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# Patterns of Smallholder Farmers' Choice of Value Addition in Gauteng Province, South Africa

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**KEYWORDS** Agro-processing. Factor Analysis. Smallholder Farmers. Value Addition

**ABSTRACT** Value addition in agriculture is the process of improving a commodity to increase its value. A growing number of smallholder farmers sell their products to low-value markets, as they have limited access to markets of high value, which is attributed to their low output and not the quality of the products. In this study patterns of value adding choice have been studied. This paper utilises data collected from 102 smallholder farmers which were randomly sampled in four districts of Gauteng Province to determine patterns of value addition performed by the smallholder farmers. The sampled smallholder farmers were producing livestock, grains and crops. Factor analysis has been carried out on 15 indicators of value addition, and the results reveal that the most performed value addition was washing and abattoir, while the least performed was fortification, labelling, drying and canning. The factor analysis extracted five factors, particularly post-harvest, food preservation, milling, post-slaughter and fortification. This paper implies that it is crucial for policymakers to know that smallholder farmers are currently adding value to their products in these patterns to promote rural and agricultural growth. It is therefore, recommended that the current patterns of value adding to various products practised by farmers be retained.

## INTRODUCTION

The value of a refined agricultural commodity is higher than that of a fundamental agricultural product (Louw et al. 2008). It is the expectation that adding value improves income (Ngore 2010). Engaging smallholder farmers into value addition will offer South African agriculture a comparative benefit (Mabhaudhi 2017). According to Priyadarshi and Routroy (2018), there are various vertical integration levels for value-added agriculture. A specific selection of a level may rely on multiple variables, such as the type of product at a particular place, the farmer's consciousness and motivation for the practice of commercial commodities production. The choice also relies on the financial requirements such as the price of installing the equipment and the value-added level the farmer chooses to take on the availability of room, the availability of labour, the atmospheric circumstances and the cost of transportation outbound (Shahidullah and Haque 2010).

It is essential to differentiate value addition and agro-processing because they are always used interchangeably. Agro-processing involves changing a form of a commodity and value addition entails adding value to a product at a cost the customer is prepared to pay, compensating for the cost of adding value (Dube et al. 2018). Value addition indicators range from washing, packaging, cleaning, labelling, branding and sorting (Byerlee et al. 2013). Added value can also occur without tampering with the product's physical shape (Thindisa 2014). The province of Gauteng is considered to be the most populated in South Africa with enormous added value relative to other metropolitan regions (Socio-Economic Review and Outlook 2016).

Smallholder farmers are different in individual features, the size of the farm, the allocation of resources between grains, cash crops, off-farm operations and livestock, the use of exterior inputs and labour, the percentage of commodities sold and the pattern of family spending (Department of Agriculture, Forestry and Fisheries (DAFF) 2012). Value addition makes commodities ready for storage, for preservation for future consumption, and instant marketing (Datta 2015). Mandisvika et al. (2015) reported that food security could be achieved if there was continuous innovation, research and communication among various participants in the value chain.

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A growing number of smallholder farmers are entering the formal industry of value addition. These farmers sell their products to low-value markets, as they have limited access to markets of high value, which is attributed to their low output and not the quality of the products (Sector Intelligence Report 2018). The National Development Plan (NDP) detailed that farming can generate employment for nearly one million by 2030, and one of the objectives is to provide support and access to value chains for fresh new entrants and smallholder farmers (NDP 2012). Department of Agriculture, Forestry and Fisheries (2012) supported this by articulating that it would capitalise on agricultural value chains that support labour-absorbing operations to speed up jobs through smallholder farming systems.

Post-harvest management is a set of post-production practices that include selection, washing, cleaning, grading, disinfecting, drying, packing and storage. Its importance is the discovery that ripening of produce can be delayed and their storage extended by reducing tissue respiration (El-Ramady et al. 2015). Snels et al. (2018) concur with this by mentioning that between the producer and the consumer, thirty to forty percent of worldwide food manufacturing is lost, and losses are anticipated to rise as the evolving dietary arrangements of increasing Africa's working class result in increased demand for perishable off-shelf products such as dairy food, horticulture, fish, et cetera. Reducing the loss of food and waste can save farmers, companies and families cash (Acedo 2016).

Value addition is known for offering higher returns, and besides that it can open up fresh markets, recognise farms, expand the market season and contribute positively to the society (Born and Bachmann 2006). Joan (2003) showed that farmers could profit from expanding into a product-related business with value-added, when the product is defined not by fluctuating farm gate prices but comparatively constant retail price. Fellows (2012) reported the different advantages of value addition livelihood activities to be, including improved short-term storage of fresh produce, preservation of seasonal surplus of crops that would otherwise be wasted, improved health and nutritional condition through consumption of crops for a substantial part of the year, increased incomes from sales of processed crops when out of season and prices are higher, adding value to crops by processing them (for example, milling flours or extracting vegetable oils).

### Objectives

The study's main objective is to determine the patterns of value-added agriculture performed by smallholder farmers in Gauteng Province.

The questions to be answered in this paper are:

- What are the types of value addition performed by smallholder farmers in Gauteng Province?
- What are the patterns of adding value amongst Gauteng Province's smallholder farmers?

## METHODOLOGY

### Study Area, Data Collection and Sampling

The study was carried out in four districts of Gauteng Province, namely, City of Johannesburg, Sedibeng, West Rand and City of Tshwane. The study used a quantitative cross-sectional data collected by the Gauteng Department of Agriculture Rural Development (GDARD) and the National Marketing Council for Agriculture (NAMC) in 2017/18. Non-probability sampling designs were used of which random sampling was preferred in this study. One hundred and two (102) smallholder farmers within the four selected districts (West Rand, City of Johannesburg, City of Tshwane and Sedibeng) were randomly sampled and interviewed depending on their availability and willingness to participate.

### Data Analysis

The model utilised in this research was factor analysis (FA). The FA tries to decrease a wide range of variables into few new sets of variables known as factors which are relative to the previous large set (Williams et al. 2010). The model of analysis of the factor is organised in a comparable manner so that all variables from a specific group correspond but have compara-

tively tiny interactions with other troop factors (Makhura et al. 1997). Aspects utilised for additional investigation should typically involve distinctive variables. FA is a recognised approach for answering the elemental questions of whether or not value addition is practised separately or in some sequence of clusters. The proceeding is practised in this study to find patterns in which value addition is scattered.

The model for analysing the factor can be indicated as a matrix:

$$X=\Lambda f+e \quad (1)$$

Where $x$ is the vector of $n$ observable variables, $f$ is the vector of $m$ insignificant factors, $\Lambda$ is called the loading matrix of the order $n \times f \times m$, and $e$ is the error of $n \times 1$

The goal of the analysis of factor, as stated above, is to detail a reduced quantity of factors in terms of the interaction of covariance between the response variables. The study utilises the Kaiser criterion of maintaining Eigenvalues higher than one (>1) to determine the amount of variables to retain, and also chooses variables with elevated factor loading results ±0.4 or higher. This study seeks to determine the relationship pattern of value-added choice among smallholder farmers.

## RESULTS

### Descriptive Statistics

Fifteen value addition practices namely, washing, sorting, slicing, drying, abattoir, chilling, storage, cutting, bottling, canning, cleaning, grading, milling, labelling and fortification, were identified. Table 1 shows the descriptive statistics of smallholder farmers who perform the various value addition practices in Gauteng Province. The results show that about fifty percent of the smallholder farmers wash and slaughter, thirty-six percent add value by storing and milling their produce, and the least value addition activity is labelling, drying, fortification and canning at seven percent. This makes washing and abattoir the most common practice in value addition.

### Patterns of Smallholder Farmers' Value Addition Choice

The FA method of extraction was utilised to evaluate the patterns of smallholder farmers' choice of value addition. Table 2 demonstrates patterns of the rotated factor for the value addition variables. Based on the Eigenvalues and interpretability of the patterns, the FA disclosed five significant value-added patterns. The five factors explained seventy-two percent of the variation in the value-added items.

**Table 1: Descriptive statistics of value addition activities**

| *Variable* | *Total (%) N=102* |
|---|---|
| Washing | 50 |
| Storage | 36 |
| Slicing | 21 |
| Labelling | 07 |
| Milling | 36 |
| Cleaning | 42 |
| Sorting | 21 |
| Chilling | 14 |
| Drying | 07 |
| Cutting | 35 |
| Grading | 28 |
| Abattoir | 50 |
| Canning | 07 |
| Bottling | 14 |
| Fortification | 07 |

*Source:* Survey (2017/2018)

## DISCUSSION

The five patterns were labelled based on the value addition items that loaded heavily:

1. Pattern 1: Post-harvest value addition.
2. Pattern 2: Food preservation.
3. Pattern 3: Milling.
4. Pattern 4: Post slaughter.
5. Pattern 5: Fortification.

### Factor 1: Post-harvest Value Addition

The first factor, post-harvest value addition, explained twenty-four percent of all the variance in the 15 value addition items. Cleaning, washing, sorting, storage, cutting and drying were the items strongly loaded in this aspect (loading scores >0.4). The loads had positive signs for all these activities, suggesting they were correlated positively. That is, they were likely to be used together by smallholder farmers. The result implies that smallholder farmers add value to their produce after harvest for convenience. This often includes cleaning, washing, sorting, stor-

**Table 2: Rotated factor patterns for value addition**

| *Variable* | *Component* | | | | | *Communality* |
|---|---|---|---|---|---|---|
| | *Post-harvest* | *Food preservation* | *Milling* | *Post-slaughter* | *Forti-fication* | |
| Cleaning | **0.860** | 0.135 | 0.054 | 0.070 | 0.303 | 5.084 |
| Washing | **0.859** | 0.079 | 0.028 | 0.131 | 0.263 | 1.815 |
| Sorting | **0.818** | 0.223 | 0.075 | -0.095 | -0.064 | 1.612 |
| Storage | **0.618** | 0.235 | 0.251 | 0.358 | -0.094 | 1.250 |
| Cutting | **0.589** | 0.319 | -0.007 | -0.216 | -0.209 | 1.051 |
| Drying | **0.584** | 0.087 | 0.278 | -0.150 | -0.185 | 0.809 |
| Bottling | 0.274 | **0.841** | 0.161 | 0.282 | 0.031 | 0.704 |
| Canning | 0.157 | **0.791** | 0.224 | -0.164 | -0.024 | 0.606 |
| Slicing | 0.497 | **0.700** | 0.101 | 0.183 | -0.018 | 0.564 |
| Grading | 0.160 | -0.135 | **0.883** | 0.079 | 0.042 | 0.468 |
| Milling | 0.112 | 0.318 | **0.759** | -0.101 | -0.034 | 0.350 |
| Labelling | 0.047 | 0.354 | **0.685** | 0.013 | -0.028 | 0.265 |
| Abattoir | -0.025 | -0.126 | 0.095 | **0.768** | -0.116 | 0.176 |
| Chilling | 0 | 0.282 | -0.154 | **0.764** | 0.084 | 0.132 |
| fortification | 0.052 | -0.014 | -0.009 | -0.069 | **0.931** | 0.115 |
| % of total variance explained | 24.042 | 16.017 | 13.966 | 10.421 | 7.935 | |

*Source*: Survey (2017/2018)

age, cutting and drying. These results match with those reported by Vithu et al. (2019), who noted that primary value addition (post-harvest) operations include cleaning, cutting, drying, sorting and storage.

### Factor 2: Food Preservation

The second factor, food preservation value addition, explained sixteen percent of all the variance in the 15 value addition items. Slicing, bottling and canning were the items strongly loaded in this aspect (loading scores >0.4). The loads had positive signs for all these activities, suggesting they were correlated positively, that is they were likely to all be used together by smallholder farmers. The result implies that smallholder farmers preserve their produce for long shelf life as well as retaining its colour, texture, flavour and nutrients. This often includes bottling and canning sliced products. Amit et al. (2017), reported the same results that different traditional techniques such as slicing and bottling had evolved and were considered by value adders to maintain nutritional value and texture.

### Factor 3: Milling

The third factor, milling value addition explained fourteen percent of the total variance in 15 value addition items. Milling, grading and labelling were the items strongly loaded in this aspect (loading scores >0.4). The loads had positive signs for all these activities, suggesting they were correlated positively. That is, they were likely to be used together by smallholder farmers. The result implies that smallholder farmers process their produce to improve efficiency by reducing post-harvest losses. This often includes grading and labelling milled products. These results concur with a report by Philippine National Standard (PNS) on grains, which considered reduction of post-harvest losses as one of the advantages of grain standardisation for farmers (PNS 2018).

### Factor 4: Post-slaughter

The fourth factor, post-slaughter value addition explained ten percent of the total variance in 15 value addition activities. Abattoir and chilling were strongly loaded in this aspect (loading scores >0.4). The loads had positive signs for all these activities, suggesting they were correlated positively, that is they were likely to be used together by smallholder farmers. The result implies that smallholder farmers perform post-slaughter for longer shelf life and excellent quality meat products. This often includes chilling

products after slaughtering. This relates to the results reported by Rani et al. (2017), who stated that carcasses are chilled to prevent the development of microorganisms and to decrease meat deterioration before supply.

**Factor 5: Fortification**

The fifth factor, fortification value addition explained eight percent total variance in 15 value addition activities. This activity, fortification, was strongly loaded in this aspect (loading scores >0.4). The loading had a favourable indication. The result implies that smallholder farmers add micronutrients to their produce to improve nutrition, flavour and convenience. This relates to the results found by Miller and Welch (2013), who stated that nutrient content was increased through fortification.

## CONCLUSION

The aim of the study was to determine the value-added patterns within the smallholder farmers of Gauteng Province. The study concludes that smallholder farmers add value through washing and slaughtering of animals. Besides, the five patterns of value addition were determined. Value addition patterns used by smallholder farmers in Gauteng Province are post-harvest, food preservation, milling, post-slaughter, and fortification. Investing in food security, development and growth of smallholder farmers will have a positive impact if policy planners consider these patterns.

The results also showed that the post-harvest value addition was generally segregated from the other value addition patterns. The findings of the FA indicated that all value addition items were practised in similar patterns and thus worked hand in hand to produce the final commodity. In terms of fortification, this may indicate opportunity for smallholder farmers to improve on the pattern. This may mean that resources are not well allocated in the direction of fortification.

## RECOMMENDATIONS

It is crucial for policymakers to know that smallholder farmers are currently adding value to their products in these patterns to promote rural and agricultural growth. Improved choices of value addition will serve multiple purposes by providing smallholder farmers improved access to value chains and enhanced livelihoods. This would be a step to boost the participation of smallholding farmers economically. Also, it is recommended that essential services, such as extension services and agricultural training on value addition, be made available to smallholder farmers.

This study provides significant research possibilities. Identification of patterns of value addition choice by smallholder farmers offers the chance to further explore the magnitude of value addition choice impact on productivity of agriculture by farmers and to consider the socio-economic factors which influence the choice that farmers take when adding value.

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