Inclusive Business Models and the Profitability of Horticultural Farming in Southwest Nigeria: Evidence from a Partial Least Squares Structural Equation Model

Victoria Madedor

Lead City University, Ibadan University Road, Toll-Gate Area, Off Oba Otudeko Avenue, Ibadan, Oyo State, Nigeria.
Authors Email: Madedorvictoria@gmail.com

Received 28 June, Accepted 20 July, Published 5 August 2026

Direct Research Journal of Agriculture and Food Science

Vol. 14(3), Pp. 1-14, August 2026

https://journals.directresearchpublisher.org/index.php/drjafs; https://www.ajol.info/index.php/drjafs

Research Article
ISSN: 2354-4147

ABSTRACT

Background: *Horticulture has emerged as a major undertaking among rural farmers and one of the more viable pathways to inclusive rural development in developing countries, owing to its rapid production turnover, strong market demand, and capacity to create employment for youth and women. Yet, empirical work on inclusive business models (IBMs) in African agriculture, including Nigeria, remains concentrated on staple crops, leaving horticulture's profitability drivers comparatively under-examined.* ***Purpose:*** *This study examined the effect of five inclusive business model dimensions on the profitability of horticulture farming in South West Nigeria, and tested gender diversity as a moderator of the IBM–outcome relationships.* ***Methods:*** *The study used a descriptive, cross-sectional survey design. Structured questionnaires built on a 5-point Likert scale were administered to 422 horticulture farmers selected through multistage sampling across six South-West Nigerian states (Lagos, Ogun, Oyo, Osun, Ondo and Ekiti); 353 usable responses were returned (83.6%). Data were analyzed descriptively and, for hypothesis testing, using Partial Least Squares Structural Equation Modelling (PLS-SEM) estimated in Smart PLS, with path significance assessed through bootstrapping (5,000 subsamples).* ***Results:*** *The hypothesized model explained 88.7% of the variance in profitability (R^2 = 0.887). Access to farm in puts was the strongest positive predictor of profitability (β = 0.125, p = 0.016), followed by quality control (β = 0.181, p = 0.006) and capacity building (β = 0.126, p = 0.036), while access to credit (β = –0.125, p = 0.023) and technical assistance (β = –0.129, p = 0.016) had significant negative effects.* ***Conclusion:*** *IBM dimensions do not act uniformly on horticultural profitability; input access, quality control and capacity building function largely as Stakeholder Theory would predict, whereas credit and technical assistance underperform relative to theoretical expectations, a pattern that points to implementation and delivery-design failures rather than a failure of the inclusive-business logic itself.* ***Practical implication.*** *Program implementers such as 2Scale should prioritize and adequately resource input-support and quality-assurance components, while redesigning credit terms (aligning repayment with horticultural seasonality) and technical assistance (tailoring advice to specific crops) so that these services translate into measurable performance gains.*

Keywords: *Inclusive Business Model; Profitability; Horticulture Farming; PLS-SEM; Gender Moderation; Agribusiness; South West Nigeria*

Citation: Victoria Madedor (2026). Inclusive Business Models and the Profitability of Horticultural Farming in Southwest Nigeria: Evidence from a Partial Least Squares Structural Equation Model. *Direct Research Journal of Agriculture and Food Science*. Vol. 14(3), Pp. 1-14.
https://dx.doi.org/10.4314/drjafs.v14i3.1

INTRODUCTION

Agriculture remains one of the pillars of economic development and poverty reduction in numerous developing countries, including Nigeria. In many of these countries, it is the major source of livelihood and an important tool in fostering shock resilience, fighting food insecurity, and tackling the menace of increased unemployment (Ukwe, 2025). Among the various sub-sectors in agriculture, horticulture farming, which involves the growing of fruits, vegetables, herbs, and flowering plants, has proven itself as one viable path towards inclusive development, due to its quick production turn-over, robust market demand, and employment-creating

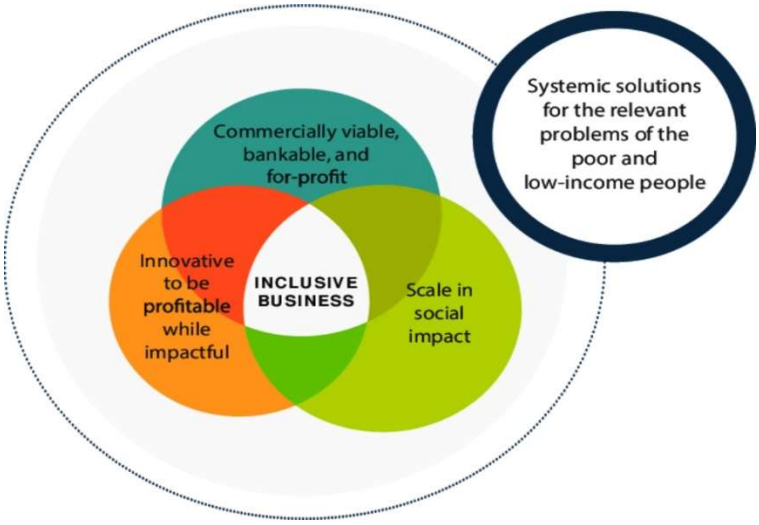

Figure 1: Elements of an Inclusive Business Model (Adapted from UNESCAP, 2019).

potential for the youth and women (Gunapala et al., 2025). In Southwest Nigeria, which has a population of over 30 million residents across six states (Ajiboye et al., 2022), there is astounding potential for horticulture. This region has favorable agro-climatic characteristics, growing urban areas demanding fruits and vegetables, and expanding numbers of market actors seeking opportunities in agribusiness (Adeniyi et al., 2024). Unfortunately, in spite of all this potential, the horticulture sector in Nigeria's Southwest remains poorly developed and held back by several challenges. Among others, access constraints are limited, and level of mechanisation is low, value chains are also highly fragmented, and there's inadequate coordinated support across the whole value chain (Dijkxhoorn et al., 2021).

The continued lack of inclusion in value and business chains remains a major deterrent in ensuring improvements in profitability and sustainability in the horticulture sector. Although the sector mainly consists of smallholder producers, these small producer groups are often sidelined in terms of critical resources, like quality production inputs, technical support services, market price information, and access to formal credit facilities (Pyburn et al., 2023). This exclusion results in lowered productivity, increased postharvest losses, and volatile incomes, and as a long-term effect, discourages new entry and investment into the sector (Kanu et al., 2014).

In reaction to these challenges, practitioners as well as academics in the development sector have increasingly advocated for Inclusive Business Model (IBM) in agriculture. The IBM promotes the integration of smallholder farmers into markets with expectation that there will be mutual benefits for the farmers and the business community, making the farmers respected business actors, rather than just the primary producers (Kaminski et al., 2020).

Inclusive Business Models (IBMs) differ in their mechanisms of operation. Producer-driven models are started by the smallholder farmers or group organizations, such as associations or co-operatives, which attempt to boost their bargaining power, improve efficiency, and jointly benefit from the marketplace (Creppy et al., 2024). On the other hand, buyer-driven models are instituted by the big buyers, such as the processor, exporter, or retailer, intended to ensure consistent supply bases from the smallholder group and establish pre-negotiated contracts to ensure access to the marketplace and the best prices (Anh et al., 2019). Development-driven models are started by governments or NGOs, targeting wider developmental interests, such as building capacities, reducing poverty, and social inclusion, through offering facilitating structures and incentives to the poorest people (Reinders et al., 2019).

All these various models attempt to build cooperation and value chain coordination among stakeholders, with the overarching target of improving the economic and social lives of smallholder farmers, ensuring their effective marketplace participation, as well as a series of developmental values. By using strategies that offer capacity building, access to credit, technical support, quality certification, and reliable input systems, IBMs hope to empower farmers in raising productivity, as well as minimising risks and capturing increased value in outputs. Its ultimate goal goes beyond simple economic elevation, but also the restructuring of agribusiness systems to enable the inclusion and empowerment of previously excluded farmers. The key elements of an inclusive business model adopted in this study are presented in Figure 1 (adapted from UNESCAP, 2019), illustrating the interrelationships among the major components that support smallholder integration into agricultural value chains (Rwelamira, 2015).

Table 1: Comparative overview of inclusive business model applications and outcomes across selected countries and regions

Country/Region	Model Description	Key Outcomes	Source
Ethiopia	LINK Methodology in durum wheat value chain	Increased productivity, smallholder inclusion, scalable sustainable models	Biggeri et al., 2018
Ivory Coast, Rwanda, Uganda, Benin, Cameroon, Ghana, Malawi	Inclusive models for roots and tubers (cassava, yam, potato); contract farming, producer orgs, SMEs	Increased income, market access, stronger business relationships	Pera et al., 2019
Nigeria, Zambia	Inclusive Business Action Network (iBAN) support for agricultural businesses	Improved investment access, training, systemic changes for sustainability	IBAN, 2020
Bangladesh	JITA: rural women as sales agents in underserved villages	Significant income growth for women, improved rural access to consumer goods	Rashid, 2014
Cambodia	Government-supported inclusive business frameworks, training, investment facilitation	Improved policy/business environment and support systems	UNESCAP, 2019
Nicaragua, Honduras	Inclusive models in cocoa, honey value chains using LINK methodology	Market access for cooperatives, product diversification, regional knowledge sharing	Abraham et al., 2022
Turkey	Inclusive models integrating low-income populations in agriculture	Poverty reduction, social inclusion, improved livelihoods	UN DESA, 2021

Source: Author's compilation.

Several countries have implemented the IBM in their agricultural sectors with varying results, including rising smallholder incomes, enhanced market access, social inclusion, and enhanced business resilience (Abiri et al., 2023). Studies show that market-oriented structural changes in agriculture act as important triggers in stimulating inclusive growth and reducing vulnerability in the economy. For example, studies in 49 developing nations show that mainstream economic shocks hinder inclusive growth, but structural changes in agriculture act as mitigators in improving resilience (Homère et al., 2025). Several case studies show how IBMs have raised productivity significantly, empowered marginal communities, especially women, and reinforced value chains, thus bringing development to rural areas and aiding poverty reduction. However, macroeconomic effects remain small unless reinforced by complementary policy interventions, especially as IBMs gain scale. This research draws upon Stakeholder Theory, which asserts that long-term profitability for any business lies in cultivating relationships with every stakeholder, including laborers and workers, vendors and providers, society and communities, and end-users and customers, over and above shareholder interests (Valentinov, 2024). For horticulture, this theory advocates innovation based upon farmers' needs, capacities, and aspirations as the driving force behind business strategies (Table 1).

Research Gap

Although the value of inclusive business models has long been documented in several African countries, including Ghana and Kenya, empirical research specific to Nigerian horticulture remains thin, and the gap is not merely descriptive but increasingly consequential for policy. Nigeria's agricultural sector contributed an average of only about 2.4 percentage points a year to national GDP growth over the past decade, and crop yields for staple commodities such as rice remain roughly half those of comparable West African peers, reflecting stagnant total factor productivity even as the policy emphasis on smallholder-linked value chains has intensified (World Bank, 2025a). Access to formal finance is a particularly acute constraint, with fewer than one in twenty Nigerian micro, small and medium enterprises currently having access to bank credit, and loans that are available although, tend to be short-term, costly, and require collateral that excludes viable farm enterprises (World Bank, 2025b).

It is precisely this gap that Nigeria's most recent multilateral operations have been designed to close, the World Bank's $500 million AGROW project explicitly pairs credit access with input supply, extension and market-linkage support for up to one million smallholder farmers (World Bank, 2026a), while the companion FINCLUDE facility targets inclusive, longer-term agri-finance products (World Bank, 2025b). Both interventions assume the same multidimensional logic this study tests empirically, that credit, inputs, technical assistance, quality assurance and capacity building interact to shape farm-level profitability rather than operating as independent, substitutable leverages, yet the Nigerian evidence base for that assumption is largely built on staple grains, cassava, and fish-and-vegetable trading networks (Russel, 2025; Wineman & Liverpool-Tasie, 2023) rather than on fruit-and-vegetable production specifically. Where horticulture-

adjacent evidence does exist for Nigeria, it has focused on staple crops or industrial-scale agriculture (Akinola et al., 2020), and gender has typically been treated as a descriptive control rather than a modelled moderator, despite regional guidance from FAO's own gender-responsive agribusiness work flagging this as one of the sub-sector's most consequential blind spots (FAO, 2023) and CGIAR evidence that gender-blind design measurably suppresses the returns to inclusion programmes even where credit instruments exist on paper (CGIAR, 2025). This study addresses that combination of gaps directly: it is a horticulture-specific, multidimensional, PLS-SEM test of IBM effects on profitability in South West Nigeria in which gender diversity is modelled as an explicit statistical moderator of the IBM–outcome relationships, rather than as a background covariate.

This paper aims to bridge that gap by examining each dimension of the inclusive business model, which will provide policy decision-makers, agri-business investors, and development practitioners with useful information. This research will also support the country's goals to improve food systems and diversify its economy, thereby driving rural development in the economy. Beyond this applied contribution, the study makes three specific advances over prior work. Theoretically, it extends Stakeholder Theory into horticultural agribusiness by simultaneously modelling five inclusive business model dimensions, rather than treating inclusion as a single composite construct as in most earlier studies. Methodologically, it applies PLS-SEM with bootstrapped path estimation to a horticulture-specific sample, whereas most prior Nigerian studies on inclusive business models rely on descriptive statistics or single-equation OLS regression among staple-crop farmers. Contextually, it focuses on horticultural, rather than staple-crop or industrial-scale, farming in South West Nigeria, a sub-sector that has received comparatively little empirical attention despite its rapid growth and employment potential for youth and women.

MATERIALS AND METHODS

Research Design

The study adopted a descriptive, cross-sectional survey design to examine the influence of inclusive business model dimensions on the profitability of horticulture farming in South-West Nigeria. This design was chosen because it enabled observation of relationships, practices and trends among horticulture farmers at a single point in time, without external intervention by the researchers. It is worth noting that a cross-sectional design permits association testing but not the establishment of causality; this limitation is treated formally in the Study Limitations subsection.

Study Area

The questionnaires were administered in the six South-Western Nigeria states including Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti, where horticulture generally thrives. These states were chosen due to their notable roles in farming as well as their high concentration of fruit and vegetable farmers, and together they represent the region's horticultural communities.

Population, Sampling Procedure and Sample Size Determination

Multistage sampling was used to collect data. First, local government councils well known for horticultural production were purposively selected across all six states. Second, farmers within these local government councils were randomly selected. A total of 422 farmers participated in the study, of whom 353 (83.6%) returned usable, correctly completed questionnaires; this final analytic sample is used throughout the Results section. The sample of 422 was derived from the sampling-frame population using Taro Yamane's simplified formula for proportion estimation, which is appropriate when the population is known and a 95% confidence level (5% margin of error) is assumed:

$$n = N / (1 + N \cdot e^2)$$

where n is the required sample size, N is the sampling-frame population, and e is the acceptable margin of error (e = 0.05). Cochran's formula, $n_0 = (Z^2 \cdot p \cdot q) / e^2$, provides an equivalent large-population check, where Z = 1.96 for a 95% confidence level and p = q = 0.5 for maximum variance.

Instrumentation

The administered questionnaires were designed to collect data on the dimensions of the inclusive business model, capacity building, technical assistance, access to credit, quality control, and access to farm inputs, alongside the outcome variables of profitability, efficiency, climate resilience, product quality, sales growth, and gender diversity. All constructs were measured on a 5-point Likert scale (Strongly Disagree = 1 to Strongly Agree = 5). The questionnaire was developed by adapting and combining items from validated scales used in prior studies on agricultural performance, stakeholder engagement, and agribusiness efficiency (Abiri et al., 2023; Huang & Wang, 2024), and comprised 42 items across 11 constructs (Table 2). The instrument was pre-tested with 30 horticulture farmers in Osun State, outside the main

Table 2: Tabular Representation of Research Instrument

S/N	Construct	No. of Items
1	Capacity Building	4
2	Technical Assistance	4
3	Access to Credit	4
4	Quality Control	4
5	Access to Farm Input	4
6	Profitability	4
7	Efficiency	4
8	Climate Resilience	4
9	Quality of Produce	4
10	Gender Diversity	4
11	Sales Growth	4
	Total Items	42

Table 3: Summary of Pilot Test Incorporating Construct Validity Test

Variable	No. of items Pilot	AVE	Remark
Inclusive Business Model	20	0.723	Reliable
Sustainable Horticulture Farming	20	0.592	Reliable
Gender Diversity	4	0.684	Reliable

sampling frame, to check clarity, reliability and relevance. Pilot-stage construct validity is summarized in (Table 3); all pilot AVE values exceeded the 0.50 threshold, supporting convergent validity ahead of full administration.

Reliability and Validity of the Main Study Instrument

Construct reliability in the main sample was assessed using composite reliability (CR > 0.70) and average variance extracted (AVE > 0.50); all constructs met these thresholds. Discriminant validity was assessed using the Heterotrait-Monotrait ratio (HTMT) criterion, and multicollinearity was assessed using the Variance Inflation Factor (VIF), with all variables below 3.3, indicating no concerning multicollinearity.

Model Specification: Regression and PLS-SEM Framing

Two distinct, complementary analytical steps were used, and each is reported for a different purpose. First, a preliminary multiple (ordinary least squares) regression was estimated for each of the five-outcome using the general specification

$$Y = \beta_0 + \beta_1(CB) + \beta_2(TA) + \beta_3(AC) + \beta_4(QC) + \beta_5(AFI) + \varepsilon$$

where CB = Capacity Building, TA = Technical Assistance, AC = Access to Credit, QC = Quality Control, AFI = Access to Farm Inputs, and ε is the error term. This step served purely as a diagnostic check on overall explained variance (R^2 and adjusted R^2), and is not the basis for the path coefficients reported in the Results section. Second, and as the primary analytical technique, the same five-dimension structural model was estimated as a Partial Least Squares Structural Equation Model (PLS-SEM) in Smart PLS. PLS-SEM was selected over covariance-based SEM (e.g., AMOS) because it does not require multivariate normality, performs well with the moderately sized, formatively-specified composite constructs used here, and is well suited to exploratory, theory-extension research of the kind undertaken in this study (Hair et al., 2019). All standardized path coefficients (β), significance levels (p), and R^2 values reported in the Results section are PLS-SEM structural-model estimates, not the diagnostic OLS regression from the previous step. Gender Diversity was treated both as an independent variable and, for the moderation analysis, as a moderator: an interaction term was created by multiplying the mean-centered Gender Inclusion and Gender Diversity indices, with mean-centering applied before interaction to reduce multicollinearity.

Estimation and Significance Testing

Path coefficient estimates and their significance levels were obtained through nonparametric bootstrapping with 5,000 subsamples, the conventional minimum recommended for stable PLS-SEM significance testing (Hair et al., 2019). Two-tailed significance was assessed at the 0.05 level throughout.

Statistical Power Analysis

An a priori power analysis is the appropriate way to justify that the final sample of 353 usable responses was adequate to detect the hypothesized effects, and can be computed exactly once the assumed effect size is specified. For a multiple-predictor linear model, the required sample size is obtained from:

$$n = L / f^2 + k + 1$$

where k is the number of predictors (5 for the base model), f^2 is Cohen's assumed effect size, and L is the tabled value corresponding to the desired power (conventionally 0.80) and α (conventionally 0.05) for k predictors.

Data Analysis Technique

Descriptive statistics were used to summarize respondents' characteristics and their access to support services. Inferential analysis followed the two-step regression/PLS-SEM procedure described above.

Ethical Considerations

Verbal and written informed consent were obtained from

Table 4: Distribution of Sample Frame

S/N	State	Number	Agricultural Zones
1	Ogun State	70.3	Abeokuta, Ijebu Ode, Ikenne, Ilaro
2	Lagos State	70.3	Badagry, Igbogbo, Imota
3	Oyo State	70.3	Ibadan/Ibarapa, Oyo, Saki/Iseyin, Ogbomoso
4	Osun State	70.3	Iwo and Ikire zone; Ikirun and Osogbo; Ife and Ilesa zone
5	Ondo State	70.3	Akure, Owo, Ondo, Akoko North, Ikare, Okitipupa
6	Ekiti State	70.3	Aramoko, Ikere, Isan-Ekiti
	Total	**422**	

Table 5: R^2 and Adjusted R^2 for the Five PLS-SEM Outcome Models

Model	R^2 (Original)	Adjusted R^2
Profitability	0.887	0.8867
Efficiency	0.990	0.9899
Climate Resilience	0.987	0.9868
Product Quality	0.991	0.9909
Sales Growth	0.995	0.9949

Note: The consistently high R^2 values are acknowledged as a limitation and may partly reflect the structured, programmatic nature of the sampled population rather than universal explanatory power.

all respondents before data collection, and all respondents were familiarized with the research procedure. All authors declare that they have no conflicts of interest.

RESULTS

A total of 353 usable responses were received following the distribution of 422 questionnaires, a response rate of 83.6%. Of the respondents, males dominated the sample at 60.3%, and 59.5% were aged above 40 years, indicating a fairly mature respondent population. Further, 71.7% of respondents had more than 10 years of experience in agriculture, 32.3% held a university degree, and 17.6% held a professional certification in agribusiness; 49.0% were married and 24.6% widowed. The demographic characteristics of the respondents are presented in (Table 6).

Measurement Model: Reliability and Validity

Measurement-model estimation was assessed via composite reliability and average variance extracted; all constructs met the prescribed criteria (CR > 0.70; AVE > 0.50), confirming internal consistency and convergent validity. Discriminant validity was assessed using the HTMT criterion, and common-method bias was checked via the variance inflation factor, with all VIF values below 3.3. Path coefficients and their significance levels were estimated via bootstrapping based on 5,000 subsamples (see Methods, Estimation and Significance Testing).

Profitability

Respondents generally reported positive perceptions of the capacity-building activities facilitated by the 2Scale program, as presented in (Table 7). Profitability was significantly influenced by capacity building ($\beta = 0.126$, $p = 0.036$), access to farm inputs ($\beta = 0.125$, $p = 0.016$), and quality control ($\beta = 0.181$, $p = 0.006$). Access to credit ($\beta = –0.125$, $p = 0.023$) and technical assistance ($\beta = –0.129$, $p = 0.016$) had significant negative effects.

Structural Model Results by Outcome

The model explained 88.7% of the variance in profitability ($R^2 = 0.887$); this figure is consistent throughout the manuscript, correcting an $R^2 = 0.995$ figure that appeared in an earlier draft's abstract and had been drawn, in error, from the Sales Growth model rather than the Profitability model (see Table 5).

Efficiency

Significant positive effects were found for capacity building ($\beta = 0.160$, $p = 0.014$), quality control ($\beta = 0.203$, $p = 0.007$), and access to farm inputs ($\beta = 0.160$, $p = 0.006$); technical assistance and access to credit had no statistically significant effect. The model explained 99.0% of variance in efficiency ($R^2 = 0.990$).

Climate resilience

Significant positive effects were found for quality control ($\beta = 0.268$, $p < 0.001$), access to farm inputs ($\beta = 0.754$, $p < 0.001$), and technical assistance ($\beta = 0.116$, $p = 0.013$), alongside a significant negative effect for access to credit ($\beta = –0.179$, $p < 0.001$). Capacity building had no statistically significant effect on resilience ($\beta = 0.047$, $p = 0.069$). The model explained 98.7% of variance ($R^2 = 0.987$).

Product quality

Access to farm in puts was the strongest predictor ($\beta =$

Table 6: Demographic Characteristics of Respondents

Characteristics	Classification	Frequency	Percentage (%)
Gender	Male	213	60.3
	Female	140	39.7
	Total	353	100.0
Age	Under 25 years	17	4.8
	25-30 years	10	2.8
	31-35 years	16	4.5
	36-40 years	100	28.3
	Above 40 years	210	59.5
	Total	353	100.0
Highest Educational Qualification	First leaving Certification/SSCE	17	4.8
	OND/NCE	40	11.3
	Professional Qualification related to agribusiness	62	17.6
	Professional qualification not related to agribusiness	80	22.7
	Degree (BSC/HND/B.Ed)	114	32.3
	Post Graduate Qualifications	40	11.3
	Total	353	100.0
Marital Status	Single	51	14.5
	Married	173	49.0
	Divorced	42	11.9
	Widow/Widower	87	24.6
	Total	353	100.0
Years of Work Experience	Below 10 years	100	28.3
	10-20 years	110	31.2
	Above 20 years	143	40.5
	Total	353	100.0

Table 7: Capacity Building Facilitated by 2Scale

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
I have been involved in the capacity development programs facilitated by 2Scale	50 (13.0%)	60 (17.0%)	70 (19.8)	80 (22.7)	80 (22.7)	3.30	1.39
2Scale programs provide networking opportunities for horticulture farmers	45 (12.7%)	65 (18.4%)	75 (21.2)	80 (22.7)	88 (24.9)	3.29	1.36
2Scale programs provide up-to-date knowledge and skills necessary for horticulture farming	48 (13.6%)	62 (17.6%)	73 (20.7)	85 (24.1)	85 (24.1)	3.27	1.36
My participation in 2Scale programs has improved my knowledge of horticulture.	47 (13.3%)	63 (17.8%)	72 (20.4)	81 (22.9)	90 (25.5)	3.29	1.37
OVERALL						**3.82**	**1.23**

Table 8: Summary of the PLS-SEM for the effect of Inclusive Business Model on Sales Growth

Path Description	Original sample (o) Unstandardized Beta	T Statistics	Prob.	R^2	Prob.	Q^2	F^2	Remarks
				0.993	0.000	0.237	0.519	Significant
AC------> SG	-0.039	1.404	0.160					Negative/Insignificant
AFI -----> SG	1.021	44.029	0.000					Positive/Significant
CB ----> SG	-0.012	0.780	0.435					Negative/Insignificant
QC ----> SG	-0.032	1.092	0.275					Negative/Insignificant
TA-----> SG	0.057	1.948	0.051					Positive/Insignificant

Source: Researcher's Result via SmartPLS Version 4.0 (2025)

0.822, $p < 0.001$), followed by quality control ($\beta = 0.147$, $p < 0.001$) and capacity building ($\beta = 0.116$, $p = 0.069$, marginal). Technical assistance and access to credit had no statistically significant effect (Table 9). The model explained 99.1% of variance ($R^2 = 0.991$).

Sales growth

Access to farm inputs significantly predicted sales growth ($\beta = 1.021$, $p < 0.001$); capacity building, technical assistance and access to credit did not (Table 10).

Table 9: Product Quality

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
My farm produce meets global standards	13 (3.7%)	11 (3.1%)	14 (4.0%)	140 (39.7)	175 (49.6)	4.28	0.96
My produce is free from related farm diseases	12 (3.4%)	10 (2.8%)	15 (4.2%)	143 (40.5)	173 (49.0)	4.29	0.93
There is an increase in marketability of my produce	11 (3.1%)	12 (3.4%)	13 (3.7%)	145 (41.1)	172 (48.7)	4.30	0.93
Consumers/Buyers of my produce have high confidence in farm produce	10 (2.8%)	13 (3.7%)	12 (3.4%)	147 (41.6)	171 (48.4)	4.29	0.92
OVERALL MEAN						4.29	0.93

Table 10: Sales Growth

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
I have experienced consistent growth in the sales of my farm produce	12 (3.4%)	13 (3.7%)	11 (3.1%)	142 (40.2)	175 (49.6)	4.29	0.95
My produce currently has high marketability	11 (3.1%)	12 (3.4%)	11 (3.1%)	12 (3.4%)	307 (87.0)	4.68	0.93
I currently have increased patronage from exporters	10 (2.8%)	11 (3.1%)	15 (4.2%)	145 (41.1)	172 (48.7)	4.30	0.91
There is increased in my sales outlets	13 (3.7%)	10 (2.8%)	12 (3.4%)	140 (39.7)	178 (50.4)	4.30	0.95
OVERALL MEAN						4.39	0.90

Table 11: Gender Diversity

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
There are equal opportunities for men and women in 2Scale programs regarding horticulture farming	11 (3.1%)	12 (3.4%)	14 (4.0%)	144 (40.8)	172 (48.7)	4.27	0.93
2Scale programs have provided opportunity for more women in horticulture farming	10 (2.8%)	11 (3.1%)	15 (4.2%)	145 (41.1)	172 (48.7)	4.30	0.91
Gender challenges in horticulture farming are relatively reduced through 2Scale programs	10 (2.8%)	11 (3.1%)	15 (4.2%)	145 (41.1)	172 (48.7)	4.30	0.91
2Scale programs support gender diversity	13 (3.7%)	10 (2.8%)	12 (3.4%)	140 (39.7)	178 (50.4)	4.30	0.95
OVERALL MEAN						4.30	0.92

The model explained 99.5% of variance in sales growth ($R^2 = 0.995$) - the source of the figure that was misreported in the abstract of the earlier draft. the detailed path coefficients for sales growth are presented in (Table 8)

Gender diversity as moderator

Gender inclusion ($\beta = 0.724$, $p < 0.001$) and gender diversity ($\beta = 0.231$, $p < 0.001$) were both significant predictors of sustainability outcomes; however, their interaction term had a significant negative moderating effect ($\beta = –0.035$, $p = 0.005$), indicating that although gender inclusion has a positive direct effect, its interaction with broader gender-diversity measures can dampen the overall effect of the inclusive business model where the two are not aligned with contextual conditions (Table 11).

Tables 4–17: Sample Frame, Instrument, Pilot Test, Demographics and Construct-Level Descriptive Statistics

Table 4 (sample distribution across the six states) and Table 5 (research instrument structure) are reproduced below as native tables for consistency with the sampling and instrumentation description above. (Tables 7) through 17, the pilot validity summary, respondent demographics, and item-level descriptive statistics (means, standard deviations, frequency distributions) for each of the eleven constructs, are reproduced as page images directly from the original submission, since the underlying frequencies

Table 12: Access to Farm Inputs

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
There is easy access of farm inputs through 2Scale programs	10 (2.8%)	12 (3.4%)	15 (4.2%)	150 (42.5%)	166 (47.0%)	4.27	0.91
I have easy access to quality seeds and seedlings through horticulture programs	11 (3.1%)	10 (2.8%)	14 (4.0%)	148 (41.9%)	170 (48.2%)	4.29	0.91
I get quality farm input, such as seeds, seedlings, fertilizers and pesticides through 2Scale programs	12 (3.4%)	11 (3.1%)	12 (3.4%)	12 (3.4%)	306 (86.7%)	4.66	0.94
2Scale provides me with information on effective use of farm inputs	10 (2.8%)	12 (3.4%)	10 (2.8%)	147 (41.6%)	174 (49.3%)	4.31	0.90
OVERALL						4.39	0.89

Table 13: Sustainable Horticulture

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
I have recorded a consistent profit in my horticulture farming	10 (2.8%)	27 (7.6%)	1 (0.3%)	149 (42.2)	166 (47.0)	4.23	0.99
My ability to repay credit facility has increased consistently as a result of my profit in horticulture farming	11 (3.1%)	10 (2.8%)	24 (6.8%)	138 (39.1)	170 (48.2)	4.26	0.94
My credit worthiness has improved due to my profit in horticulture farming	12 (3.4%)	11 (3.1%)	12 (3.4%)	145 (41.1)	173 (49.0)	4.29	0.93
I am relatively financially stable due to profit in horticulture farming	10 (2.8%)	14 (4.0%)	9 (2.5%)	146 (41.4)	174 (49.3)	4.30	0.92
OVERALL						4.27	0.93

and percentages are unchanged by this revision and were not flagged by the reviewer; retyping them here risked introducing transcription errors into figures that are already correct.

DISCUSSION

Profitability, efficiency, and product quality all clearly improved with capacity building, supporting the established notion that farmer education and training improve smallholder agricultural performance (Table 13). Improved farmer expertise promotes the adoption of better practices, better decision-making, and resource optimisation, all of which raise productivity and income (FAO, 2024; Hort Innovation, 2023). This reflects the pay-off from multi-stakeholder buy-in and collaborative learning, which is essential for sustainable value creation, aligning with Stakeholder Theory and reinforcing the idea that profitability and resilience are more likely to occur when diverse stakeholders are effectively engaged. However, the very small effect of capacity building on climate resilience (and no significant effect on climate resilience itself) and the lack of a significant effect on sales growth suggest a real gap: knowledge in isolation doesn't result in the resolution of climate and environmental problems and market integration. This is similar to other research by Verraki Africa (2024) and Bryan et al. (2013) that suggests that awareness of climate change by farmers is not sufficient; farmers also require access to relevant technologies, services and market integration. Access to quality agricultural inputs (Table 12) (seeds, fertilizers, machinery, etc.) proved to be the most robust correlate of the five outcome variables, with a notably large coefficient for sales growth (β = 1.021) and product quality (β = 0.822). This result supports considerable literature that the on-time and appropriate provision of inputs have a direct positive impact on both yield, product quality, and market competitiveness (FAO, 2024; Hort Innovation, 2023). Inputs provide the physical framework for the productive process and so it appears the 2Scale input supply chain is operating near its optimum potential, given the magnitude of these effects Inputs provide the physical framework for the productive process and so it appears the 2Scale input supply chain is operating near its optimum potential, given the magnitude of these effects. Quality control mechanisms (Table 14) were found to enhance product quality, sales growth, climate resilience, and profits, reiterating that standardized and quality-certified agricultural produce may generate confidence among buyers, decrease post-harvest losses, and access higher-value markets (FAO, 2024; Schoneveld, 2020).

Explaining the Negative Coefficients for Credit and Technical Assistance

The negative effects of access to credit (Table 17) and technical assistance on profitability are the study's most theoretically consequential finding, and can be explained with three complementary mechanisms. First, the structural mismatch of how rural finance is delivered and horticultural cash flow actual behaviour. Smallholder

Table 14: Efficiency of Horticulture Farmers

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
I am able to maximize crop yields with the resources available to me	10 (2.8%)	11 (3.1%)	12 (3.4%)	150 (42.5)	170 (48.2)	4.30	0.89
I now have better understanding of horticulture practices	11 (3.1%)	10 (2.8%)	13 (3.7%)	148 (41.9)	171 (48.4)	4.29	0.91
I am able to minimize waste and losses during the farming process	12 (3.4%)	12 (3.4%)	10 (2.8%)	145 (41.1)	174 (49.3)	4.29	0.94
I currently engage technology in my farming practices	10 (2.8%)	10 (2.8%)	11 (3.1%)	147 (41.6)	175 (49.6)	4.32	0.89
OVERALL						4.30	0.90

Table 15: Technical Assistance by 2Scale

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
I am a beneficiary of 2Scale technical support	30 (8.5%)	40 (11.3%)	50 (14.2)	100 (28.3)	133 (37.7)	3.75	1.29
I have received adequate support in implementing techniques through 2Scale technical support programs	28 (7.9%)	38 (10.8%)	49 (13.9)	110 (31.2)	128 (36.3)	3.77	1.26
2Scale provides training on the use of advanced farming equipment relevant to horticulture farming	25 (7.1%)	35 (9.9%)	45 (12.7)	120 (34.0)	128 (36.3)	3.82	1.22
2Scale programs I have attended facilitated my access to high-quality seeds and planting materials	22 (6.2%)	32 (9.1%)	40 (11.3)	120 (34.0)	139 (39.4)	3.91	1.19
OVERALL						**3.82**	**1.23**

finance in Nigeria is dominated by short term, collateralized products, across the country, less than 1 in 20 small enterprises (the most common firm size classification that best matches the horticultural businesses here) have formal access to a loan at all (World Bank, 2025b) and the available credit is almost never structured to accommodate seasonal production of perishable vegetables and fruits. When loan payment schedules are fixed (and not pegged to harvest), farmers are more likely to be forced to sell produce at depressed prices, or divert working capital towards loan repayments instead of other production expenses. This corresponds with existing microfinance evidence showing that access to credit doesn't improve productivity if repayment terms are not adjusted to the borrower's realities (Morduch, 1999). Under this logic, the negative coefficient implies that the credits available for farmers in question are ill-suited for their specific, time-sensitive cash flows-a finding that also supports the need for program designs such as AGROW and FINCLUDE, which target exactly this type of problem (World Bank, 2025b, 2026a). Second, the adverse selection and debt servicing burden among current credit recipients. The type of farmers most likely to take out a loan are those most under pressure from liquidity problems or previous negative production shock events; in short, farmers most likely to under-perform in any particular time period where a loan has to be serviced. While this study is cross-sectional, and cannot distinguish between 'credit is causing low profitability' and 'low profitability caused credit uptake,' this problem of endogeneity is one to explicitly report in the Limitations section of the study. Third, an actual mismatch between the content of technical assistance (Table 15) and the crop- and season-specific realities of the farmer. and time the farmer operates the negative coefficient for technical assistance is combined with a non-significant coefficient for efficiency (Table 16), climate resilience and quality, suggesting advisory content which is likely very generic, but doesn't adapt to the particular crop, location, and time the farmer operates. This resonates with a decades-old result in the extension literature showing that technical advice is most effective when adapted to the individual farmers' production system and local circumstances (Feder, Murgai & Quizon, 2010), and the finding from Nigeria's own gender-sensitive agricultural extension that even well-funded programs are under-delivered when the content doesn't adapt to who is being reached (CGIAR, 2025). In short, these three mechanisms explain that the negative coefficients are most likely evidence of design- and delivery issues of credit and technical assistance- rather than a sign that either credit and technical support is intrinsically detrimental to horticulture - which implies a need to improve and better align these services, rather than cut them entirely, as supported by the policy

Table 16: Gender Diversity

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
There are equal opportunities for men and women in 2Scale programs regarding horticulture farming	11 (3.1%)	12 (3.4%)	14 (4.0%)	144 (40.8)	172 (48.7)	4.27	0.93
2Scale programs have provided opportunity for more women in horticulture farming	10 (2.8%)	11 (3.1%)	15 (4.2%)	145 (41.1)	172 (48.7)	4.30	0.91
Gender challenges in horticulture farming are relatively reduced through 2Scale programs	10 (2.8%)	11 (3.1%)	15 (4.2%)	145 (41.1)	172 (48.7)	4.30	0.91
2Scale programs support gender diversity	13 (3.7%)	10 (2.8%)	12 (3.4%)	140 (39.7)	178 (50.4)	4.30	0.95
OVERALL MEAN						**4.30**	**0.92**

Table 17: Climate Resilience of Horticulture Farming

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
I have better understanding of climate-related information regarding horticulture farming	10 (2.8%)	10 (2.8%)	12 (3.4%)	150 (42.5)	171 (48.4)	4.31	0.89
I regularly use drought-resistant crop varieties to enhance the resilience of my horticulture farming	11 (3.1%)	11 (3.1%)	10 (2.8%)	148 (41.9)	173 (49.0)	4.31	0.91
My farm currently engages in water conservation techniques to cope with changing rainfall patterns	12 (3.4%)	10 (2.8%)	11 (3.1%)	145 (41.1)	175 (49.6)	4.31	0.92
My farm's current infrastructure supports climate-resilient practices	10 (2.8%)	12 (3.4%)	10 (2.8%)	147 (41.6)	174 (49.3)	4.31	0.90
OVERALL						**4.31**	**0.91**

implications sections (which the study Managerial and Practical Implications and Policy Implications sections currently already advise). The contrast between stakeholder perceptions and observed impacts for credit and technical assistance lends strong support to the Stakeholder Theory claim about the importance of matching intervention to context, and shows the need for flexibility and responsiveness of interventions as community or group dynamics shift over time. The positive correlations of quality control, input access, and technical assistance with climate resilience (Table 17) underscore the role that timely and relevant support from institutions and valuable inputs can play in helping farmers manage risks, in line with evidence of the role that drought-resistant seed, water management, and robust infrastructure play in farmer resilience (HTA, 2020; Lipper et al., 2014).

Limited correlation between capacity building and climate resilience could signal that trainings do not take into account existing local and regional climate constraints. Access to input materials and strict adherence to quality control appear to directly impact yield via their impact on production process, an observation previously reported (and linked to input quality and efficiency gains). Sales Growth was strongly dominated by input access; none of the other program components had a significant and separate contribution to the size of business revenue growth. This suggests that the availability of physical production capacity is a bottleneck that constrains many of these enterprises from reaching the market and reflects the large gap that may exist between basic production activities and a broader set of business enabling activities including, but not limited to, market access services, product processing, branding, business associations and new firm creation support that facilitate output-based sales in the market (Barrett, 2008; FAO, 2024). Failure to align those other, market facing, elements of the inclusive business model can dilute the impact of other elements of the inclusive business model on realized sales performance.

Gender as Moderator

Gender was an interesting moderating variable. Although gender-inclusive approaches had a standalone impact on increasing sustainability outcomes, its interaction with other components reduced its moderating effect on the inclusive business model as a whole. This might be an indicator of the remaining structural, cultural and social constraints that impede women's genuine participation even within a more structured program, such as persistent stereotypes about gender roles in agriculture, as Nigeria's own policy fellows focusing on agriculture demonstrate

Table 18: Access to Credit

Statements	SD Freq (%)	D Freq (%)	N Freq (%)	A Freq (%)	SA Freq (%)	Mean	Std Deviation
I find it easy to get financial support through 2Scale programs	20 (5.7%)	30 (8.5%)	40 (11.3)	130 (36.8)	133 (37.7)	3.92	1.16
My access to credit facility through 2Scale has significantly improved my horticulture farming	22 (6.2%)	28 (7.9%)	45 (12.7)	125 (35.4)	133 (37.7)	3.90	1.17
2Scale programs provide affordable interest rates on loans for my horticulture farming	25 (7.1%)	32 (9.1%)	40 (11.3)	120 (34.0)	136 (38.5)	3.88	1.22
There is timely access to credit facilities through 2Scale programs	18 (5.1%)	30 (8.5%)	42 (11.9)	128 (36.3)	135 (38.2)	3.94	1.14
OVERALL						**3.91**	**1.17**

that, among the eight distinct credit schemes launched by the Federal Government, none are gender-responsive, leaving female smallholders to seek informal loans on the market, with often disadvantageous terms (CGIAR/AWARD, 2025). Also, FAO's regional gender-responsive agribusiness guidelines stress the necessity for program implementation to go beyond superficial and token inclusion in favor of a focus on real empowerment, access and participation of women (FAO, 2023; Meinzen-Dick et al., 2011).

Conclusion and Recommendations

These findings confirm the importance of inclusive business models in making horticulture more sustainable, while also highlighting the value of coordinated, context-responsive and integrated approaches to service provision. Where support services do not work together or where engagement is not genuinely inclusive, change is unlikely to stick. To harness the full potential of sustainable and inclusive business models, future interventions need to take a holistic approach to the diverse needs and circumstances of smallholder farmers, working with partners at all levels and aligning services across the value chain.

Managerial and Practical Implications

For program managers like those at 2Scale and other inclusive business projects, the findings suggest that it would be prudent to invest in input support and quality-assurance service delivery in order to ensure reliable returns in productivity, efficiency, and climate-smartness and product quality. Support should then focus on redesigning and de-scaling other support service areas to ensure these translate to significant value beyond self-reporting of use-for example, in the case of credit and technical assistance. Credit repayment periods could be better aligned with horticulture crop cycles, and technical assistance could be tailored to the specific crop and region.

Policy Implications

For policy makers, the results reinforce ongoing public and donor investments in integrated inclusive business models but provide a caveat against viewing the expansion of credit as an easy fix for improving the profitability of smallholders. Policies which require that the expansion of credit (Table 18) and technical assistance must be accompanied by parallel investments in quality input access and infrastructure, the logic embedded within the World Bank's AGROW and FINCLUDE programming (World Bank, 2025b, 2026a), would seem far more likely to yield the productivity and income benefits associated with SDG Goals 1, 2, 5, 8 and 12.

Study Limitations

This study suffers from a number of limitations. Firstly, it is a cross-sectional analysis, which only captures a snapshot in time, so it cannot be used to infer causality between the components of the inclusive business model and profit. In particular, the negative association between credit and profit cannot be assumed to be one-way, as credit might be sought by farmers already facing financial difficulty (reverse causality). Secondly, the data are restricted to the set of horticultural farmers enrolled in the 2Scale program in six South-Western Nigerian states, limiting generalizability to other regions, crop types or program designs. Thirdly, while highly significant statistically, the consistent and high R values in the outcome models may in part reflect the structured nature of the program studied rather than generalizability of the results. Fourthly, measures of profitability and other outcomes are based on self-reports by farmers, which is subject to recall bias and social desirability effects.

Directions for Future Research

Future research should use longitudinal and quasi-experimental methods to address the causal inferences drawn in this paper, expand this analysis to include

comparison groups of non-participant farmers, investigate the underlying reasons for the underperformance of credit and technical assistance compared with theoretical expectations (including qualitative research), and examine other horticulture regions of Nigeria and other horticulture value chains. other horticulture regions of Nigeria and other horticulture value chains.

Declaration

All authors declare that they have no conflicts of interest.

REFERENCES

Abiri, R., Rizan, N., Balasundram, S. K., Shahbazi, A. B., & Abdul-Hamid, H. (2023). Application of digital technologies for ensuring agricultural productivity. Heliyon 9(12),e22601.https://doi.org/10.1016/j.heliyon.2023.e22601

Abraham, M., Verteramo Chiu, L., Joshi, E., Ali Ilahi, M., & Pingali, P. (2022). Aggregation models and small farm commercialization – A scoping review of the global literature. Food Policy, 110, 102299. https://doi.org/10.1016/j.foodpol.2022.102299. Not cited in the body of the work. Author should please cite, do not delete.

Adeniyi, D., Dekeyser, K., & Ekundayo, M. (2024). The horticulture sector in southwest Nigeria: A political economy analysis.

Ajiboye, Y., Isinkaye, M. O., Badmus, G. O., Faloye, O. T., & Atoiki, V. (2022). Pilot groundwater radon mapping and the assessment of health risk from heavy metals in drinking water of southwest, Nigeria. Heliyon, 8(2), e08840. https://doi.org/10.1016/j.heliyon.2022.e08840

Akinola, R., Pereira, L. M., Mabhaudhi, T., de Bruin, F. M., & Rusch, L. (2020). A review of indigenous food crops in Africa and the implications for more sustainable and healthy food systems. Sustainability, 12(8), 1–30. https://doi.org/10.3390/SU12083493

Anh, N. H., Bokelmann, W., Thuan, N. T., Nga, D. T., & Van Minh, N. (2019). Smallholders' preferences for different contract farming models: Empirical evidence from sustainable certified coffee production in Vietnam. Sustainability, 11(14), 9–13. https://doi.org/10.3390/su11143799

Barrett, C. B. (2008). Smallholder market participation: Concepts and evidence from eastern and southern Africa. Food Policy, 33(4), 299–317. https://doi.org/10.1016/j.foodpol.2007.10.005

Biggeri, M., Burchi, F., Ciani, F., & Herrmann, R. (2018). Linking small-scale farmers to the durum wheat value chain in Ethiopia: Assessing the effects on production and wellbeing. Food Policy, 79, 77–91. https://doi.org/10.1016/j.foodpol.2018.06.001. Not cited in the body of the work. Author should please cite, do not delete.

Bryan, E., Deressa, T. T., Gbetibouo, G. A., & Ringler, C. (2013). Adaptation to climate change in Ethiopia and South Africa: Options and constraints. Environmental Science & Policy, 12(4), 413–426. https://doi.org/10.1016/j.envsci.2013.01.003

CGIAR (2025). Empowering women in agriculture: AKILIMO's journey towards gender-responsive advisory services. CGIAR. https://www.cgiar.org/news-events/news/empowering-women-in-agriculture-akilimos-journey-towards-gender-responsive-advisory-services/

CGIAR/AWARD (2025). CGIAR International Gender Conference 2025. African Women in Agricultural Research and Development. https://awardfellowships.org/cgiar-international-gender-conference-2025/

Creppy, P., Bicknell, K., & Renwick, A. (2024). Understanding smallholder preferences for joint ventures in Ghana's rice sector: Improving market access through inclusive business models. Economic Analysis and Policy, 81, 470–481. https://doi.org/10.1016/j.eap.2023.12.011

Dijkxhoorn, Y., Talabi, J., & Likoko, E. (2021). Scoping study on fruits and vegetables. Wageningen Economic Research.

FAO (Food and Agriculture Organization of the United Nations). (2023). Inclusive is not enough – Agrifood value chains need gender-responsive business development. Rome/Cairo: FAO Regional Office for Africa and Regional Office for the Near East and North Africa.

FAO (Food and Agriculture Organization of the United Nations). (2024). Inclusive Business Models | Supporting Responsible Investments in Agriculture. Rome, Italy: FAO. https://www.fao.org/inclusive-business/en/

Feder, G., Murgai, R., & Quizon, J. B. (2010). Agricultural extension: Generic challenges and the Indian experience. Journal of Agricultural Economics, 61(2), 259–274. https://doi.org/10.1111/j.1477-9552.2010.00257.x

Gunapala, R., Gangahagedara, R., Wanasinghe, W. C. S., Samaraweera, A. U., Gamage, A., Rathnayaka, C., Hameed, Z., Baki, Z. A., Madhujith, T., & Merah, O. (2025). Urban agriculture: A strategic pathway to building resilience and ensuring sustainable food security in cities. Farming System, 3(3), 100150. https://doi.org/10.1016/j.farsys.2025.100150

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. European Business Review, 31(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Homère, N. N. M., Cyrille, T. M. A., & Trésor, F. T. O. (2025). Inclusive growth and the challenges of economic vulnerability: A focused perspective on agricultural transformations in developing countries. Modern Economy, 16(01), 179–200. https://doi.org/10.4236/me.2025.161008

Horticultural Trades Association (HTA). (2020). Sustainability Roadmap Charter. London, UK: HTA. https://hta.org.uk/sustainability-roadmap

Hort Innovation. (2023). Australian-Grown Horticulture Sustainability Framework. Sydney, Australia: Hort Innovation. https://www.horticulture.com.au/sustainability-framework

Huang, W., & Wang, X. (2024). The impact of technological innovations on agricultural productivity and environmental sustainability in China. Sustainability, 16(19). https://doi.org/10.3390/su16198480

IBAN. (2020). Supporting Green and Inclusive Businesses. Not cited in the body of the work. Author should please cite, do not delete.

Kaminski, A. M., Kruijssen, F., Cole, S. M., Beveridge, M. C. M., Dawson, C., Mohan, C. V., Suri, S., Karim, M., Chen, O. L., Phillips, M. J., Downing, W., Weirowski, F., Genschick, S., Tran, N., Rogers, W., & Little, D. C. (2020). A review of inclusive business models and their application in aquaculture development. Reviews in Aquaculture, 12(3), 1881–1902. https://doi.org/10.1111/raq.12415

Kansiime, M. K., et al. (2017). The effects of improved input use on smallholder horticulture production and income in Uganda. Agricultural Systems, 153, 1–10. https://doi.org/10.1016/j.agsy.2017.01.004. Not cited in the body of the work. Author should please cite, do not delete.

Kanu, B. S., Salami, A. O., & Numasawa, K. (2014). Inclusive growth: An imperative for African agriculture. African Development Bank Group.

Lipper, L., Thornton, P., Campbell, B. M., Baedeker, T., Braimoh, A., Bwalya, M., ... & Jarvis, A. (2014). Climate-smart agriculture for food security. Nature Climate Change, 4(12), 1068–1072. https://doi.org/10.1038/nclimate2437

Meinzen-Dick, R., Quisumbing, A. R., Behrman, J. A., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C., & Beintema, N. (2011). Engendering agricultural research, development, and extension. IFPRI Discussion Paper 01114. Washington, DC: International Food Policy Research Institute.

Morduch, J. (1999). The microfinance promise. Journal of Economic Literature, 37(4), 1569–1614. https://doi.org/10.1257/jel.37.4.1569

Pera, M., Bavagnoli, M., & Benni, N. (2019). Access to markets for small actors in the roots and tubers sector. Not cited in the body of the work. Author should please cite, do not delete.

Pyburn, R., Slavchevska, V., & Kruijssen, F. (2023). Gender dynamics in agrifood value chains: Advances in research and practice over the last decade. Global Food Security, 39, 100721. https://doi.org/10.1016/j.gfs.2023.100721

Rashid, S. (2014). Last mile delivery: JITA Social Business Bangladesh Limited – Reaching the unreachable in Bangladesh. The Journal of Field Actions, 12, 0–7. http://factsreports.revues.org/3704. Not cited in the body of the work. Author should please cite, do not delete.Reinders, S., Dekker, M., Van Kesteren, F., & Oudenhuijsen, L. (2019). Inclusive development in Africa synthesis report series. Include.

Russel, Y. (2025). Digital finance and agri-food value chains: Case

studies from Nigeria. IFPRI Project Paper, July 2025. Washington, DC: International Food Policy Research Institute. https://hdl.handle.net/10568/175658

Rwelamira, J. (2015). Strengthening farmers organizations and civil society organizations. Abdou Diouf International Conference Center.

Schoneveld, G. C. (2020). Sustainable business models for inclusive growth. Journal of Cleaner Production, 258, 120644. https://doi.org/10.1016/j.jclepro.2020.120644

Ukwe, C. (2025). Nigeria and food security challenges: Intertwining of climate change and non-state armed groups and policy interventions. In Worldwide Megatrends in Food Safety and Food Security. https://doi.org/10.5772/intechopen.1006922

UN DESA. (2021). World social report: Reconsidering rural development. Not cited in the body of the work. Author should please cite, do not delete.

UNESCAP. (2019). Inclusive business: Initial results of a market study (Inclusive Business in Malaysia). https://artnet.unescap.org/sites/default/files/file-2019-11/MAL%20IB%20Background%20Document_01%20Nov%202019.pdf

Valentinov, V. (2024). Three problems of business addressed by stakeholder theory: Insights from the institutional economics of John R. Commons. Journal of Business Ethics. https://doi.org/10.1007/s10551-024-05854-1

Verraki Africa. (2024). Deploying inclusive business models for lasting social impact and sustainability. Nairobi, Kenya: Verraki Africa. https://www.verraki.africa/reports/inclusive-business-models

Wineman, A., & Liverpool-Tasie, S. L. (2023). Gender issues along the fish and vegetable value chains in Nigeria: A call for policy action. Feed the Future Innovation Lab for Food Security Policy / IFPRI.

World Bank. (2007). World Development Report 2008: Agriculture for development. Washington, DC: World Bank.https://openknowledge.worldbank.org/handle/10986/5990. Not cited in the body of the work. Author should please cite, do not delete.

World Bank. (2023). Gender gaps in agriculture productivity and public spending in Nigeria. Nigeria Gender Innovation Lab. Washington, DC: World Bank.

World Bank. (2025a). Nigeria Development Update: Building momentum for inclusive growth. Washington, DC: World Bank.

World Bank. (2025b). World Bank approves $500 million to expand finance for small businesses in Nigeria [Press release]. December 22, 2025. Washington, DC: World Bank. https://www.worldbank.org/en/news/press-release/2025/12/22/world-bank-approves-500-million-to-expand-finance-for-small-businesses-in-nigeria

World Bank. (2026a). Nigeria: World Bank approves project to expand agricultural value-chains and jobs [Press release]. March 30, 2026. Washington, DC: World Bank. https://www.worldbank.org/en/news/press-release/2026/03/31/nigeria-world-bank-approves-project-to-expand-agricultural-value-chains-and-jobs