

Understanding the coexistence of large and small-scale millers: an important element for relevant rural policies in the Limpopo Province of South Africa.

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'Understanding the coexistence of large and small-scale millers: an important element for relevant rural policies in the Limpopo Province of South Africa'

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1. INTRODUCTION

The purpose of this paper is to understand the coexistence and permanence of both large and small-scale millers in the Limpopo Province of South Africa, and thus to highlight the diversity of maize meal household procurement strategies, as an important element for policies intended to improve smallholder welfare and food security.

Maize is the most important grain crop produced in South Africa. A summary of maize production in South African during the 2004/05-production season is shown in Table 1. It is evident from Table 1 that the commercial maize production sector contributes 97.7% of the total maize produced in South Africa.

Table 1 : A summary of maize production by the commercial- and subsistence sectors in South Africa for the 2004/05 production season

CROP	AREA PLANTED		FINAL CROP	
	2004 / 05		2004 / 05	
	HA	% of total maize	TONS	% of total maize
Commercial:				
White Maize	1,700,000	52.7	6,540,700	55.83
Yellow maize	1,110,000	34.4	4,909,300	41.90
Commercial maize total	2,810,000	87.2	11,450,000	97.73
Subsistence agriculture:				
White Maize	324,960	10.1	202,755	1.73
Yellow maize	88,480	2.7	63,193	0.54
Subsistence maize total	413,440	12.8	265,948	2.27
Total maize	3,223,440		11,715,948	

Source: Crop Estimates Committee (2006)

The most important maize producing provinces in South Africa (accounting for 91.4% of the total commercial white maize production) are the Free State, North-West and Mpumalanga. Commercial white maize production in the Limpopo Province accounts for only 1.4% of the total commercial white maize production in South Africa.

Within the South African context white maize is primarily produced as a human staple food, while yellow maize is primarily utilised as animal feed. According to the National Food Consumption Survey up to 98% of rural consumers and up to 71% of urban consumers consume maize porridge on a regular basis and the study also indicated that maize is among the five most commonly consumed food types among children in South Africa (along with white sugar, tea, whole milk and brown bread) (Steyn and Labadarios, 2000).

The commercial maize meal sector in South Africa produces mainly super-, special-, sifted- and unsifted maize meal. There are different extraction rates for these maize meal types: Super (62.5%), special (78.7%), sifted (88.7%) and unsifted (98.7%) (National Chamber of Milling, 2003).

The National Department of Agriculture (DoA) specifies technical regulations for the various types of maize meal, as described in the Maize Products Regulations (No. 792, 27 April 1984), last revised Regulation No. 1739 of 17 September 1993. The technical requirements for the various maize meal types are summarized in Table 2.

Table 2 : The South African technical requirements for super-, special-, sifted and unsifted maize meal according to the Maize Product Regulations (No. 1739, 17 September 1993)

	Maize meal type:			
	Super	Special	Sifted	Unsifted
Maximum fat content by mass	< 2.0%	≥2.0% ≤3.0%	≥3.0% ≤4.0%	≥3.5% ≤4.5%
Maximum fibre content by mass	0.8%	1.2%	1.2%	≥1.2% ≤2.5%
% that should pass through 1.4mm sieve	≥90%	≥90%	≥90%	≥90%
% that should pass through 300µm sieve	<90%	Not specified	Not specified	Not specified

The DoA also provides some general descriptions of the various types of maize meal. Super maize meal is a very fine granulated maize meal, which contains few or no germ or bran fractions. Special maize meal is a fine granulated maize meal from which a large portion of the germ and bran fractions has been removed. Sifted maize meal is granulated maize meal from which a very small portion of the bran fraction has been removed. Unsifted maize meal is a coarse product obtained by grinding maize without removing the bran and germ portions. Thus, the level of maize meal refinement increases from unsifted to super. Furthermore, price increase as the level of refinement of the maize meal increases. Finally, when dealing with informal maize millers, the term “straight-run maize meal” might be encountered. Straight-run maize meal is a product obtained by grinding maize without removing or adding bran or germ portions. It is usually produced when maize grain is milled by a hammer mill using a sieve setting that produces no by-products (i.e. no bran or germ removed).

It is important to note that for the informal maize-milling sector, super-, special- and sifted maize meal does not have the same definition as in the formal sector. In the informal sector the extraction rate is the same for all types of maize meal (95% to 99%), but different consistencies resembling super-, special- and sifted maize meal are produced by changing the sieve in a mill to a finer or coarser sieve size. Essentially, the consumer gets back almost all of what is put in, the difference lies in the fineness of the meal.

Even though the commercial farming sector is responsible for about 97.7% of formal maize production in South Africa, the production of maize by households and emerging farmers is a common practice in South Africa. As mentioned earlier, the Limpopo Province produces only 1.4% of the total commercial white maize production in South Africa. According to the latest

Agricultural Census, Limpopo is the most rural province in South Africa, with an 86.7% of the total population living in rural areas in 2001. The importance of smallholder maize production is emphasised by the fact that the maize produced through smallholder agriculture is a staple food source to the poorest, most nutritionally vulnerable segment of the South African population.

2. OBJECTIVES AND METHODS

If the importance of informal maize production and processing in South Africa is generally recognised, the results of a comprehensive literature search showed that very little is known on small-scale maize millers in terms of their milling practices, marketing and maize procurement practices.

Given the prevalence of small-scale millers in the Limpopo Province and their perceived importance in maize meal provision and food security in the Limpopo Province, this paper provides an analysis of the most affordable maize meal procurement options available to small-scale maize producing rural households in the Giyani and Venda areas of the Limpopo Province. The analysis takes into consideration the existence, advantages and disadvantages of small (service)- and large millers and the consequent maize meal procurement possibilities presented to households. The paper will also contribute towards an improved understanding of the factors impacting on the coexistence of small- and large maize millers in the Limpopo Province.

For the purpose of our analysis, we combine data resulting from different surveys that were conducted in the Limpopo Province, in the Giyani and Venda districts. These districts were chosen for the concentration of both large scale and small-scale millers and for their rural features. The cultivation of maize is very common in these areas. The first survey was conducted in 2005 and covered interviews with 181 randomly selected maize consumers in the Venda area, 168 randomly selected maize consumers in the Giyani area and 25 small-scale (swap) maize millers in the Venda and Giyani areas. The second survey (conducted in 2006) covered interviews with 25 farmers, interviewed as both suppliers and consumers of maize to understand their maize production and consumption behaviour. Small-scale and large service millers were also surveyed. The farmers interviewed in the 2006 survey were mostly cultivating under dry-land conditions and thus formed part of the most vulnerable population. They still represent the majority of farmers in this province. Some interviews were also conducted with small-scale maize farmers, which are part of an irrigation scheme to check for possible behaviour variations.

3. GENERAL PATTERNS OF MAIZE PRODUCTION, PROCESSING AND CONSUMPTION

The survey results identified a variety of outlets and strategies for maize utilisation. These are related to small-scale farmers strategies and capacities to produce maize, as well as the different types of processors present in the Province as is described in section 3.2. Finally, on the consumer side, different patterns of consumption could also be identified.

3.1 Different uses of maize production

3.1.1 Options and mechanisms for selling of maize grain

Some farmers will sell most of their maize grain to a commercial miller; others will sell maize grain directly to their community. Many farmers use the exchange system or swap milling either of a small miller or a commercial miller offering this service (such as Progress Milling or NTK), to get their maize processed to maize meal. They mostly use the maize meal for their own consumption, immediate or future. A few farmers sell the processed maize meal to people in the community.

The maize grain selling decision is primarily dependant on the quantity produced as would be expected. Farmers reaching a certain level of maize production can opt for different strategies depending on their intended use of the maize. They generally keep and process enough for household consumption and sell the remaining part as grain. However, the decision to sell grain can also be linked to the level of diversification in farm household income sources. Among farmers harvesting less than 1.5 tonnes, a few choose to sell their entire crop . These farmers are also producing cash crops (such as vegetables) especially during other times of the year within irrigation schemes. Other farming households with members of their household earning external income (and thus not experiencing shortage of food), do not dedicate their maize to household consumption.

Even if agriculture is usually not seen as a remunerative activity, it is also observed that some men previously working outside agriculture are returning to agriculture, especially on irrigations schemes, and these men produce maize as a cash crop.

Some farmers also use grain maize as a cash crop in order to buy inputs for farming (mostly seeds and fertilizers), even if they cannot fully satisfy their annual consumption needs with the remaining part. This usually occurs in the beginning of the production season. Other farmers will only sell enough grain to provide cash for swap milling fees.

When considering maize as a cash crop, most farmers prefer to sell green maize (maize on the cob) to hawkers / informal traders. These opportunities will depend on the presence and on-time visits of hawkers and the distance to the nearest town, where the green maize will be prepared and consumed. Even though this maize marketing option seems to be more profitable than selling grain, it is not available to the majority of farmers. Consequently most farmers will sell grain to a large miller or directly to the community.

Maize grain selling to the community is generally more profitable than selling to a commercial miller. Prices are higher (varying between R100 and R150 per 80kg maize grain compared to a SAFEX based price of about R86 per 80kg in the case of Progress Milling). At the community level grain prices are agreed upon at the local level between producers and buyers. Nevertheless, grain selling to the community only offers a limited outlet and is restricted to small quantities per transaction, which can cause storage problems for farmers.

Some farmers indicated that they changed their maize grain marketing strategy from selling to local consumers, to selling to large millers (such as Progress Milling), due to an increase in their maize production area. Even if prices offered by the commercial millers are lower, the entire harvest is sold in one transaction after harvesting. In addition to solving the storage issue, according to surveyed farmers, this availability of a larger sum of money serves as an

incentive to save it and invest it in their agricultural activities. On the other hand, selling small quantities to community members from time to time (with a fragmented income flow) caused farmers to spend these smaller amounts of money earned each time in a non-productive way. Commercial millers can also, on prior agreement and based on sufficient quantity to collect, provide transportation to collect grain from the small-scale farmer, which solves a big constraint for these small farmers.

Although some farmers with larger production quantities will only use one miller for processing of their entire crop, others use a variety of different channels, such as sales to the local community or to hawkers in combination with sales to a commercial miller. They adapt the quantity sold to different channels to demand.

3.1.2 Other maize production uses

As already mentioned, a common practice among small-scale maize farmers is to use the service of swap millers to cover their household needs for maize meal. Among those producing more than they require for their household consumption, some sell the 'surplus' production to commercial millers, while others will process and store the grain for future possible needs. Some farmers will engage in household level processing of maize grain to maize meal (e.g. through a hand mill or manual crushing of grain). Many farmers also give part of their production in grain or maize meal to relatives, neighbours or poor people. Some receive other kinds of support in exchange.

3.2 Different swap milling actors

Given the importance of small-scale maize production and maize consumption, as well as the stability of maize consumption in the Limpopo province, certain commercial millers (with processing facilities in the Limpopo Province) have developed programs to provide small-scale maize farming households with alternative options for swap milling and / or maize meal procurement. These programs are based on an exchange system. Farmers bring relatively small quantities of grain (usually in 80kg bags) to depots of the commercial miller located in villages within these areas, in exchange for "grain credit". The grain is then transported to the main milling facility of the commercial miller at a central location in the Limpopo Province and used to produce various types of branded maize meal (super-, special-, sifted- and unsifted maize meal). The maize meal is then distributed to the various depots in the province. When a farmer requires maize meal, he can withdraw a certain quantity of maize meal (usually an 80kg bag). It is important to note that within this system a farmer will not receive maize meal prepared from his own grain, but rather from the commercial mill's grain stock (since the grain of all the farmers delivering to the mill will be combined in the production process). The cost of the maize meal obtained through the milling service is based on a milling fee (e.g. R95 for super, R68 for special and R59 for sifted maize meal) and 15kg of additional grain to compensate the mill for extraction losses. Thus, this system provides small-scale farmers with grain storage facilities and presents them with the opportunity to exchange grain for a variety of branded commercial maize meal types. Expansion of these commercial millers working under exchange program is still underway, with the number of depots increasing in rural areas. These expansions constitute the basis of a strategy to share the territory, and thus the source for procurement and demand for milling and maize meal, among the commercial service milling companies, and thus not to compete directly through milling fees.

They will often also sell maize production inputs at the depots. In the last 5 to 10 years, some of these commercial millers engaged in community development programs with the support of the government or related collective organisations (e.g. the maize trust) within which they provide some technical assistance to farmers. These programs are intended to increase maize productivity, thus fostering household food security and at the same time, consolidating local procurement capacity for commercial millers as well as demand for the exchange programs.

This system is to a certain extent a copy of the milling service provided by small service or swap millers operating at the village level. The small swap millers are usually located in rural villages and within close proximity of their customers. People who do not have their own vehicle or money to pay for a taxi, can easily bring their production to the miller without bearing additional costs (e.g. by walking or using a wheelbarrow or donkeys cart). When using the service of a small village-level swap miller a customer will take grain to the mill for processing. The batch sizes are often small (e.g. 20 litre or 25 litre buckets) but can also be an 80kg bag of maize grain. The miller will then process the customer's grain to maize meal at a fee (e.g. R30 to R35 for an 80kg bag) usually while the customer waits; and the customer will receive maize meal that was manufactured by using his / her own grain. These mills usually have small hammer- or roller mills and produce sifted or unsifted maize meal. The technology employed by these mills usually requires minimal maintenance and thus low cost. It is important to note that for the informal maize-milling sector, super-, special- and sifted maize meal does not have the same definition as in the formal sector. In the informal sector the extraction rate is the same for all types of maize meal (95% to 99%), but different consistencies resembling super-, special- and sifted maize meal are produced by changing the sieve in a mill to a finer or coarser sieve size. Essentially, the consumer gets back almost all of what is put in, the difference lies in the fineness of the meal. It is important to note that the seasonality of maize production has a very strong influence on the operation of these small swap mills. They are usually very busy during the maize harvesting season after which business will decline dramatically as households' grain supplies become depleted. Also, during periods of drought when there is a lack of small-scale maize production in these areas these millers will often close down temporarily (e.g. to seek alternative employment) until the next normal production season. Despite the alternative system provided by some of the commercial millers, small millers are still numerous in certain areas of the Limpopo Province and their role should not be disregarded in this highly rural province.

It is thus important to highlight how the development of exchange systems and community development programs affect the coexistence between small and large millers in this province. Better understanding rural households' maize meal procurement strategies and small-scale farmers practices will help getting better insights into this issue.

3.3 Different consumption patterns

Households in the Giyani and Venda areas of the Limpopo Province can acquire maize meal through various strategies. As mentioned above, households that are producing maize grain can use the swap milling systems of small village-level swap millers or the swap milling system of commercial millers to acquire maize meal. If a household does not produce grain or does not produce enough grain for its annual needs or prefer to sell their entire crop as a cash crop, purchasing of commercial maize meal will be necessary. If a household has to buy maize meal, typical purchase locations include large retailers (e.g. Shoprite/Checkers, SPAR), retail outlets of commercial millers, smaller retailers, small local shops, informal traders and

in selected cases maize producing households in their villages. An overview of the consumption behaviour of maize consumers in the Giyani and Venda areas are presented in this section, based on the results of the consumer survey that was conducted in 2005 (covering interviews with 181 and 168 randomly selected maize consumers in the Venda and Giyani areas). Table 3 presents a summary of the maize meal procurement and consumption behaviour of households in the Venda and Giyani areas of the Limpopo Province.

Table 3 : Maize meal procurement and consumption behaviour of households in the Venda and Giyani areas of the Limpopo Province

Behaviour :	Venda area:	Giyani area:
Produce white maize :	33%	44.0%
Maize meal preferences :		
Prefer commercial- to small swap miller maize meal	35.4%	39.3%
Prefer small swap miller- to commercial maize meal	36.5%	55.4%
Maize meal purchasing in month preceding the survey :		
Super	25.4%	48.8%
Special	49.2%	44.6%
Sifted	7.2%	11.3%
Brand preferences	Blue Bird & White Diamond	Tafelberg & Induna
Maize meal purchase location :	National retailer (80.4%) Retail outlet of commercial mill (15.2%)	National retailer (66.7%) Small local shops (15.5%) Smaller retailers (11.9%)
Purchasing frequency :	Once/month (82.0%)	Once/month (90.1%)
Purchase quantity :	50kg bag (23.2%) 12.5kg bag (21.0%)	80kg bag (40.5%) 50kg bag (26.8%)
Transport to purchase maize meal :	Self-drive (57.8%) Taxi (25.6%)	Taxi (33.0%) Self-drive (31.1%) Walking (27.4%)

4. HOUSEHOLD LEVEL PROFITABILITY ANALYSIS OF SWAP MILLING VERSUS PURCHASE OF MAIZE MEAL

As can be deduced from the previous section, there still exists a high diversity of actors and options for maize production and processing, which reflects in and is related to a high diversity of behaviours of small-scale farmers and households. Diversity is also observed in terms of production costs for small holders as is described in the next section, 4.1, with cost ranging from below 50 rands to above 200 rands per bag of maize.

In order to better understand these small farmers' behaviours related to swap milling, which is still a very common practice among small-scale farmers, and to get more insights into the diversity of observed behaviours, we discuss the economic rationale of producing maize for swap milling versus purchasing maize meal in different situations. Hence, we propose a simple model that highlights the profitability associated with producing maize for swap milling compared with directly purchasing maize meal. This model relies on a number of assumptions and observations during the fieldwork, as presented in section 4.2. Results are

presented in the form of graphs that are interpreted in section 4.3. Elements contributing to the actual behaviour that may appear to go against the economic rationale are highlighted in section 4.4.

4.1 Insights into observed production costs of smallholders

Based on the data collected in May and June 2006 with small-scale farmers in Giyani and Venda, the total cost of maize production was calculated for each surveyed farmer. In order to compare it with the price of a 80kg bag of commercial maize meal, these production costs were divided by the number of 95kg bags produced by the farmer, which is equivalent to the number of 80kg bags of maize meal that the farmer will get after processing (considering the Progress Milling¹ service milling as a reference). The 15kg maize grain difference corresponds to the standard swap milling extraction rate used by commercial millers such as Progress Milling.

It appears that the production costs of small-scale farmers are highly variable ranging from below 50 or 70 rands per bag of 80 kg grain to more than 200 rands². Different determinants for production cost can be highlighted. Farmers within irrigation scheme are much more likely to reach production costs below 70 rands, even though cultivation of maize is not always done under irrigation but as a summer crop in rotation with vegetables that are irrigated. This level of cost is then associated with much higher yields than the average for small farmers, i.e. more than two tonnes per hectares, and better management of soil fertility.

For farmers outside irrigation schemes, costs below 120 rands are possible under a 'cost minimisation' strategy; that is when not using either external labour or tractor hiring for soil preparation, or using very low levels of external labour, seeds, fertilisers and tractor hiring. Farmers under rainfed conditions with this type of strategy can reach costs below 70 rands per bag even if their yields are very low.

For farmers with a higher level of investment in agriculture who are using a lot of family labour and achieves medium yield levels; costs usually range between 70 and 120 rands per 80kg bag of maize grain.

Costs between 120 and 200 rands generally correspond to farmers producing under rain fed conditions on small plots, and thus getting small quantities of maize as a result. This cost range can also characterise farmers having good yields but very high costs, either because of hired labour or tractor hiring.

Costs above 200 were also observed. They are generally associated with both bad yields and high level of use of external labour or payment of a high rate for renting a tractor. It has been observed that the cost of hiring a tractor can vary significantly in the different communities that were surveyed; interviews with key informants also confirmed this.

These maize production cost observations were used to develop the following basis typology of small-scale maize farmers in the survey areas:

¹ Progress milling is the main commercial milling company that has developed an exchange program in the studied area. In the rest of the paper, the option of using this kind of exchange program will be based on the Progress Milling program.

² Costs for production are calculated based on the surveys data not accounting for the cost of family labour, which are highly variable among the farmers.

Farmers' categories	Production cost range (/80kg grain)
Low production cost category	From 30 to 70 rands
Medium production cost category	From 70 to 120 rands
High production cost category	From 120 to 200 rands
Very high production cost category	Above 200 rands

These ranges will be used to discuss profitability and affordability of producing maize for swap milling.

4.2 Main assumptions and features of the profitability calculations

Our assessment of the profitability and/or affordability³ of producing maize for swap milling is based on calculating the production cost above which it is not economically worthy to produce maize that we call 'threshold' production cost. To do this, we account for transportation costs and prices of purchasing maize meal in different outlets. We calculate this 'threshold' production cost for different locations, based on the following basic equation:

<p>Production cost threshold (PCT)+ Transportation cost to miller + Milling Fee (MF) = Maize meal price (MP) + Transportation cost to store</p> <p>That is:</p> <p>PCT = MP - MF + 2*(Cost per km*Distance to Store –Cost per km*Distance to Miller)</p>
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This equation shows the relation between the 'threshold' production cost and the location of the farmers (distance to store and to miller).

We base our calculation on prices and costs captured during the survey of May and June 2006, considering the two most purchased standard types of maize meal: super and special. Prices for maize meal and processing fees vary according to the different outlets as described below.

Two options for swap milling are considered: local swap millers or Progress Milling's milling service. Progress Milling's milling fees are the same in the different depots located in the surveyed area and are as indicated in the following table:

	Progress Milling's milling fee/ 80kg bag ⁴
Super maize meal	95 rands
Special maize meal	68 rands

Local millers' fees are much more variable. Based on data from our survey, we used an average milling fee of 35 rands per 80kg bag of maize grain. The extraction rate, and thus the loss associated with milling the maize, is usually very small and always below the 15kg practiced by Progress Milling and the other commercial millers. We do not take into account this difference, which can be seen as lowering even more the cost of swap milling with local millers.

³ Because of our focus on the production side, we use the word profitability but as it is calculated by comparing its costs to purchase, we could also call it affordability.

⁴ As already mentioned, farmers bring 95kg bags of maize to Progress Milling and get 80kg bags of maize meal to account for the extraction rate.

For purchasing maize meal, two options are considered:

- buying from SPAR, which is one of the main supermarket chains in the area and has stores in all the major towns in the survey area;
- or buying from a Progress Milling depot (also located throughout the survey area).

Prices for purchasing super and special maize meal are as indicated in the table below:

Prices in rands, June 2006	Super Maize Meal	Special Maize Meal
Progress Milling ⁵	235	177
SPAR Tzaneen	205	218
SPAR Giyani	205	175
SPAR Makhado	244	214

The maize meal prices considered at the different SPAR stores are for the more popular and consumed brand (which is usually the Tafelberg Brand).

While SPAR only has stores located in the major towns, Progress Milling depots are more widespread in the area. They can be found in all major towns but also in some more scattered rural villages. These differences in geographical distribution are accounted for by considering different areas. We thus calculated the relation between the ‘threshold’ production costs and the location of the farmers for three kinds of ‘archetypical’ situations, based on the main areas where surveys were conducted. These situations were chosen to highlight the high diversity in locations for farmers with regard to towns, stores and depots and reflect the associated variability in transportation cost and in prices.

Based on our observation in the Giyani and Venda districts, we assume that there are local millers within walking distance for all the farmers in the different areas that we consider in our calculations.

In the **Giyani area**, both the SPAR supermarket and the Progress Milling depot where farmers can either buy their maize meal or get their maize processed are located in Giyani. No Progress Milling depot can be found near Giyani in the considered area. ‘Distance to Miller’ and ‘Distance to Store’ are thus the same, and are equivalent to the distance to Giyani, except for the local miller case where no transportation cost are involved for milling. Based on this, we thus calculate the ‘threshold’ production costs for farmers in this area with regard to the distance to Giyani.

In the **Tzaneen area**, purchase of maize meal can be done either at the SPAR supermarket store or at the Progress Milling depot. In the region we consider, there is also a depot of Progress Milling where maize can be processed 13km away from Tzaneen.

In the **Makhado area**, purchase of maize meal can also be done in Makhado at the SPAR or at the Progress Milling depot. In the region where surveys were conducted, the Progress Milling depot is located 25 km away from Makhado.

In these two situations, ‘Distance to Miller’ and ‘Distance to Store’ are different but a relationship can be established between these two distance variables. And thus only the

⁵ Prices are the same in the different depots of Progress Milling.

distance to store, which is equivalent to the distance to Tzaneen or to Makhado, is used in calculations.

Another source of variation that we consider deals with transportation methods used by the farming households. Not all farmers have their own vehicles. Some farmers use collective taxis; others hire transport from their neighbours or participate in a locally organised collective transportation initiative. Transportation costs differ for the various options. We based our calculation on a very conservative figure of 1.85 rands per km when using own transportation cost.⁶ For taxi transport, a cost of 1 rand per km was used (average cost for distances between 5 and 40 km as reflected in the surveys).

Furthermore, when travelling to the major towns and supermarkets, purchasing maize will not be the only aim of farmers. They will most probably buy other grocery items and may purchase inputs at the same time. To account for this multipurpose travel dimension, we consider that only a portion of the transport cost is to be associated with maize purchasing. We estimate this by using a cost of 0.2 rands per km, when travelling to towns.

Given the strict household preference either for 'special' or for 'super' maize meal, we consider these two options separately and thus do not calculate 'Thresholds' production costs based on producing maize to get it processed as 'super' versus purchasing 'special' or vice versa.

'Thresholds' production costs are thus calculated in the three areas according to the following possible arbitrage:

1. For super maize meal:

- producing maize for swap milling with Progress Milling versus purchasing from Progress Milling (referred to as **Su PM** in the next graphs)
- producing maize for swap milling with Progress Milling versus purchasing from SPAR (referred to as **Su SM** in the next graphs)
- producing maize for swap milling with a local miller versus purchasing from SPAR (referred to as **L Su SM** in the next graphs)

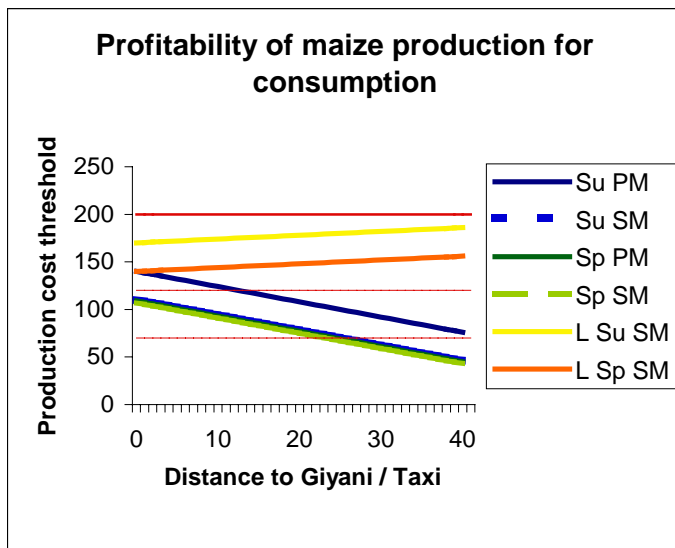
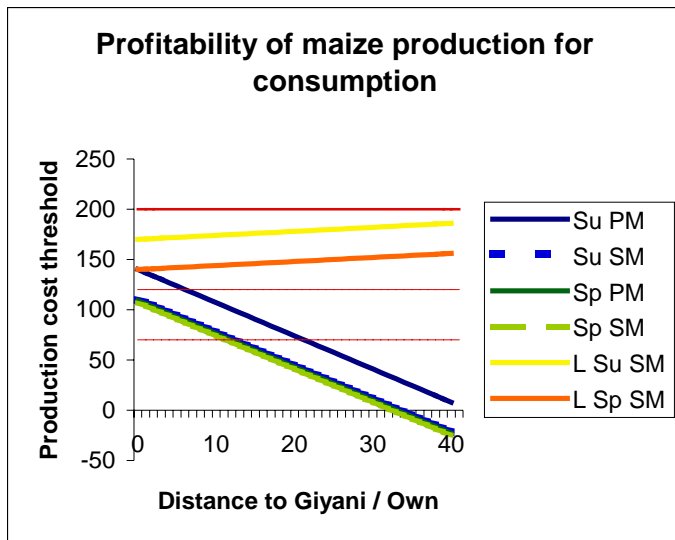
2. For special maize meal:

- producing maize for swap milling with Progress Milling versus purchasing from Progress Milling (referred to as **Sp SM** in the next graphs)
- producing maize for swap milling with Progress Milling versus purchasing from SPAR (referred to as **Sp PM** in the next graphs)
- producing maize for swap milling with a local miller versus purchasing from SPAR (referred to as **L Sp SM** in the next graph)

4.3 'Threshold' production costs results and analysis

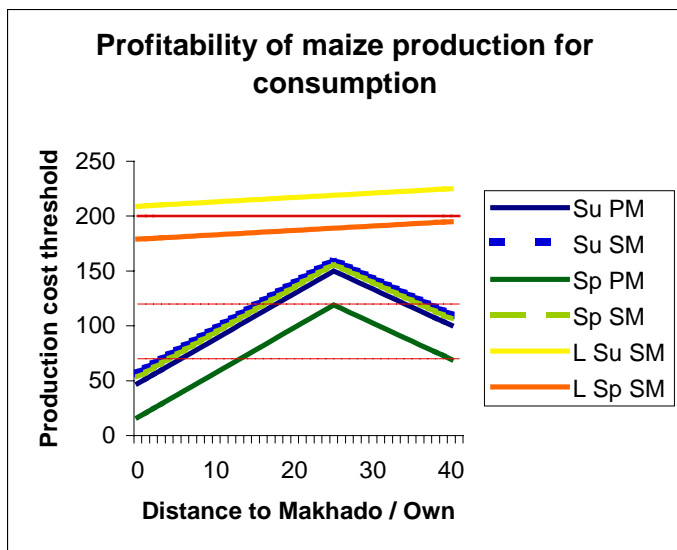
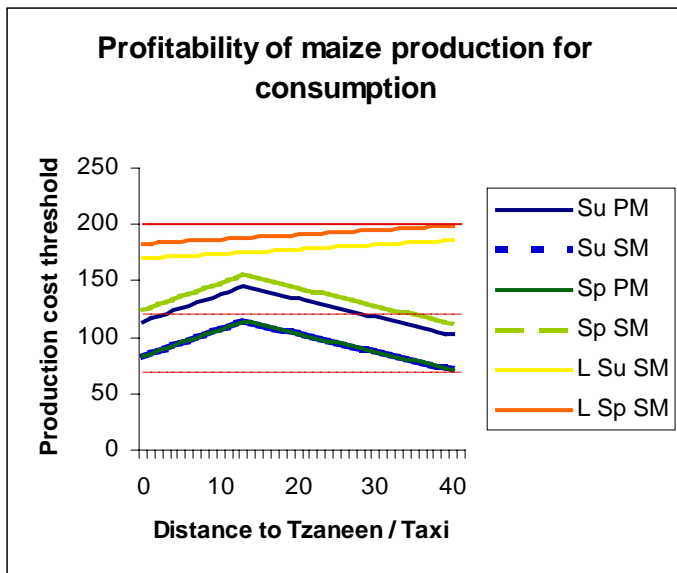
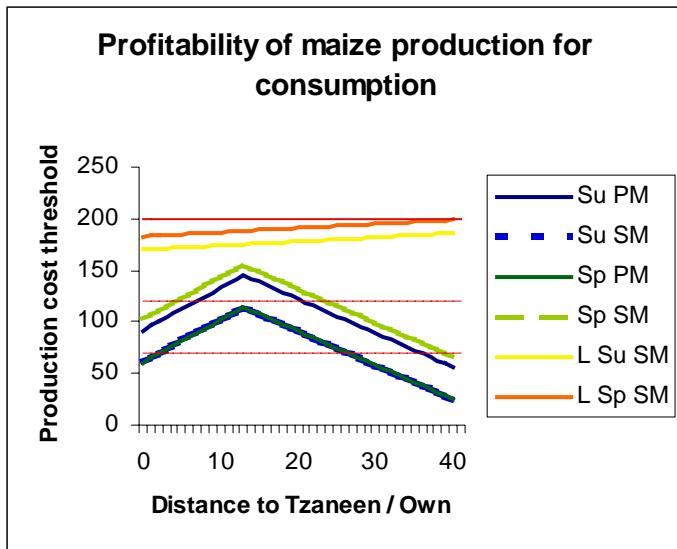
The results are presented in two graphs for each area, one considering that farmers use their own transportation means, the other considering that they use a taxi. The ranges of production costs that were observed and described in section 4.1 are represented on the graphs with the red lines (at 70 rands, 120 rands and at the 200 rand level).

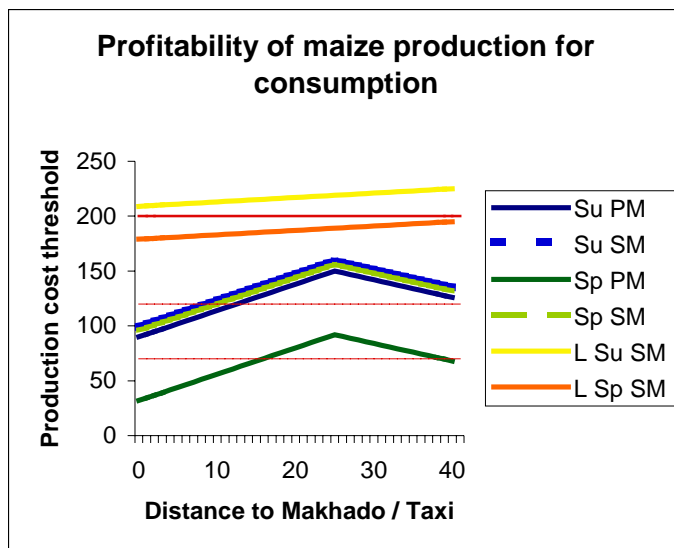
⁶ This assumption is based on the average rate of the South African Automobile Association for fuel and wear of vehicles with an engine capacity of 1300cc to 1800cc, since the vehicles owned by rural households are usually older with higher fuel consumption.



From these two graphs, the basic effect of distance to Progress Milling on the profitability of producing maize for swap milling can be underlined, with Progress Milling swap milling not being economically worthwhile even for the most efficient farmers when the distance increases, especially when using own transportation.

Then, we can see the different thresholds arising from different prices associated with different qualities and brands, and therefore different margins: with direct purchasing from Progress Milling Super maize meal being the most expensive option in the Giyani area, and thus inducing a higher threshold of profitability.





With regard to the Giyani area, it is interesting to note how the presence of a Progress Milling depot can affect the threshold production cost distribution, and contributes to raise the profitability of growing maize for swap milling. The community development program, which is aimed at improving productivity of maize production, reinforces this.

On a general basis, it is interesting to stress the diversity of profitability levels associated with the different options and situations, and to note that the calculated thresholds mostly fall inside the range of observed production costs, making the decision of whether to produce maize for swap milling or to directly purchase it economically sensible. Different situations in terms of depot locations of Progress Milling and significant differences in prices for the different outlets and qualities are thus critical in small farmers' economic welfare.

As expected, a local village miller is always the more affordable option for swap milling. But it is also worthwhile noting that, in the three areas, for farmers with production costs above 200 rands, almost none of the strategies of swap milling are economically rationale, even with local village millers. Nevertheless, production costs above 200 rands are not uncommon. More generally, farmers enduring high production and transportation cost would be better off in strict economic terms by directly purchasing maize rather than producing it. Nevertheless, production of maize mill for swap milling is still a very common practice, even among farmers with high production costs.

The next section builds upon this economic assessment and other considerations to give more insights into small farmers' actual behaviours, and puts forward other key drivers and factors for these behaviours, that highlight the coexistence of small and large millers.

4.4 Actual behaviours of small-scale households regarding swap milling and their determinants

A first important comment to better understand the decision of whether or not to produce maize is the huge impact of the climatic conditions on small-scale maize production, which is mainly undertaken under rainfed conditions. These climatic conditions in the studied area can be highly variable, with critical drought certain years or flooding other years. Decision of whether to produce maize thus entails a high level of risks, and forecasting of production level

and yields is very difficult.⁷ This can explain certain discrepancies between actual behaviour and the expected economically rational behaviour as described in the previous section. A major discrepancy is the case where farmers are still producing maize even if they would be better off purchasing it. Indeed our economic calculations are based on actual production costs that account for the achieved yields. And these calculations cannot be done before the planting season, that is at the moment when decision to produce is taken.

Furthermore, profitability of production might not be the only factor behind the decision to produce maize, especially for farmers enduring very high production costs. Obviously, costs of production are dependant on good or poor management and on external factors (such as climatic events but also animals devastating the crop). But a critical factor related to costs above a certain level appears to be the existence of pensions. Elders benefiting from pensions are responsible for a large proportion of small-scale farming. They are usually not able to mobilise a lot of family labour. But they can afford high cost because of the monthly 'income' flow from their pension. Even if they usually reach very low yields, their investment in agricultural production is relatively high. In this case, hiring labour or a tractor in the community for maize production can be a way of contributing to redistribute money to the community. In a broader sense, maize production can have a status role for the elders. They have always been producing maize in this region.

Another important decision is whether to enter into an exchange program with a commercial miller or with a local swap miller, the latter being the more affordable option. Local swap milling can thus provide for a very cheap option, especially when maize production has been low and for very poor households. Nevertheless, it is important to state that the decision to deal with a local swap miller cannot be reduced to the affordability dimension.

Another dimension is the convenience aspect. Local swap millers can process very small quantity of maize on demand as already mentioned. With low production level, farmers can store their production in grain at home and get their maize processed as often as they need. For high level of production, however this argument of convenience can revert. A critical factor then becomes the storage capacity, which local swap millers cannot provide. Local millers generally do not have maize grain storage facilities, and the maize meal they produce has a limited lifespan of about three months.

The storage facility offered by commercial millers under exchange program can play a key role in farmers' decision to enter into these exchange programs. Farmers are ensured to have fresh maize meal for their consumption all along the year by going to the commercial milling depot. Furthermore, they only pay for the milling fee when getting back their maize. Their maize can be stored this way for several years depending on farmers' needs. It is then observed that many small-scale farmers, even when producing slightly more than needed for their actual consumption, get their whole production processed by large millers and stored. They will then keep it for specific occasions such as a burial or in expectation of bad years. For some farmers, given this storage facility, maize production is then also used as a saving means. They store their maize meal bags with the commercial miller, and they can sell them to the commercial miller at the market price whenever they need money⁸.

⁷ Our data regarding production costs, which are based on one production season, are for a normal to good production season, with good rains.

⁸ Very few farmers market maize meal to community members after using commercial millers services, probably in part at least because of the lack of storage capacity and of marketing skills. When it is observed, it is usually to support neighbours or family members.

Decision to enter into an exchange program is furthermore supported by the power conferred by the brand and the trust in large companies to provide a product of high and standardised quality. When farmers do not have enough maize meal for their own consumption, they usually buy some of the same brand. Choice between commercial companies is obviously dependant on the distance to the depot or shop and on milling fees. But these are usually more or less the same among commercial millers, and these companies normally operate in different areas, with their expansion in rural areas still underway. A factor in explaining choices is the loyalty to a miller or to its brands. This explains the effort deployed by some large companies to attract farmers, among others with their exchange program and community development program.

Nevertheless, some farmers, even with level of production requiring some storage or making it worth selling their production, will still use the service of a local miller for at least part of their own consumption. It concerns generally the grain quantity that they can store at home, before the quality of the maize grain deteriorates. They sell the rest of their production to a commercial miller, or get it processed and stored in good conditions. Their choice of dealing with a local village miller for their consumption is then related to preferences for traditional maize meal or for specific types of flour such as the African maize meal with which they can prepare porridge. It is reinforced by the fact that the maize meal farmers get from the swap millers is produced with the maize they deliver to them, contrary to the maize meal produced by the large millers who have centralised processing facilities. With small village millers, farmers are dealing with people from their community; they can observe the processing and thus control it; they can decide upon the contents and consistency of the maize meal. A strong proximity is thus entailed in the relation, not only because of geographical closeness.

On the other hand, even some very poor households and farmers with high production costs or with low volume of production, prefer to use the commercial milling service because of their perception of commercial maize meal, i.e. Super and Special, as a high quality maize meal and because of their loyalty to a commercial brand. An important future research issue departing from this statement is to understand the factors / conditions under which households might be willing to switch consumption from commercial maize meal to maize meal produced by local swap millers due to the affordability of the latter option.

The discussion in this section of the paper illustrated the diversity of possible behaviour options of small-scale farmers influencing the coexistence of small and larger millers. It highlighted the important point that these behaviours are usually not only based on economic factors, but also on a variety of other factors.

5. CONCLUSION AND RECOMMENDATIONS

It is argued that the lack of knowledge and understanding surrounding small millers can undermine the design of policies and models to improve smallholder welfare and household food security. Such an understanding is especially critical in order to develop insights into the food security roll of the small-scale milling sector in the South African context. The information presented in this paper attempted to contribute to improve this understanding by highlighting small farmers maize meal procurement strategies, and then giving grounds to an

When selling maize to the community, it is done in grain as previously described; and customers get maize processed on their own, either with a local miller or by themselves.

improved understanding of the coexistence of small and large millers in the South African context.

As mentioned in the paper, competition among large millers in the Limpopo Province is basically dealt with through a tacit distribution of the different areas to set up depot and stores and thus does not really reflect in a price competition (in terms of milling fees). Thus the permanence of small millers can contribute to a more effective competition among millers in favour of small farmers. Furthermore, contrary to large millers, which can procure maize grain from the major production areas in South Africa, small millers clearly depend on local grain procurement. Relating development programs and policies only or mainly to large millers would certainly destroy the coexistence of small and large millers, weakening small farmers' positions and undermining their livelihoods.

From our understanding of small farmers' behaviours, it appears that an important aspect in explaining small millers' permanence is the proximity between small farmers and small millers. This does not necessarily mean lower geographical distance than with large millers. Even if transport cost is a major constraint to most small-scale farmers, some depots of the large millers companies are located in very rural and remote areas. Proximity also relies on elements such as membership to the same community, and on the transparency of the processing. The maize meal that farmers get from the small swap millers is produced with the maize they deliver to them, contrary to the maize meal produced by the large millers who have centralised processing facilities. With small millers, thus a trust and ownership component strengthens the relationship and plays a major role in the proximity. Furthermore, swap milling with a local village miller also entails a cultural dimension. It is related to tradition.

Another important specific resource contributing to the permanence of small millers is their simple equipment and process, and low maintenance costs. This increases their resilience to shortage in procurement, which is still very dependent on climatic conditions (mostly rain fed agriculture with low inputs level) and thus highly variable in the Limpopo Province. If large millers can cope with this high variability in production by procuring from other Provinces, it is observed that small millers stop operating for some time (up to several years) before starting again their activity. If this allows small millers resilience, on the other hand, it prevents them from investing in this activity, for example to obtain grain storage facilities and to start engaging in production milling, which could increase their competitiveness with regard to large millers.

With development of programs supported by commercial millers, aimed at the improvement of small-scale farmers' management and production practices, expected positive spin-offs include higher yields and lower production costs.⁹ This will make swap milling an even more affordable option. Commercial millers engaging in swap milling can thus appear as a more attractive option, as they would then represent for a larger proportion of small farmers a more affordable option to get highly standardised quality maize meal rather than by purchasing it. The storage capacity they provide to small-scale farmers will also appear to be even more relevant with farmers having more production. Consequently, local swap millers could progressively lose their procurement source and disappear. However, by highlighting that farming households' decision to deal with local village millers is not only related to economic factors, a counter-argument can be made. The increase in production from small farmers

⁹ Furthermore, it is not clear whether the pensioner farmers, which still represent an important proportion of small-scale maize production, will change significantly their production practices.

could even secure a more stable flow of grain to swap millers for service milling that could then support further investment on their side.

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