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Value chain mapping and marketing efficiency of smallholder cowpea farmers in Capricorn and Waterberg districts of Limpopo province

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Abstract:

Marketing plays a major role in agricultural production and this is because agriculture has the potential to provide the majority of smallholder farmers with employment and income. However, for smallholder farmers to enjoy the benefits provided by agriculture they need to have a reliable market for their produce. This paper therefore examined cowpea value chain mapping and marketing efficiency among cowpea farmers in Ga-Molepo of Capricorn district and Bela-Bela of Waterberg district. Primary data was collected through face to face interviews from 80 smallholder cowpea farmers using structured questionnaire. Value chain map, descriptive statistics and binary logistic regression model were used to analyse the data. The study findings showed that 66% of the smallholder cowpea farmers were market efficient and 34% were market inefficient. It was also revealed that women were more involved in cowpea production than men. Results of binary logistic regression model employed indicated that age, household size, years in schooling, years in farming cowpea, income generated from selling cowpea, quantity of cowpea sold and occupation of the farmers had positive significant influence on marketing efficiency in the study area. The paper therefore recommends that increased investment in education and training opportunities for smallholder farmers for better profit making and stakeholders in agriculture value chain in the study area should come together for proper coordination of activities to further enhance efficiency.

Keywords: Cowpea production, Limpopo province, marketing efficiency, value chain mapping, Smallholder farmers



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INTRODUCTION

Agriculture plays a significant role and serves as a critical economic sector in Limpopo province in terms of its contribution to the economy, and the number of employment opportunities it produces within local communities (Baloyi, 2010). Although agriculture remains to be highly labour intensive, it still serves as a source of economic relief from poverty for the majority of people residing in rural areas of Limpopo province. The majority of people involved in agricultural practices are emerging and smallholder/small scale farmers. These farmers try to earn a living from production of livestock, broilers, fruits & vegetables and cereal crops. The most produced crop among smallholder farmers is known to be maize,

which in most cases is intercropped with other crops such as cowpea, Bambara groundnuts etc. Cowpea is a drought-tolerant legume that also serves as a staple food for the majority of Africans alongside maize, especially the rural poor. However, Singh *et al.* (2003) stated that cultivating and storing the crop (cowpea) comes with its challenges, insect pests are the biggest constraints and a problem when it comes to cowpea production. For some time now, research and production of cowpea in South Africa has been neglected due to lack of improved varieties, knowledge of good agronomic practices, availability of good seeds and the discouraging marginal returns to farmers (Asiwe, 2009).

Access to formal agricultural markets remains a challenge for smallholder farmers more especially in rural areas. Besides poor infrastructural facilities, the main reason for this dilemma is that smallholder farmers do not have the most advanced technology as commercial farmers do that will enable them to produce the quantity and quality of product needed to be marketable (Baloyi, 2010). Food value chains and access to markets are interrelated in a sense that more value will be added to the products if formal markets are realised. Access to formal markets will not only benefit the smallholder farmers participating, but will also contribute to community development. Food value chains do not comprise only the stakeholders directly involved in the production of products in question, but smallholder farmers can also be involved in the value chains as wage labourers in production and processing also as providers in the service markets that support value chains, as explained by Seville *et al.* (2011). Thereby value chain mapping is essential to understanding of markets, their relationships, the participation of different actors and the critical constraints that limit the growth of agricultural production and consequently the competitiveness of smallholder farmers.

LITERATURE REVIEW

Smallholder farmers are defined in many ways depending on the context or even a country. They are drivers of many economies in Africa even though their potential is often not brought forward. According to Department of Agriculture, Forestry and fisheries (DAFF, 2012), smallholder farmers are defined as those farmers that own small-based plots of land on which they grow subsistence crops and one or two cash crops relying almost entirely on family labour. The term “smallholder” often is interchangeably used with “small-scale”. These farmers are regarded as such because of limited resources and the not-so advanced technologies they work with, but still produce enough for their own consumption and income generation. Kirsten and Van Zyl (1998) highlighted that mind-set of smallholder farmers that

is deep-rooted in South Africa, it is no wonder that smallholder farmers were always considered in a negative light, and why smallholder farming in the country never really had a chance.

McComick and Schmitz (2001) defined value chain mapping as creating a visual representation of the connections between actors in value chain analysis as well as other stakeholders. Value chain mapping is considered a standard tool in value chain research and analysis. It helps in explaining and understanding the process by which a product goes through before and until it reaches the final consumer. Efficiency is one of the most important goals in agricultural and food marketing as it directly affects food security, particularly the economic and physical access to food households (Sumalde and Quilloy, 2015). Marketing efficiency is the ratio of market output (satisfaction) to marketing input (cost of resources) as described by Rit (2014). An increase in this ratio denotes increased efficiency, a decrease represent low efficiency. It is important that the farmers are efficient in marketing their products; this will ensure that they have a greater marketing margin. Pabuayon *et al.* (2014) as cited by Sumalde and Quilloy (2015) further highlighted that efficient and effective flow of food from production point (farmers) to consumption point (consumers) can facilitate the availability, accessibility and affordability of adequate food to consumers. Marketing efficiency can benefit all the key actors in a market chain. An efficient marketing system is achieved when the resulting marketing costs (including losses) are minimized and profits of market intermediaries are reasonable.

Leafy vegetable farming can be crucial to the economic growth of the country in a sense that food security can be guaranteed. Hlungwani (2011) emphasised that about 90% of the population of South Africa relies on agriculture for their livelihoods. Severe climatic conditions such as drought can hamper the agricultural production especially for smallholder farmers, making it impossible for them to harvest, to sell and for own consumption. Cowpea is a drought-tolerant crop which is essential for maize production. Most smallholder farmers during planting season, they intercrop cowpea with maize and sorghum, mainly because of nitrogen fixing cowpea holds. South Africa being a water-scarce country as it is, there is a need to promote the utilization of traditional heat-drought-tolerant crops (Hlungwani, 2011). However, traditional leafy vegetables such as cowpea are amongst drought tolerant crops which are least researched and given attention to. Unlike maize, in South Africa cowpea is considered a subsistence crop, whereas in other African countries it is produced in masses. Due to lack of quality seeds, farmers have no other alternative but to carry on planting cowpea seeds with low production, late maturing and prone to insects (Asiwe, 2009).

Domestic utilization of cowpea is poor because production is still at subsistence level under smallholder farmers. Currently in Limpopo province the leaves from cowpea are harvested fresh and consumed as green leafy vegetables and dried for future use (Asiwe, 2009).

A study done by Van Rensburg *et al.* (2007), showed the importance of leafy vegetables as protein enriching also as a way of ensuring food security. The study focused on different leafy vegetables consumed in South Africa, cowpea included. Domestic production of cowpea is mostly done in rural areas by smallholder who most of the times obtain low yields due to the subsistence level of production characterized by lack of improved technologies, inputs and agronomic practices (Faith *et al.*, 2011). Although cowpea is produced by smallholder farmers at subsistence level, they still harvest enough to be marketed. According to Weinberger and Lumpkin (2001) as cited by Chagomoka *et al.* (2014), even though vegetable production in the Eastern and Southern Africa constitute only a small share of the arable land area, it has the potential to be highly profitable, provide employment opportunities and generate income. However, to understand this potential, farmers and other value chain actors must improve the competitiveness of their vegetable production and marketing commodities to increase market share and profits (Chagomoka *et al.*, (2014). Value addition to cowpea can improve the livelihoods of farmers and increase their income generation. Smallholder farmers will be able to sell their cowpeas also in processed form, thereby increasing the market in which they are selling their produce. This is evidenced by Mzeyece (2010) stating that if local production increased, there was every possibility that marketers could get cowpeas at lower prices and makes more money; consequently with increased market participation, all actors in the cowpea value chain are likely to have increased returns on their sales. However, the unequal distribution of agricultural inputs such as land, farm assets, support services, market access, infrastructure and income that persists in South Africa (Matsane and Oyekale, 2014) hampers the growth of smallholder farmers' businesses. The majority of smallholder farmers in South Africa lack the adequate marketing facilities, of which when they do exist they are completely under-developed and inefficient (Adeleke *et al.* 2010) as cited by (Matsane and Oyekale, 2014).

RESEARCH METHODOLOGY

The study was carried out in Capricorn and Waterberg districts of Limpopo province, in the areas of Polokwane and Bela-Bela municipalities. Primary data was in the form face-to-face

interviews from 80 smallholder cowpea farmers using structured questionnaire. Extension officers from Limpopo Department of Agriculture helped with meeting the farmers whenever necessary. The data was analysed using value chain mapping, descriptive statistics and binary logistic regression model.

Value chain mapping – a data flow chart was used as a descriptive tool to map how a product moved from point of production to being consumed. Descriptive statistics in the form of mean, frequencies and percentages were used to describe the socioeconomic characteristics of smallholder cowpea farmers in Polokwane and Bela-Bela municipalities.

Marketing efficiency measure – in analysing if farmers are efficient or not in marketing their cowpeas, the cost of resources employed has to be less than the output produced from the limited resources. Therefore, marketing efficiency was measured using the marketing efficiency measure. This method of measuring marketing efficiency was given by Acharya and Agarwal (2001). The method is known for its simplicity in calculating marketing efficiency and ease of interpretation. The method is as follows:

$$ME = \frac{NFP}{TMC+TMM}$$

Where ME = marketing efficiency, NFP= net price received by farmers, TMC= total marketing costs, TMM= total marketing margin. For a farmer to be efficient in marketing their products ME=>1 indicates efficiency and <1 shows inefficiency (Longwe *et al.*, date accessed: 03-02-2016)

Binary logistic regression model – binary logistic regression model was used to determine the determinants of marketing efficiency. The model is known to be a statistical method used to predict a categorical (usually dichotomous) variable from a set of predictor variables (Wuensch, 2015). The assumption is that P (Y=1) is the probability of the occurring event, therefore it is important that the dependent variable is coded accordingly. The factor level 1 of the dependent variable should represent the desired outcome. Another fundamental assumption is that the binary logistic regression model assumes linearity of the independent variables and the log odds.

The general Binary Logistic Regression Model is expressed as follows:

$$\text{Log} (P) = \ln \left(\frac{P_i}{1-P_i} \right) = \alpha + \beta_i X_i + \dots + \beta_k X_k + U_i$$

Where $\ln \left(\frac{P_i}{1-P_i} \right)$ is the natural log of the odds, P_i is the probability that the farmer is market efficient, $1-P_i$ is the probability that the farmer is not market efficient, β_i is the estimated parameter, X_i is the explanatory variable and U_i is the disturbance term.

Model specification is as follows: $ME = \beta_0 + \beta_1AGE + \beta_2GNDR + \beta_3HSLDSZ + \beta_4EDLVL + \beta_5OCCPT + \beta_6LNDOWN + \beta_7FRMEXP + \beta_8QNTYSLD + \beta_9INCMGNRTD + \beta_{10}MRKTACC + U_i$

Table 1: Description of variables used in the Binary Logistic Regression Model

Variables	Description	Unit of measurement
Marketing efficiency (dependent variable)	1 if farmer is market efficient, 0 otherwise	Dummy
$X_1 = AGE$	Age of the farmer	Years
$X_2 = GNDR$	1 if farmer is male, 0 otherwise	Dummy
$X_3 = HSLDSZ$	Number of people in the household	Number
$X_4 = EDLVL$	Years of formal education	Years
$X_5 = OCCPT$	Occupation of the farmer	Category
$X_6 = LNDOWN$	1 if farmers owns land, 0 otherwise	Dummy
$X_7 = FRMEXP$	Years a farmer has been farming cowpea	Years
$X_8 = QNTYSLD$	Quantities of cowpea sold	Kg
$X_9 = INCMGNRTD$	Income generated from selling cowpea	Rand
$X_{10} = MRKTACC$	1 if farmer has formal market access, 0 otherwise	Dummy

Source: Computed from survey data.

RESULTS AND DISCUSSION

Table 2 shows the socioeconomic characteristics of smallholder cowpea farmers in Polokwane and Bela-Bela municipalities of Capricorn and Waterberg districts of Limpopo province:

Age - The mean age of smallholder cowpea farmers was 63.93 years, suggesting that older people mostly dominated cowpea farming. The minimum age of cowpea farmers in Ga-Molepo and Bela-Bela is 26, and the maximum being 83.

Household size (Number of people in the household) - The average household size was 5.36; the larger the household the more adequate supply of family labour was ensured. The minimum number of people found living in a household was 1, while maximum was 12. With the average and maximum numbers being as stated, this is likely to imply that family labour was more used than hired labour.

Years in schooling - Most farmers are considered to be illiterate and lack formal schooling experience. The results from descriptive statistics showed that the minimum number of years a farmer has been to school is 0, while maximum is at 15 and average years of schooling are 7.36. This suggests that most cowpea farmers have limited years in formal education.

Years in farming - Experience is an essential tool in farming, the more experience you have in farming a particular crop, the more likely you are to succeed. The minimum number of years a farmer has in farming cowpea was 1 year, which includes those farmers that had just started farming cowpea and has less than one year. The maximum number of years being 45 and the mean/average is 9.38 years. This implies that most cowpea farmers have many years farming cowpea and that should come with experience.

Income generated from selling cowpea - The main aim of most smallholder farmers is to make enough income to sustain their livelihood also to continue with farming operations. The results got from descriptive statistics showed that the minimum amount of money cowpea farmers got from selling their cowpea was R200. From the farmers that were interviewed, some did not have a reliable market, because they had just started planting cowpea. The maximum amount of money cowpea farmers got from their sales was R2000, while the average was R680.83. This shows that cowpea farming is a profitable business, and farmers are able to sustain their livelihoods.

Table 2: Socioeconomic characteristics of smallholder cowpea farmers

Variables	N	Minimum	Maximum	Mean/Average
Age of the farmer	80	26	83	63.93
Household size	80	1	12	5.36
Years in schooling	80	0	15	7.36
Years in growing cowpea	80	1	45	9.38
Income generated from selling cowpea	80	200	2000	680.63

Source. Computed from survey data.

Gender of cowpea farmers - Figure 1 shows gender of cowpea farmers, indicating which gender is more involved in cowpea farming. The results showed that more women were involved in cowpea farming with 57% more than their male counterparts having just 43%. Cowpea farming has always been considered a women’s job, that’s probably the reason why there are more women participating in cowpea farming than men.

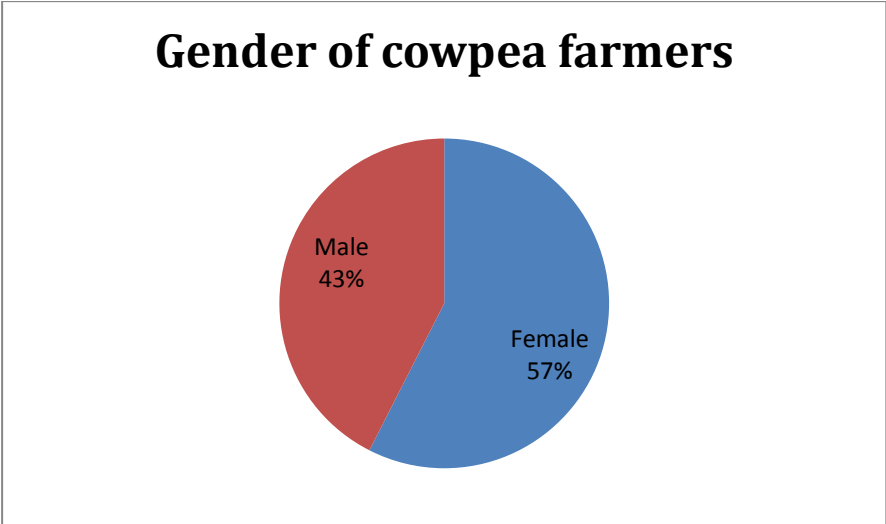


Figure 1: Gender of cowpea farmers

Source. Computed from survey data.

Occupation of cowpea farmers - different activities that farmers are involved in (excluding farming) are among the major factors that affect farmers’ level of production. Highlighting and discussing these activities can pinpoint on the reasons why cowpea farmers are succeeding or failing in producing cowpea. Activities like occupation of the farmer is relevant in showing us whether it leads to a farmer succeeding or failing in cowpea farming. Figure 2 presents results of the occupation of the farmer. The results showed that 37 out of 80 respondents were full-time cowpea farmers, followed by those who were full-time farmers and on pension at 20. Few farmers who are farming cowpea were either self-employed, pensioners and employed or unemployed.

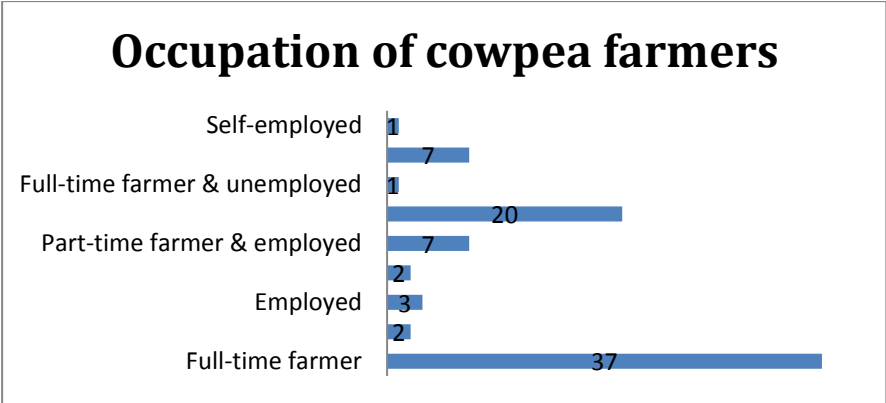


Figure 2: Occupation of cowpea farmers

Source: Computed from survey data.

Quantities of cowpea sold - one of the determinants of farmers being profitable when selling their produce is the quantities of cowpea sold. Studies have shown that farmers are more likely to make profit if they sell their products in small kilograms, that way consumers

have a choice of coming back to buy more if they like the product. With regards to quantities of cowpea farmers sold their produce, figure 3 shows that out of the 80 respondents that were interviewed, only few farmers sold their cowpeas at 1, 5, 10 kilograms; 1,2,5 kilograms; 500 grams, 1 & 2 kilograms; 500 grams, 1,2 & 5 kilograms and 5, 10, 20 kilograms. The “other” represents those cowpea farmers who were selling cowpea in different scales other than the measurements mentioned including larger kilograms such as 10 and 20 kilograms only.

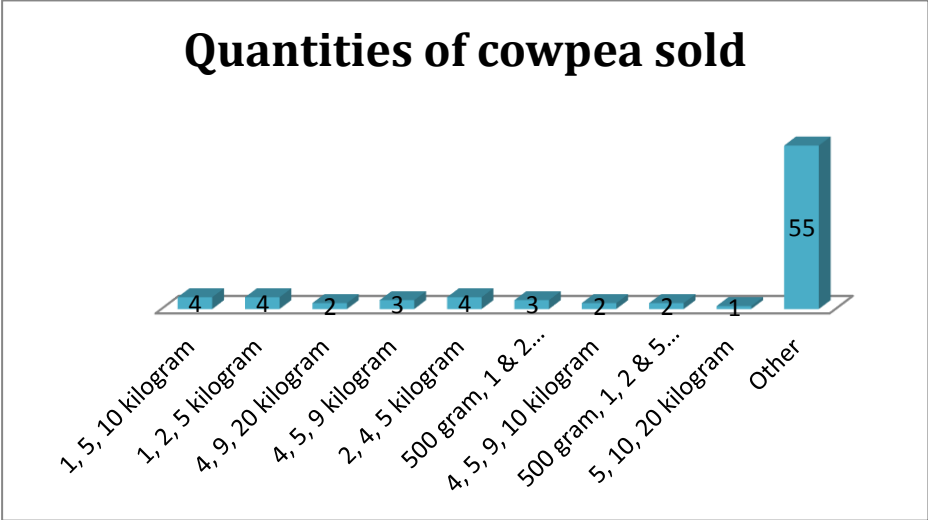


Figure 3: Quantities of cowpea sold
 Source: Computed from survey data.

Land ownership of cowpea farmers - land is one of the most important factors in agricultural practices. A farmer who owns land is more likely to be productive than a farmer with inherited or leased land. Land ownership gives security in cases where a farmer needs capital to start or continue with their farming practices. Figure 4 showed that 81% of the farmers farming cowpea owned land, whereas 19% did not have land ownership. However, with respect to this study having no land ownership did not mean the farmers had no access to land.

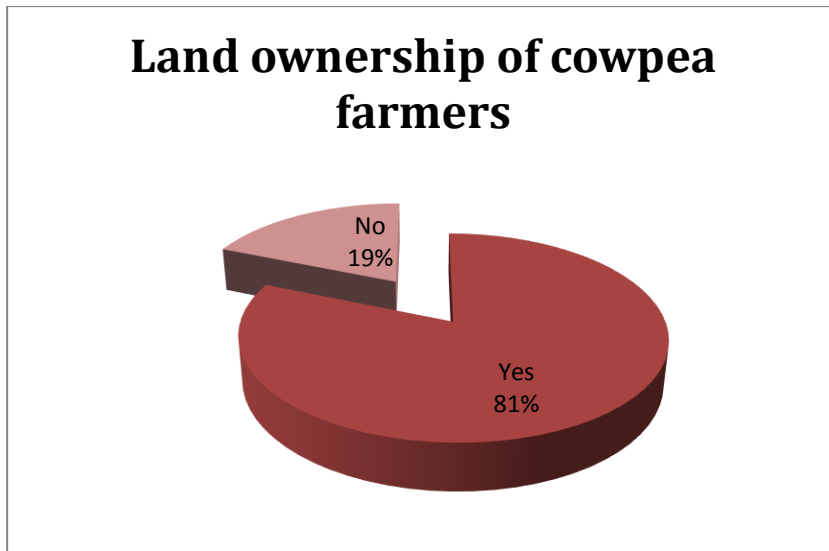


Figure 4: Land ownership of cowpea farmers
Source: Computed from survey data.

Formal market access of cowpea farmers - access to markets is a vital requirement for the poorly resourced farmers in rural areas, if they are to enjoy the benefits of agricultural growth. In this regard, it is important that farmers have access to formal sufficient markets, that way they will be able to realise higher returns from selling their products. Figure 5 depicts that only 22% of cowpea farmers had access to a formal market, whereas a greater margin of 78% had no access to formal markets. Meaning that the 78% represented those farmers had access to informal market. This could be because some of the cowpea farmers had just started selling cowpea, therefore contributing to a larger percentage of 78% of those who had access to informal market.

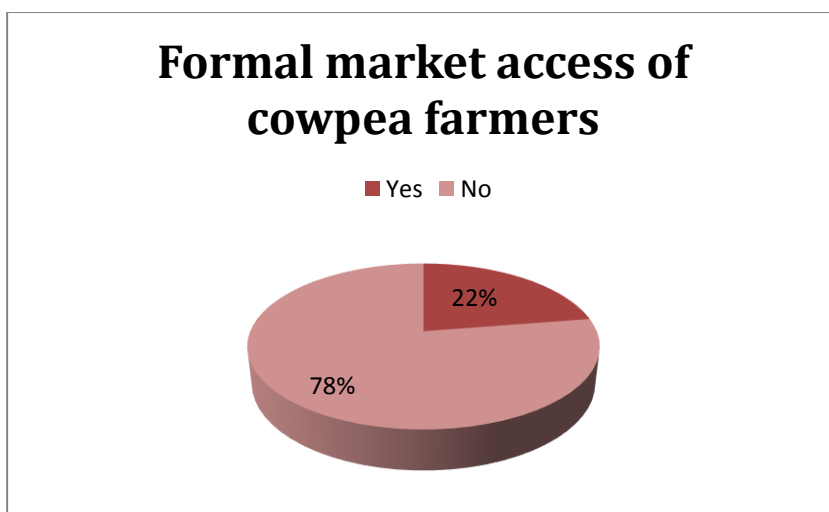


Figure 5: Formal market access of cowpea farmers
Source: Computed from survey data.

Marketing efficiency of smallholder cowpea farmers

Table 3 below shows the frequencies and percentages of smallholder cowpea farmers’ market efficient and inefficient. Results from descriptive statistics revealed that 53 (66%) of 80 farmers were market efficient while the remainder being 27 (34%) farmers were inefficient. The larger number of farmers being market efficient shows that more farmers did not incur many costs in marketing their products, while farmers that were found to be market inefficient could mean that they did not price their products at the highest price possible enough to cover the marketing costs incurred.

Table 3: Frequency and percentage of farmers’ market efficient and inefficient

	Frequency	Percentage (%)
Market efficient	53	66
Market inefficient	27	34
	80	100

Source: Computed from survey data.

Value chain mapping

In mapping the value chain for cowpea in Ga-Molepo and Bela-Bela, smallholder cowpea farmers were asked questions regarding what takes place from point of cowpea production to how they get their products to the consumers. The value chain mapping showed different stakeholders’ participating in cowpea value chain; the relationships and linkages are as shown.

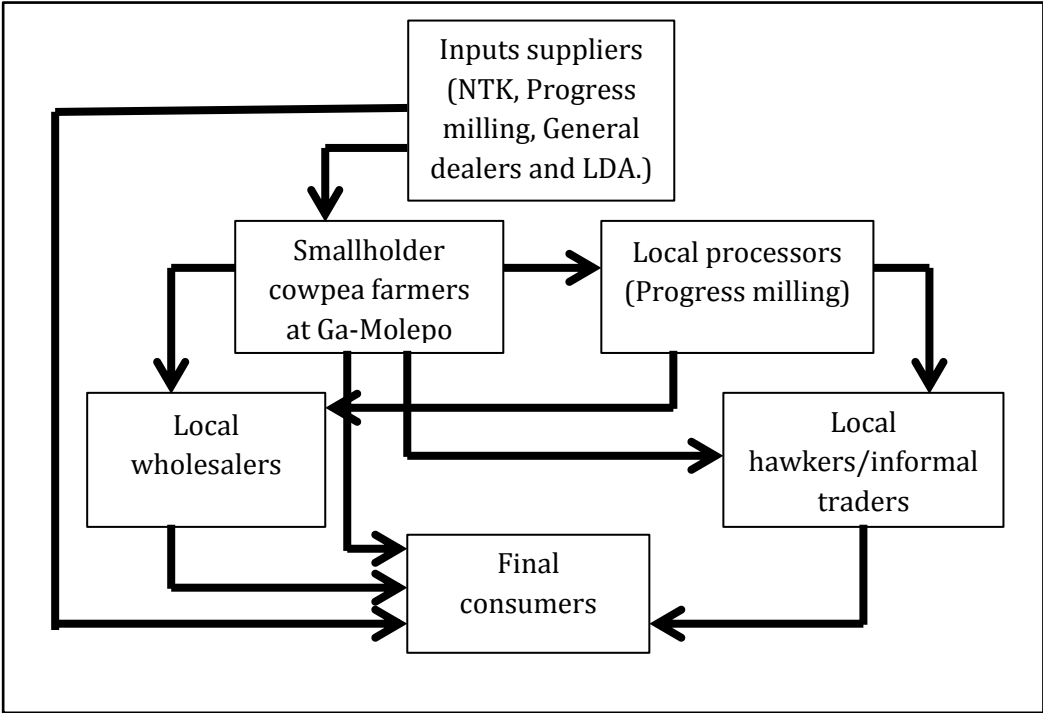


Figure 6: Value chain map of smallholder cowpea farmers at Ga-Molepo
Source: Obtained from survey data.

Several farmers at Ga-Molepo engage in agricultural farming, particularly cowpea and maize. From figure 6 above, it shows that the farmers purchase inputs from the suppliers. These include seeds, fertilizers and pesticides. Although growing cowpea does not need application of fertilizers as it fixes nitrogen in the soil, the fertilizers are bought so as to strengthen the soil further for planting of maize. These farmers intercrop cowpea with maize and for this reason; too much fertilizer is not applied. During the interviews, some of the farmers growing cowpea indicated that they usually take their cowpeas to local processors and these processors sold the cowpea to final consumers and other participants on the chain.

Participants in the cowpea value chain and their roles at Ga-Molepo

Inputs suppliers - the input suppliers in the study area included NTK, General Dealers, Progress Milling and Department of Agriculture. These participants are responsible for supplying inputs to the farmers, such as; fertilizers and pesticides. The farmers are able to ask for more information from these participants regarding cowpea production and other agriculture-related matters.

Smallholder cowpea farmers - the role smallholder cowpea farmers played on the value chain is that they served as a link between input suppliers and consumers. These farmers played the main role on the chain by adding value through production of cowpea and made it available to consumers. On the other hand, these cowpea farmers served as a market for input suppliers like NTK, General Dealers and Progress Milling. After production, farmers packaged cowpea in different sizes.

Local wholesalers - these participants are able to buy cowpeas in surplus at a low price from the farmers and later sell to the consumers at higher price than initially bought. The reason behind this is that they have done value addition to the product in the form of packaging; making it attractive for the consumers to buy and also storage.

Local processors - smallholder cowpea farmers take their seeds to the processing company, where local processing adds value to cowpea by cleaning, grading and storing the product. Since farmers do not have the facilities to store and grade their produce, they take their post-harvests to local processors.

Local traders/hawkers - the role of these participants along the value chain is that they help farmers in generating more sales from their harvest. They sell various fruits and vegetables as a way of earning a living. Cowpea is common in local communities for its importance as a

relish to supplement maize. Informal traders served as a link between suppliers and consumers, also a reliable market for the farmers. The informal traders bought cowpea seeds in larger quantities from farmers. Cowpeas would be packaged in different sizes ready to be sold, however how the product was packaged did not involve too much value addition. Generic packaging was employed to make the product more presentable.

Final consumers - final consumers as participants on the cowpea value chain included people in the surrounding villages and towns. The role these participants played on the cowpea value chain is that they make farmers be aware of what kind of seeds needs to be produced. Final consumers also serve as the main market for cowpea farmers, informal traders, local wholesalers and input suppliers in Ga-Molepo in a sense that they have a choice to buy from different participants on the cowpea value chain.

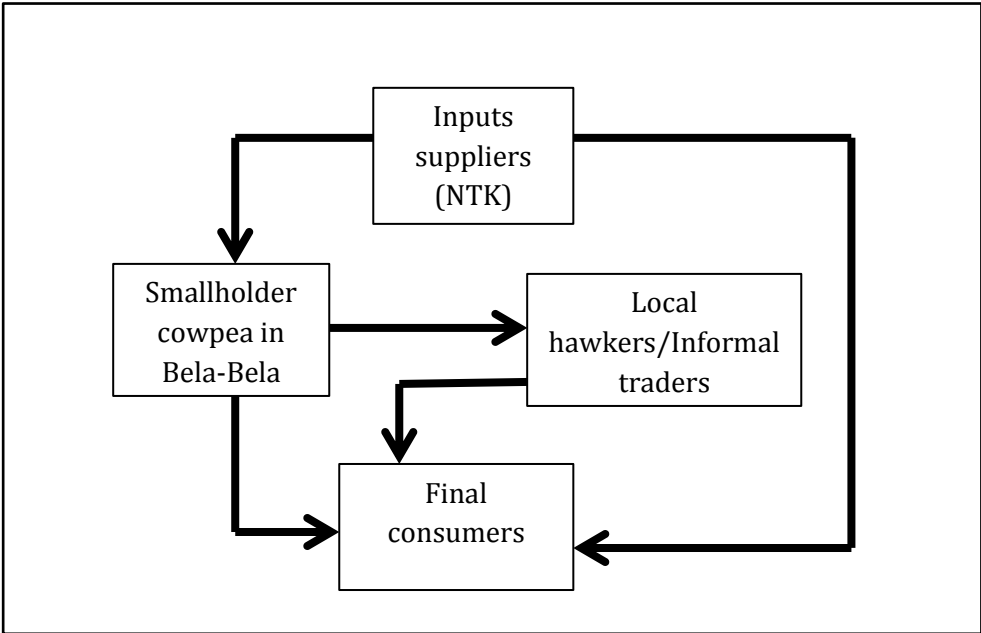


Figure 7: Value chain mapping of smallholder cowpea farmers at Bela-Bela. Source: Obtained from survey data.

Cowpea production in Bela-Bela is still at a low level, where smallholder farmers grow the crop mainly for consumption. A few of the farmers interviewed, were able to produce the crop for both consumption and income generation. In mapping the value chain, farmers indicated that they bought the seeds from the suppliers in town, plant them and sell to the people.

Participants in the cowpea value chain and their roles at Bela-Bela

Input suppliers - input suppliers in Bela-Bela comprised of NTK as the main supplier of agricultural production inputs. They are responsible for supplying inputs to the farmers, such

as seeds, fertilizers and pesticides. The farmers are able to ask for more information regarding what they are producing, and the suppliers are able to help them.

Smallholder cowpea farmers - the role smallholder cowpea farmers play in adding value to the cowpea production; is to produce the crop in a suitable manner as much as they can, to have quality yields available to consumers. The smallholder cowpea farmers in Bela-Bela also served as a link between input suppliers and the final consumers. However, final consumers also served a market for these cowpea farmers as major part of their harvest was consumed by people from the neighbouring villages.

Informal traders/hawkers - the role of these participants along the value chain is that they help farmers in generating more sales from their harvest, but also making profit in the process. The local hawkers buy cowpea seeds from the farmers, and direct the sales to the final consumer.

Final consumers - these participants are the most important on the value chain, because without this linkage there would be no value chain as they serve as the main market for input suppliers, smallholder cowpea farmers and informal traders. They add value to cowpea in that they make farmers know what kind of seeds needs to be produced; as these consumers are always looking to get the best value for their money.

Table 4: Results from binary logistic regression model examining the determinants of marketing efficiency of cowpea farmers in Ga-Molepo and Bela-Bela

Predictor variables	Coefficient (B)	SE	Wald	Sign	Exp (B)
Constant	-21.002	14.729	2.033	.154	.000
Age of the farmer	.435	.195	4.977	.026*	1.545
Gender of cowpea farmers	-2.831	1.852	2.336	.126	.059
Household size	1.710	.780	4.804	.028*	5.530
Years of schooling of cowpea farmers	1.014	.536	3.583	.058**	2.756
Occupation of cowpea farmers	-1.137	.520	4.787	.029*	.321
Land ownership of cowpea farmers	-2.614	6.097	.184	.668	.073
Years of growing cowpea	-.259	.129	4.015	.045*	.772
Quantities of cowpea sold	-.581	.301	3.724	.054**	.559
Income generated from selling cowpea	-.016	.007	5.932	.015*	.984
Access to formal market	-.332	1.592	.044	.835	.717

Model summary

Chi-square (df=8)	62.6
-2 Log likelihood	16.565
Cox & Snell R Square	65.8
Nagelkerke R Square	91.1

Note at * ,**, indicate significant at 0.05 and 0.10 respectively

Source: Computed from survey data.

Table 4 showed results from binary logistic regression model which indicated that seven variables (age, household size, years in schooling, occupation of the farmer, years in farming cowpea, quantities at which cowpea is sold, income generated from selling cowpea) out of ten variables that were regressed were significant in influencing the marketing efficiency of cowpea farmers in Ga-Molepo and Bela-Bela. The model was tested for goodness of fit using Hosmer and Lemeshow's goodness-of-fit for logistic regression models. Hosmer and Lemeshow test showed a Chi-square value of 62.6 and statistically significant at 1.000, implying that the model fit the data well.

With regards to coefficient of determination (R^2), for regression models with categorical dependent variable such as the binary logistic regression, it is not possible to compute the R^2 . Therefore, approximations such as the Nagelkerke R^2 are calculated instead. Nagelkerke R^2 was used in this study as a proxy estimate to R^2 which measures the variation in the response that is explained by the model. The Nagelkerke R^2 was found to be 91.1% which indicates that 91.1% of the variation in marketing efficiency of cowpea farmers is explained by the explanatory variables. The log likelihood value was 16.565 and the Cox and Snell R square was 65.8%.

Age - The results showed that age had a positive coefficient of 0.435 and was statistically significant at 5% level. The positive coefficient suggests that as a farmer gets older, the possibility of being market efficient increases by 0.435. A study done by Oteh and Njoku (2014) found that age was negatively significant to marketing efficiency of farmers. The authors highlighted that it was expected that with an increase in age of the farmer, will bring about a decrease in marketing efficiency since as a farmer gets older the less likely he/she is to adopt new technologies to improve his marketing efficiency. This is however not consistent with findings from Farayola *et al.* (2013), who found that an increase in age of the farmer leads to an increase in their marketing efficiency. This also corroborated by the results from

descriptive statistics of this study that showed that the maximum age of farmers producing cowpea is 83, the average being 63 and minimum is 26. Although, most of the times farmers are regarded as being illiterate, and therefore can't adopt new methods introduced; experience is an important factor in this regard. Cowpea farming can be tiring to plant and therefore needs people with patience and passion for the crop. Ovwigho and Ifie (2009) as cited by Adesina and Eforuoku (2016) mentioned that youth recently are not interested in hard labour more especially agriculture, as they perceive it as being hard and dirty.

Household size - Household size was found to be statistically significant at 5% level, p-value of 0.026 with a positive coefficient of 1,710 and odds ratio of 5.530. This showed that the number of people in the household had a positive influence on marketing efficiency of cowpea farmers. As a household size increases by 1.710 the odds that the farmer will use family labour to increase his marketing efficiency is 5.530 more likely holding all other independent variables constant. This is supported by Oteh and Njoku (2014) indicating that household size was established to be positively significant at 5% level. It is further stated that large household sizes are virtually seen as an advantage in terms of contributing to labour and as such, perceived as a source of cost reduction. In support of this statement, Etwire *et al.* (2013) also found that there is a positive relationship between household size and participation in agricultural practices. It has been indicated that a farmer with a large household can delegate other important activities to other household members, while he participates in agricultural projects.

Years of schooling - Number of years of schooling of a household head was found to be significant at 10% with a p-value of 0.058. the number of years a farmer has been to school has an impact on how a farmer adopt information with regards to marketing, or even new technology that will help them to improve their marketing efficiency. Nnadi and Akwikwu (2008) also mentioned that years in schooling affects the use of information efficiently, emphasizing that the more years a farmer has been to school the less likely he is to have difficulty with adopting modern agricultural technologies. However, Farayola *et al.* (2013) found that years in schooling of a farmer were highly significant but negatively related to marketing efficiency. The results were in contrast with former expectations as it was expected that education should enhance the level of market information, hence marketing efficiency.

Occupation of cowpea farmers - Occupation of cowpea farmers had a negative influence on the marketing efficiency of cowpea farmers. The variable was significant at 5% level, a p-value of 0.029, a coefficient of 1.137 and a log odds ratio of 0.321. The descriptive statistics indicated that a farmer did not solely had farming as an occupation but had other work

commitments besides farming, only 37 farmers out of 80 respondents were full-time farmers. The negative relationship means that the more jobs a farmer had, while holding all other variables constant reduced the likelihood of a farmer being market efficient by 0.321. However, Adesina and Eforuoku (2016) and Nnadi and Akwikwu (2008) indicated that parent's engagement in farming as an occupation was significant as a determinant of youth participating in agriculture. This corroborates to the fact that occupation of a farmer does influence how successful a farmer will be in their agricultural production.

Years of growing cowpea - Years in growing cowpea was found to have a negative influence on the marketing efficiency of farmers. Years in farming cowpea had a significant level of 5% and negatively related with a coefficient of -0.259. Years in farming cowpea was expected to be positively related with marketing efficiency, as with experience comes knowledge on how to be market efficient. A study done by Adenuga *et al.* (2013) on “ Marketing efficiency and determinants of marketable surplus in vegetable production” found that there was significance and positive relationship between years in farming (experience) and marketing efficiency of farmers. It was indicated that farming experience may be due to the fact that experienced farmers are more enlightened and thereby they are well familiar with the efficient marketing of their marketable surplus and were able to reduce market loss. However, Farayola *et al.* (2013) found that there was no significance and relationship between marketing experience and marketing efficiency of cocoa farmers.

Quantities of cowpea sold - Quantities of cowpea sold was found to be statistically significant at 10%, a p-value of 0.054 and a coefficient of -0.541 which indicates that the variable is negatively related to marketing efficiency. This means that with an increase in every quantity sold, there was a decrease in marketing efficiency of cowpea farmers. Since the descriptive statistics showed that more farmers had access to informal market (78%), this implied that consumers had freedom to buy cowpea where the quantities sold were at a reasonable price. An increase in quantities sold means that the prices were also increasing, and consumers are likely to get the best value for their money. Farayola *et al.* (2013) found that quantities sold of cocoa was not significant with marketing efficiency of farmers, but found that selling price was significant at 5% level and positively related to marketing efficiency. It was mentioned that a positive relationship between selling price and marketing efficiency could be because consumers are motivated by favourable selling price.

Income generated from selling cowpea - The variable income generated from selling cowpea was found to be statistically significant at 5% with a p-value of 0.015, coefficient of -0.016 and odds ratio of 0.984. Income generated by farmers from selling their cowpea was

negatively related to marketing efficiency. This means that the amount of money the farmers got from selling their products had no effect on how efficient they were in marketing. The results from the descriptive statistics showed that about only 22% of the farmers responded had access to formal market, while the remainder 78% had access to informal market. The lack of access to formal market could have had an effect on the income generated, and hence a decrease in marketing efficiency. Farmers did not have a stable and reliable market for source of income. However, these results are in contrast with findings of Oteh and Njoku (2014) who found that income generated by farmers from selling their products was highly significant and related to marketing efficiency, stating that an increase in income contributes to an increase in marketing efficiency.

Identifying marketing constraints among smallholder cowpea farmers at Ga-Molepo and Bela-Bela

Several constraints were encountered when marketing cowpeas. Table 5 below showed a number of constraints that hinder farmers in marketing their cowpeas. The descriptive statistics showed that amongst all the challenges/constraints farmers were facing, pests were the most problematic. This is in similarity with the results of Farayola *et al.* (2013) highlighting that among problems facing cocoa marketers inadequate storage facilities, pests, diseases, price instability and high cost of transportation were the most problematic with pests and diseases ranking number one.

This is due to the fact that cowpeas are subjected to weevils and other types of bugs, whereby they suck on pods and leave the outer part of the cowpea. This leads to farmers having nothing or less to sell, which is a big concern since they are losing out on making bigger profits. These farmers are operating on small-scale basis and therefore do not have adequate storage facilities. However, some farmers do manage to send their cowpeas to progress milling facilities to store their produce.

Table 5: Constraints encountered when marketing cowpea

Challenges	Frequency	Percent (%)
Pests and access to markets	13	16.3
Lack of access to market	2	2.5
Pests and lack of access to credit	4	5.0
Lack of access to credit and market	6	7.5
Lack of information on how to process cowpea	9	11.3

Weeds and pests problems	6	7.5
pests	23	28.8
Pests and water shortages	8	10.0
Other	9	11.3
Totals	80	100

Source: Computed from survey data.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The main aim of the study was to map the value chain and determine the marketing efficiency of smallholder cowpea farmers in Capricorn and Waterberg districts of Limpopo province. Data was collected using structured questionnaire from 80 smallholder cowpea farmers using purposive sampling technique in Ga-Molepo of Capricorn district and Bela-Bela of Waterberg district. Value chain mapping in Ga-Molepo of Capricorn district indicated that the main participants on cowpea value chain were input suppliers, smallholder cowpea farmers, local wholesalers, local hawkers/traders, local processing companies, contractors then the final consumer. It was indicated that each participant on the value chain added value to the product to ensure profitability, while on the other hand final consumers got value for their money.

In Bela-Bela of Waterberg district the value chain map showed that the main participants on the value chain of cowpea were inputs suppliers, smallholder cowpea farmers, local hawkers/traders and final consumers. Most farmers in Bela-Bela are engaged in farming particularly sunflower, maize and other types of beans. Cowpea is produced at a small-scale level hence; there are not many participants on the value chain. Farmers in this area have great interest in farming cowpea in masses. Lack of information on how to farm cowpea to be profitable, lack access to high yielding, pests and heat resistant seeds inhibit the farmers in succeeding.

Using the marketing efficiency measure to determine if smallholder cowpea farmers were efficient or inefficient, it was found that 66% of the farmers were efficient and 34% of the farmers were inefficient. Binary logistic regression model was used to examine the determinants of marketing efficiency. Constraints which smallholder cowpea farmers encountered with regards to production, marketing and selling cowpea were identified. Amongst the constraints encountered which included lack of access to formal market, lack of information on how to process cowpea, weeds, water shortages etc. pests problems were ranked to be the main challenge farmers are faced with regarding cowpea production

Age of the household head, household size, years in schooling were found to be positively significant; while years in farming cowpea, income generated from selling cowpea, quantities at which cowpea is sold and occupation of the household head were found to be negatively significant. Age of the household head, household size, years in schooling were found to be positively significant; while years in farming cowpea, income generated from selling cowpea, quantities at which cowpea is sold and occupation of the household head were found to be negatively significant.

Constraints which smallholder cowpea farmers encountered with regards to production, marketing and selling cowpea were identified. Amongst the constraints encountered which included lack of access to formal market, lack of information on how to process cowpea, weeds, water shortages etc. pests problems were ranked to be the main challenge farmers are faced with regarding cowpea production. Few recommendations were suggested and are as follows:

- It is recommended that government (value chain analysts, policy makers and extension workers) together with other stakeholders assist in ensuring that food value chains relationships are established so that market opportunities can be created for smallholder cowpea farmers.
- Aged people are the ones who appreciate farming more than young people, thus it is recommended that farmer schools be introduced in rural areas. At these schools, farmers can be taught about basic knowledge relating to agricultural production. Farmers should also be trained on adopting technologies that will make production more efficient and easier. Knowledge form a crucial part in the success of smallholder agricultural production, as it has it has been observed that years of schooling was significant factor contributing to marketing efficiency of smallholder cowpea farmers. The farmers could also be taught about bookkeeping systems, whereby they are able to see costs of production and marketing; and if they are making profit in carrying out their operations.
- Farmers can form cooperatives wherein they produce in groups; government is most likely to be quick to help such farmers in terms of funding and in providing the resources to work with. When farmers come together as a collective, they display a sense of unity and determination towards accomplishing their goals and that makes it easier for funding organisations to approach such farmers. Cooperatives also help in ensuring that farmers within those cooperatives are able to get a bigger land to enable them to produce different crops.

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