy program launched in 2023 and successfully graduated its third cohort of 201 female learners.** This program covers the equivalent of the first 6 years of primary school and equips farmers with the literacy and numeracy skills needed to understand farming concepts and practices. The acquired knowledge was applied to maintaining basic farm records, reading agriculture extension services flyers, and comprehending agricultural instructions on right usage of farm inputs, such as fertilizers, seeds, and agrochemicals.

## SDG TARGETS



Ensure that all girls and boys complete free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes



Ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy outcomes



Substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship



Upgrade education facilities to provide effective learning environments for all

# PROGRAM STRATEGY & IMPACT

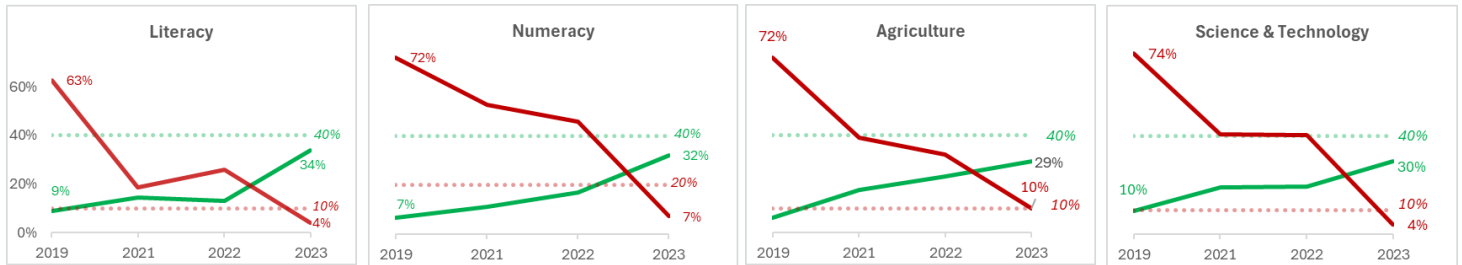
The accountable education initiatives catalyzed significant progress in improving learning outcomes in all project areas.

In the pilot communities in Katsina State, the ratio of high-performing students (scoring above 80%) in numeracy and literacy increased from 17% to 32% and from 13% to 34%, respectively, between 2022 and 2023. Students' performance in science and technology increased from 19% to 30%.



Ratio of higher performers is increasing while ratio of low performers is decreasing across all subjects in Pilot Villages

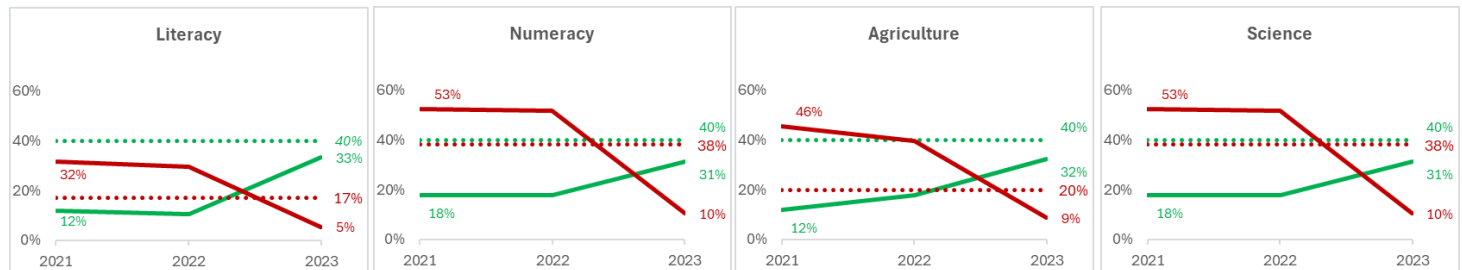
FIG 6



In the first expansion area of Katsina State, there was a substantial reduction in the ratio of low-performing students (scoring zero) across various subjects between the 2022 and 2023 academic year — literacy (from 30% to 5%), numeracy (from 52% to 10%), agriculture (from 40% to 9%), and science and technology (from 48% to 5%).

Ratio of higher performers is increasing while ratio of low performers is decreasing across all subjects in First Expansion Villages

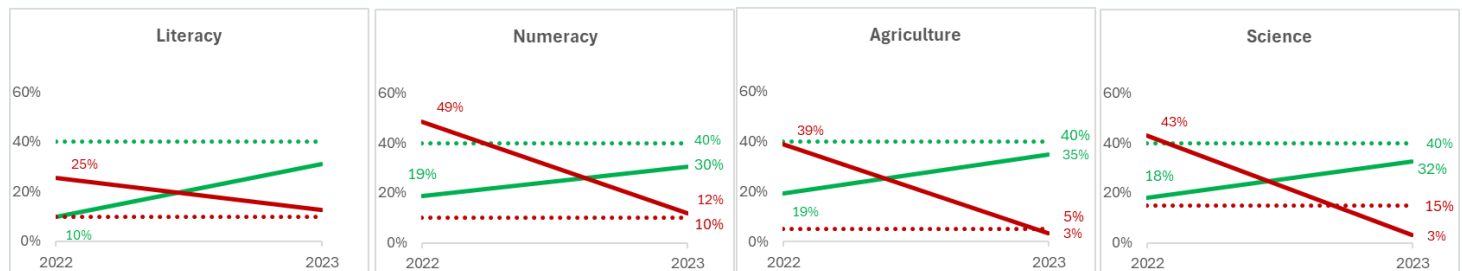
FIG 7



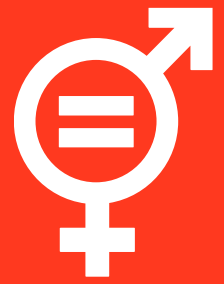
Schools in the second expansion area in Kaduna State are also demonstrating strong signs of progress as Rayuwa works with teachers, SBMCs, parents, the government, and students to strengthen the education system. As a result, the ratio of high-performing students in numeracy and literacy increased from 19% to 30% and from 10% to 31%, respectively, between 2022 and 2023. Students' performance in science and technology also increased from 18% to 32%.

Ratio of higher performers is increasing while ratio of low performers is decreasing across all subjects in Second Expansion Villages

FIG 8



## Sustainable Development Goal #5



# GENDER EQUALITY

Achieve gender equality and empower all women and girls.



## NIGERIA AT A GLANCE

Nigeria ranks **130th** out of 146 countries in the global gender gap report in 2023, indicating pervasive gender disparity with a score of **63.7%**. Despite comprising nearly half of the population, women constitute **70%** of individuals living in extreme poverty (less than \$1.90 a day) in the country.

Despite making up 70-80% of Nigeria's agricultural labor force, women smallholder farmers own less than **10%** of the country's land.

In Katsina State, the literacy rate for women is only **32.6%**, compared to 62.6% for men.

In Nigeria, Female-headed households with less than a primary education experience a poverty rate of **34.72%**, while male-headed households in similar educational circumstances face a higher poverty rate of 66.17%.

“During the inaugural Rayuwa Best Farmer Initiative in 2023, Asmau stood out as the top sorghum farmer and the sole female recipient of awards in both the Kaduna and Katsina project regions.”

## Asmau Laminu

Asmau Laminu, a 35-year-old farmer and mother of five, resides in the Ari Community of Katsina State. She is an active member of the Noma Ba Taki Wasa Da Kasa Farmers' Cooperative Society Limited.

In Northern Nigeria, access to land for women is very challenging. Asmau's father bequeathed 1.6 hectares of land to her on his deathbed. However, Asmau encountered difficulties in fully utilizing the land, leading to lower production yields of 2.5-3 tons per hectare. She contemplated giving up on farming.

**In 2022, when Rayuwa expanded to her community, Asmau participated in Rayuwa's GAP training.** She implemented the use of improved seed varieties, proper plant spacing, integrated pest management, and the correct method of fertilizer application. The result was a remarkable increase in production output, reaching an impressive 6 tons per hectare in 2023. The capacity-building training on harvest, post-harvest loss, financial literacy, and greenfield day activities transformed Asmau's approach to farming.

**This improved yield had a positive impact on Asmau's family, enabling her to support her children with school materials and household items.** The family's previous struggle during the "Hunger Season" became a thing of the past. With the increased yield, Asmau diversified her income generation by venturing into livestock. She currently owns eight goats after selling four to address financial needs and has already bought inputs for the next farming season. The adoption of Rayuwa-promoted practices significantly contributed to Asmau's success, demonstrating the impact of sustainable farming practices.



# PROGRAM STRATEGY & IMPACT

Integral to improving agricultural resiliency and accountable education systems is the full and equitable participation of women. Rayuwa works with all stakeholders in the project area to identify and implement locally appropriate solutions that ensure men and women have equal access to opportunity.

Rayuwa's gender equality strategy is founded on three key principles:

- Understand the different knowledge levels, needs, priorities, challenges, and opportunities of various stakeholders.
- Consistently employ a participatory and iterative approach to address the root causes of relevant gender-related disparities.
- Staff the program appropriately to ensure the project is equipped to integrate gender inclusive practices.

Key results of Rayuwa's commitment to narrow the gender gap in 2023 by consciously targeting and customizing activities that enable full and effective participation in the project area include:

- **39%** of women farmers (4,393) trained in GAP.
- **76%** of women farmers (3,129) engaged in a farmer cooperative.
- **10%** of farmers (14) who participated in the input-on-credit scheme are women.
- **44%, 40%, and 17%** of female students score over 80% in literacy (Hausa and English), numeracy, and science and technology, respectively.

To increase households' access to micro-finance and reduce their vulnerability to shocks, Rayuwa trained women to form and manage VSLAs.



Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women



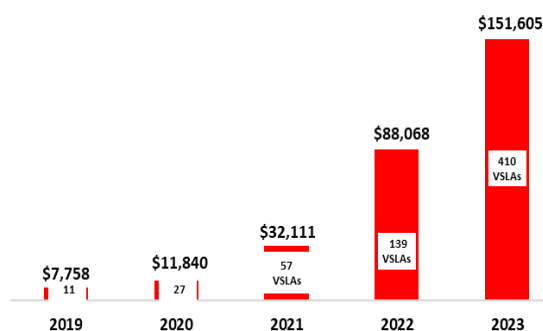
Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic, and public life

VSLAs' total savings has been on the rise since inception with the formation of additional VSLA groups

In 2023, Rayuwa facilitated the formation of an additional 271 VSLA groups (269 women groups and two male groups), bringing the total VSLA groups to **410** VSLAs (398 female groups and 12 male groups) with 67% membership increase from 2022.

Cumulatively, the VSLAs have saved ₦108,421,100 (\$255,770) since its inception to date. A total of ₦139,058,265 (\$328,044) has been disbursed as revolving loans among members, of which ₦135,696,150 (\$320,113) of the loan amount as been repaid. ₦7,406,645 (\$17,472) was generated as interest on loan repayment and ₦7,174,020 (\$16,923) has been contributed as social fund.

Total Savings Achieved by VSLAs (\$USD)



Promoting women's economic empowerment is recognized for its positive impact on household and community economic development. Nevertheless, women in northern Nigeria encounter obstacles in acquiring assets, particularly land, and confront cultural barriers restricting their mobility. To rectify this disparity, Rayuwa focuses on empowering women through the Household Income Diversification (HHID) program. This initiative involves training women to initiate and manage micro-enterprises at the household and farm levels. The HHID program aims to enable women, irrespective of cultural constraints, to pursue their ambition of owning businesses and generating income for themselves and their families.

Rayuwa recorded a significant increase in household income generation activities among women in 2023:

- **18 new businesses** were started, and **38 existing businesses** were upgraded in the pilot villages
- **82 new businesses** were started, and **360 existing businesses** were upgraded in the first expansion area.

## Sustainable Development Goal #8



# DECENT WORK & ECONOMIC GROWTH

Promote sustained, inclusive, and sustainable economic growth; full and productive employment; and decent work for all.



## NIGERIA AT A GLANCE

According to the World Bank, the poverty rate in Nigeria increased to **46%** in 2023, representing 104 million poor Nigerians. Nearly **12%** of the world population in extreme poverty lives in Nigeria.

In 2023, the combined rate of unemployment and time-related underemployment in the labor force in Nigeria was **15.5%**. The workforce participation rate for females in Nigeria is **52.1%**, while for males, it is **65.5%**.

In Katsina State, unemployment is **25%**.

The agriculture sector employs **35%** of the Nigerian workforce, with crop production making up **94%** of all agriculture-based economic activity.

“ My journey serves as a beacon of hope and empowerment for women in my community. My continued success demonstrates the transformative impact of Rayuwa's support in fostering inclusive and sustainable economic growth. Looking ahead, I remain committed to expanding my business and contributing to the prosperity of my community. ”

## Rahila Abdu

Rahila Abdul, aged 27, has continued to thrive in her entrepreneurial endeavors. She expanded her product offerings, including locally made liquid soap, body cream, insecticides, air fresheners, and hair cream, which generated ₦120,000 (\$183) within a year. Additionally, her investment in a grinding machine has generated an additional ₦40,000 (\$94) in income.

Rahila utilized part of her earnings to cultivate a hired piece of land, which is about 0.09 hectares, employing strip farming techniques to grow sorghum and soybean. This yielded 0.4 tons of sorghum and 0.05 tons of soybean. Her tailoring services have also generated an additional ₦36,000 (\$85) With her earnings, she purchased two goats and began grain banking, storing 0.9 tons of grains for future use.

**In 2023, Rahila won the Rayuwa Innovation Challenge** for her business plan proposal on the use of crop protection products using locally sourced natural materials.

**As a strong advocate of VLSAs, Rahila inspires women to save and invest on their farms and enterprises by forming and joining VSLAs.** In 2023, she facilitated nine groups to establish VSLAs – more than doubling her portfolio to 15 VSLAs.

Her story is not just one of personal triumph but serves as a beacon of hope for aspiring individuals in her community, demonstrating that with the right mindset and support system, anything is attainable.

# PROGRAM STRATEGY & IMPACT

Increasing the profitability, resilience, and efficiency of smallholder farmers is essential to achieving an economically stable, food secure, inclusive, and prosperous Nigeria. Rayuwa builds the capacity of farmers to improve farming methods, increase the yields of their farms, effectively manage their farms as a business, and enhance the resilience of their farms to weather biological, economic, and other external shocks.

Rayuwa’s key objectives to ensuring farming is a pathway to prosperity:

- Strengthen current sources of agricultural income, reduce income volatility and its vulnerability to shocks, and maximize the productivity of agriculture-based income through enhanced cultivation of irrigated and rainfed crops, crop diversification, and strategic integration of resilient and high-value crops.
- Integrate cross-cutting themes of financial management; market linkages to inputs, agricultural technologies, finance; environment and climate; and collaboration with government.

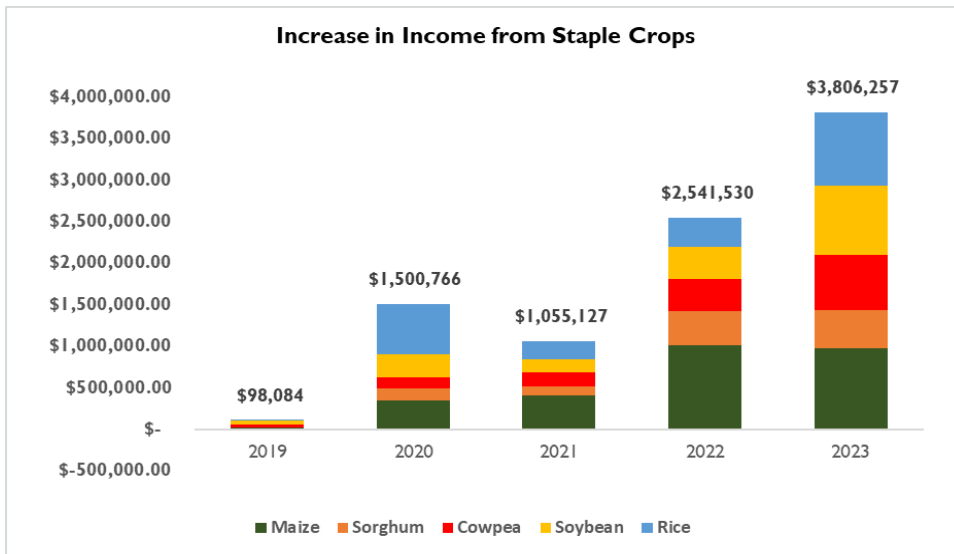
Despite the market volatility, climate shocks, regional insecurity, Rayuwa-supported farmers generated **\$3,806,257** of net additional income from maize, rice, sorghum, cowpea, and soybean in 2023.

## SDG TARGETS

Achieve higher levels of economic productivity through diversification, technological upgrading and innovation

Achieve full and productive employment and decent work for all women and men and substantially reduce the proportion of youth not in employment, education or training

FIG 10



A farmer in the Rayuwa project area adopting a rolling injector planter

To increase farming efficiency and reduce drudgery, Rayuwa continued to create a sustainable market for micro mechanization by addressing both the supply and demand side constraints.

- Since inception, Rayuwa has organized **166** youths in groups to establish micro-enterprises, which function as local service providers of micro-mechanization services.
- In 2023, through the Smart-Subsidy Initiative, **25** farmers (17 male and eight female) obtained farmer drudgery reduction machines and offered services to other farmers for a fee to generate additional income.
- To further increase farmers’ access to technology, the Rayuwa team has established a linkage agreement with machine suppliers to guarantee price discounts for farmers from the communities.



## Sustainable Development Goal #13

# CLIMATE ACTION

Take urgent action to combat climate change and its impacts.



### NIGERIA AT A GLANCE

Desertification and soil degradation in Nigeria's arid, semi-arid, and subhumid dry areas continue to proliferate and expand. Presently, over **35%** of Nigeria's landmass has been eroded, posing a threat to the livelihoods of more than **40 million** people.

In a study conducted in 2020 in Katsina State, it was discovered that **70%** of surveyed residents reported losses in both the size and quality of agricultural land attributed to erosion and deteriorating soil fertility. Additionally, **56%** of respondents observed reduced livestock productivity, while **70%** experienced a rise in incidents of pests and livestock diseases. Furthermore, **61%** faced increased costs associated with crop production, and **39%** reported a growing trend of farmer poverty.

“ *Access to quality-improved and drought resistant seed varieties provided by the Rayuwa project through the ICS initiatives changed the trajectory of my farming experience and made me an employer of labour in my community* ”

### Dauda Yawa

Dauda Yawa, 36, resides in the Unguwan Shukau community with his wife and three children (two boys and a girl). With 18 years of farming experience, he cultivates maize, rice, sorghum, and soybean. However, erratic weather patterns, extreme temperatures, and unpredictable rainfall have posed significant challenges to Dauda's farming practices, negatively impacting his yields.

After Rayuwa expanded to his community in 2021, he began attending Rayuwa's Good Agricultural Practices (GAP) trainings in 2022. Dauda decided to apply GAP to his farming activities, adopting the deep placement method for fertilizer application, planting drought tolerant seed varieties, utilizing mechanized farm equipment to enhance efficiency and reduce labor, applying organic kitchen waste, and integrating inorganic fertilizers to bolster his crops' resilience against the challenges posed by climate change. Through the weekly climate-smart e-extension messages disseminated by Rayuwa, Dauda was able to follow up on how and when to carry out appropriate GAP activities. **By adopting climate-smart practices, Dauda improved his soil health, conserved natural resources, minimized environmental degradation, and enhanced biodiversity on his farms.**

In the same year, Dauda achieved bumper harvests for all his crops. He harvested 4.5 tons of maize, a significant jump from his 2021 yield of 2.7 tons, marking a remarkable **66%** increase in agricultural productivity. Moreover, his rice yield surged by **20%**, cowpea by **37%**, and soybean by **10%**. In 2022, Dauda attended Rayuwa's demonstration of modern micro-mechanization equipment used on the demo plots. Intrigued by the potential to reduce drudgery and increase efficiency, Dauda invested in eco-friendly micro-mechanization equipment like the rolling injector planters which contributes positively to soil health due to low disruption to carbon-trapping soil and precision farming that reduces competition with weed, reducing the need for herbicides.

Dauda also planted economic fruit trees, these not only provide economic benefits but also contribute to reducing the concentration of greenhouse gases in the atmosphere, thereby helping to mitigate climate change.





# PROGRAM STRATEGY & IMPACT

The next generation of farmers will inherit dramatically different resources and conditions from their parents. Rayuwa integrates climate-smart agricultural practices into its trainings to ensure smallholder farmers are equipped to mitigate and adapt to climate change while sustainably increasing farm yields and profitability.

Key objectives to safeguard current and future generations of farmers are:

- Increase the adoption of climate-sensitive good agricultural practices such as water and soil management, integrated pest management, efficient land use, intercropping, and diversifying cropping systems to include short- and long-term high-value and resilient crops.
- Increase access to information that assists farmers to anticipate and navigate climate shocks and safety net mechanisms—such as crop insurance—to mitigate the impact of climate shocks.
- Cultivate greater environmental awareness by integrating environmental science into school curricula.

Soil degradation and desertification are expected to worsen in Nigeria, increasing food insecurity and demographic displacement in 11 “frontline” states that are dependent on land resources—including Katsina State. To build farmer and community resilience to mounting climate shocks, Rayuwa promotes the adoption of climate-smart agriculture through training, demonstrations, and technological up-scaling.

Through its Inputs-on-Credit Scheme (ICS) in 2023, Rayuwa facilitated access to drought tolerant, high-yield crop seeds for 172 farmers (90% male and 10% female)—The ICS also includes crop insurance and climate information to mitigate the effect of climate shocks.

Farmers in the Rayuwa supported villages are increasingly applying climate-smart agricultural practices:



68%

of farmers practice environment friendly **integrated pest and disease management practices**



95%

of farmers practice **soil management**



72%

of farmers adopted the use of **early maturing, heat and drought tolerant seed varieties**



869

metric tons of expected carbon sequestration (over 10 years) **from planting 8000 fruit trees** introduced by Rayuwa

## SDG TARGETS



Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters



Improve education and awareness-raising on climate change mitigation, adaptation, impact reduction, and early warning



Combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods, and strive to achieve a land degradation-neutral world

Through its partnership with the Nigerian Meteorological Agency, Rayuwa disseminated **77,773** messages on climate information and market linkages to farmers. Rayuwa translates the Agency’s relevant weather information into Hausa and rebroadcasts it to farmers in the Rayuwa project area.

## Sustainable Development Goal #17



# PARTNERSHIPS FOR THE GOALS

Strengthen the means of implementation and revitalize global partnerships for sustainable development.



## TRANSLATING PURPOSE INTO PRACTICE

## Government Partnership

The Sustainable Development Report 2023 placed Nigeria among the **bottom 20** countries globally in terms of progress toward achieving the United Nations Sustainable Development Goals (SDGs) targets by 2030.

*Rayuwa's strong commitment to partnership lays the foundation of trust, transparency, and community ownership that has been critical to the program's success to date, and for its expansion into new communities this year.*

“The Government is committed to replicating the transformative success of the Rayuwa project throughout the state. By harnessing its proven strategies and working closely with the local communities, we pledge to empower farmers, enhance food security, and ensure sustainable agricultural development for a prosperous future.”

**Prof. Ahmad Muhammad Bakori,**  
Honorable Commissioner of Agriculture  
Katsina state

The partnership between the Rayuwa project and the **Ministry of Agriculture in Katsina and Kaduna States on sustainable graduation is ongoing**, aiming to replicate the success of the Rayuwa project across the entire states. This collaborative effort is already showing promising results in enhancing agricultural productivity and improving livelihoods.

Initially, the Rayuwa project targeted specific areas, focusing on promoting resilience-enhancing agricultural practices. Recognizing the Project's potential, the State Government Ministries have stepped in to provide crucial support, including access to agricultural extension services, resource sharing, and mobilizing resources. Together they are in the process of establishing training workshops, demonstration farms, and distributing improved seeds and micro-mechanization equipment to farmers.

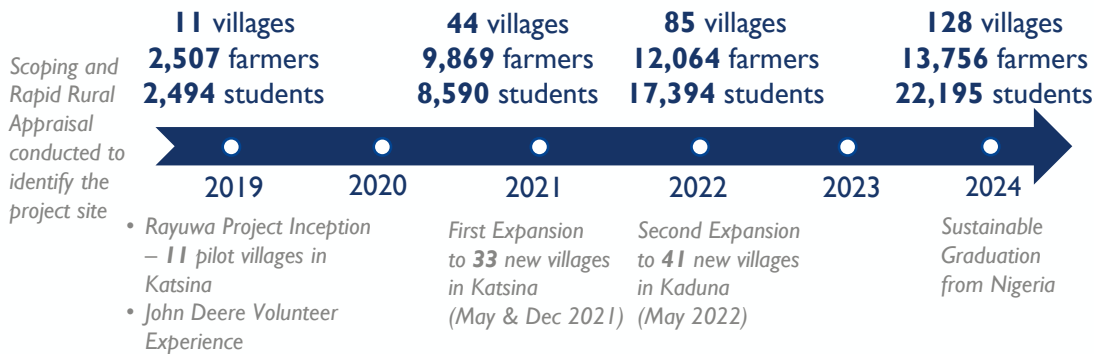
This ongoing partnership aims to empower smallholder farmers with sustainable farming methods, leading to increased productivity, enhanced food security, and better resilience to climate change impacts. As this partnership progresses, it highlights the significance of collaborations between government agencies and community-based organizations in driving sustainable development and improving rural livelihoods.

Additionally, **Rayuwa continues to collaborate closely with relevant government education stakeholders and institutions**, complementing the government's efforts in the areas of capacity-building for school support officers, conducting teacher trainings on improved pedagogies, curriculum development, and distribution of teaching and learning materials.



# PROGRAM STRATEGY & IMPACT

Distinct from many philanthropic or development initiatives, Rayuwa embodies equitable and inclusive collaboration between the John Deere Foundation, Pyxera Global, the communities, the Government of Nigeria, and other strategic partners that strengthen the enabling environment. By consciously weaving together these robust partnerships, Rayuwa has grown from 11 villages to 128—and is equipped to support the smallholder farmers of today and tomorrow improve their lives and livelihoods.



## SDG TARGETS



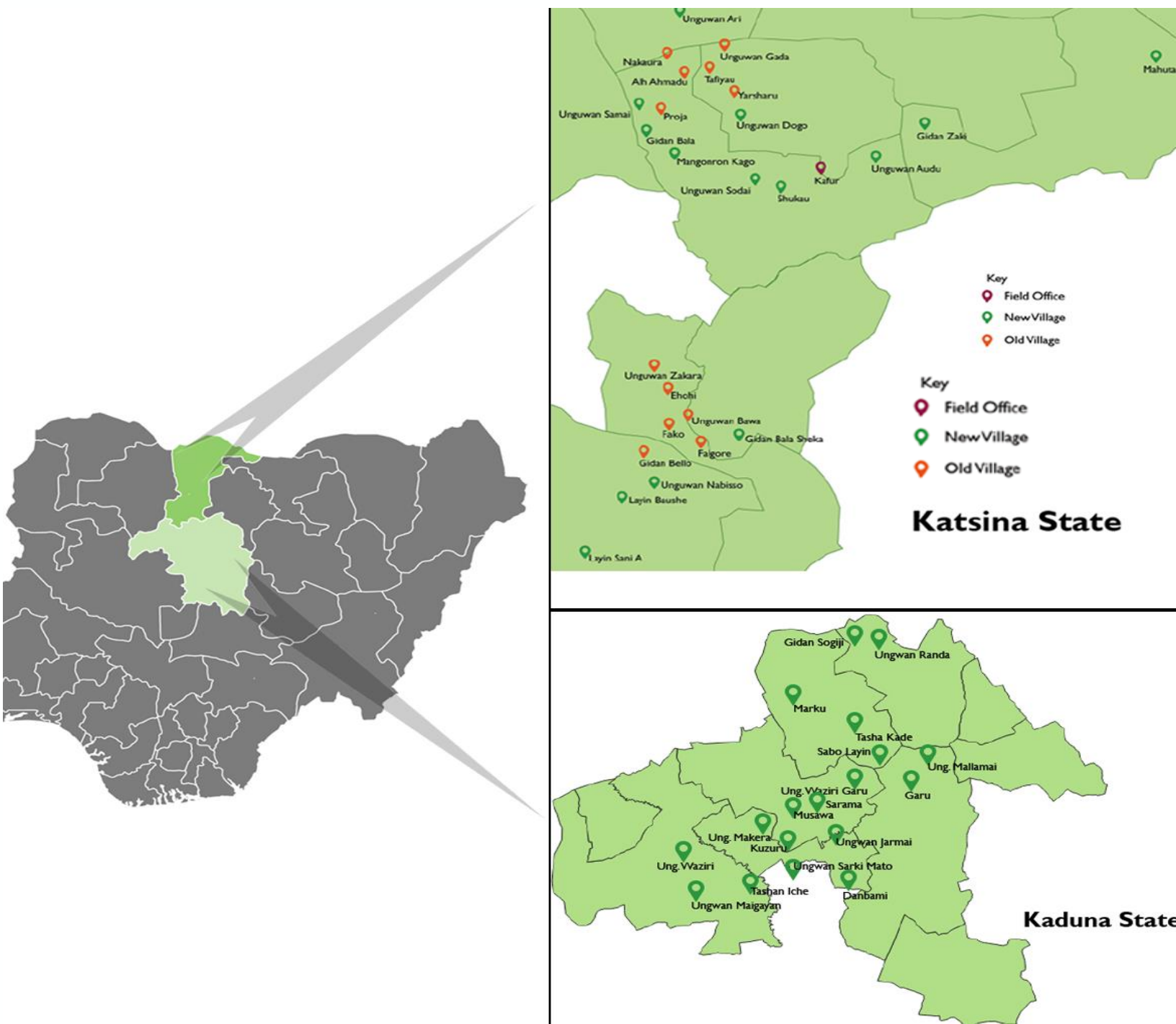
Encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies of cross-sector and multi-stakeholder partnerships to mobilize and share knowledge, expertise, technology, and financial resources

- **Continued work with government agricultural agencies** KATARDA and Katsina State Ministry for Agriculture and Rural Development. Partnered with the Kaduna State government for Rayuwa's expansion into Kaduna State.
- **Partnered with Sterling Bank to disburse agricultural loans** valued at ₦46 million (approximately \$108,516) to 172 farmers.
- **Formed linkages between farmer cooperatives/farmer unions and input suppliers to enhance access to farm inputs:**
  - Established offtake agreements between two farmers unions and Alana Green for 200 metric tons of maize in 2023.
  - Facilitated the supply of 26 metric tons of NPK fertilizer from Flour Mills Golden Penny amidst supply chain shocks.
  - Fostered the relationship between cooperatives and seed suppliers, resulting in the supply of 4.3 metric tons of maize and 0.05 tons of rice seeds from Basamukh Seeds for the 2023 rainy season production.
- **Secured a linkage agreement with machine suppliers** to guarantee price discounts for participating farmers.
- **Strengthened School-based Management Committees**, with 177 SBMC officials (142 males and 37 females) representing 41% of current SBMC leadership across 27 schools participating in the first phase of capacity enhancement training.
- **Partnered with 44 government schools and 405 government teachers** while building a network of 35 community education workers (CEWs) in Katsina State and Kaduna State, respectively.
- **Strengthened capacity of 25 SSOs.** To strengthen the supervision of schools, Rayuwa facilitated a three-day training for 25 school support officers on school supervision, monitoring, record keeping, and accountability.
- **Roll-out of a new curriculum for the remedial program** to address new needs and issues such as the increasing importance of STEM education in schools and generally to improve learning outcomes. Two curriculums (Literacy and Numeracy) were developed and are currently being implemented across 25 remedial centers.

## Appendix A

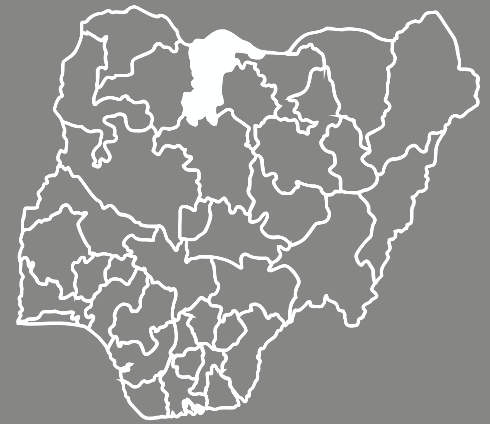
# Map of Project Area

Since its inception, Rayuwa has leveraged the lessons and trust cultivated with the communities in the initial 11 villages in Katsina State (“Pilot Area”) to inform and iterate its expansion across 33 new villages in Katsina State (“First Expansion Area”) and 41 new villages in Kaduna State (“Second Expansion Area”).



## Appendix B

# Smallholder Farmer Classification



The purpose of identifying and classifying farmers by economic status is to support the appropriate targeting of Rayuwa's intervention for farming households as they transition through the pathway to prosperity and resilience.

Class	Hyper-Subsistence Farmer	Subsistence Farmer	Beginner Farmer	Resilient Farmer
Description	<ul style="list-style-type: none"> <li>Manual cultivation. Does not own cattle to cultivate land.</li> <li>Highly vulnerable to fluctuations in weather.</li> <li>Hunger Season is &gt;1 month/year.</li> <li>Hunger Season occurs each year.</li> <li>Farm does not produce a surplus. The farmer is not connected to the market.</li> <li>All family members work the farm. If children are enrolled in school, attendance is low, especially during planting and harvest seasons.</li> </ul>	<ul style="list-style-type: none"> <li>Manual cultivation. Owns cattle and uses livestock to cultivate land.</li> <li>Moderately vulnerable to climate, biological, and market fluctuations.</li> <li>Hunger Season is &lt;1 month/year and is <i>not</i> a consistent threat.</li> <li>Farm produces a surplus. The farmer has some market connectivity.</li> <li>All family members work the farm. Children likely attend school, with attendance variable during planting and harvest seasons.</li> </ul>	<ul style="list-style-type: none"> <li>At least one tractor service is financially feasible.</li> <li>Low vulnerability to climate, biological, and market fluctuations.</li> <li>Hunger Season may occur during extreme circumstance fluctuations. Duration is well below one month/year.</li> <li>Farming family is engaged in some valorization activities.</li> <li>Farmer is connected to the market</li> <li>Children attend school, with some variability in attendance to support the farm.</li> </ul>	<ul style="list-style-type: none"> <li>Farm productivity is stable and robust. Farmer regularly hires at least one tractor service per year.</li> <li>Resilient to climate, biological, and market fluctuations.</li> <li>Strong market connectivity. Farmer buys inputs and sells surplus crops.</li> <li>Valorization activities are integrated into post-harvest management.</li> <li>Children attend school, with no need to miss classes to help with planting and harvesting.</li> </ul>
Services	<ul style="list-style-type: none"> <li>Increase production with a focus on food and nutrition security</li> </ul>	<ul style="list-style-type: none"> <li>Increase production</li> <li>Financial literacy and inclusion</li> <li>Basic mechanization services</li> <li>Farmer aggregation and farm clustering</li> <li>Enterprise diversification</li> </ul>	<ul style="list-style-type: none"> <li>Increase production</li> <li>Financial literacy and inclusion</li> <li>Basic mechanization services</li> <li>Farmer aggregation and farm clustering</li> <li>Enterprise diversification</li> <li>Increased market engagement (commercialization)</li> </ul>	<ul style="list-style-type: none"> <li>Increase production</li> <li>Financial literacy and inclusion</li> <li>Basic mechanization services</li> <li>Farmer aggregation and farm clustering</li> <li>Enterprise diversification</li> <li>Full market engagement (commercialization)</li> <li>Post-harvest processing (value addition)</li> </ul>

# Appendix C

# Citations



- Babura, Bashir & Isah, Saheed & Chamo, A. (2017). [Role of Smallholder Farmers in Nigeria's Food Security](#). United Nations Development Program (2020). [Human Development Report 2020 \(The Next Frontier: Human Development and the Anthropocene Briefing Note for Countries on the 2020 Human Development Report—Nigeria\)](#). Global Network Against Food Crises, Food Security Information Network, and United Nations World Food Program (2021). [2021 Global Report on Food Crises: Joint Analysis for Better Decisions](#).
- UNICEF (September 15, 2021). [First day of school 'indefinitely postponed' for at least 1 million Nigerian students: UNICEF joins global call and 'digital freeze' to urge children's access to education](#).
- Toussaint, Kristin for *Fast Company* (May 04, 2021). [How John Deere is teaching small farmers better agricultural techniques to end 'hunger season'](#).
- E.M. Okon, B.M. Falana, S.O. Solaja, S.O. Yakubu, O.O. Alabi, B.T. Okikiola, T.E. Awe, B.T. Adesina, B.E. Tokula, A.K. Kipchumba & A.B. Edeme (2021). [Systematic review of climate change impact research in Nigeria: implication for sustainable development](#), *Heliyon*, Volume 7, Issue 9, 2021, e07941, ISSN 2405-8440. <https://doi.org/10.1016/j.heliyon.2021.e07941>
- Funmilayo F. Ilesanmi, Olayinka S. Ilesanmi & Aanuoluwapo A. Afolabi (2021). [The effects of the COVID-19 pandemic on food losses in the agricultural value chains in Africa: The Nigerian case study](#), *Public Health in Practice*, Volume 2, 2021, 100087, ISSN 2666-5352. <https://doi.org/10.1016/j.puhip.2021.100087>.
- Civil Resource Development and Documentation Centre and The Valyrian Group (2015). [Strengthening Existing and Emerging Women Mobilisation Platforms and Small Holder Women Farmers; Association in Nigeria \(Women Lead Agriculture in Nigeria\)](#)
- Food and Agriculture Organisation of the United Nations (2019). [Gender and Land Rights Database: Gender and Land Statistics](#)
- Munn, E. & Campbell, J. for the Council on Foreign Relations (April 10, 2019). [Ensuring Women's Land Rights in Nigeria Can Mitigate Effects of Climate Change](#).
- Murtala, A. M, Arokoyu, S. B., Weli., V. E. (January 31, 2020). [Perception of Climate Change and Its Effects on Rural Livelihood in Katsina State, Nigeria](#), *Journal of Natural Sciences Research*, Volume 10, No. 2, ISSN 2224-3186 (Paper), ISSN 2225-0921 (Online), DOI: 10.7176/JNSR/10-2-04.
- Global Hunger Index: [Nigeria](#) (2021).
- The Guardian (November 8, 2021). [Nearly 17 mln Nigerians face food insecurity](#).
- World Food Programme (February 2021). [Essential Needs and Nutrition Analysis – Northwest Nigeria \(Zamfara, Sokoto, Katsina\)](#).
- Katsina State Government (2016). [Katsina State Investor's Handbook](#).
- Food and Agriculture Organization of the United Nations (2017). [Evidence on internal and international migration patterns in selected African countries](#).
- UNICEF: Nigeria (2017). [The Challenge: One in every five of the world's out-of-school children is in Nigeria](#).
- MacroTrends. [Nigeria Literacy Rate 1991-2022](#).
- UN Women (2020). [Women Count: Nigeria: Gender data gaps and country performance](#).
- World Economic Forum (March 2021). [Global Gender Gap Report 2021](#).
- Runde, Daniel, Savoy, Conor & Staguhn, Janina. Center for Strategic & International Studies (July 7, 2021). [Supporting Small and Medium Enterprises in Sub-Saharan Africa through Blended Finance](#).
- Feed the Future, ISF, MasterCard Foundation, Rural & Agricultural Finance Learning Lab (November 2019). [Pathways to Prosperity: Rural and Agricultural Finance, State of the Sector Report](#).