

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 8; August 2026; Page No. 250-257

Received: 11-05-2026
Accepted: 15-06-2026

Indexed Journal
Peer Reviewed Journal

Socioeconomic characteristics and adaptation strategies of pig farmers in Ika south local government area, delta state, Nigeria

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i8d.4018>

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Abstract

This study examined socioeconomic characteristics of pig farmers and their adaptation strategies in Ika South Local Government Area of Delta State, Nigeria. Descriptive cross-sectional survey design was employed, data were collected from 80 pig farmers randomly selected from 16 communities using multi-stage sampling technique and analyzed with descriptive statistics. Results revealed that farmers were predominantly male (81.3%), married (62.5%), and concentrated in the 41-45 years age group (45.0%). Educational attainment was relatively high, with 95.0% having formal education (55.0% secondary, 37.5% primary, 7.5% tertiary). Mean household size was 13.6 members and mean farming experience was 19.1 years. Regarding enterprise characteristics, 61.3% operated combined farrowing and finishing systems, 81.3% practiced semi-intensive management, while 81.3% lacked credit access. Majority (77.5%) earned annual income of ₦301,000-₦400,000. Leading information sources were fellow farmers (95.0%) and livestock dealers (73.3%). Adaptation strategies included adequate wallowing (77.5%), corrugated roofing (76.3%), resistant breed use (76.3%), and modified feeding practices (71.3%). Enhancement strategies deemed most important were special credit schemes (mean=3.50), priority lending to pig farmers (mean=3.50), and input subsidies (mean=3.20). Major limiting factors were lack of improved technologies (95.0%), poor extension information (77.5%), limited breed access (76.3%), and high labor costs (73.8%). The study concluded that pig farmers possess valuable experience and education but face multiple constraints requiring comprehensive support interventions.

Keywords: Socioeconomic characteristics, pig farmers, adaptation strategies, smallholder farming, Delta state

Introduction

The livestock sector occupies a strategic position in Nigeria's agricultural economy, contributing significantly to employment generation, income creation, and food security. Within this sector, pig production has emerged as an important enterprise for smallholder farmers, particularly in southern Nigeria where cultural and religious restrictions are less pronounced compared to predominantly Muslim northern regions. The Food and Agriculture Organization (FAO, 2021) ^[9] reports that pig production is among the fastest-growing livestock sectors globally, with developing countries accounting for most of this growth. In Nigeria, pig population and production have expanded considerably over recent decades, driven by increasing demand for animal protein, urbanization, and recognition of pigs' biological efficiency in converting feed to meat (Ogunniyi and Omoteso, 2021; Ajala *et al.*, 2017) ^[14, 2].

Pig production offers several comparative advantages that make it particularly suitable for smallholder farmers. Pigs possess high prolificacy, with sows capable of producing two litters per year with 8-12 piglets per litter under good management (Holness, 2017; Serres, 2019) ^[10, 18]. They exhibit superior feed conversion ratios compared to ruminants, requiring approximately 3-4 kg of feed to produce 1 kg of body weight gain (Moseri *et al.* 2023) ^[11]. Pigs reach

market weight in 6-8 months compared to 18-24 months for cattle, enabling faster capital turnover (Ezeibe, 2010) ^[7]. Additionally, pigs are omnivorous and can utilize diverse feed resources including agricultural by-products, household waste, and forage, reducing dependence on expensive commercial feeds (Okoli, 2018; Babatunde and Fetuga, 2020) ^[15, 4].

Despite these advantages, pig production in Nigeria faces numerous challenges that constrain productivity and profitability. Studies by Adesehinwa *et al.* (2013) ^[1], Ajala (2017) ^[3], and Ezeibe (2018) ^[8] have documented various constraints including inadequate access to quality breeding stock, high feed costs, limited credit availability, insufficient veterinary services, disease outbreaks, inadequate extension support, poor infrastructure, and in some contexts, religious and cultural biases against pork consumption. The severity and nature of these constraints vary across different agro-ecological zones, production systems, and farmer categories, necessitating localized research to inform context specific interventions.

Understanding the socioeconomic characteristics of pig farmers is fundamental to designing appropriate development interventions and support systems. Socioeconomic variables such as age, education, farming experience, household size, income level, and access to resources significantly influence

farmers' management practices, technology adoption, adaptation capacity, and overall farm performance (Adesehinwa *et al.*, 2003; Bamiro, 2008) ^[1, 5]. For instance, younger farmers may be more willing to adopt innovations but lack capital and experience, while older farmers possess experience but may be risk averse. Educated farmers typically demonstrate greater capacity to process information, adopt technologies, and manage production challenges effectively (Oladele, 2012; Ajala, 2017) ^[16, 2]. Farming experience provides accumulated knowledge and skills essential for decision making, while household size influences labor availability and consumption pressure on farm income.

Ika South Local Government Area of Delta State presents an interesting context for examining pig production dynamics. Located in southern Nigeria's humid tropical zone, the area benefits from favorable climate for crop and livestock production but also faces environmental challenges including high temperatures, humidity, and seasonal rainfall variations. The area's population of over 160,000 inhabitants includes diverse socioeconomic groups ranging from subsistence farmers to commercial agricultural entrepreneurs, civil servants, and business owners. This socioeconomic diversity creates varied contexts for pig production, from small-scale backyard operations with 2-5 pigs to medium and large-scale commercial enterprises with 50-100 breeding sows.

Pig farming in Ika South LGA operates within a broader context of agricultural transformation occurring across Delta State and southern Nigeria. Increasing urbanization, rising incomes, and dietary diversification are driving growing demand for animal protein, particularly pork which is culturally acceptable and increasingly consumed in urban centers (Nwobodo, 2017) ^[13]. Simultaneously, farming systems are evolving from traditional extensive scavenging systems toward semi-intensive and intensive production utilizing improved breeds, commercial feeds, and better housing (Moseri *et al.* 2018) ^[11]. These transformations create both opportunities and challenges for farmers, requiring adaptation in management practices, market engagement, and production strategies.

Previous research on pig production in Nigeria has primarily focused on production economics (Ezeibe, 2010; Ogunniyi and Omoteso, 2021) ^[7, 14], technical efficiency (Bamiro, 2008) ^[5], marketing systems (Nwobodo, 2017) ^[13], and specific technical aspects such as nutrition (Tewe and Adesehinwa, 2015) ^[19, 1] and breed performance (Okoli, 2018) ^[15]. While these studies provide valuable insights, limited research has comprehensively examined the socioeconomic profiles of pig farmers, their information sources, adaptation strategies employed, and constraints faced within specific local contexts like Ika South LGA. Understanding these dimensions is critical for developing farmer centered interventions that build on existing capacities while addressing genuine constraints.

Despite the recognized potential of pig production to contribute to food security, income generation, and rural livelihoods in Delta State, several challenges hinder optimal sector development in Ika South Local Government Area.

First, there is inadequate empirical documentation of the socioeconomic characteristics of pig farmers in the area. While anecdotal evidence suggests pig farming engages diverse categories of people from small-scale subsistence

farmers to medium and large-scale commercial operators, systematic data on farmers' demographic profiles, educational backgrounds, farming experience, household characteristics, and economic status are lacking. Without this baseline understanding of who pig farmers are, development programs and extension services cannot effectively target interventions to match farmers' capacities, needs, and circumstances. Questions remain about whether pig farmers are predominantly young or mature, educated or with limited schooling, experienced or novice, resource poor or relatively well-endowed in all factors that significantly influence appropriate support strategies.

Second, pig farmers in Ika South LGA operate under challenging conditions including tropical heat stress, limited access to inputs, inadequate extension support, and economic constraints, yet their responses to these challenges have not been systematically documented. Farmers undoubtedly develop and employ various adaptation and coping strategies based on indigenous knowledge, peer learning, and practical experience. However, these strategies whether related to breed selection, housing design, feeding practices, disease management, or marketing remain largely undocumented. Understanding what adaptation strategies farmers currently employ, which strategies are most widely adopted, and how effective these strategies are would provide valuable insights for extension programs and farmer training. Additionally, identifying gaps between farmers' current practices and recommended practices would highlight priority areas for intervention.

Furthermore, information sources through which farmers acquire knowledge about pig production practices have not been documented for the study area. Understanding whether farmers rely primarily on formal extension services, fellow farmers, private input dealers, mass media, or other channels is essential for designing effective communication strategies for disseminating improved technologies and practices. The apparent mismatch between limited extension coverage and continuing production suggests farmers are accessing information through alternative channels that warrant investigation. Thus, this study examined the socioeconomic characteristics and adaptation strategies of pig farmers in Ika South Local Government Area of Delta State, Nigeria.

Methodology

The study was conducted in Ika South Local Government Area, Delta State, Nigeria. Ika South LGA covers approximately 463 square kilometers in the northern part of Delta State, with Agbor serving as the administrative headquarters. The estimated population exceeds 163,000 inhabitants distributed across 16 major communities including Agbor-obi, Alihame, Omumu, Alisimie, Ozanogogo, Emuhu, Aliagwa, Ewuru, Ekuku-Agbor, Oki, Agbor-Nta, Aliokpu, Alisor, Abavo, Alizomor, and Idumoza. The area is predominantly inhabited by Ika-speaking people, an Igbo sub-group. The economy is based on agriculture (crop farming and livestock production), trading, transportation, and civil service employment. The tropical climate features distinct wet (April-October) and dry (November-March) seasons with mean annual temperature of 26-28°C and rainfall of 1800-2500mm.

The study employed a descriptive cross-sectional survey research design. This design was appropriate for collecting

data from a sample of pig farmers at a single time point to describe their characteristics, practices, and experiences without experimental manipulation (Check and Schutt, 2012) [6].

The target population comprised all pig farmers in Ika South LGA. A multi-stage sampling procedure was used to select respondents. First, 16 communities with active pig farming were purposively selected. Second, one pig farm was randomly selected from each community. Third, five respondents (farm owners, managers, or experienced workers) were randomly selected from each farm, yielding 80 total respondents.

Data were collected using structured questionnaires containing both closed-ended and open-ended questions. The questionnaire comprised four sections:

Section A: Sociodemographic information (gender, age, marital status, education, household size, farming experience);

Section B: Enterprise characteristics (farming system, feed sources, management practices, credit access, income);

Section C: Information sources and adaptation strategies;

Section D: Production enhancement strategies and limiting factors. Likert scales (Strongly Agree to Strongly Disagree; Very Important to Not Important) were used for perception and rating items.

Face and content validity were established through expert review by specialists in agricultural education, extension, and animal science. Test-retest reliability method yielded correlation coefficients exceeding 0.60, indicating acceptable reliability.

Data were collected by the researcher with assistance from trained enumerators familiar with local language and culture. Questionnaires were administered to literate respondents while interviews were conducted with non-literate farmers. Data collection occurred during farm visits at times convenient to farmers.

Data were analyzed using descriptive statistics (frequencies, percentages, means, standard deviations) calculated using Statistical Package for Social Sciences (SPSS). For Likert-scale items on 4-point scales, mean scores ≥ 2.50 indicated agreement/importance while means < 2.50 indicated disagreement/lack of importance.

Results

Table 1 presents comprehensive socioeconomic and enterprise profiles of pig farmers in Ika South LGA. Gender distribution reveals strong male dominance (81.3%) compared to females (18.8%). This masculine predominance in pig farming aligns with broader patterns in Nigerian livestock production documented by Ajala *et al.* (2017) [2] and Ogunniyi and Omoteso (2021) [14], attributing this gender disparity to cultural norms assigning livestock management primarily to men, greater male access to productive resources including land and credit, and physical demands of pig farming activities such as pen construction, waste management, and handling large animals. Nevertheless, the 18.8% female participation indicates women's growing involvement in pig production, potentially reflecting changing gender roles, female-headed households, or women's entrepreneurial initiatives in livestock enterprises. Age distribution indicates concentration in mature productive years, with 45.0% in the 41-45 age bracket and 37.5% in the

36-40 range. The mean age of 41.2 years suggests pig farming attracts middle-aged individuals rather than youth or elderly populations. This age profile has important implications for innovation adoption, risk-taking behavior, and sector sustainability. Middle-aged farmers typically possess accumulated capital, experience, and established market networks while maintaining physical capacity for farm operations. However, limited youth participation (only 8.8% aged ≤ 35 years) raises concerns about generational succession and long-term sector viability, reflecting broader rural youth migration patterns documented across Nigerian agriculture.

Marital status data shows majority of farmers are married (62.5%), with smaller proportions single (21.3%) or divorced/widowed (16.3%). Marriage correlates with household stability, labor availability through family members, and responsibility for dependents that motivates income generation. Married farmers often benefit from spousal support in farm activities, particularly in feeding, cleaning, and record-keeping tasks commonly performed by wives in Nigerian farming households.

Educational attainment is notably high, with 95.0% having formal education. Secondary education predominates (55.0%), followed by primary (37.5%) and tertiary (7.5%), while only 5.0% lack formal schooling. This educational profile substantially exceeds typical rural farming populations in Nigeria and suggests pig production attracts relatively educated individuals. Education enhances capacity to access and process technical information, adopt improved practices, maintain farm records, and engage effectively with markets and institutions. The predominance of secondary education indicates farmers possess basic literacy and numeracy essential for commercial farming but may benefit from technical training in specialized pig production aspects. Household size averages 13.6 members, considerably exceeding Nigerian national average of 4.9 persons per household (NBS, 2020). Large household sizes reflect extended family systems prevalent in southeastern Nigeria, where households incorporate nuclear family, aging parents, unmarried siblings, and dependent relatives. While large households provide potential farm labor, they also impose substantial consumption pressure on farm income, potentially limiting capital available for farm investment and technology adoption.

Farming experience averages 19.1 years, indicating substantial accumulated knowledge and practical expertise. Experience distribution shows relatively even spread: 23.9% with ≤ 10 years, 23.9% with 11-20 years, 20.1% with 21-30 years, and substantial proportions with > 30 years of experience. Long farming tenure provides valuable insights into seasonal production patterns, disease management, breeding practices, and market dynamics. However, long experience with traditional methods may also create resistance to new technologies, particularly when farmers have developed successful coping mechanisms within existing systems.

Regarding enterprise characteristics, farm size distribution reveals predominance of small-scale operations, with 71.5% maintaining 1-50 pigs and 27.7% with 51-100 pigs. Only 1.3% operate larger enterprises exceeding 100 animals. This small-scale dominance reflects typical African pig production patterns characterized by limited capital, land

constraints, and market access challenges that prevent enterprise expansion.

Piggery enterprise types show 61.3% conducting all operations (breeding, farrowing, piglet rearing, and finishing), 27.5% combining farrowing and finishing, and 11.3% specializing in farrowing only. Integrated operations allow farmers to capture value across production stages but require diverse skills, sustained feed supply, and adequate facilities. Specialization, though less common, enables focused management and may reduce capital requirements. Feed sources reveal 51.3% combining commercial and farm-mixed feeds, 22.5% using exclusively farm-mixed feeds, 15.0% utilizing kitchen remnants, and 11.3% relying solely on commercial feeds. Predominance of mixed feeding strategies reflects farmers' efforts to balance nutritional requirements with cost management in context of expensive commercial feeds. Farm-mixing allows incorporation of locally available ingredients including crop residues, processing by-products, and household waste, reducing feed costs while maintaining adequate nutrition.

Management systems show overwhelming dominance of semi-intensive practices (81.3%) compared to extensive systems (18.8%). Semi-intensive management involves housing with controlled access to outdoor areas, supplementary feeding beyond foraging, and some disease prevention measures. This system balances investment requirements, labor demands, and productivity outcomes, making it appropriate for smallholder contexts. The near-absence of fully intensive systems reflects capital and technical constraints limiting adoption of sophisticated housing, climate control, and complete confinement systems.

Credit access remains severely limited, with 81.3% lacking access to formal credit. Among those obtaining capital, 52.5% depend on loans (presumably informal sources given limited formal credit access) and 45.0% rely on alternative sources including personal savings, family contributions, and livestock sales. Limited credit access severely constrains farm expansion, technology adoption, and ability to weather production challenges. This finding echoes broader agricultural finance challenges in Nigeria where smallholder farmers face collateral requirements, high interest rates, and institutional barriers limiting formal credit access.

Annual income distribution shows remarkable concentration in the ₦301,000-400,000 range (77.5%), with smaller proportions earning ₦201,000-300,000 (10.0%), ₦401,000-500,000 (8.8%), or outside these ranges. This income clustering suggests relatively standardized production scales and market conditions across farms. However, these income levels, equivalent to approximately \$600-800 USD annually at prevailing exchange rates, indicate pig farming provides modest rather than substantial income, likely supplementing rather than replacing other livelihood activities.

Extension access shows 55.0% lack contact with extension services while 45.0% have some access. This limited extension coverage reflects broader agricultural extension challenges in Nigeria including insufficient extension personnel, poor funding, inadequate transportation, and weak linkages between research, extension, and farmers. Limited extension access forces farmers to rely on alternative information sources and indigenous knowledge for production decisions.

Table 1: Socioeconomic and Enterprise Characteristics of Pig Farmers (N=80)

Variable	Categories	Frequency	Percentage	Mean
Gender	Male	65	81.3	-
	Female	15	18.8	-
Age (years)	≤35	7	8.8	41.2
	36-40	30	37.5	
	41-45	36	45.0	
	46-50	4	5.0	
	>50	3	3.8	
Marital Status	Single	17	21.3	-
	Married	50	62.5	-
	Divorced/Widowed	13	16.3	-
Education	No formal education	4	5.0	-
	Formal	76	95	=
	Primary	30	37.5	-
	Secondary	44	55.0	-
Household Size	Tertiary	6	7.5	-
	≤10	19	23.9	13.6
	11-20	55	69.0	
	21-30	6	7.6	
	>30	0	0.0	
Farming Experience (years)	≤10	19	23.9	19.1
	11-20	19	23.9	
	21-30	16	20.1	
	31-40	7	8.9	
	>40	8	10.2	
Farm Size (number of pigs)	1-50	57	71.5	-
	51-100	22	27.7	-
	>100	1	1.3	-
Piggery Enterprise	Farrowing only	9	11.3	-
	Farrowing & finishing	22	27.5	-

	All operations	49	61.3	-
Source of Feed	Commercial only	9	11.3	-
	Farm-mix only	18	22.5	-
Management System	Commercial & farm-mix	41	51.3	-
	Kitchen/home remnants	12	15.0	-
	Extensive	15	18.8	-
Credit Access	Semi-intensive	65	81.3	-
	Have access	15	18.8	-
Source of Finance	No access	65	81.3	-
	Savings	2	2.5	-
	Loans	42	52.5	-
Annual Income (₹)	Others	36	45.0	-
	<200,000	1	1.3	-
	201,000-300,000	8	10.0	-
	301,000-400,000	62	77.5	-
	401,000-500,000	7	8.8	-
Extension Access	>500,000	2	2.5	-
	Have access	36	45.0	-
	No access	44	55.0	-

Source: Field Survey, 2025

Table 2 reveals diverse information sources accessed by farmers, with fellow farmers overwhelmingly dominant (95.0%). Peer-to-peer knowledge exchange through farmer-to-farmer communication represents primary learning mechanism, reflecting social learning processes where farmers observe, discuss, and adopt practices from successful colleagues. This horizontal information flow compensates for weak formal extension but may perpetuate suboptimal practices if peer networks lack exposure to improved technologies.

Livestock dealers emerge as second most important source (73.3%), highlighting private sector's role in technology dissemination. Input suppliers including feed dealers, equipment vendors, and livestock traders provide technical advice alongside product sales, creating informal extension system driven by commercial relationships rather than public provision. However, dealer advice may prioritize product sales over farmers' best interests, potentially compromising technical quality.

Extension agents reach only 45.0% of farmers despite public extension system's mandate for universal coverage. This limited reach reflects systemic extension challenges and suggests substantial unmet demand for technical support. Mass media (35.0%) and internet/social media (23.8%) serve modest proportions, with low internet access indicating digital divide limiting online information access in rural areas. Veterinary officers (22.5%), print materials (15.0%), and NGO projects (10.0%) serve even smaller proportions, representing supplementary rather than primary information channels.

Table 2: Information Sources for Pig Production (N=80)

Information Source	Frequency	Percentage
Fellow pig farmers	76	95.0
Livestock dealers	59	73.3
Extension agents	36	45.0
Mass media (radio/TV)	28	35.0
Internet/social media	19	23.8
Veterinary officers	18	22.5
Print materials	12	15.0
NGOs/Projects	8	10.0

Source: Field Survey, 2025 (Multiple responses allowed)

Table 3 documents diverse adaptation strategies farmers employ responding to environmental, economic, and technical challenges. Provision of adequate wallowing facilities (77.5%) represents most widely adopted strategy, addressing heat stress through pigs' natural thermoregulatory behavior. Wallows allow pigs to cool through evaporative heat loss and conductive cooling from contact with mud and water, effectively managing thermal stress in hot humid conditions. High adoption suggests farmers recognize wallowing's importance and can implement this relatively low-cost intervention.

Corrugated roofing sheet use (76.3%) provides affordable weather protection while enabling heat reflection compared to traditional thatching materials. Modern roofing materials improve housing durability and hygiene while requiring modest investment accessible to smallholders. Heat-resistant breed use (76.3%) indicates strategic genetic selection favoring animals with superior heat tolerance, disease resistance, and adaptability to local conditions over exotic breeds requiring intensive management.

Modified feeding practices (71.3%) encompass various adjustments including feed formulation changes, feeding frequency adjustments, and feed type diversification responding to ingredient availability and cost fluctuations. Kitchen waste supplementation (67.5%) reduces commercial feed dependence, utilizing household food remnants that provide nutritional value while managing household waste. Increased water provision (65.0%) addresses both hydration needs and cooling requirements, recognizing water as critical for thermoregulation, digestion, and lactation.

Improved housing ventilation (60.0%) facilitates air movement reducing heat accumulation and humidity in pig houses. Strategic shade tree planting (57.5%) provides natural cooling through canopy shade and evapotranspiration, creating more comfortable microclimates around pig facilities. Water sprinklers/spraying (51.3%) directly cools pigs through evaporative cooling, particularly during peak heat periods.

Feeding time adjustments (47.5%) shift feeding to cooler periods (early morning and evening) reducing heat increment from feeding during hottest hours. Local/indigenous breed use (45.0%) complements heat-resistant breed adoption, with

some farmers preferring indigenous stock's superior adaptation to local conditions despite slower growth rates. Health management intensification (41.3%) includes enhanced vaccination, deworming, and disease monitoring addressing increased disease pressure under climate stress and intensive production.

Table 3: Adaptation Strategies Employed by Pig Farmers (N=80)

Adaptation Strategy	Frequency	Percentage
Provision of adequate wallowing facilities	62	77.5
Use of corrugated roofing sheets	61	76.3
Use of heat-resistant breeds	61	76.3
Modified feeding practices	57	71.3
Supplementation with kitchen waste	54	67.5
Increased water provision	52	65.0
Improved ventilation in housing	48	60.0
Strategic planting of shade trees	46	57.5
Use of sprinklers/water spraying	41	51.3
Adjusting feeding times	38	47.5
Use of local/indigenous breeds	36	45.0
Health management intensification	33	41.3

Source: Field Survey, 2025 (Multiple responses allowed)

Table 4 presents farmers' ratings of potential production enhancement strategies. Special credit schemes and priority lending both achieve highest importance ratings (mean=3.50), reflecting severe financial constraints farmers face. Access to affordable credit would enable investment in improved breeds, feeds, housing, and equipment currently beyond farmers' reach. Credit importance transcends production stages, affecting breeding stock acquisition, feed procurement, facility construction, and operational expenses.

Table 4: Strategies for Enhancing Pig Production (N=80)

Enhancement Strategy	Mean	SD	Rank
Special credit schemes for pig farmers	3.50	0.68	1st
Priority lending to pig farmers	3.50	0.71	1st
Subsidization of inputs	3.20	0.85	3rd
Provision of improved breeds	3.18	0.79	4th
Enhanced extension services	3.15	0.82	5th
Training in modern techniques	3.10	0.88	6th
Improved veterinary services	3.08	0.86	7th
Formation of cooperatives	3.00	0.92	8th
Market information systems	2.95	0.89	9th
Infrastructure development	2.88	0.95	10th

Source: Field Survey, 2025 (Scale: 4=Very Important, 3=Important, 2=Moderately Important, 1=Not Important)

Input subsidization ranks third (mean=3.20), addressing high costs of commercial feeds, veterinary products, and equipment that consume substantial farm income. Government subsidies reducing input costs would improve profitability and enable adoption of recommended production practices currently economically prohibitive. Improved breed provision (mean=3.18) reflects farmers' recognition that genetic improvement represents fundamental productivity enhancement pathway, yet quality breeding stock remains largely inaccessible.

Enhanced extension services (mean=3.15), training in modern techniques (mean=3.10), and improved veterinary services (mean=3.08) cluster together, indicating strong demand for technical support across production domains. These moderate-to-high ratings suggest farmers recognize

knowledge gaps and technical skill deficiencies limiting production optimization. Cooperative formation (mean=3.00), market information systems (mean=2.95), and infrastructure development (mean=2.88), while valued, receive lower priority ratings possibly because farmers perceive more immediate needs in credit, inputs, and technical knowledge.

Table 5 identifies multiple interrelated constraints limiting farmers' adaptation capacity. Lack of improved production technologies (95.0%) emerges as most pervasive constraint, encompassing limited access to modern breeding stock, efficient feeding systems, climate-controlled housing, waste management technologies, and precision production tools. Technology gaps prevent farmers from implementing recommended practices even when aware of their benefits.

Poor extension information (77.5%) reflects inadequate public extension provision discussed earlier, leaving farmers without reliable technical guidance for production decisions. Limited improved breed access (76.3%) constrains genetic improvement possibilities, forcing reliance on unimproved local stock or informal breeding networks of uncertain quality. High labor costs (73.8%) create operational challenges especially for larger farms requiring hired labor for feeding, cleaning, and animal handling tasks.

Inadequate capital/credit (72.5%) creates binding financial constraints limiting investment in all production aspects. High feed costs (71.3%) represent ongoing operational challenge as feed typically constitutes 70-80% of pig production costs, making profitability highly sensitive to feed prices. Poor veterinary services (67.5%) limit disease prevention and treatment capacity, increasing mortality and morbidity losses.

Market information deficiencies (60.0%) prevent optimal marketing decisions regarding timing, pricing, and buyer selection. Poor infrastructure (56.3%) including roads, electricity, and water supply increases production costs and marketing challenges. Disease outbreaks (52.5%) cause periodic production losses despite farmers' best prevention efforts. Cultural/religious constraints (47.5%) create market limitations in predominantly Muslim areas and social stigma in some communities. Land scarcity (43.8%) restricts farm expansion possibilities in increasingly populated areas.

Table 5: Factors Limiting Adaptation Strategies (N=80)

Limiting Factor	Frequency	Percentage
Lack of improved production technologies	76	95.0
Poor extension information	62	77.5
Limited access to improved breeds	61	76.3
High labor costs	59	73.8
Inadequate capital/credit	58	72.5
High cost of feeds	57	71.3
Poor veterinary services	54	67.5
Lack of market information	48	60.0
Poor infrastructure	45	56.3
Disease outbreaks	42	52.5
Cultural/religious constraints	38	47.5
Land scarcity	35	43.8

Source: Field Survey, 2025 (Multiple responses allowed)

Discussion

The study's findings reveal pig farming in Ika South LGA as practiced predominantly by middle-aged, married, educated

males with substantial farming experience but operating under significant resource constraints. The demographic profile suggests pig production attracts individuals with maturity, responsibility, and some education who view pig farming as viable income source within diversified livelihood portfolios. However, the concentration in middle age raises sustainability concerns as youth largely avoid pig farming, potentially due to migration to urban areas, perceived social status issues, or limited capital for entry, consistent with the male-dominated, middle-aged demographic profile of pig producers reported by Ajala *et al.* (2017)^[3] and Ogunniyi and Omoteso (2021)^[14].

High educational attainment among pig farmers contradicts common assumptions about livestock farming as refuge for uneducated rural populations. Instead, findings suggest educated individuals recognize pig production's economic potential and actively engage despite challenges. This educational capital represents important resource for extension and development programs, as literate farmers can process written materials, adopt complex technologies, and engage formal institutions more effectively than non-literate counterparts, supporting the link between education and innovation adoption established by Oladele (2012)^[16] and Ajala (2017)^[2].

The predominance of semi-intensive management reflects practical compromise between resource availability and production intensity aspirations. Semi-intensive systems enable some production control and productivity improvements over extensive scavenging while avoiding capital-intensive requirements of fully intensive systems. However, this intermediate position may also represent transition point where farmers aspire toward intensive production but lack resources for full transformation, suggesting need for targeted support facilitating this transition, a pattern consistent with the shift from extensive to semi-intensive systems documented by Moseri *et al.* (2018)^[11].

Limited credit access emerges as critical constraint cutting across all production aspects. Without adequate financing, farmers cannot invest in improved breeds, quality feeds, better housing, veterinary care, or farm expansion regardless of technical knowledge or motivation. Credit constraint particularly affects youth and women who typically have less accumulated capital and face greater collateral barriers in formal financial markets. Addressing credit access through specialized agricultural finance programs, collateral-free lending schemes, or cooperative credit systems could substantially enhance production potential, echoing recommendations from Adesihinwa *et al.* (2013)^[1] and Bamiro (2008)^[5] on financing constraints in pig enterprises. Information source patterns reveal informal knowledge networks' predominance filling gaps left by inadequate formal extension. While peer learning enables practical knowledge sharing and social support, it also risks perpetuating suboptimal practices if farmer networks lack exposure to research-based innovations. Livestock dealers' prominent role as information sources creates potential conflicts of interest where commercial considerations may outweigh farmers' best interests. Strengthening public extension and creating mechanisms for reliable technical information dissemination independent of commercial agendas would improve decision quality, corroborating the

reliance on informal peer and dealer networks noted by Ajala *et al.* (2017)^[3] and Ogunniyi and Omoteso (2021)^[14].

Adaptation strategies farmers employ demonstrate considerable indigenous innovation and practical problem-solving. Wallowing provision, strategic roofing choices, breed selection, and feeding adjustments show farmers actively responding to environmental and economic constraints within their resource means. However, limited adoption of more sophisticated strategies like sprinkler systems or intensive health management suggests capital and knowledge constraints prevent accessing full range of available adaptations. Extension programs could validate and build upon existing farmer innovations while introducing accessible complementary technologies, particularly around breed selection where Okoli (2018)^[15] similarly emphasized the role of breed choice in tropical performance outcomes.

Enhancement strategy ratings clearly prioritize financial support and input subsidization over training and institutional development. While understandable given severe resource constraints farmers face, this priority pattern risks overlooking importance of knowledge, skills, and institutional capacity that enable effective resource utilization. Balanced development programs should address both financial access and technical capacity simultaneously, recognizing that credit without knowledge produces limited impact while knowledge without capital enables only theoretical understanding.

Limiting factors identified by farmers paint comprehensive picture of multidimensional constraints spanning technological, informational, economic, infrastructural, and market dimensions. This constraint multiplicity means single-intervention approaches will likely achieve limited impact. Instead, comprehensive support packages addressing multiple constraint dimensions simultaneously would better facilitate sustainable pig production development. Priority should focus on constraints affecting largest farmer proportions and those creating bottlenecks limiting other improvements, a multidimensional constraint profile similarly documented by Adesihinwa *et al.* (2013)^[1] and Ezeibe (2018)^[8] in other Nigerian pig-producing regions.

Conclusion

This study examined socioeconomic characteristics and adaptation strategies of pig farmers in Ika South Local Government Area, Delta State, Nigeria. Findings reveal pig farming attracts predominantly middle-aged, married, educated males with substantial experience operating small-to-medium scale farms under semi-intensive management systems. Farmers demonstrate considerable practical knowledge and indigenous innovation through diverse adaptation strategies addressing heat stress, feed costs, and production challenges. However, they face severe constraints including limited improved technologies, inadequate extension support, restricted breed access, high input costs, insufficient credit, and poor infrastructure that collectively limit production potential.

The study concludes that pig farmers in Ika South LGA possess valuable human capital through education and experience that remains underutilized due to multiple constraining factors. Current adaptation strategies, while innovative, remain limited by resource constraints preventing adoption of more sophisticated technologies. Enhancement

requires comprehensive interventions addressing financial access, technical support, input availability, market development, and institutional strengthening simultaneously rather than fragmented single-issue approaches.

Recommendations

Based on study findings, the following recommendations are proposed:

1. Government and financial institutions should establish specialized credit schemes for pig farmers with favorable terms including low interest rates, flexible repayment schedules aligned with pig production cycles, and minimal collateral requirements. Cooperative credit arrangements and group lending could reduce transaction costs and improve access for smallholder farmers.
2. Agricultural extension agencies should increase pig production specialists, provide regular farmer training on improved breeding, feeding, housing, and health management, and establish demonstration farms showcasing best practices. Extension should build upon farmers' existing knowledge while introducing complementary innovations.
3. Government should subsidize critical inputs including quality breeding stock, commercial feeds, veterinary products, and housing materials to reduce production costs and enable technology adoption. Subsidies should target genuine smallholder producers and include mechanisms preventing elite capture.
4. Establish nucleus breeding farms and multiplication centers providing quality breeding stock at affordable prices. Artificial insemination services could accelerate genetic improvement while reducing breeding stock costs.
5. Develop and disseminate timely market information including pig prices, demand patterns, and marketing opportunities through mobile phones, radio programs, and farmer group meetings enabling better marketing decisions.
6. Strengthen or form pig farmer cooperatives facilitating bulk input procurement, collective marketing, experience sharing, and advocacy. Cooperatives can improve bargaining power while reducing individual farmer transaction costs.
7. Government should prioritize rural infrastructure including road networks, electricity supply, and water systems supporting pig production and marketing. Infrastructure improvements reduce production costs while expanding market access.
8. Design targeted programs attracting youth into pig production through training, startup capital support, and mentorship addressing sustainability concerns from limited youth participation.

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