

## **Socio-economic Factors Influencing Marketing Practices and Opportunities for the Smallholder Pig Farming Enterprise in the Cape Metropole District, South Africa**

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### ***ABSTRACT***

*Urban smallholder pig production is one of the farming systems that dominate urban agriculture in South Africa. However, the challenges of urban smallholder pig farmers in adopting sustainable marketing practices have not been identified. Therefore, a survey was conducted amongst 160 pig farmers from five suburbs of the Cape Metropole District in South Africa to determine the impact of socio-economic factors on marketing practices and the accompanying challenges for urban smallholder farms. Data was collected using a convenience sampling technique and subjected to descriptive statistics, analysis of variance, and binomial logistic regression. The main challenges experienced by farmers were a slow growth rate in pigs (54% of respondents), scarcity of production inputs (25%), and difficulty in finding marketing information (20%). The main sustainable marketing practices adopted by smallholder pig farmers included the use of a farmgate marketing channel (82% of*

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respondents), the sale of live pigs (52%), and affiliation with marketing organisations (16%). Logistic regression marginal effects revealed that farmers who were women, older, African traditional religion adherents, and had less farming experience, education, training, and access to extension services, relied on paid labour and one source of income, farmed extensively and off-plot, and owned small farms, one livestock type, indigenous breeds and small pig herds, were more likely to face challenges and fail to adopt sustainable marketing practices ( $P \leq 0.05$ ). In conclusion, the identified socioeconomic factors have a significant impact on farmers' decision-making and should be incorporated in devising sustainable marketing strategies and policies to enhance market access and pig sales on smallholder urban farms in developing countries.

**Keywords:** Animal Slaughter, Farmgate, Formal Markets, Marketing Information, Pig Sales.

## 1. INTRODUCTION

Pig production plays a significant role in the agricultural industry, providing pork as a vital source of protein for human consumption (Roesel *et al.*, 2019). The demand for pork in South Africa has increased gradually due to rising population, urbanisation, and per capita income (Davids *et al.*, 2014). At the same time, the demand for high-quality and safe pork amongst consumers in urban areas has also been rising (Department of Agriculture, Land Reform and Rural Development [DALRRD], 2021; Davids *et al.*, 2014; Levy *et al.*, 2013). Such attributes include hygienic slaughtering standards and pork that is lean, flavoursome, healthful, free from diseases and harmful residues (Baltenweck *et al.*, 2018; Magqupu *et al.*, 2023). In this context, it is essential to comprehensively develop the smallholder urban pork value chain, identify sustainable pig marketing practices, and understand the socio-economic factors influencing the adoption of such practices, as well as their relationship to consumer preferences (Kimbi *et al.*, 2016; Mathobela *et al.*, 2024a). This could help to optimise the circular bioeconomy, enhance marketing efficiency, and address the diverse needs of different consumer segments of smallholder urban pig farmers (Mathobela *et al.*, 2024a; Magqupu *et al.*, 2024).

Smallholder pig farming is more convenient in urban areas, as it is practised on small landholdings compared to the larger tracts of land required for cattle, sheep, and goat farming (Mathobela *et al.*, 2024b; Okello *et al.*, 2021). Owing to its proximity to traders, slaughterhouses, high-quality markets, and efficient road networks, urban smallholder pig farming is more market-oriented than rural pig farming (Mathobela *et al.*, 2024a; Ström *et al.*,

2017). Effective marketing in the urban smallholder piggery enterprise is essential for economic growth and poverty reduction (Ajala & Adeshinwa, 2008; Levy *et al.*, 2013). However, the marketing of pigs in the urban smallholder sector is subject to several challenges, including non-compliance with animal welfare, biosecurity, slaughter and waste management regulations (Kagira *et al.*, 2010; Majunder & Cherala, 2021). Pork sold in these informal markets is perceived to be less safe compared to that from retail stores, due to a lack of efficient cooling systems and poor hygiene conditions (Deka *et al.*, 2007; Dietze, 2011). In addition, the value chain is not sufficiently structured and informal markets are poorly organised with limited access to technology, production information, and services (Mugonya *et al.*, 2021; Ouma *et al.*, 2015). To create effective development strategies for the urban smallholder pig enterprise in developing countries, it is essential to identify the existing challenges and sustainable pig marketing practices, as well as the socio-economic factors influencing them.

Previous studies on urban smallholder pig marketing practices have been more concentrated on evaluating smallholder pig marketing systems to enhance farmers' access to high-value markets (Kimbi *et al.*, 2016; Levy *et al.*, 2013). However, there is a knowledge gap regarding the socio-economic variables influencing the challenges faced by urban smallholder pig farmers and the sustainable marketing practices they adopt. The socio-economic factors influencing smallholder farming practices and marketing decisions can be broadly categorised into farm (economic/financial), farmer (personal/demographic) and institutional characteristics (Mathobela *et al.*, 2024a, b). Understanding farmers' socio-economic factors may enable the development of effective interventions for the long-term growth of the urban smallholder pig industry. Therefore, the current study aimed to determine the socio-economic factors that have bearing on the challenges experienced by smallholder farmers and on the adoption of sustainable marketing practices by pig smallholder farms in the Cape Metropole District, South Africa.

## **2. RESEARCH METHODOLOGY**

### **2.1. Ethical Clearance and Precautionary Measures**

In accordance with the South African National Health Act No. 61 of 2003 (RSA, 2004), the Social, Behavioural, and Education Research (REC: SBE-17285) Ethics Committee at Stellenbosch University approved the current study. Since the study was conducted during the COVID-19 pandemic, in May 2021, all safety precautions, research guidelines, laws, and regulations, as emphasised by the Research Ethics Committee, were followed. The research

team adhered to all the necessary COVID-19 Occupational Health and Safety protocols as a mitigating strategy, including the use of cloth face masks, sanitisers, boxes of tissues, non-contact infrared thermometers and record-keeping sheets. Furthermore, the five rules of good hygiene to prevent the spread of COVID-19 were observed. These included regular washing of hands with soap and water or disinfecting with a 70% alcohol-based hand sanitiser, the wearing of a cloth mask at all times to cover the mouth and nose, adhering to the social distancing rule of at least 1.5 m and avoiding meeting in groups, coughing or sneezing into a tissue or elbow, not touching the face with unwashed hands, and staying at home when feeling unwell. The South African Animal Diseases Act 35 of 1984 (RSA, 1984) was also enforced due to an outbreak of African swine fever (ASF) in the study area. All necessary mitigating strategies, biosecurity measures, and precautionary measures were followed during farm visits to prevent the spread of the disease. The study's objectives and potential benefits were explained to the participants prior to the interviews. Following this, each participant provided written informed consent, and they were assured of their privacy and anonymity. Participation was entirely optional, and individuals were informed that they could withdraw from the interview process at any moment.

## 2.2. Study Site and Selection of Farmers

The study was carried out in the low-income, high-density suburbs of Eerste River (GPS coordinates: -34.020630, 18.711254), Khayelitsha (-34.040539, 18.714261), Mfuleni (-34.008137, 18.675448), Penhill (-33.973532, 18.717577) and Strand (-34.129302, 18.881187), all located in the Cape Metropole District of South Africa's Western Cape province. These five suburbs were selected because of the large population of smallholder farmers who raise pigs there, according to officials from the Western Cape Department of Agriculture. The sampling unit consisted of the head of household, who owned at least two adult pigs. A study sample of 160 pig farmers from Mfuleni (n = 31), Eerste River (n = 33), Penhill (n = 30), Khayelitsha (n = 36), and Strand (n = 30) was obtained using a convenience sampling technique. For convenience, the sampling technique involved selecting pig farmers based on their availability and willingness to participate in the study, with the assistance of extension officers and animal health professionals from the Western Cape Department of Agriculture. Slovin's formula (Yamane, 1967) was used to determine the acceptable sample size, as follows:

$$n = \frac{N}{1+N(e)^2} = \frac{383}{1+383(0.06)^2} = 161$$

where  $n$  = sample size required,  $N$  = the total number of small-scale pig farmers in the five surveyed suburbs, and  $e$  = the acceptable sampling error. Since participants were not selected randomly, the opportunistic (i.e., convenience) sampling technique may have introduced bias, making the results less representative of the larger population. Nevertheless, the technique enabled the researchers to conduct the interviews at a convenient time during the day, with close observations of the animals, infrastructure, production and marketing practices. This helped validate the data and enhance the accuracy of the results.

### **2.3. Data Collection**

Data was collected through face-to-face personal interviews with pig farmers using pre-tested structured questionnaires administered in local languages (i.e., Afrikaans, isiXhosa, and English). The questionnaire was pre-tested on 15 April 2021 with 10 farmers in Kayamandi (GPS coordinates: -33.926706, 18.843263), using a prototype that had been developed. Kayamandi is a low-income, high-density suburb of Stellenbosch in the Western Cape province of South Africa, sharing similar socio-economic characteristics with the surveyed suburbs. Pretesting examined whether the survey was properly completed and whether respondents truly understood the questions, ensuring they would provide all the required data. Following the pre-test, changes were made to the questionnaire, including the rewording and rearranging of several questions to guarantee clarity, a logical question flow, and adequate guidance. The survey comprised 61 closed-ended, open-ended, and multiple-choice questions about household demographics (8 questions), farm characteristics (10), pig marketing practices (16), challenges (4), opportunities (4), and agricultural support services (19). The average interview time was approximately 45 minutes per respondent. Personal observations, physical examinations, reviews of pre-existing records, and, when appropriate, photos were used to supplement the data collected *via* questionnaires.

### **2.4. Statistical Analysis**

The PROC FREQ of SAS 9.4 (SAS Institute Inc., Cary, NC, USA) was used to analyse descriptive statistics for demographics, pig marketing practices, and agricultural support services data. To evaluate the associations between suburbs and characteristics of general pig marketing practices, a Chi-square test was performed. The Shapiro-Wilk and Levene tests were used to determine the normality and homoscedasticity of this dataset, respectively. The PROC GLM of SAS was used to separate the means of the data on pig body weight, number of sales

and slaughtered pigs, price, and distance to market at a 5% ( $P \leq 0.05$ ) level of probability using Tukey's test.

Logistic regression analysis was employed to identify the variables influencing the key challenges faced by farmers and their adoption of key marketing practices. The PROC LOGISTIC model estimated the log chances of farmers choosing a specific marketing practice or facing a specific challenge. Socio-economic factors such as gender, age, religion, education level, farming experience, workforce, source of income, farm size, type of livestock, herd size, type of breeds kept, production system, location, agricultural advisory services, and pig management training were included in the model as independent variables (Table 1). The change in the likelihood that pig farmers could encounter a specific challenge or adopt a specific key marketing practice for a unit change in each socio-economic and ecological component was predicted using the marginal effects of logistic regression, based on the binomial logistic model. The binomial logistic regression model was selected based on its ability to accommodate numerous explanatory factors, account for the effects of confounding variables, facilitate the interpretation of dichotomous preference aspects, and ease data interpretation. However, if the differences in the independent variables are not verified, the projected values generated by the logistic regression may fall outside the range, and the relationship between the input and response may not be linear. Greene (2020) stated the model as follows:

$$\text{Prob}(Y_j = i) = P_{ji} = \frac{\exp(\beta_i X_j)}{\sum \exp(\beta_k X_j)} \text{ where } 0 < P_{ji} < 1 \quad (1)$$

Equation 1 was linearised into (2):

$$\text{Prob}(Y_j = i) = P_{ji} (\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \dots \beta_k X_k) \quad (2)$$

where:  $\text{Prob}(Y_j = i)$  is the the probability of a farmer to experience a key challenge or adopt key sustainable marketing practices with two response categories of either 'yes' or 'no' coded as 1 or 0;  $\beta_0$  = Intercept;  $\beta_1, \beta_2, \dots, \beta_n$  = coefficients of independent variables;  $\chi_1, \chi_2, \dots, \chi_n$  = independent variables. Following the variables' fitting, the residual model was:

$$Y_i \text{ (key challenge or key sustainable marketing practices)} = \beta_0 + \beta_1(\text{gender}) + \beta_2(\text{age}) + \beta_3(\text{religion}) + \beta_4(\text{education}) + \beta_5(\text{farming experience}) + \beta_6(\text{workforce}) + \beta_7(\text{income source}) + \beta_8(\text{farm size}) + \beta_9(\text{type of livestock kept}) + \beta_{10}(\text{herd size}) + \beta_{11}(\text{type of pig breeds kept}) + \beta_{12}(\text{production system}) + \beta_{13}(\text{location}) +$$

$\beta_{14}$ (extension services) +  $\beta_{15}$ (pig marketing training) +  $\varepsilon$ , where;  $\beta_0$  = Intercept,  $\beta_1$ , ...,  $\beta_{15}$  = Coefficients and  $\varepsilon$  = Error. Probability values were considered significant at 5% ( $P \leq 0.05$ ).

**TABLE 1: Description of Socio-Economic Factors Influencing Pork Marketing Practices and Challenges of Smallholder Farmers in the Cape Metropole District, South Africa**

<b>Independent variable</b>	<b>Description of independent variables</b>
Gender	Gender of the farmer (1 = Male, 0 = Female)
Age	Age of the farmer [1 = Youth (40 years and younger) 0 = Elderly adults (older than 40)]
Religion	Religion of the farmer (1 = Christian, 0 = None/ Traditional)
Education level	Educational level of the farmer (1 = No formal education to primary education, 0 = Secondary to tertiary education)
Farming experience	Farming experience of the farmer (1 = 10 years and less, 0 = More than 10 years)
Workforce	Type of workforce used by the farmer (1 = None/ family labour, 0 = Paid labour)
Sources of income	Source of income [1 = Pig sales only (primary), 0 = Other sources of income (secondary)]
Farm size	Farm size [1 = Small (less than 500m <sup>2</sup> ), 0 = Large (500m <sup>2</sup> and more)]
Type of livestock kept	Type of livestock kept by the farmer (1 = Pigs only/ monoculture, 0 = Other livestock/ multispecies)
Herd size	Herd size [1 = Small (30 pigs and less), 0 = Large (More than 30 pigs)]
Type of breeds kept	Type of pig breeds kept by the farmer (1 = Exotic only, 0 = Indigenous and their crossbreds)
Production system	Production system practiced by the farmer (1 = Intensive, 0 = Extensive/ Semi-intensive)
Location	Location of the farm [1 = Township (on-plot), 0 = Farmland (off-plot)]
Extension services	Framer receiving agricultural extension services (1 = Yes, 0 = No)
Pig production training	Farmer receiving pig production training (1 = Yes, 0 = No)

### 3. RESULTS

#### 3.1. Attributes of the Farmers and Pig Herds

Farmer and herd attributes were reported in a companion study by Mathobela *et al.* (2024b). Briefly, most participants were men, practised Christianity, aged 36-60 years, secondary school graduates, and had more than six years of experience in pig farming. In addition, the majority of the surveyed participants farmed on small, privately owned farms and relied primarily on unpaid family labour and income from the sale of live pigs and pork. Pigs were mainly raised for sale and consumption. In the surveyed suburbs, pig herd sizes ranged between 24 and 36. Participants in the surveyed suburbs also raised chickens, cattle, sheep and goats.

#### 3.2. Pig Weighing Practices

Only 4% of the farmers weighed the pigs, and over 80% used visual body appearance to estimate pig weight, with more respondents from Khayelitsha, Mfuleni, and Penhill ( $\chi^2 = 22.63$ ;  $\phi_c = 0.53$ ;  $P \leq 0.05$ ) than the other suburbs. No differences ( $P > 0.05$ ) were observed in the body weight of mature pigs across the five suburbs (Table 2).

**TABLE 2: Mean ( $\pm$  standard error) for Pig and Pork Marketing Characteristics in Smallholder Farms in the Cape Metropole District, South Africa**

Marketing performance	Eerste River	Khayelitsha	Mfuleni	Penhill	Strand	<i>P</i> value
Pig body weight (kg)	110.0 $\pm$ 28.05	74.0 $\pm$ 7.02	126.3 $\pm$ 25.40	99.0 $\pm$ 13.01	87.5 $\pm$ 22.50	0.754 7
Pig sales per year	33.4 $\pm$ 21.30	7.9 $\pm$ 1.06	13.2 $\pm$ 2.86	38.1 $\pm$ 9.23	7.1 $\pm$ 1.19	0.188 7
Pig slaughtered per year	8.3 $\pm$ 2.19 <sup>ab</sup>	5.8 $\pm$ 1.29 <sup>b</sup>	10.8 $\pm$ 2.05 <sup>ab</sup>	27.8 $\pm$ 14.5 <sup>a</sup>	10.4 $\pm$ 3.97 <sup>ab</sup>	0.035 2
Price of mature pig (R)	2 494 $\pm$ 171	2 623 $\pm$ 218	2 903 $\pm$ 266	2 709 $\pm$ 164	2 229 $\pm$ 149	0.198 0
Price of carcass (R)	2 000 $\pm$ 289 <sup>ab</sup>	2 580 $\pm$ 314 <sup>ab</sup>	3 236 $\pm$ 252 <sup>a</sup>	2 167 $\pm$ 667 <sup>ab</sup>	1 967 $\pm$ 260 <sup>b</sup>	0.037 3
Price of pork cuts (R)	85 $\pm$ 27.2	35 $\pm$ 10.9	93 $\pm$ 29.2	90 $\pm$ 60.0	30 $\pm$ 11.5	0.153 5

Distance to market (km)	9.8 ± 2.27	6.8 ± 3.86	11.8 ± 3.84	17.1 ± 1.41	19.1 ± 4.02	0.0648
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a, b: Least square means in the same row not sharing a common superscript are significantly different ( $P \leq 0.05$ ); kg: kilogram; R: rands; km: kilometre

Farmers who weighed pigs only did so prior to slaughter or selling. The likelihood of using visual weight estimation for pigs decreased ( $P \leq 0.05$ ) by 304, to 327%, with a unit increment in males, youths, Christians, level of education, farming experience, family labour, sources of income, farm size, type of livestock kept, herd size, use of exotic breeds, intensive and on-plot farming, extension services, and training in pig production (Table 3).

**TABLE 3: Socio-economic Factors Influencing Key Pork Marketing Practices Adopted by Smallholder Pig Farmers in the Cape Metropole District, South Africa**

Variable	Margin	Standard Error	t Value	P> t	[95% Conf. Interval]	
<i>Visual weight estimation</i>						
Gender	-3.2658	0.4557	-7.17	<.0001	-4.1589	-2.3727
Age	-3.2581	0.4557	-7.15	<.0001	-4.1513	-2.3649
Religion	-3.2504	0.4558	-7.13	<.0001	-4.1437	-2.3570
Education level	-3.2504	0.4558	-7.13	<.0001	-4.1437	-2.3570
Farming experience	-3.2108	0.4561	-7.04	<.0001	-4.1049	-2.3168
Workforce	-3.2426	0.4559	-7.11	<.0001	-4.1361	-2.3491
Sources of income	-3.2734	0.4556	-7.18	<.0001	-4.1663	-2.3804
Farm size	-3.0350	0.4578	-6.63	<.0001	-3.9323	-2.1376
Type of livestock	-3.2734	0.4556	-7.18	<.0001	-4.1663	-2.3804
Herd size	-3.2734	0.4556	-7.18	<.0001	-4.1663	-2.3804
Type of breeds kept	-3.2581	0.4557	-7.15	<.0001	-4.1513	-2.3649
Production system	-3.2734	0.4556	-7.18	<.0001	-4.1663	-2.3804
Location	-3.2734	0.4556	-7.18	<.0001	-4.1663	-2.3804
Extension services	-3.2504	0.4558	-7.13	<.0001	-4.1437	-2.3570
Pig production training	-3.2658	0.4557	-7.17	<.0001	-4.1589	-2.3727

***Marketing organization membership***

Gender	-1.6848	0.2270	-7.42	<.0001	-2.1298	-1.2398
Age	-1.7292	0.2313	-7.47	<.0001	-2.1827	-1.2758
Religion	-1.7047	0.2318	-7.36	<.0001	-2.1590	-1.2505
Education level	-1.7211	0.2315	-7.44	<.0001	-2.1748	-1.2674
Farming experience	-1.6796	0.2322	-7.23	<.0001	-2.1348	-1.2245
Workforce	-1.7130	0.2316	-7.40	<.0001	-2.1670	-1.2590
Sources of income	-1.6848	0.2270	-7.42	<.0001	-2.1298	-1.2398
Farm size	-1.4837	0.2361	-6.28	<.0001	-1.9465	-1.0208
Type of livestock	-1.6928	0.2269	-7.46	<.0001	-2.1375	-1.2481
Herd size	-1.6928	0.2269	-7.46	<.0001	-2.1375	-1.2481
Type of breeds kept	-1.6767	0.2272	-7.38	<.0001	-2.1219	-1.2314
Production system	-1.6928	0.2269	-7.46	<.0001	-2.1375	-1.2481
Location	-1.6928	0.2269	-7.46	<.0001	-2.1375	-1.2481
Extension services	-1.6767	0.2272	-7.38	<.0001	-2.1219	-1.2314
Pig production training	-1.6848	0.2270	-7.42	<.0001	-2.1298	-1.2398

***Farmgate marketing channel usage***

Gender	1.5686	0.2458	6.38	<.0001	1.0869	2.0504
Age	1.4988	0.2414	6.21	<.0001	1.0257	1.9718
Religion	1.4773	0.2418	6.11	<.0001	1.0033	1.9513
Education level	1.5686	0.2458	6.38	<.0001	1.0869	2.0504
Farming experience	1.6205	0.2580	6.28	<.0001	1.1149	2.1261
Workforce	1.4773	0.2418	6.11	<.0001	1.0033	1.9513
Sources of income	1.5094	0.2411	6.26	<.0001	1.0367	1.9820
Farm size	1.5235	0.2677	5.69	<.0001	0.9989	2.0481
Type of livestock	1.5198	0.2409	6.31	<.0001	1.0477	1.9920
Herd size	1.5198	0.2409	6.31	<.0001	1.0477	1.9920
Type of breeds kept	1.5581	0.2460	6.33	<.0001	1.0760	2.0403
Production system	1.5198	0.2409	6.31	<.0001	1.0477	1.9920
Location	1.5198	0.2409	6.31	<.0001	1.0477	1.9920
Extension services	1.5476	0.2462	6.28	<.0001	1.0649	2.0302

Pig production training	1.5686	0.2458	6.38	<.0001	1.0869	2.0504
<b><i>Seeking financial support</i></b>						
Gender	-2.2882	0.2805	-8.16	<.0001	-2.8379	-1.7384
Age	-2.2809	0.2806	-8.13	<.0001	-2.8309	-1.7310
Religion	-2.2588	0.2809	-8.04	<.0001	-2.8093	-1.7083
Education level	-2.2809	0.2806	-8.13	<.0001	-2.8309	-1.7310
Farming experience	-2.2285	0.2813	-7.92	<.0001	-2.7798	-1.6772
Workforce	-2.2662	0.2808	-8.07	<.0001	-2.8165	-1.7159
Sources of income	-2.2882	0.2805	-8.16	<.0001	-2.8379	-1.7384
Farm size	-2.0523	0.2839	-7.23	<.0001	-2.6087	-1.4958
Type of livestock	-2.2954	0.2804	-8.19	<.0001	-2.8450	-1.7458
Herd size	-2.2954	0.2804	-8.19	<.0001	-2.8450	-1.7458
Type of breeds kept	-2.2809	0.2806	-8.13	<.0001	-2.8309	-1.7310
Production system	-2.2954	0.2804	-8.19	<.0001	-2.8450	-1.7458
Location	-2.2954	0.2804	-8.19	<.0001	-2.8450	-1.7458
Extension services	-2.3550	0.2902	-8.11	<.0001	-2.9238	-1.7862
Pig production training	-2.3695	0.2900	-8.17	<.0001	-2.9380	-1.8011

Poor pig growth rate (54% of respondents) was the most common challenge experienced by the farmers across all five suburbs. To avert this challenge, farmers suggested providing the pigs with supplementary feed (49% of respondents), adequate medicine (9%), minimising inbreeding (9%) and acquiring training on pig husbandry (9%) as solutions. The probability of pig farmers experiencing a slow growth rate in pigs was not influenced ( $P > 0.05$ ) by any of the investigated predictor variables.

### 3.3. Pig Slaughtering Practices

Across the five suburbs, 61% of the farmers slaughtered pigs on-farm, with more respondents ( $\chi^2 = 23.56$ ;  $\phi_c = 0.39$ ;  $P \leq 0.05$ ) coming from Mfuleni compared to the other suburbs. Penhill had a greater ( $P \leq 0.05$ ) number of pigs slaughtered annually than Khayelitsha (Table 2). Porkers (56%), baconers (37%), and weaners (18%) were the most slaughtered pig classes. Sixty percent of the farmers did not experience slaughter-related challenges. The remaining

40% faced several slaughter challenges, including unavailability of slaughtering facilities (13%), high slaughter costs (7%), restraint bars (6%) and stunning equipment (5%), insufficient energy to boil scalding water (5%) and lack of refrigerators for carcass preservation (4%). Most (74%) of the farmers proposed building a proper slaughtering facility as one of the slaughter solutions. However, 5% suggested access to information on recommended slaughter practices, use of offal as a payment method to reduce slaughter costs, selling live pigs only, storage of wood for boiling scalding water in a dry place, and provision of electricity for operating the refrigerator as possible solutions that they could implement to counteract challenges associated with pig slaughter. The likelihood of lacking slaughter facilities decreased ( $P \leq 0.05$ ) by 190 to 215%, with a unit increase in males, youths, Christians, level of education, farming experience, family labour, sources of income, farm size, type of livestock kept, herd size, use of exotic breeds, intensive and on-plot farming, extension services, and training in pig production (Table 4).

**TABLE 4: Socio-economic Factors Influencing Key Pork Marketing Constraints Experienced by Smallholder Pig Farmers in the Cape Metropole District, South Africa**

Variable	Margin	Standard Error	t Value	P> t	[95% Conf. Interval]	
<i>Absence of slaughtering facilities</i>						
Gender	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Age	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Religion	-1.9042	0.4051	-4.70	<.0001	-2.6983	-1.1102
Education level	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Farming experience	-2.1001	0.4325	-4.86	<.0001	-2.9478	-1.2523
Workforce	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Sources of income	-1.9253	0.4046	-4.76	<.0001	-2.7183	-1.1323
Farm size	-2.1518	0.4725	-4.55	<.0001	-3.0778	-1.2257
Type of livestock	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Herd size	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Type of breeds kept	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Production system	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Location	-1.9459	0.4041	-4.82	<.0001	-2.7379	-1.1540
Extension services	-2.0794	0.4330	-4.80	<.0001	-2.9281	-1.2308

Pig production training	-1.9253	0.4046	-4.76	<.0001	-2.7183	-1.1323
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***Shortage of customers***

Gender	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Age	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Religion	-1.7391	0.3007	-5.78	<.0001	-2.3285	-1.1497
Education level	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Farming experience	-1.6977	0.3017	-5.63	<.0001	-2.2890	-1.1065
Workforce	-1.7391	0.3007	-5.78	<.0001	-2.3285	-1.1497
Sources of income	-1.7391	0.3007	-5.78	<.0001	-2.3285	-1.1497
Farm size	-1.9459	0.3563	-5.46	<.0001	-2.6443	-1.2475
Type of livestock	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Herd size	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Type of breeds kept	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Production system	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Location	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637
Extension services	-1.7391	0.3007	-5.78	<.0001	-2.3285	-1.1497
Pig production training	-1.7525	0.3004	-5.83	<.0001	-2.3414	-1.1637

***Difficulties in finding information***

Gender	-1.4078	0.2326	-6.05	<.0001	-1.8637	-0.9519
Age	-1.3545	0.2290	-5.92	<.0001	-1.8033	-0.9058
Religion	-1.3106	0.2300	-5.70	<.0001	-1.7614	-0.8598
Education level	-1.3971	0.2329	-6.00	<.0001	-1.8535	-0.9407
Farming experience	-1.3754	0.2334	-5.89	<.0001	-1.8328	-0.9179
Workforce	-1.3652	0.2287	-5.97	<.0001	-1.8135	-0.9170
Sources of income	-1.3545	0.2290	-5.92	<.0001	-1.8033	-0.9058
Farm size	-1.8659	0.2980	-6.26	<.0001	-2.4500	-1.2817
Type of livestock	-1.3652	0.2287	-5.97	<.0001	-1.8135	-0.9170
Herd size	-1.3652	0.2287	-5.97	<.0001	-1.8135	-0.9170
Type of breeds kept	-1.3545	0.2290	-5.92	<.0001	-1.8033	-0.9058

Production system	-1.3652	0.2287	-5.97	<.0001	-1.8135	-0.9170
Location	-1.3652	0.2287	-5.97	<.0001	-1.8135	-0.9170
Extension services	-1.3437	0.2292	-5.86	<.0001	-1.7930	-0.8945
Pig production training	-1.4078	0.2326	-6.05	<.0001	-1.8637	-0.9519
<b><i>Scarcity of production inputs</i></b>						
Gender	-1.1100	0.2141	-5.18	<.0001	-1.5297	-0.6904
Age	-1.1100	0.2141	-5.18	<.0001	-1.5297	-0.6904
Religion	-1.1585	0.2206	-5.25	<.0001	-1.5909	-0.7261
Education level	-1.0986	0.2144	-5.12	<.0001	-1.5189	-0.6784
Farming experience	-1.1221	0.2176	-5.16	<.0001	-1.5486	-0.6957
Workforce	-1.1213	0.2138	-5.24	<.0001	-1.5404	-0.7023
Sources of income	-1.1100	0.2141	-5.18	<.0001	-1.5297	-0.6904
Farm size	-0.9527	0.2265	-4.21	<.0001	-1.3967	-0.5086
Type of livestock	-1.1213	0.2138	-5.24	<.0001	-1.5404	-0.7023
Herd size	-1.1213	0.2138	-5.24	<.0001	-1.5404	-0.7023
Type of breeds kept	-1.1100	0.2141	-5.18	<.0001	-1.5297	-0.6904
Production system	-1.1213	0.2138	-5.24	<.0001	-1.5404	-0.7023
Location	-1.1213	0.2138	-5.24	<.0001	-1.5404	-0.7023
Extension services	-1.1451	0.2170	-5.28	<.0001	-1.5704	-0.7199
Pig production training	-1.1100	0.2141	-5.18	<.0001	-1.5297	-0.6904

### 3.4. Pig and Pork Marketing Practices

Across all five suburbs, income was primarily generated by selling live pigs (52% of respondents), carcasses (18%), or a combination of both (29%). Eerste River had more ( $\chi^2 = 34.03$ ;  $\phi_c = 0.34$ ;  $P \leq 0.05$ ) respondents who sold live pigs than the other suburbs. There were no differences ( $P > 0.05$ ) in annual pig sales, price of mature live pigs, retail cuts, and distance to the market across the five suburbs (Table 2). However, Mfuleni had higher ( $P \leq 0.05$ ) prices for whole/half carcasses than Strand (Table 2). The likelihood of pig farmers selling live pigs was not influenced ( $P > 0.05$ ) by any of the investigated predictor variables. About two-thirds of farmers sold whole carcasses and retail cuts of pork. The class of pigs commonly sold were porkers (56% of respondents), baconers (40%), and weaners (35%). Pigs were mainly sold to

the local community (73% of respondents), with Khayelitsha having more ( $\chi^2 = 37.75$ ;  $\phi_c = 0.34$ ;  $P \leq 0.05$ ) sales than the other suburbs. Only 18% and 6% of the pigs were sold to informal traders and family members, respectively. A total of 54% of pigs were transported to the market in small trucks and 13% by trailers. The transport was arranged either by the buyers (69% of respondents), farmers (28%), or middlemen (3%). About 85% of the farmers belonged to a marketing organisation that largely provided information on pig production (55% of respondents), neighbourhood watch (14%), pig sales (9%), and access to land (9%). Farmers who did not participate in any organisations cited lack of representation (36%), provision of inadequate information (20%), and perceived no value in joining (19%) as the main reasons. The probability of a farmer to be a member of a marketing organisation decreased ( $P \leq 0.05$ ) by 148 to 173%, with a unit rise in males, youths, Christians, level of education, farming experience, family labour, sources of income, farm size, type of livestock kept, herd size, use of exotic breeds, intensive and on-plot farming, extension services, and training in pig production (Table 3).

Farmgate (82% of respondents) was the dominant marketing channel used by the farmers, followed by the use of middlemen (9%), abattoirs (8%), and auctions (3%). Farmgate markets were primarily used due to convenience (71% of respondents), the lack of alternatives (9%), and limited funds (9%). The likelihood of farmers to adopt the farmgate marketing channel increased ( $P \leq 0.05$ ) by 148 to 162%, with a unit increment in males, youths, Christians, level of education, farming experience, family labour, sources of income, farm size, type of livestock kept, herd size, use of exotic breeds, intensive and on-plot farming, extension services, and training in pig production (Table 3). Farmers who opted to work with middlemen for marketing purposes did so based on network referrals (57% of respondents) or convenience (43%). Four-fifths of the farmers used the formal market for convenience, while 13% and 7% benefited from better management and competitive prices for the product, respectively. Most farmers (79% of respondents) preferred to sell their pigs throughout the year, whereas 8% and 13% sold pigs in the wet and dry seasons, respectively. A large flock size (67% of respondents) and regular cash flow (20%) were the main reasons why farmers preferred to sell pigs all year round. Two-fifths of farmers did not encounter pork marketing challenges. However, some farmers reported a lack of clientele (15%), absence of formal markets (9%), non-payments from clients who purchase on credit (7%), negative perceptions of pork healthfulness (7%), limited marketing exposure (6%), inadequate marketing tools (6%) and unreliable markets (5%) as other challenges. Farmers offered a variety of marketing solutions including marketing training

(23%), access to formal markets (15%), assistance in advertising (13%), producing high-quality pigs (10%), using reliable markets (5%), selling pigs or pork for cash (5%), maintaining stable selling prices (5%) and growing herd size (5%). The probability of farmers experiencing customer shortage decreased ( $P \leq 0.05$ ) by 170 to 195%, with a unit increase in males, youths, Christians, level of education, farming experience, family labour, sources of income, farm size, type of livestock kept, herd size, use of exotic breeds, intensive and on-plot farming, extension services, and training in pig production (Table 4).

### **3.5. Agricultural Support Services**

An overview of the extension and veterinary services received by smallholder pig farmers in the Cape Metropole District, South Africa, is presented in Table 5. Two-fifths of the farmers received information about pig marketing from the other farmers, while 17% accessed it from social media, 13% from customers, and 10% from elders. Only 18% of the farmers received extension services, and 82% of these services came from government departments. Mfuleni had more ( $\chi^2 = 16.75$ ;  $\phi_c = 0.33$ ;  $P \leq 0.05$ ) respondents who received extension services than other suburbs. The extension services were provided to nearly 40% of the farmers on a need-to-know basis, while the rest received the services on either a quarterly (30%) or annual basis (17%). Only 28% of the farmers received veterinary care, with more respondents ( $\chi^2 = 26.63$ ;  $\phi_c = 0.42$ ;  $P \leq 0.05$ ) coming from Penhill than from the other suburbs. The government provided nearly three-quarters of the veterinary services, with Khayelitsha receiving more ( $\chi^2 = 15.97$ ;  $\phi_c = 0.43$ ;  $P \leq 0.05$ ) services compared to other suburbs. The frequency of farmers receiving veterinary services was mainly quarterly (41%) or as needed (34%).

**TABLE 5: Extension and Veterinary Services Received by Smallholder Pig Farmers in the Cape Metropole District, South Africa**

Data variable	Class	Eerste River (%)	Khayelitsha (%)	Mfuleni (%)	Penhill (%)	Strand (%)	Total (%)	$\phi_c$	$\chi^2$	P value
<i>Extension and advisory services</i>										
Receiving extension services?	Yes	25.0	2.8	39.3	14.3	10.7	17.8	0.3319	16.7445	0.0022
	No	75.0	97.2	60.7	85.7	89.3	82.2			
<i>Veterinary services</i>										
Receiving veterinary services?	Yes	42.4	5.6	37.9	50.0	7.1	27.9	0.4158	26.6291	<.0001
	No	57.6	94.4	62.1	50.0	92.9	72.1			
Veterinary services sector	Government	84.6	100	90.9	64.3	0	74.4	0.4309	15.9703	0.0428
	Private	7.7	0	9.1	28.6	100	20.9			
	NGO	7.7	0	0	7.1	0	4.7			
<i>Training services</i>										
Receiving training services?	Yes	37.5	13.9	37.9	28.6	0	23.4	0.3426	18.0717	0.0012
	No	62.5	86.1	62.1	71.4	100	76.6			

$\phi_c$ : Cramer's V;  $\chi^2$ : Chi-square

One-fifth of the farmers in each of the five surveyed suburbs acquired training services, with government officials providing 74% of them (Table 5). Eerste River and Mfuleni had more respondents ( $\chi^2 = 18.07$ ;  $\phi_c = 0.34$ ;  $P \leq 0.05$ ) who received training services than other suburbs. Two-fifths of the farmers received need-based training when necessary, while one-third received training on an annual basis. According to respondents, the training received covered the pig value chain (36% of respondents), pig production (27%), and animal health (15%), with Eerste River having the highest number of respondents who received training ( $\chi^2 = 44.57$ ;  $\phi_c = 0.67$ ;  $P \leq 0.05$ ). Only 9% of the farmers received financial support once, and the support was mainly from the government (83%). The probability of seeking financial support decreased ( $P \leq 0.05$ ) by 205 to 237%, with a unit rise in males, youths, Christians, level of education, farming experience, family labour, sources of income, farm size, type of livestock kept, herd size, use of exotic breeds, intensive and on-plot farming, extension services, and training in pig production (Table 3).

Farmers across all five suburbs reported experiencing a scarcity of production inputs (25%), limited access to information on pig production and marketing (20%), lack of service delivery (18%), not receiving feedback after farm visits from extension officers (6%), farming on illegal communal land (5%), lack of training and advice (4%) and no farm visits by extension officers (3%). According to the farmers, possible solutions proposed included the provision of production inputs (30%), delivering need-based training (23%), advocating for more site visits by extension officials (15%), establishing proper communication channels (15%), employing more government extension personnel (6%) and acquiring title deeds to land (4%). The likelihood of encountering difficulties in finding information and scarcity of production inputs decreased ( $P \leq 0.05$ ) by 131 to 187% and 100 to 120%, respectively, with a unit rise in males, youths, Christians, level of education, farming experience, family labour, sources of income, farm size, type of livestock kept, herd size, use of exotic breeds, intensive and on-plot farming, extension services, and training in pig production (Table 4).

#### 4. DISCUSSION

The information obtained from this study provides insight into the pig marketing practices and agricultural support services adopted by urban smallholder pig farmers, as well as the accompanying challenges in the Cape Metropole District, South Africa. In agreement with the current study, most smallholder pig farmers used visual appraisal to determine the weight of

pigs before slaughter and sale (Berihu & Tamir, 2016; Mulindwa *et al.*, 2016; Mutua *et al.*, 2020). As a result, farmers are often exploited by buyers who undervalue and underpay for their pigs (Mugonya *et al.*, 2021; Mulindwa *et al.*, 2016; Ouma *et al.*, 2015). The use of the visual weight estimation method could be related to the unavailability of farm resources such as weighing scales, which are costly (Kimbi *et al.*, 2016). Due to its drawbacks, the visual weight estimation method offers a more suitable alternative, providing a comparatively precise, reliable, and affordable method for estimating the live weight of pigs for resource-limited farmers (Kabululu, 2023). The decline in farmers' probability of visually estimating pig weight, given a unit increase in farming experience, education level, extension services, and production training, was expected. This could be explained by the fact that resourceful and knowledgeable farmers often utilise technology, which may include weighing scales, rather than the visual weight estimation method. The decrease in the likelihood of using the visual weight estimation method among more educated farmers agrees with Mulindwa *et al.* (2016), who reported that knowledge and information on pig husbandry positively influence farmers' ability to weigh their pigs.

The majority of respondents in the survey practised on-farm pig slaughtering, confirming earlier reports by Qekwana and Oguttu (2014). The decreased likelihood of lacking slaughtering facilities, with a unit increase in the number of Christians, could be attributed to Christianity's humane animal welfare practices (Adam *et al.*, 2019). The decline in the probability of not having slaughter facilities, with a unit increase in males, could be related to the observation that men have greater access to resources and are frequently in charge of tasks requiring strength, expertise, and abilities such as slaughtering. At the same time, women have limited access to resources and are primarily responsible for mundane household tasks (Nguyen-Thi-Duong *et al.*, 2022). The observed positive influence of extension services and training on ownership of slaughtering facilities may have been attributed to farmers being more knowledgeable about on-farm informal pig slaughter, meat safety regulations, and inappropriate meat handling that can pose a health risk to customers (Dietze, 2011; Mutua *et al.*, 2020). Additionally, farmers who sell slaughtered pigs typically pay substantial transaction expenses, including expensive fees for slaughter, cold storage and transportation (Antwi & Seahlodi, 2011).

Farmers sold live pigs more frequently than carcasses or meat, confirming previous findings by Shongwe *et al.* (2020), who reported that 68% of farmers sold live pigs, while 57%

slaughtered for household consumption. The high sales of live pigs may be attributed to several factors, primarily driven by farmers' preference due to convenience or the absence of slaughter facilities among smallholder farmers (Atherstone *et al.*, 2019; Mathobela *et al.*, 2024a, 2025; Ndwandwe & Weng, 2018). To ensure the efficient marketing of pork, the provision of low-cost slaughterhouses or mobile abattoirs, along with information about formal markets, is recommended (Atherstone *et al.*, 2019; Ndwandwe & Weng, 2018). Despite a high number of live pig sales, socio-economic factors had no influence on the mode of sale. This study found that price differentials between suburbs may be linked to a lack of market information, differences in pig live weight estimation skills and price bargaining power among urban smallholder pig farmers (Le *et al.*, 2016).

Informal slaughter without proper meat inspection was a common practice among urban smallholder pig farmers. Such a practice poses health risks to consumers (Mutua *et al.*, 2020). As a result, this could lower pork sales from the informal market and reduce profit for the urban smallholder pig producers (Dietze, 2011). The influence of age on the shortage of customers agrees with the study by Madzimure *et al.* (2014), who reported that young farmers (<30 years) had better chances of selling pigs than older farmers. The age of pig farmers is directly related to their condition as human resources, who manage the day-to-day production and marketing of pigs, and have a direct impact on working productivity (Ajala & Adesehinwa, 2008; Manese *et al.*, 2016).

Regarding education and training, similar findings were reported where farmers with more knowledge of pig husbandry and marketing practices sold more pigs than those without such knowledge (Madzimure *et al.*, 2014). Educated farmers with access to updated market information possess stronger market networking, negotiating power, and enterprise management skills, and are more likely to adopt new technological advances in farming, thereby increasing their market access (Tilahun *et al.*, 2023). The finding that herd size positively influences the customer base aligns with the study by Antwi and Seahlodi (2011), who reported that smallholder pig farmers who produce on a reasonably large and effective scale have access to high-value markets and higher profit margins. Additionally, they may utilise crossbreeding systems to expand the breeding herd, as this strategy has been proven beneficial for commercial pork producers.

The shortage of customers experienced by the pig farmers in the current study is not surprising. It is possible that some people in the community may not accept pigs due to cultural, spiritual,

and religious reasons (Weka *et al.*, 2021). Additionally, some individuals refrain from consuming pork due to financial constraints and personal taste preferences (Roesel *et al.*, 2019). Some consumers perceive pork as being less healthy and more oily than beef and lamb, which is contrary to its high proportion of health-beneficial polyunsaturated fatty acids (Roesel *et al.*, 2019).

The finding that non-membership in farmers' associations or organisations is one of the major constraints faced by urban smallholder pig farmers concurs with previous reports (Kirima *et al.*, 2017). The active participation of farmers in agribusiness associations serves as a source of empowerment, facilitating access to the market and the sharing of technical knowledge and information (Mugonya *et al.*, 2021; Nwachukwu & Udegbonam, 2020; Ouma *et al.*, 2015). In this regard, farmers have been recommended to leverage the opportunities offered by such agribusiness organisations to enhance production efficiency, herd size, value-added, and market share (Ndwandwe & Weng, 2018).

The finding that socio-economic factors influence the likelihood of farmers having a marketing organisation has been reported previously (Dietze, 2011; Ouma *et al.*, 2015). Gender had an influence on market organisation in the current study, and the dominance of men reduced the likelihood of farmers adopting such associations. The decrease in the likelihood of men's affiliation with farmer organisations can be attributed to the gender-sensitive and women's empowerment policies of urban farmers' organisations, which specifically target women (Ouma *et al.*, 2015). However, it has also been observed that women in the pig farming sector tend to frequently face social obstacles that limit their ability to take the lead in marketing sectors (Dietze, 2011). Regarding knowledge transfer, some marketing programmes are based on membership, and smallholder farmers who do not operate in organised groups seldom receive agricultural advisory services (Tatwangire, 2013). This explains the effect of extension services on adopting marketing organisation in the current study. Thus, farmers operating in isolation and who have limited exposure to extension services tend to inadvertently limit their production performance due to the difficulties of collectively sourcing funding, accessing markets, and controlling market prices (Ndwandwe & Weng, 2018).

The identification of farmgate and middlemen as the dominant marketing channels used by the farmers agrees with previous research (Abu *et al.*, 2016; Berihu & Tamir, 2015; Levy *et al.*, 2013). On the one hand, although farmgate sales are less remunerative, they are convenient, reduce transportation costs, and mitigate stress-related losses in pigs (Berihu & Tamir, 2015).

On the other hand, sales through middlemen play a crucial role by linking farmers to end markets, reducing the costs and risks associated with maintaining a market, and often offering better prices (Mutua *et al.*, 2020). However, middlemen can take a large share of the profits in the value chain, thereby limiting smallholder farmers' opportunities for upgrading (Abebe *et al.*, 2016).

The influence of education level, training, and extension services on pig and pork marketing channels was expected. The less knowledgeable and informed smallholder pig farmers often lack animal husbandry skills and the ability to network, resulting in struggles with increasing production and securing reliable markets (Madzimore *et al.*, 2014). Similarly, location influenced farmers' adoption of the market channel, with on-plot farmgate sales being the preferred choice over off-plot sales. This is because on-plot farmers are located near urban areas, away from farmlands, which renders their pig sales easily accessible (Madzimore *et al.*, 2014). Besides these factors, breed choice also influenced pig production, with farmers having a higher preference for exotic breeds due to their larger body size and faster growth rates compared to indigenous breeds (Ouma *et al.*, 2015). As expected, farmers who rear exotic breeds had greater sales and marketing options. Thus, even though some farmers raised and valued indigenous breeds for their meat in the current study, no effort had been made to improve the local breeds into the niche market due to their small body size, slow growth rate and perceivably inferior carcass quality (Halimani *et al.*, 2010; Madzimore *et al.*, 2014).

The lack of agricultural support services, including access to extension, training, agribusiness, and financial services reported in the present survey corresponds with previous reports (Atherstone *et al.*, 2019; Nwachukwu & Udegbonam, 2020). The lack of agricultural support services may result in inadequate information, poor skill development, and ineffective farm management (Nwachukwu & Udegbonam, 2020). Most of the agricultural support services in the surveyed areas were provided by government-affiliated organisations; however, challenges remain concerning the capacity of the personnel responsible for disseminating these services. Therefore, training government extension officers on how to disseminate knowledge to farmers could improve the production capacity and market access of urban smallholder pig farmers (Mathobela *et al.*, 2024a; Ndwandwe & Weng, 2018). Financing is a critical barrier for urban smallholder farmers to transform into market-oriented production (Dietze, 2011). Smallholder farmers are often overlooked by financial institutions because they lack the collateral to secure loans or other forms of financial support. Additionally, cultural barriers among farmers

influence their reluctance to acquire loans (Okello *et al.*, 2021). Therefore, it is essential for governments, donors, and other development actors to develop innovative models that provide a comprehensive package of inputs, support, and financing for urban smallholder pig farmers (Okello *et al.*, 2021).

All the investigated socio-economic factors influenced the provision of financial support, but sources of income and herd size were the most prominent. The influence of income source and herd size on the provision of financial support was expected, as smallholder farmers with multiple income sources tend to maintain large herd sizes because they can afford the necessary production inputs (Dietze, 2011). Key production inputs in pig farming (i.e., feed, medicines and slaughter equipment) are costly but essential for efficient pig production and marketing (Dietze, 2011), warranting government support. It was not surprising that pig farmers with small herd sizes, due to a lack of finance, were unable to restructure their production into a market-driven model.

## **5. CONCLUSIONS AND RECOMMENDATIONS**

The main challenges faced by urban smallholder farmers in the studied low-income suburbs were slow pig growth rates, scarcity of production inputs, and difficulties in accessing marketing information. The use of the farmgate marketing channel and sales of live pigs were the key sustainable marketing practices adopted by smallholder pig farmers in the surveyed areas. The likelihood of farmers to encounter marketing challenges and not to adopt sustainable marketing practices was high among the women, older, African traditional religion adherents, and those with less farming experience, education, training, and access to extension services, as well as those that relied on paid labour and on only one source of income, farmed extensively and off-plot, owned small farms, one livestock type, indigenous breeds, and small pig herds. Considering these farmers' socio-economic factors can guide the creation of effective pig marketing strategies, ultimately increasing market access and the sustainability of small urban pig farming enterprises in developing countries. To ensure consistency of supply and sustainable access to high-value markets, urban smallholder farmers are encouraged to network with key value chain actors, identify markets and understand their specifications prior to production.

## 6. ACKNOWLEDGEMENTS

The authors would like to express their appreciation to the smallholder pig farmers in the Cape Metropole District and officials from the Western Cape Department of Agriculture for their participation in this study. Special thanks are due to the Technology Innovation Agency (TIA), acting through the Red Meat Industry Research Association, the South African Pork Producers' Organisation (SAPPO), Stellenbosch University's Social Impact Division, and the National Research Foundation (NRF) for their financial support.

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