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PROFITABILITY AND MARKET PERFORMANCE OF SMALLHOLDER POTATO ENTERPRISES IN THE EASTERN CAPE PROVINCE, SOUTH AFRICA

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ABSTRACT

Potato (*Solanum tuberosum*) is one of the major staple crops and cash crops in sub-Saharan Africa. Its reputation continues to rise due to the increase in human population and the demand for potatoes is predictable. Potato-produce has a good market reputation and is the major source of household income in developing countries, especially South Africa. However, the increase in potato enterprise comes with its share of challenges that need to be addressed. Smallholder farmers in South Africa are still facing challenges in accessing and participating in lucrative and agro-food value chains, hence their farm returns are very low. There are very few research studies that have assessed the profitability and market performance of potato enterprises. Therefore, this study aimed to investigate the profitability of smallholder potato enterprises in the Eastern Cape Province. A multi-stage sampling procedure was employed to select 160 potato farmers. Primary data were collected using a structured questionnaire. Descriptive statistics, gross margin analysis, benefit-cost ratio and marketing margin analysis were used to analyze the data. The study results reveal that the potato enterprise is profitable and contributes to farmers' well-being. Farmers and sellers determined the price of potatoes. The reason for this market conduct is due to the weak characterization of smallholder farming. Performance analysis established that the total gross marketing and profit margins were highest when farmers sold potatoes to consumers and the lowest when farmers sold to middlemen and retailers. The study recommends that policymakers and government invest in improving infrastructure and educational training of farmers in terms of marketing and taking farming as agribusiness. The study further recommends that policymakers and farm organizations must strengthen institutions that take reliable and timely market information; established potato markets close to the farmers, especially those residing in rural areas. There must be a partnership established between research institutes and universities so that they constantly contribute by releasing high-yielding and disease-resistant varieties to advance the production and productivity of the vegetable sector. The study suggests that there is a need for government involvement to create strong market relations between farmers and consumers and to give suitable training to agricultural extension agents.

Key words: Eastern Cape, Food security, Gross margin, Potato enterprise

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INTRODUCTION

African countries still face challenges of high unemployment rate, food insecurity and poverty, and ways of addressing those [1]. However, agriculture is a key sector in the development of African economies, contributing a significant portion to the national gross domestic product (GDP) and employing over 75% of the population [2]. This means that the general economic growth of the African countries also depends on the success of the agricultural sector [3]. However, this agricultural sector is in the hands of mainly small-scale farmers who still use traditional methods and rudimentary tools of production, resulting in unsustainably low crop yields, despite their high commercial and export potential. Also, smallholder farmers in South Africa still face challenges in accessing lucrative markets and hence get lower returns [4, 5]. Literature suggests that smallholder farmers have the ability to boost the economic growth as they can generate more profit margin when they sell in local markets as compared to selling to middlemen [6]. Due to financial constraints, lack of inputs and poor storage facilities and the low prices used at local markets for many smallholder famers, small-scale farming's contribution to the economic growth is limited or halted [6]. According to Singh *et al.* [7], smallholder farmers are not profitable, wherein they require financial assistance to improve their productivity, and marketability, and hence improve their returns.

Moreover, lack of capital, high cost of transportation and low market returns are the factors constraining smallholder farmers producing Irish potato in marketing and profitability [8]. For better and higher returns to be realised, market information, proper marketing strategies and market access are considered important. Lack of market information which can lead to the poor market choice, is one of the factors which negatively affects access to markets and profitability [9-10]. A study by Ddamulira *et al.* [11] further revealed that despite an increase in production and prices, few smallholders participate in markets, which further highlight an urgent need to assist smallholder farmers to access to the markets. Also, a drastic increase of human population puts high pressure on the static land and other limited resources. This is further aggravated by the impacts of climate change which occurs due to the misuse of manmade and natural resources.

Therefore, to meet the challenges of poverty and rural income improvement, the rural agricultural system needs to be transformed from a subsistence production system into more commercialized agriculture. A 2013 survey by Jayne *et al.* [13] stated that the improvement of smallholder farming into a commercialized farming system results in a decline in food prices due to the increased competition and

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reduced cost of food marketing and processing. Also, studies by Adenew [14] and Szűcs *et al.* [15] indicated that agriculture plays a significant role in household income and food security.

Agriculture is considered the most robust balance key component in bringing together the economic development of any country in the world. It is an important sector of any country's global economy as it contributes mainly to its gross domestic product (GDP) [16, 17]. Most importantly, the food security of any country largely depends on the level of its state and its development [18]. The majority of developing countries, including South Africa, directly and indirectly, depend on agricultural products for survival [19]. Crop production within agriculture has been the most significant point of entry for resource-poor and low-skilled households [20]. As a result, most developing countries take advantage of prioritizing crop production for food consumption and household income. In most developing countries, crop production, mainly potato and other vegetables, are produced by smallholder farmers to improve their livelihoods. The literature argues that crop production has great potential and stands a significant chance to gain considerable returns of income from potato enterprises [1]. Potato is also known for its nutritious value and has a great potential to even create employment for rural people and those not directly involved in crop production, and potentially improve food security among the rural poor in South Africa in general [1].

Potato (*Solanum tuberosum*) is known as a tuber crop and is an essential commodity to the smallholder sector [21]. These farmers usually grow potatoes as a supplement staple food commodity which adds to the household economy by increasing the income. However, potatoes are widely grown by smallholder farmers to achieve food security and enhance family income by South Africans in the Eastern Cape Province. But still, it is proven that the production market in smallholder farmers is very weak [3]. On the other hand, the wholesalers make the highest net margin as they relatively charge a higher price using their market power [22]. In this regard, smallholder farmers are forced to obtain a lower share of the profit margin from selling their produce.

Potato farming enterprises have been widely recommended as sustainable livelihood strategies that play an imperative role as a cash and consumption crop to households, improving household income and food security [21]. Also, demand for potatoes continues to grow worldwide. Potato is a valuable cash crop for millions of farmers [21]. Local production costs usually determine potato prices. Agricultural production policy decisions in South Africa are constrained by a lack of information on the related profitability of different crops.

The literature that shows the profitability of potato production and the market performance of smallholder producers in the Eastern Cape Province of South Africa is still rare. The analysis of crop production profitability and market performance is of paramount importance for the decision-making in agricultural and policy analysis. The study answered the following questions: 1) What are the main constraints that the smallholder potato farmers encounter in the area? 2) How profitable is potato production in the area? 3) What is the structure of the potato market in the area? 4) Who gets more benefits within the potato market channel?

Increased potato productivity will play a buffer role to the increasing food prices, thus enhancing household income in developing countries. In this regard, the production of potatoes has a great food security potential in the district. Farmers chose to increase the production and marketing of these enterprises, among others, based on the crop's potential in the study area [23]. However, given the mounting pressure on land, sustaining higher growth rates in agriculture production requires substantial improvements in factor productivity. Consequently, transforming production structure (mostly subsistence-based) to more commercially oriented production will be vital in sustaining growth. In an economy where resources are scarce and opportunities for new technologies are limited, efficiency studies will show that it is possible to raise productivity by improving efficiency without raising the resource base or developing new technology [24].

Potato (*Solanum tuberosum L.)* is produced for home consumption and sale by smallholder farmers in the Wolaita zone, southern Ethiopia [25]. Potato has already been considered a specialty crop in Ethiopia due to its role in improving the food security of the nation. However, its low productivity in the areas is attributed to the current practices of its production without appropriate nutrient management practices [26], and lack of high-yielding varietal options [27]. Therefore, this study intended to investigate the profitability and market performance of smallholder potato enterprises in the Eastern Cape Province using different frameworks and econometric models to analyze.

Conceptual framework

Potato is an imperative vegetable with high yields all over the world, especially in sub-Saharan Africa. In Africa, potato production and consumption are growing daily as people see it as easy to farm as it requires less work and water availability than other vegetables. This vegetable is becoming more dominant in rural areas as smallholder farmers are generating many returns due to high output. Various studies done by Hailu [28], Tolno *et al.* [29] and Tegegne [30] presented the potential of this vegetable crop and further showed that it is profitable. Potato is a fragile commodity; as a result, the lack of storage facilities makes it less expensive during the crop season, which negatively affects farmers. The study investigates

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the profitability and market performance of potato enterprises. To achieve the objective of this study, it is significant to understand market channels as this is the first step towards achieving profitability and market performance of farmers. Figure1 below demonstrates the conceptual framework of potato enterprise.

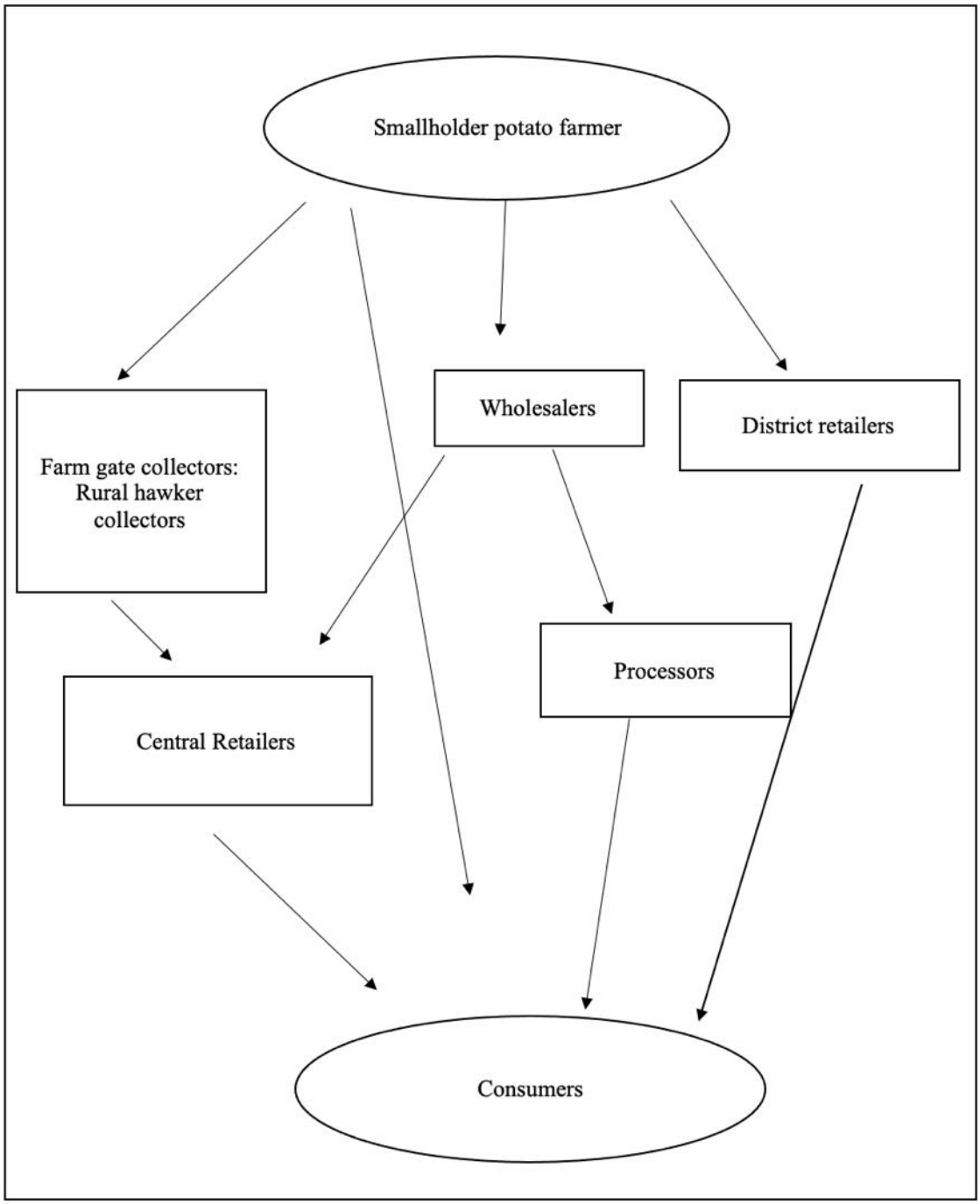

Figure 1: Potato marketing channel [31]

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Potato enterprise has various marketing channels available which a farmer can select the best from in selling their potato produce. The conceptual framework of the potato enterprise value chain is viewed as a network of horizontal and vertically unified value chain actors that are jointly designed to provide products to a market. The value chain actors involved all the stages as early as the production stage until the last actor in the consumer stage.

According to Schipmann [32], the first stage and actor start during the production process, starting at the input supply. Later on, covers production, processing, and marketing and ends with the consumption of a particular product. The value chain is seen as the easy one on paper, yet it is the hard one that requires a particular skill to improve farm returns and the performance of farmers in terms of markets. The production stage involves farmers and input suppliers until the product is ready to be sold. For the sake of this study, researchers intend not to spend much time on it as the main focus is from the farmer to the market and consumers. The second part of a value chain, the interactions between the single stages, is the relationships and contractual linkages that regulate the way the goods are exchanged between different stages and are decisive for the overall character of the chain. The third stage is the most critical stage of the value chain as it involves various marketing channels available for each farmer. These stages lead to the governance structure of a chain that can be seen as a soft skill [33].

For this study, a farmer is faced with choosing between farm gate channel (where you sell to people locally, hawkers, and rural collectors), wholesalers, and retailers (they purchase in bulk or have contractual agreements but mostly are price setters) marketing channels. After purchasing from the farmer (producer of the vegetable commodity), the wholesalers send the product to processors for various processing stages such as potato chips and other products before sending it to the last stage, which is the consumer. The rural collectors who buy at the farm gate sell the produce to both retailers and wholesalers to generate some profit rather than selling straight to consumers. The last stage involves consumers as all other actors sell their final product to consumers to generate returns. As much as producers have an option of selling straight to farmers, they opt to sell to other actors (rural collectors, wholesalers, and retailers) as these stages are more lucrative and profitable than selling straight to consumers. The above conceptual framework allows farmers to expand the market system as it enables them to diversify and explore various marketing channel choices to reduce the risks, uncertainties, and inefficiencies.

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MATERIALS AND METHODS

Study area

This was conducted in the Eastern Cape (EC), which comprises Ciskei and Transkei's former homelands. Eastern Cape Province (ECP) is the second-largest province in South Africa in land size after Northern Cape, covering 13.9 % of South Africa`s area. Also, it is considered one of the two second poorest provinces in South Africa (Limpopo being the second province) [33, 34]. It consists of six district municipalities, namely, O.R Tambo, Chris Hani, Amathole, Alfred Nzo, Cacadu and Ukhahlamba, with two metropolitan areas, including Nelson Mandela Bay and Buffalo City and Bisho as a provincial capital [34]. According to South Africa Eastern Cape Development Corporation (ECDC), Eastern Cape has the third-largest population with an estimated population of approximately 6 829 958 with most of the provincial population speaking the isiXhosa language [35]. According to ECDC [35] and Naicker *et al.* [36], most people in the province largely depend on the land, its natural resources and agricultural livelihood strategies, including the production of potatoes to supplement their household needs. This trend does not seem to change even now [37]. The study focused on four district municipalities within the province: OR Tambo, Alfred Nzo, Joe Gqabi, and Amatole. According to Naicker *et al.* [36] and Mdoda and Obi [38], these four district municipalities are among the districts that are affected by poverty and food insecurity shocks within the province. These district municipalities are noted to be dominant and active in potato production. This translate that households engage in potato production to improve their livelihoods Hence, these four district municipalities were chosen for the study. Figure 2 below shows the map of the Eastern Cape Province.

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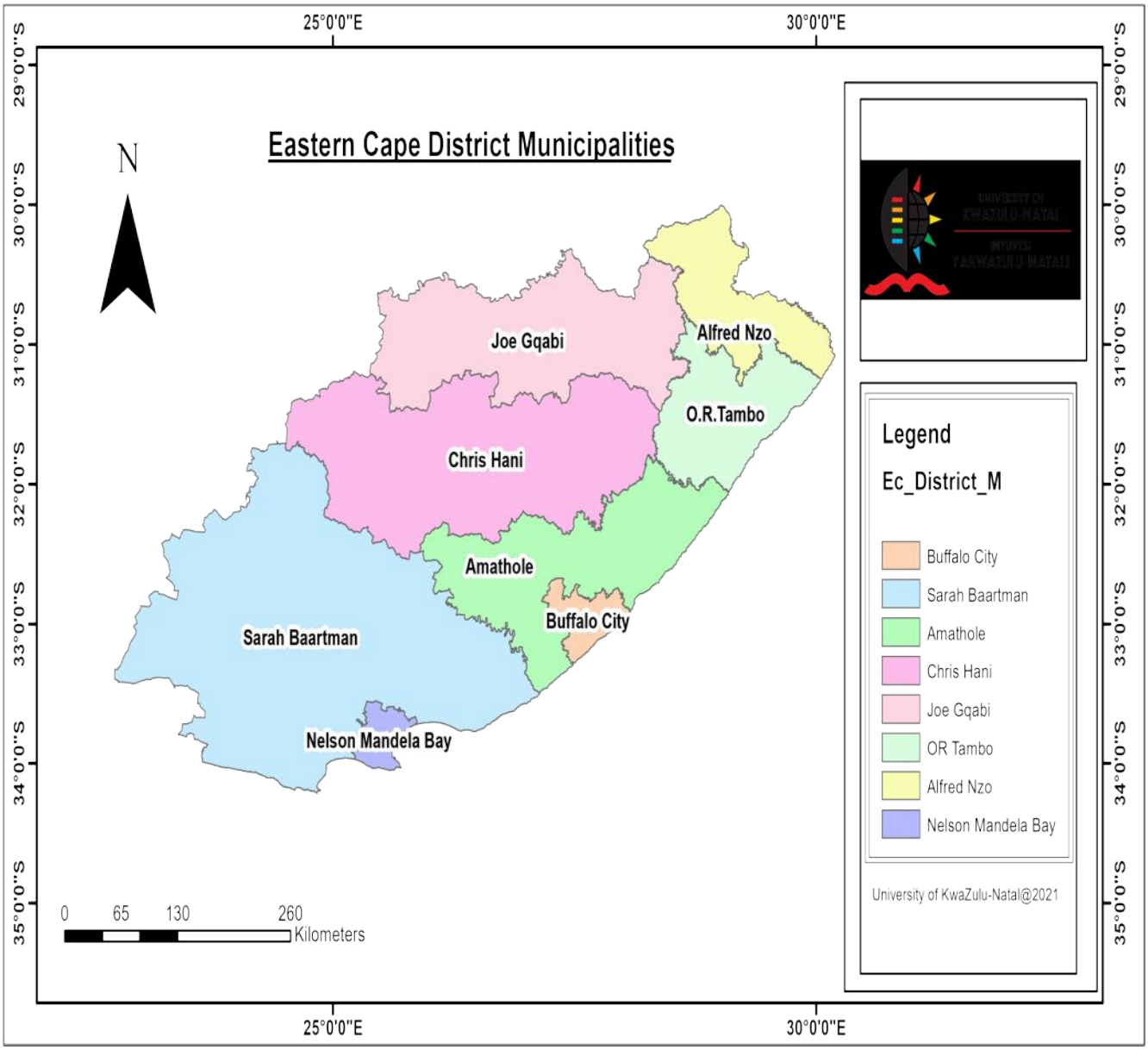

Figure 2: Map of Eastern Cape Province

Sampling procedure, frame and sample size

The approach of this paper is an inquiry that involves the use of a descriptive approach. This study adopted a cross-section research design to capture detailed information regarding the economic assessment of smallholder potato enterprise production for profit and viability. The data were collected on several variables, such as demographics and household socio-economic factors, their marketing and performance and challenges faced.

The study made use of a multi-stage sampling procedure. The multi-stage was used because it allows the researcher to sub-divide the study area into segments,

allowing the large sample to be pooled. The first stage of the multi-stage was to select the district municipalities in the province where the study was conducted, producers of vegetables, especially potatoes. The district municipalities were O.R Tambo district, Alfred Nzo district, Joe Gqabi district and Amathole. These were selected because their climate conditions favour vegetable production, and there is water availability for irrigation purposes as there are irrigation schemes situated in these districts. The second stage involved selecting two local municipalities and villages where these farmers were situated and produced vegetables. Within these four district municipalities, eight local municipalities and 16 villages were considered in this study. The last stage was selecting farmers randomly to make up the sample size of 130 smallholder farmers. The unit of analysis was smallholder potato farmers. The list of smallholder vegetable farmers obtained from Farm organization and Department was used as a sampling frame and was obtained from extension officers working in these areas.

Data collection

A semi-structured questionnaire was administered during single-visit interviews with respondents and was used as the primary data collection tool using the home language, IsiXhosa. Questionnaires were arranged and administered on a farmer-to-farmer basis. The questionnaire was pretested before it was finalized. Pretesting was done to improve the questionnaire and check on essential aspects such as the time taken to complete the questionnaire and the suitability and appropriateness of the questions. Time considerations were imperative in the questionnaire administration, given the level of farmer exhaustion in the study area. Pretesting was done in the same community with a few farmers who did not participate in the main survey. Data collection was conducted by five well-trained enumerators in the Local Municipalities chosen.

Data were collected from individuals or respondents in the sample by using interviewer-administered structured questionnaires. The interviewer read questions to respondents, and their answers were recorded. The questionnaire comprised closed and open-ended questions. Questionnaires were interviewer-administered to alleviate the problem of misinterpretation or misunderstanding of words or questions by respondents. Most of the questions were structured as closed-ended questions to obtain information from respondents for the easy coding of responses.

Data analysis

The study used three sets of data analysis, namely descriptive statistics, gross margin function, and marketing margin analysis. Descriptive statistics were used to estimate farmer characteristics and farm inputs using means, frequencies,

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percentages and tables. The gross margin function was used to estimate farmers' profitability, while the marketing margin was used to measure the performance of farmers.

Gross Margin Function

The study used the gross margin function and cost-benefit ratio to estimate the profitability of smallholder potato farmers. The gross margin is a measure of enterprise feasibility and is the difference between gross income and total variable costs [6, 39, 40]. Gross margin is defined as the difference between the value of the enterprise's gross output and the variable cost of production directly associated with the enterprise [27]. Gross margins are widely used to evaluate the enterprise's economic viability and are mostly used in agriculture to plan and compare farmers that pose similar characteristics within their enterprise [21]. The gross margin analysis is the primary method used to determine profitability. Net Farm Income (NFI) was used for this study to determine the profitability of smallholder potato farmers.

$$GM_i = TR_i - TVC_i \quad \text{.....1}$$

GM is the gross margin per potato output.
TR is the total revenue from the production of potatoes, i measured in terms of potato farm.
TVC is the total variable cost from the production of potatoes, i measured in terms of potato farm.

The Total revenue, which is equivalent to potato income or gross income from each potato, was calculated as:

$$TR_i = P_i \times Q_i \quad \text{.....2}$$

Where
Pi is the farm-gate price of potatoes
Qi is the total quantity produced for each potato per kg

From the equation, the variable costs in the research emanated from the employment of labour (hired and family), use of fertilizer, use of a tractor for preparation and harvesting, use of pesticides, marketing costs and seeds which farmers used. The calculation of total expenditures for each input used was calculated from the quantities used multiplied with respective prices. The study found out that there was no division of labour across the enterprises, although

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farmers have various and limited specializations and use the same labour in all of the crops they produce. Therefore, total variable costs were calculated using the following expression:

$$TVC_i = \sum_{i=1}^{2}(K_{it} + S_{it} + L_{it} + T_{it} + P_{it} + M_{it}) \quad \text{.....3}$$

Where:
K_{it} is the fertilizer expenditure
S_{it} is the total expenditure on seed
L_{it} is the total labour expenditure on each enterprise
T_{it} is the cost of tractor used for preparation and harvest
P_{it} is the pesticide expenditure used
M_{it} is the marketing cost.

Net Farm Income (NFI) is defined as the return related to land (own and hired), capital (own and borrowed) and management (own and hired), and own and unpaid family labour [6]. Net Farm Income is the product of gross margin and fixed costs, where fixed costs and production costs are deducted from farm gross margin. Net Farm Income provides essential information about the results of operating activities over a period of time. NFI is often described in aggregate and is an influential and highly exposed statistic when used to describe the fitness of the farming sector. The following is the illustration of the gross margin formula:

$$NFI_i\ (\pi) = GM_i - TFC_i \quad \text{.....4}$$

NFI= is the Net Farm Income/ Profit
GM= is the farm gross margin
TFC= is the total fixed cost of the farm

Cost-benefit analysis

To calculate the private profitability of the potato enterprise for this study, an ex-ante CBA model was used. The model measures the profitability connected with each output by comparing the differences between their net benefits. The net benefit from the potato output is equal to the difference in the flow of benefits and costs over the lifecycle of the potato production, as shown in Eq. 4. Benefit-cost analysis was carried out by using the formula:

$$\frac{\text{Benefit (B)}}{\text{Cost (c)}}_i \text{ ratio} = \text{Gross returns}/\text{Total costs} \quad \text{.....5}$$

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Marketing margin

The study made use of marketing margin analysis to estimate potato enterprise performance. Marketing margin is an imperative index in assessing farmer performance, especially value chain performance [12]. The marketing marginal analysis was used to analyze potato performance using marketing cost and margin. Mujuru and Obi [23] and Sitepu *et al.* [25] define marketing margin as the difference between the price paid to the farmer (farm-gate price) and the price paid by the final buyer (retail price). The marketing margins are calculated based on the decrease in marketing price with the acquisition price of each agricultural commodity at the selling agency [23]. Marketing margins are computed at various points along with the market structure (be value chain) and then are compared with consumer price [31, 37]. The technique of analysis of marketing margin was as follows:

$$\text{TGMM} = \frac{\text{Final Consumers' Price} - \text{Producers'Price}}{\text{Final Consumers'Price}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Here, TGMM is the total gross marketing margin.
After computing TGMM, it is imperative to introduce the idea of "producer participation", "farmer's portion," or "producer's gross marketing margin" (GMM) which is the portion of the price paid by the final consumer that belongs to the farmer as a producer. It should be emphasized that farmers that act as middlemen also receive an additional marketing margin. The producer's margin or share in the consumer price (GMMp) is calculated as:

$$\text{GMMp} = \frac{\text{Pricepaidbytheconsumer} - \text{Marketinggrossmargion}}{\text{Pricepaidbytheconsumer}} \times 100 \quad \ldots\ldots\ldots 7$$

$$\text{GMMp} = 1 - \text{TGMM} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 8$$

where, GMMp is = the producer's share in consumer price

RESULTS AND DISCUSSION

Socio-economic characteristics

Table 1 presents the results of the socio-economic features of the respondents who participated in the study. Potato farming was dominated by female farmers at 74%. The reason for this is the fact that vegetable farming in the province is associated with females as they normally plough it in home gardens and small fields, while men are normally involved in livestock and crop farming. The average age of farmers was 54 years with an average family size of 5 people per

household. Farming is dominated by elderly people as young people do not want to associate with farming and they migrate for good-paying jobs in cities, leaving the elderly to be involved in farming [24, 39]. Family size was used as a proxy for farm labour, reason being most farmers use their family for labour as they cannot afford to hire labour. Most farmers were married and that was beneficial for the study in decision making as married farmers tend to make good decisions especially when it comes to commercialization, as compared to single farmers. Farmers were literate as they had spent 8 years in primary school. These results agree with those of Tadesse [31], that education is very significant for farming as it strengthens working efficiency, manages business and decision making, resulting in more farm returns and improved food security. This played a huge role in the human capital aspects of farmers as they managed to acquire vast knowledge which they used in improving their farming as they are able to understand innovative farming techniques, and access market information which is beneficial for their farm operations. The average farm size was 2 Ha, which is the typical farm size for smallholder farmers, and they had 11 years of farming experience as they practice farming for a living. This result concurs with Tshiame [6], that having farm experience when it comes to potato farming is important.

The average household income was R5 890.13 (South African Rand) which is made up of social securities and farm returns. Farmers in the Eastern Cape solely depend on farming and social securities as their only strategy for living. Potato farmers had access to extension services and were members of farm organizations, which played a huge role in assisting farmers to commercialize their produce and had access to market information as well as new agricultural techniques used to enhance their productivity. Access to credit was the most critical issue in the study area as the majority of potato farmers had no access to financial support and as a result, relied on social grants and remittances to operate their farms. This agrees with Gabaye [39], that having access to extension services and being a member of a farm organization is very beneficial in improving farm produce and sustainability of the farm. Potato farmers had to travel 10km to access markets, which contributed significantly to their low farm returns as there were high transport costs incurred which discouraged them from participating in markets.

Table 2 displays the cost and returns analysis of potato production. The profitability of a potato enterprise is very imperative as it plays a crucial role in determining the success and failure of the farm. In this study, the potato enterprise gross margin was ZAR 9 969.05, and net farm income was R9 018.51. The analysis for potato enterprises showed that potato production was profitable in the area. The ratio of input-output prices is presented which shows an increasing trend. This implies that

the production process is getting expensive for the farmers, which is squeezing their profit margins as the cost-benefit ratio is 1.94%. This showed that for every ZAR 1 spent on potato production, farmers stand to make a profit of ZAR 1.94. Thus, smallholder potato farmers in the Eastern Cape Province are able to cover their production costs and make a profit from the sales of their products. These results agree with Mdoda and Obi [38], that smallholder vegetable production is profitable in the Eastern Cape. The reason for the low B/C ratio was an increase in costs of labor and the cost of fertilizer. There were prolonged drought conditions which resulted in a high infestation of disease in potatoes, which led to low production and low benefit-cost ratio in the study area.

The average amount of potato produced by smallholders was 2 636.23 kg/year. This low productivity potato was due to the influence of diseases during the study period. These results agree with Mdoda and Obi [38], that production from smallholder farmers is not as big as they produce on a small plot size and use obsolete technologies to practice farming, which lowers productivity.

Farm size: farmers had access to 2ha which was arable and good for farming. Farmers used 1.5 hectares for ploughing potatoes and the remaining 0.5 ha was used for building, storage facilities and equipment storage.

Distance to market centres: Farmers were situated far away from the market centres as they traveled 1 km to reach the market. Most of the farmers, due to high transaction costs sold their produce in groups or used middlemen to transport their produce to minimize cost. Most of the retailers and wholesalers were fetching their produce from the farmers, which reduced their profit returns. Farmers closer to markets might sell a higher percentage of their potatoes and make more profit than farmers who need to drive 10km to reach markets. Additionally, farmers further from the market produce higher-value commodities and use most of their produce for home consumption and sell less due to high transaction costs.

Potato Market Conduct

The study analysed the potato market conduct. The study results reveal the price-setting and selling strategy of potato farmers. The results reveal that 48% of farmers negotiate the selling price of their produce while many smallholder commercial farmers are price takers. The result shows that the pricing strategy was not competitive as 52% of buyers decided on potato price decisions. The purchase price was set mainly by buyers, reflecting a flawed market with information asymmetry. These results were in line with Ordofa *et al.* [12] and Tadesse [31], who found that buyers decided the price of dairy, fruits and

vegetables in Ethiopia. The study further shows that about 70% of the farmers specified that the payment term was conducted through cash- in- hand system.

Performance of Potato Market-

The performance of the potato market was assessed based on the level of market margins and marketing costs for key market contributors.

Production Cost of Potato Producers

Potato-producing farmers in the study area incurred costs mostly during the production phase. They incurred an average production cost of R8 659.06 per kilogram. The estimated cost included labour, seed, fertilize, pesticide, land, and tractor rental costs.

Potato Market Channels

Table 3 presents the results of the marketing channel of potato production. A marketing channel is described as a set of people, organizations, and activities that work together to transfer goods (products and services) from the point of origin to the point of consumption. Wholesalers, retailers, rural collectors, and consumers were the main market chain actors that received potato products from farmers with the % share of 8.23, 40.43, 62.16 and 53.10%, respectively. The total quantity of potato produced by sample producers was about 6 545 kilograms, from these, 3 665 kilograms were supplied to the market. The study results find the wholesalers, retailers, rural collectors and consumers as the most used marketing channels of potato production.

Potato average marketing costs for different marketing agents

Table 4 illustrates the potato average marketing costs for different marketing agents. The study calculated marketing costs to easily calculate the share of profit captured by key actors in the market flowchart. The wholesalers incurred the highest marketing cost (109.15 ZAR/Kg), followed by rural collectors (77.9 ZAR/Kg). These results were in line with those of Schipmann [32], who found wholesalers and rural collectors to have the highest marketing costs. This is due to transportation costs as farmers are not located close to the marketplaces, storage loading/unloading, packaging and other miscellaneous costs incurred. Table 5 indicates potato marketing margin for different channels. The table portrayed differences between the total income from potato transactions and the costs sustained in the process of potato exchange, which gives the marketing profit of each actor, namely producers, rural collectors, retailers and wholesalers.

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The study results revealed that potato farmers' market profit was highest when they directly sold to consumers at ZAR 212.51, followed by wholesalers and retailers with ZAR 234.08 and ZAR 190.08, respectively. The results suggest that farmers receive more profit by selling to consumers and wholesalers their potato produce. This finding concurs with Tadesse [31], who found that producers are more profitable if they sell their produce to wholesalers and consumers. The retailers and wholesalers made a significant profit when buying from the farmer and selling to consumers as they recorded high-profit returns of ZAR 175.15 and ZAR 234.45, while rural collectors made a profit of ZAR 161.82. The study results reveal that the channels that made a significant profit in the study area were retailers and wholesalers compared to farm gates in the form of rural collectors.

Total gross marketing margin (TGMM) is highest in channels of rural collectors (II) and wholesalers (IV), which was 77.36%, while the lowest was in channel III, which was 40.67%. The farmers' share (GMM%) was highest in channel II, accounting for 68.15% of the total consumers' price and the lowest in channel III accounting for 42.40%. The study results reveal that the total marketing margin increases as the product moves away from the production centre. The results reveal that producers usually get lower prices while final consumers pay high prices for potato products. This implies that producers have less power in managing the market chain [40].

CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

The study sought to investigate the profitability and performance of smallholder potato enterprises in the Eastern Cape Province using gross and marketing margin analytical techniques. To calculate the private profitability of the potato enterprise, an ex-ante CBA model was used. The study further made use of marketing margin analysis to estimate potato enterprise performance. The study concludes that potato production is profitable in the Eastern Cape Province of South Africa. Smallholder farmers supply their potato products to wholesalers, retailers, collectors and consumers. The retailers and wholesalers are generating supreme profit margin than other actors in the market chain, while the producers get lower prices and final consumers pay high prices for potato products. The potato market in the study area is branded by a weak oligopoly (focused on few trades) due to lack of market information, lack of financial support, low bargaining power, entry barrier, and high price variation between producers and consumers, making the potato market imperfect. Smallholder potato farmers attained a higher percentage share of margin when they sold their produce directly to consumers. The study recommends improving the input supply system so that farmers can receive proper production inputs and market information flows, quantity and quality needed at the

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right time. The study further recommends strengthening of agricultural personnel and farm organizations through using innovative technologies in disseminating information to farmers. Additionally, the study recommends agro-processing training for smallholder farmers as this will enable farmers to take advantage of various marketing channel opportunities and avoid loss of potential farm returns through produce spoilage and forced low price sales.

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Conflict of interest

The authors declare no conflict of interest.

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Table 1: Characteristics of potato farmers n =130

Continuous characteristics	**Mean**	**SD**
Age of the farmer	54.01	13.13
Years spent in school	8.45	2.34
Farm size (ha)	2.10	1.67
Farm experience	11.23	6.54
Household size	5.34	3.13
Household income ®	5 890.13	7654
Distance to a market centre (km)	10.32	4.15
Categorical characteristics	**Frequency**	**Percentage**
Sex:		
Male	34	26
Female	96	74
Access to extension:		
Yes	78	60
No	52	40
Member of farm organization:		
Yes	75	58
No	55	42
Access to credit:		
Yes	47	36
No	83	64
Marital status:		
Married	78	60
Single	32	24
Windowed	20	16

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Table 2: Cost and return analysis of potato production

Elements of costs and returns	**Mean**	**Std. Dev.**	**% Share**
Potato output obtained per hectare in Kg (Q)	120.43	18.67	
Price of potato sold per Kg in Rands (P)	154.68	19.30	
Total Revenue (TR) = Q x P	18 628.11	5 623.10	
Family consumption and livestock kg/year	1,069.80	721.23	
Potato sold kg/year	940.43	318.67	
Potato seed kept for planting (kg/year)	626	159.32	
Total output	**2 636.23**	**1199.22**	
Variable costs			
Seed cost per Kg in Rands	2 500.78	1 628.41	54.36
Family labour	1 687.24	659.44	16.56
Hired labour in Rands	556.67	573.12	
Total Labour in Rands	2 243.91	1387.43	
Cost of tractor during preparations and harvesting in Rands	920.30	542.34	
Fertilizer use for potato production in Rands	1 689.44	351.86	
Pesticides cost in Rands	68.94	80.44	
Marketing costs (costs of transportation, store and sack)	1 235.69	485.78	
Total Variable Costs (TVC)	**8 659.06**	**3 264.58.75**	**96.61**
Fixed Cost (FC)			
Land rented in Rands	950.54	154.34	
Total Fixed Cost (TFC)	950.54	154.34	8.20
TC= TVC+TFC	9 609.60	3 192.63	
GM = TR-TVC	9 969.05	1 986.75	
NFI= GM-FC	9 018.51	1 874.56	
Benefit-cost ratio	1.94%	0.475	

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Table 3: Marketing channel of potato production

Marketing channels					
Channel I: Farmer	Consumer				
Channel II: Farmer	Rural collector		Wholesalers	Retailers	Consumers
Channel III: Farmer	Retailer	Consumer			
Channel IV: Farmer	Wholesalers	Retailers	Consumers		

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Table 4: Potato marketing margin for different channels (ZAR/qt)

Agents		Channel I	Channel II	Channel III	Channel IV
Producer	Purchasing price				
	Production costs	173.54	173.54	173.54	173.54
	Marketing cost	64.5	42.63	64.5	
	Selling price	450.55	410.28	425.50	425.50
	Market profit	212.51	194.11	234.08	190.08
	GMMp (%)	100	68.15	42.40	55.11
Rural collector	Purchasing price		410.28		
	Production costs				
	Marketing cost		77.9		
	Selling price		550		
	Market profit		161.82		
	GMMp (%)		39.44		
Retailers	Purchasing price			430.65	
	Production costs				
	Marketing cost			76.5	
	Selling price			678.65	
	Market profit			175.15	
	GMMp (%)			40.67	
Wholesalers	Purchasing price		600	425.50	425.50
	Production costs				
	Marketing cost		135.45		135.45
	Selling price		863		863
	Market profit		227.55		234.45
	GMMp (%)		37.92		54.86
	TGMM (%)		77.36	40.67	54.86

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