The Determinants of Smallholder Farmers Inclusion /Exclusion in Modern Agro-food Supply Chains:

A Case of the Tomato Sub-Sector in Limpopo and Mpumalanga Provinces in South Africa

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Abstract

This paper discusses the effects of markets restructuring on small-scale farmers in South Africa by analysing the determinants of small-scale farmers' market choices in the tomato sector in two Provinces. South Africa has a very dualistic agricultural sector with a highly performing large-scale capital intensive agriculture on one hand and a traditional, semi subsistence small-scale communal sector on the other. Small farmers' participation in modern markets (i.e. supermarkets, agro-processors and national fresh produce markets) is thus very low. Furthermore, results from our survey indicate that small-scale tomato growers in Limpopo and Mpumalanga provinces prefer supplying informal markets than modern markets. The econometric analysis of household level data indicates that access to land is a key determinant of their participation in modern markets. As confirmed by our survey, small-scale farming systems in South Africa are still very poorly capitalised. While still not being widely used, the key non-land asset variable is whether they can produce under greenhouses, thus supplying consistent quality demanded by the modern local channels. Other factors such as education and location in a good tomato producing area are also significant determinants of participation in modern markets. Interestingly, ownership of a cell phone as well as the number of market channels to which the farmers are connected are significant in determining market choices but they are negatively related to modern markets choice, which is to be related to the different natures of the transactions. Modern markets propose fixed prices or at least very stable prices under some forms of contractual arrangements while informal markets offer relatively flexible prices, price discovery and price risk management (through multiple marketing strategies) thus being much more important. The econometric analysis also shows that supplying modern markets does not improve small-scale farmers' income whereas the access to a cell phone does, which supports the importance of the cell phone in price management as well as the preference for informal markets.

Key words: Restructuring food markets, smallholder farmers, market channel choice

1. Introduction

Primary agriculture accounts for 2.7 percent of the country's GDP, taking its backward and forward linkages with other industries the contribution adds up to more than 12% (Louw *et al.*, 2007). South Africa has the best performing agricultural sector in Sub-Saharan Africa, but the legacy of the apartheid regime's discriminatory policies means that the communal farming sector where small scale farming dominates, has not shared in this phenomenal success (Pote *et al.*, 2007).

Post 1994 market liberalisation period has witnessed rapid agro-industrialisation of the agricultural sector. There has been transformation of the agro-food markets in the country characterised by the rise in dominance of retailers and agro-processors. The restructuring process has been accompanied by increased concentration, changes in procurement strategies, introduction of private standards and consolidation of the production base (Louw *et al*,. 2007),. Consolidation is also evident from the relatively high levels of concentration observable in food production, processing, wholesale and retailing systems. However this transformation process risks the exclusion of smallholder farmers from food markets (Kirsten & Sartorius, 2006, Sartorius & Kirsten 2006).

The risk of exclusion is more pronounced among small scale emerging black farmers. They have been subjected to double barrelled exclusion, firstly on efficiency grounds and secondly regarding the institutional set up largely as a result of the colonial legacy. In addition they are also faced with a number of challenges including a high degree of uncertainty, low profits, and a lack of ability to meet the ever-changing necessities brought about by new forms of agribusinesses (Kirsten & Sartorius, 2002). Research has shown that there are few black farmers who integrated into modern agribusiness value chains either for supermarkets or agro-processors (Sartorius & Kirsten, 2006). The majority of the small scale farmers still supply to traditional markets such as hawkers, bakkie traders and wet/open markets (Louw *et al*, 2007). These traditional markets are best placed to serve these small scale farmers in remote areas because of their low transaction costs, relatively flexible prices and proximity.

2. Research Questions and Hypotheses

The central research question of this paper is "what are the determinants of smallholder farmers' inclusion/exclusion from modern food supply chains?" The paper also seeks to evaluate the impact of market channel choices on household incomes and technology use. The following hypotheses are tested; the first hypothesis is that household characteristics (age, farm size, gender, education level) are significant determinants of inclusion/exclusion of smallholder farmers from modern tomato supply chains. The second hypothesis is that "access to non-land assets such (green-house, irrigation packhouse and cellphones) enables the inclusion of smallholder farmers in modern food supply channels. The third hypothesis states that collective action enables inclusion of smallholder farmers' participation in modern supply channels. The last hypothesis is that market channel choices have significant impacts on incomes, technology use and input use levels.

3. Methodology

A total of 345 smallholder tomato farmers were interviewed using a semi-structured household questionnaire. A two staged sampling procedure was used for sampling household which were interviewed, the first stage involved purposively choosing tomato growing districts in the two provinces and the second stage households were purposively selected based on lists of tomato growers which was provided by extension workers in the study areas. Therefore the survey sample is a representative of the smallholder tomato growers in South Africa. In Limpopo Province two districts Mopane and Vhembe were selected whilst in Mpumalanga only one district Eenhlanzeni was chosen. Approximately 65% of the sample population was selected from Limpopo province and nearly 35% from Mpumalanga Province. In each district we randomly selected villages in which we administered the questionnaire. Then households were randomly selected from the randomly selected villages. After collecting the data we derived a weighting procedure for estimating the weights of the individual households which were interviewed, the weight for hth household producing tomatoes from kth village if the jth district in ith province is defined as???

PIJKH=Wu*Wij*Wijk*Wijkq*Wijkqh

4. Survey Results

The results of this household survey are used in two ways in this study, firstly to give a description of tomato production and marketing among smallholder farmers in South Africa. Second the results will be used to run a two stage econometric model for testing the study hypotheses stated before. There are six main tomato marketing channels available and accessible to farmers in the study areas, namely supermarkets, National Fresh Produce Markets (especially Johannesburg Fresh Produce Markets), *bakkies* traders[1], hawkers on foot and local or wet markets except for agro-processors which are only accessible by farmer from the Limpopo province. The Johannesburg Fresh Produce Market is the furthest tomato marketing channel for most farmers in the study areas, on average it is more than 200 km away. The other marketing channels in both provinces are within 50km radius for most households in both provinces. The majority of the farmers (more than 90 percent) supply their tomatoes to different supply chains as individuals; there are very few respondents who collectively market their tomatoes to the different supply chains.

The majority (over 60 percent) of the farmers supply their tomatoes to hawkers, with an equal number supplying to hawkers on foot and hawkers with bakkies. Hawkers on foot are usually from the same or nearby villages whilst hawkers with bakkies are usually from distant places, especially distant cities such as Durban or Rustenburg including from neighbouring countries such as Zimbabwe, Botswana and Mozambique. Hawkers with bakkies are a dominant supply chain for Mpumalanga tomato farmers, this can be explained by the proximity of the province to Mozambique and Swaziland and given that other market channels such as agro-processors and Fresh produce markets are absent thus cross border agents (hawkers with bakkies) present a significantly more viable market opportunity. About 10 percent of the farmers interviewed (mainly from Limpopo) supply their tomatoes to the Fresh Produce Markets, specifically the Johannesburg Fresh Produce Markets. Less than 15 percent of the farmers supply their tomatoes to local open or wet markets in their municipalities. Supermarkets and agro-processors are the least supplied

[1] They are informal traders or middleman who operate small trucks buying directly from farmers before reselling to the different outlets up the value chain.

channels, less than 5 percent of the farmers supply to Supermarkets in such cases they supply to the SPAR stores (franchise formats) and local general dealers.

There are more farmers who supply their tomatoes to supermarkets in Limpopo province compared with Mpumalanga, a possible explanation may be that there are more SPAR stores in Limpopo who have developed innovative procurement schemes for small farmers. Less than 10 percent of the households, only from the Limpopo province supply their tomatoes to agro-processors such as Tiger brands and Giants. Among those who supply supermarkets few (40 percent) have supply contracts, the same applies for the farmers who supply to Agro-processors. The presence of all market channels in Limpopo province is an indication that there are more marketing dynamics in the province compared to Mpumalanga province.

Table 1. Access and use of markets

	Limpopo (%) n-225	**Mpumalanga** (%) n=120	**Overall N=345**
Supermarkets	4.38	0.79	3.8
Agro-processors	7.97	0.00	7,7
resh Produce Markets	19.12	3.94	10.7
Hawkers	32.27	74.02	32.7
bakkies traders	15.94	13.39	30.8
Local market	20.32	7.87	13,9

Source: Survey data

Over 70 percent of the interviewed farmers supply to more than one marketing channel, in some cases up to four channels either at the same or different periods. In such circumstances where a farmer sells to more than one market channel, the bulk of the total marketed production is supplied to hawkers. Most smallholder tomato farmers in the study areas supply their tomatoes to the market throughout the year although there is a significant variation with regards to market timing. In the case of supermarkets, there are equal percentages of farmers who supply their tomatoes in the first three quarters of the year, whilst about 20 percent supply to supermarkets throughout the year. For the rest of the supply channels (agro-processors and fresh produce markets, hawkers and the open market), the majority supply their tomatoes in the first quarter of the year but there is also significant proportion of farmers who supply throughout the year.

During both the in and off peak tomato seasons, hawkers with bakkies offer the highest price whilst agro-processors have the lowest prices. Price fluctuations were greatest with the open markets, hawkers with bakkies and hawkers on foot, whilst supermarkets' and agro-processors' prices are stagnant throughout the year. This may explain why farmers prefer to supply to traditional channels (hawkers and open markets) than to modern markets (supermarkets and agro-processors). The majority of the farmers interviewed ranked ready markets and good prices as the main driving forces behind farmers' market channel choice. Lack of supply contracts, high quality requirements and high transport costs were the major limiting reasons which farmers alluded to the lack of market access.

During the survey farmers were asked a hypothetical question on their market preferences under different circumstances in a bid to ascertain if farmers' market choice decisions would be different from the current practices if they are given power to choose or when they are facing different marketing scenarios. In circumstances where they are looking for the highest price, the majority of the farmers would prefer to sell to supermarkets and the local open green markets. The explanation may be that on one hand some supermarkets such as Woolworths and Pick 'n Pay offer a premium price for quality products while on the other hand the open markets allow farmers to reap all the marketing margins since they will be selling directly to the final consumer (housewives). The majority of the farmers prefer Johannesburg Fresh Market when they want to establish a long term relationship; an explanation to this is that farmers have developed some long term relationship based on trust with the market agents. They trust these agencies to negotiate in good faith on their behalf as they have repeatedly engaged them to sell on their behalf. Supermarkets and the Johannesburg fresh produce markets are the most preferred market channels in terms of getting the right prices for their best grade tomatoes. The explanation for supermarkets is the same as in the highest price scenario but for the Fresh Produce Market the explanation is that the wholesaling system allows farmers with quality products to bargain for better prices.

Hawkers and local markets are the most preferred channels if farmers want to sell bulk un-graded tomatoes, this can be a result of the fact that some hawkers are not particular about which grades and quality standards they buy. They can have any

grade or quality, but they will then grade on their own and sell the tomatoes based on their quality so as to increase their marketing margins. According to the results of the household survey, supermarkets, agro-processors and fresh produce markets have a set of quality standards. In most cases they demand fresh quality first grade products and they do not tolerate mixed grades. In addition to quality requirements, supermarkets and agro-processors demand certain level of packaging requirements, they demand that farmers must use crates for packing and these must be well labelled with the name of the producer, address, grade and the shelf life or expiry dates.

Table 2: Market preference

Type of market	Highest price	Long term relationship(	best grade one	Un-graded tomatoes (%)
Supermarkets	31.01	17.75	24.23	0.28
Agro-processors	3.35	14.37	3.62	1.40
Fresh produce markets	9.22	24.23	38.16	0.56
Hawkers with bakkies	17.32	18.03	10.86	6.46
Hawkers on foot	16.20	5.35	1.95	44.94
Local market	22.91	20.28	21.17	46.35

Source: Survey data

5. Econometric Analysis

The 345 household units in the sample were split into two categories based on the main market channels which they supply their tomatoes to. The first category is made of farmers who sell the major share of their tomatoes to modern market channels such as supermarkets, agro-processors and the National Fresh Produce Markets. The second category is made of farmers who sell the biggest share of their tomatoes to traditional market channels such hawkers, bakkie traders and the local open markets A two stage econometric analysis approach was used to evaluate the factors which determine smallholder farmers participation in modern food supply chains.

The first stage is a choice probit model[2] in which the dependant variable market channel choice is a binary variable (zero [0] for traditional markets and one [1] for modern markets).

The first stage model is stated as:

(1) M_k= f (Household Characteristics, Risk, Farm $Size_{t-n}$, Other $Assets_{t-n-}$ Shifters)

[2] The weighted data as explained in the data collection section

Where M_k is the market channel choice, it is a binary variable (0, 1); t-n refers to lagged variables. In this context the variables were lagged by five years (to the 2001/2 season). The second stage of the model estimates the impact of selected market channel choice (M_k) on Y which are tomato revenues, fertilizer use, capital to labour ratio and capital to land ratio.

The second stage model is expressed as:

(2) $Y = f$ (Incentive, Risk, Farm Size $_{t-n}$, Other Assets $_{t-n}$, Policy Shifters, Other Shifters, Mk)

6. Description of the econometric variables

The household survey was conducted in two provinces, Mpumalanga and Limpopo. The Limpopo province is well known as a tomato production province as 70 percent of tomatoes in South Africa come from this province. Mpumalanga agriculture is largely dominated by fruits; grains and sugar cane, with a few pockets where tomatoes are grown. Table 3 describes the right hand variables, which were used in the model, for both the first and second stages.

Table 3: Variables description used in econometric model

Variable Type	**Variables**	**Description**	**Total (N=345)**	**Modern (N=85)**	**Traditional (N=260)**
Household characteristics	Gender	Male headed households	59.4	63.95	58.30
	Age	Years	54	55.13	54.22
	Education	Years	8	7.62	8.20
	Labour	Number	6	6.92	6.27
Assets	Farm size	Hectares	5.7	8.58	4.85
	Transport	% own	32.0	22.0	23.0
	Greenhouse	% owners	4	3.5	1.2
	Packhouse	% access	8.1	2.33	10.00
	Mobile phone	% owners of mobile phones	67	73	76
	Tractors costs	Cost of hiring a tractor	R3 114.94	R3 416.17	R2 214.69
	Irrigation type	Type of irrigation, 0, high technology 1 for low technology	49.85	55	34.88
Risk	Price	Price per Kg	0.81	0.83	0.80
	Market channels	Number of	2.4	1.9	2.0

		market channels sold to			
	Non-farm income	Amount R	R2780	R1645.17	R3026.17
	Cooperative	% member	44.38	26.44	50.38
shifters	Training	% trained in agriculture	40.7	33	34.9
	Extension	% access to extension service	62	77	73
	Access to credit	% received credit	9.3	8.8	8.9
	Main Road		9.46	4.23	8.15

7. Model Results

According to the results of the first stage econometric estimation presented in Table 2, geographical location, education, farm size, access to greenhouse, number of supply channels, cooperative membership, cell phone ownership and type of irrigation type are significant determinants of market channel choices by smallholder farmers at 10 percent confidence level..

Table 4: Results of the 1st Stage: Market choice model

	Coef.	Z	P>z
District	0.40	1.67	0.10*
Gender	-0.15	-0.48	0.63
Age	0.00	0.03	0.97
Education	0.10	2.12	0.03**
Experience	0.02	1.52	0.13
Family size	0.04	0.85	0.40
Non-farm income	0.00	-0.84	0.40
Farm size	0.07	2.69	0.01***
Greenhouse	1.33	2.02	0.04**
Pack house	0.53	0.86	0.39
Coop member	-0.63	-1.72	0.09*
Extension	-0.03	-0.10	0.92
Credit	-0.09	-0.15	0.88
Price per kg	-0.43	-0.73	0.46
Market channels	0.45	2.87	0.00***
Main road	0.00	-0.67	0.50
Phone	-0.60	-1.89	0.06*
Transport	0.33	0.89	0.37
Tractor cost	0.00	0.04	0.97
Irrigation type	0.97	3.22	0.00***
_cons	-2.65	-2.11	0.04

* (P<0.10) =10 percent significance level ** (P<0.05) =5 percent significance level *** (P<0.01) =1 percent significance level

Location is estimated using a dummy variable proxied by the provinces in which the study was carried out, 1 for Limpopo and 0 for Mpumalanga. Location is significant

at one percent significance level; it means that there is significant difference in terms of market channel choice made by farmers between these two provinces. These two provinces have distinct geo-economic and climatic characteristics with regards to tomato production and marketing. On one hand Limpopo province is a tomato growing region, it is home to several tomato agro-processors and related agribusiness firms. On the other hand Mpumalanga province does not have favourable geo-climatic conditions for tomato production and it also has no agro-processing firms dealing with tomatoes. The overall explanation is that the presence of agribusiness and related infrastructure enables small scale farmers to participate in modern market channels.

Education level of the household head is significant at five percent significance level, it is positively related to market choice indicating that the more education a farmer is the more likely he/she is going to participate in modern marketing channels. It is expected that those farmers who have higher education levels can gather and understand production and marketing information so that they can adjust their production and marketing systems according to the supply specifications set by modern marketing channels.

Farm size is statistically significant at one percent significance level; this means that tomato growers with a larger land size are more likely to participate in modern/modern marketing channels. The explanation is that farmers with relatively large land holdings have the capacity to increase their production levels such that they will be able to meet the quantity and consistency demands set by modern market channels such as agro-processors and supermarkets.

Access to a greenhouse is statistically significant at five percent significance level this means farmers who own or have access to a greenhouse are more likely to participate in modern marketing channels. Farmers with a greenhouse are able to produce throughout the year and the temperature control technology allows them to grow quality tomatoes which can meet the quality demands which are usually set by modern market channels such as supermarkets.

Membership to a cooperative is significant at 10 percent significance level and its coefficient has a negative sign. This means that households who belong to a

cooperative are likely to supply traditional markets over modern markets. The explanation maybe that most of these cooperatives are loose coalition of farmers whose mandate maybe in getting the best price as opposed to securing a stable long term market for the farmers.

Attitude towards marketing risk is proxied by the number of market channels to which a farmer supplies his/her tomatoes. The variable is significant at one percent significance level. This means that farmers who have a big market portfolio (supplying to more marketing channels) are likely to supply to modern marketing channels. The modern markets usually procure through contracts which can enable farmers to deal with issues of market risk which are quite relevant especially with regards to the marketing of fresh produce commodities such as tomatoes.

Ownership of a mobile phone significantly determines market channel choice at 10 percent significance level. The variable is negatively related to market channel choice which means that farmers in the study area with access to mobile phones are more likely to participate in traditional marketing channels. The explanation is that farmers with mobile phones are more likely to have better access to modern traders??? especially cross border bakkie traders and therefore prior marketing arrangements are made through mobile phones before they procure tomatoes from the producers. A mobile phone also influences farmers' decisions on where and when a farmer may get updates on price information. Given that prices are relatively more flexible with traditional market channels than modern market channels, farmers with mobile phones tend to supply their tomatoes to traditional market channels

Irrigation type is a significant determinate of market channel choice at one percent significance level. This means that households with advanced irrigation technology such as drip and sprinkler systems are likely to participate in modern market channels compared to those with less advanced irrigation systems such as the furrow system and bucket. Advanced irrigation technology allows farmers to improve their yields and can water their fields throughout the season which allows them to meet supply demands set by modern markets in terms of quantity and consistency.

8. Impact of market channel choice on incomes and technology use

Several indices were used to determine the impact of market channel choice on income, technology and input use. According to the second stage model results, shown in Table 3, market channel choice has no impact on tomato income or fertiliser use, capital to land ratio and capital to labour ratio. The significant determinants for tomato incomes are farm sizes, access to a pack house, access to credit, and access to transport. For fertilizer use geographical region, gender, cooperative membership, farm size, utilisation of extension and access to credit are significant determinants of fertiliser use. Family size, farm size and tractor costs are the only significant determinants for capital to labour ratio whilst geographical region farm size, access to a pack house and access to a mobile phone are significant determinants for capital to labour ratio..

Table 5: 2nd stage , Market channel choice impact

	Revenue		Capital to land ratio		Capital to labour Ratio		Fertilizer use	
	Coefficient	**P>t**	Coefficient	**P>t**	Coefficient	**P>t**	Coefficient	**P>t**
District	5718.70	0.16	5459.30	**0.06**	-13.2713	0.65	341.33	**0.00**
Gender	3342.95	0.60	-1562.11	0.78	32.14775	0.27	-244.88	**0.04**
Age	209.55	0.37	126.21	0.49	0.487515	0.72	-5.01	0.22
Education	-14.77	0.83	29.08	0.89	1.312283	0.92	-2.29	0.93
Training	2312.00	0.67	701.97	0.95	35.29766	0.14	-35.83	0.58
Experience	115.74	0.75	-52.83	0.61	0.178709	0.72	-6.65	0.16
Family size	966.80	0.33	560.09	0.59	-5.37552	**0.06**	17.83	0.43
Non farm income	0.17	0.88	0.16	0.60	0.001166	0.73	-0.01	0.36
Farm size	814.19	**0.07**	-1627.98	**0.00**	4.747302	**0.02**	22.42	**0.01**
Greenhouse	7770.38	0.59	2629.21	0.89	20.56138	0.89	184.62	0.49
Pack house	15689.53	**0.06**	17198.35	**0.01**	6.556752	0.69	-0.33	0.98
Coop member	-6537.74	0.26	-178.58	0.91	-49.0184	0.19	301.35	**0.0**1
Extension	6942.37	0.38	7236.33	0.24	54.46745	0.36	-201.04	**0.04**
Credit	-18587.54	**0.03**	-9895.89	0.22	-50.1225	0.60	323.64	**0.04**
Price per kg	-11036.09	0.76	-8504.77	0.45	-77.0195	0.27	-162.20	0.66
Phone	8860.04	0.11	-280.04	**0.02**	118.6902	0.21	110.65	0.16
Market choice	-4219.39	0.40	4476.91	0.36	-13.401	0.67	34.43	0.79
Transport	8313.54	**0.04**	9823.61	0.94	36.95928	0.96	-172.30	0.52
Tractor cost	-6831.20	0.88	-3847.27	0.76	-16.0759	**0.04**	-57.13	0.69
Irrigation type	-1084.51	0.30	1594.86	0.94	24.38292	0.31	3.56	0.24
_cons	5698.30	0.68	-206.06	0.80	-32.3828	0.73	-108.12	0.70

* (P<0.10)=10 percent significance level ** (P<0.05)=5 percent significance level

*** (P<0.01)=1 percent significance level

Impact on tomato income

Farm size is as can be expected positively related to total tomato revenue at five percent significance level. Farmers with big plots achieve economies of scale in production which allows them to minimise costs and maximise profits. Access to a pack house is positively related to tomato revenue at 10 percent significance level. This means value addition through packing and sorting increases the income obtained by farmers from selling tomatoes. Access to transport is significant at five percent levels; its coefficient is positive which means access to transport can improve a farmers tomato income. Access to credit is significant at five percent level, its coefficient is positive this means farmers with access to credit are able to invest properly in production which in turn allows them to increase their productivity and the subsequent returns.

Fertiliser use

Location (geographical region) is positively related to fertiliser use at one percent significance level which means fertiliser use among tomato farmers varies significantly across the different production regions. This is expected due to the higher production potential of areas in Limpopo. Gender of the household head is negatively related to fertiliser use at five percent significance level which means female headed households have higher fertiliser use levels than their male headed counterparts. Membership to a cooperative is positively related to fertiliser use at one percent significance level. Farm size is positively related to total fertiliser use at one percent significance level. This means farmers have larger farmers are likely to invest more in fertiliser use. Extension positively related to fertiliser use at five percent significance level this means that farmer who have access to extension advice are more likely to have higher fertiliser use levels than those who do not get such services. Access to credit is positively related to fertiliser use at five percent significance level, this means farmers with access to credit have higher fertiliser use levels than those who do not have access to credit.

Capital to Labour ratio

Labour size is negatively related to capital to labour ratio at five percent significance level, this means farmers in the study area use more labour and less capital in their

tomato enterprises. Farm size is significant at five percent level and has a positive coefficient; this means that households with more land use more capital than labour in their tomato enterprises. Tractor costs is negatively related to capital to labour ratio at five percent significance level, this means that households who more tractor cost use more capital than labour in their tomato enterprise.

Capital to Land ratio

Location is positively related to capital to land ratio at 10 percent significance level this means that there is a significant variation in terms of input use (capital to land), across the different districts in the study area. Farm size is negatively related to capital to land ratio at one percent significance level. This means those households with the larger farms are likely to use more land than capital in their tomato enterprises. Access to a pack house is positively related to capital to land ratio at one percent significance level, this means that households with access to pack house either by owning or leasing are more likely to use more capital than land in their tomato enterprises. Access to a mobile phone is positively related to capital to land ratio at five percent significance level, this means those households with mobile phones are likely to use more capital to land in their tomato enterprises

9. Conclusion

The transformation of agro-food markets is at an advanced stage, despite providing opportunities for new markets, it risks marginalisation of small scale farmers from agribusiness supply chains. The majority of the small scale farmers in South Africa are classified as subsistence, with a few pockets of semi commercialised production especially for fresh produce commodities. Small scale farmers or emerging farmers have been victims of exclusions from mainstream agricultural markets. Given the rise of modern food markets together with changes in procurement systems of these channels, there is need to evaluate the determinants of smallholder farmers' participation in restructuring agri-food markets. There are questions whether smallholder farmers should work towards integrating themselves into modern food supply chains.

The results of the econometric analysis show that the first two hypotheses of the study partially hold. Education level for the household head and farm size are significant in

determining smallholder farmers' market channel choice. Based on the second hypothesis access to a greenhouse and advanced irrigation technology are significant in determining smallholder farmers' market channel choice. The third hypothesis hold as collective action is significant in influencing participation of smallholder tomato growers in modern market channels. Lastly the results of the second stage nullifies the fourth hypothesis, namely that market channel choice has no impact on income, technology and input use.

Overall the econometric results shows that emphasis should not only be placed on linking small scale farmers to modern markets, but there is need to consider the role of traditional markets as alternative marketing options. The ideal is to link farmers to market channel choices which maximize their incomes given the different constraints ranging from production to transaction costs. There is also need for farmers to invest in non land assets such as greenhouses, irrigation and access to information (proxied by cellphone ownership) to enable them to attain the production thresholds which enable them to meet the quality, quantity and supply consistency set by the modern market channel farmers. Although the role of collective action in enhancing market access come out significantly. There is need for stakeholders, especially civic society to invest in building the capacity of small scale farmers to act collectively to enhance their access to modern markets.

Related tables on collective actions

Forms of collective action

	dynamic	Traditional
tomato organization	40.70	29.12
Agriculture Cooperative	27.91	50.58

agric activ coop is involved in

	dynamic	Traditional
Prodn	18.60	31.80
output mkting	6.98	4.98
inputs supply	4.65	1.53
All	4.65	3.83
production and marketing	1.16	13.41
non response	63.95	44.44

Services provided by the tomatoes organization

	dynamic	Traditional
input credit	2.33	1.53
Training	5.81	10.73
Marketing	12.79	11.11
Transport	2.33	1.53
Extension	16.28	6.13
training and marketing	2.33	0.77
Non response	58.14	68.20

% percentage who sell collectively

	dynamic	traditional	Total
Supermarkets	3.53		3.53
Agro-processors	1.16		1.16
Fresh Produce Markets	4.65	1.92	6.57
Hawkers	7.06	10.73	17.79
Bakkie traders	4.65	8.43	13.08
local markets	9.41	8.43	17.84

10. **References**

LOUW A., CHIKAZUNGA D., JORDAAN, D & BIÉNABE, E. (2007) *Restructuring food markets in South Africa: Dynamics within the context of the tomato subsector*, Report Regoverning Markets Project, IIED, University of Pretoria.

POTE PETER P.T, OBI AJURUCHUKWU& GAVIN C. FRASER (2007) *Technical Constraints to Smallholder Development in South Africa: Implication for Market Access and Food Chain Management.* Poster paper at the International Food and Agribusiness Management Association, Parma, Italy, June 23-26, 2007.

KIRSTEN, J. & SARTORIUS, K. (2002). Linking Agribusiness and Small-scale Farmers in Developing Countries: *Is There A New Role for Contract Farming*? *Development Southern Africa.* Vol 17(4)

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