

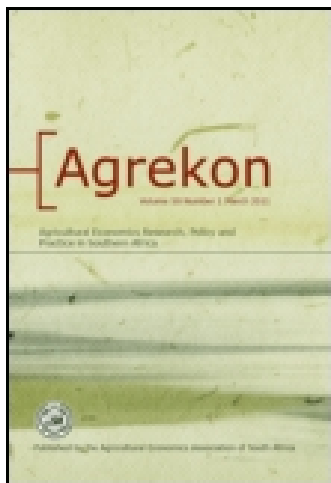
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Characteristics of potato contract producers in the South African potato processing industry

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CHARACTERISTICS OF POTATO CONTRACT PRODUCERS IN THE SOUTH AFRICAN POTATO PROCESSING INDUSTRY

D.B. Strydom¹, H. van Zyl², B.J. Willemse³

ABSTRACT

Imports in the South African processing and frozen fries industry are on the increase. Thus, procurement for processing companies becomes more complex and the competition for local producers is increased. Local processors need to find adequate supplies at the lowest price whereas producers need to deliver at the best price. In order for processing companies to ensure sufficient quality and quantity, a good procurement strategy such as contract marketing is required. However, the characteristics of producers willing to adopt contract marketing must be identified. In order to do so, characteristics of contract producers in the Eastern Free State who used two different governance structures (contract and spot-market) were interviewed. A questionnaire was used and data were analysed with a Principal Component Regression combined with a Logit model. Out of 26 possible characteristics, nine were identified as significant ($P < 0.1$ or $P < 0.5$). The characteristics included less marketing cost, market information, only channel, less quality penalties, transport, price certainty, negotiation period, number of contacts, and less risk. Processing companies wanting to establish marketing strategies, target producers, and improve current contracts can use the nine characteristics. The characteristics can also be used to negotiate long-term contracts with producers.

Keywords: contract market, marketing strategies, potato industry

JEL Classification: M3 and Q1

1 INTRODUCTION AND BACKGROUND

Fresh produce and processing are the two main marketing channels for the South African potato industry. The channels make use of different governance structures and procurement methods. The fresh produce channel predominantly uses a spot market (table potatoes). According to Rhodes *et al.* (2007), this is an open market that competes in a similar fashion to perfect competition. The processing industry,

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on the other hand, uses a contract governance structure.

Contractual arrangements are increasingly important in improving the effectiveness and efficiency of agricultural supply chains (Ali and Kumar 2011). Two related and powerful trends have emerged in current farming practices. Firstly, farmers and producers use agricultural contracts to guide the marketing and production of commodities. Secondly, there is a production shift from smaller to larger farms, which increases the economies of scale. Combined structural changes like these affect cost and productivity, not only in agriculture, but also the broader food sector. Rhodes *et al.* (2007) find that processors in the agricultural industry make use of two specific contracts in order to procure commodities, namely production contracts and marketing contracts.

Production contracts focus on compensation, contractor responsibilities, and farmer-provided grower services, all of which are defined in the contract. Contractors usually hold ownership of the commodities and provide key inputs in transport, veterinary services, feed and seedlings, during production. Marketing contracts focus on the commodity delivered to the contractor. The processing companies specify a mechanism for commodity price determination or a specific commodity price, product quantity to be delivered, quality standards, and delivery outlet. Pricing mechanisms can limit a farmer's risk regarding the wide fluctuations in market prices, and price premiums can be specified for commodities with desired levels of specified attributes. In South Africa, most of the potatoes for frozen fries are sold under marketing contracts (hereafter referred to as contracts).

In terms of supply chain analysis, the use of contracts is not a new topic. Various authors have investigated and developed the contract theory. Tregurtha and Vink (1999) emphasised the importance of trust and relationships within contracts.

Little attention has been paid to factors that influence producers' opinions and perceptions of contracts. Research suggests that marketing methods used by the producer, profitability, and the number of buyers to whom the producer sells, significantly influence attitudes toward marketing contracts (Ali and Kumar, 2011; Lawrence and Grimes, 2001). Thus, low-cost producers who market their products via group marketing or individual contracts have more positive attitudes towards marketing contracts than producers selling on the spot market. Masuku, Kirsten, Van Rooyen and Perret (2003) also indicated that trust is very important. The conclusion from their study was that "relationships characterized by trust, physical and psychological commitment as well as cooperation between exchange parties is more important for mutual benefit and good quality relationship".

According to PotatoSA (Personal communication, P. van Zyl, 22 October 2011), 352 873 tons of potatoes were used for processing purposes in 2010, and increased by 38% from 2000 to 2010. South Africa also imports large amounts of frozen fries, depending on the exchange rate and European production seasons (Personal

communication, P. van Zyl of PotatoSA, 22 October 2011). Import competition is confirmed by the import propensity data (Imports/consumption), which increased from 2% in 2005 up to 6% in 2010. The import figures are illustrated in Figure 1. The fast growth in frozen fries production and import competition compel local processing companies to contract local farmers in order to ensure quality as a core competency. Thus it is important for processing companies to determine their target producers and to establish which type of producers will be interested in participating in contract farming.

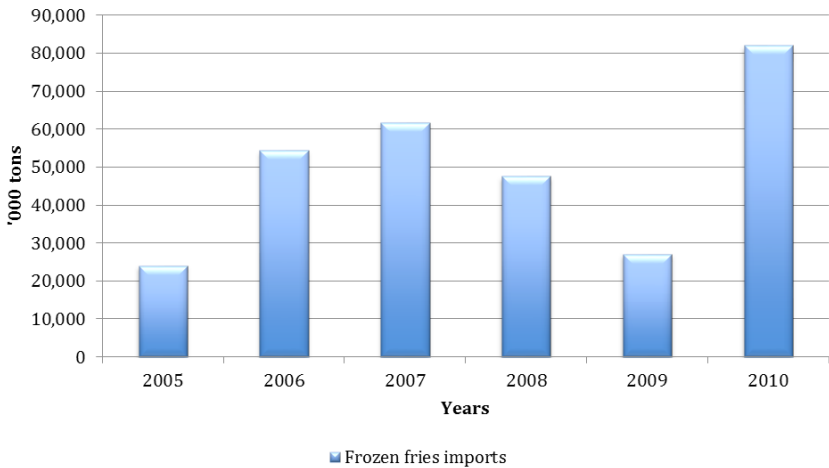


Figure 1: Frozen fries imports into South Africa

(Source: Personal correspondence P. van Zyl, PotatoSA industry information, 2011)

The aim of this study was to assist frozen fries processors to establish target producers and determine which producers would participate in contract marketing. The characteristics of producers willing to participate in contract marketing were determined and procurement strategies developed.

2 DATA AND METHODOLOGY

A telephonic interview was conducted to determine the characteristics of producers who would participate in contract marketing within the potato industry. The study area comprised the eastern Free State (South Africa); this region best represented the table and processing potato industry with a high concentration of table and

processing potato producers. Telephonic questionnaires obviated travelling and a census method was used. All eastern Free State producers listed at Potatoes South Africa (PSA, the organisation representing potato producers in South Africa) were interviewed (n=70).

The questionnaire was compiled from a literature review and discussions with key role-players within the potato industry. Questions regarding the characteristics of producers who would find contracts favourable were included. Corrections and suggestions from the discussions were incorporated, and the questionnaire was submitted to role-players for another round of discussion. After consensus was reached that the questionnaire encompassed all important aspects, a pilot survey including two Potato South Africa managers and two commercial farmers was conducted.

Data variables that did not differ much between respondents were confirmed by a correlation matrix (Table 1). The correlation indicated the presence of multi co-linearity, which could lead to a lack of significance of individual variables (Gujarati, 2003). In order to overcome this problem, principal component regression (PCR) was used to reduce the observed variables into a much smaller set of principal components. The variables that were reduced and excluded from the study according to the anti-image matrix were as follows:

- Age
- Education
- Experience
- Profit
- Size
- Credit options
- Distance to market
- Ownership of land
- Trust
- Conflict

These variables were also tested by means of running a Logit regression in Simtar. However, none of these variables was significant at a 95% confidence interval.

The PCR method standardises all variables to a mean of zero and standard deviation of one, thereby minimising problems associated with scaling (Shiimi, 2010). The number of factors in principal component analysis can be determined by using the Kaiser Criterion. This criterion explains that only factors with an eigenvalue greater than 1.00 should be retained. The eigenvalue is a measure of the amount of variance (of the original variables) explained by the principal component. An eigenvalue of 1.00 indicates that the principal component explains at least the amount of variance contained in one of the original variables.

According to Filzmoser (2001) in Shiimi (2010), the principal component regression primarily estimates response variables at the basis of hypothesised explanatory variables. The nature of the study data that included outliers made least

square (LS) regression and classical PCA vulnerable. Outliers influence parameter estimates and therefore PCR and linear multiple regression need to be made more robust. Shiimi (2010) explains the application of PCR as follows: In a PCR, the dependent variable \mathbf{Y} is regressed on a subset of the principal components. “The estimated regression coefficients for the principal components in the chosen subset are used to obtain regression coefficients for the original columns of \mathbf{X} ” (Hwang and Nettleton, 2003:72). Magingxa *et al.* (2006) uses the PCR method within a maximum likelihood estimation framework.

The matrix below uses standardised variables in order to calculate the eigenvalues and eigenvectors ($\lambda_1, \lambda_2, \dots, \lambda_k, \mathbf{v}_i$) in Equations 1 and 2.

$$|\mathbf{C}-\lambda\mathbf{I}| = 0, |\mathbf{C}-\lambda_j\mathbf{I}|\mathbf{V}_j = 0 \tag{1}$$

In order to obtain matrix \mathbf{v} the eigenvectors \mathbf{V}_j were arranged into a matrix reflected in Equation 2.

$$\mathbf{V} = \begin{bmatrix} v_1 & v_2 & \cdot & \cdot & \cdot & v_{1k} \\ v_2 & v_2 & \cdot & \cdot & \cdot & v_{2k} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ v_{k1} & v_{k2} & \cdot & \cdot & \cdot & v_k \end{bmatrix} \tag{2}$$

The matrix \mathbf{V} is orthogonal as its columns satisfy the conditions $\mathbf{v}_i'\mathbf{v}_i = \square 1$ and $\mathbf{v}_j'\mathbf{v}_i = \square 0$ for $i \neq j$

$$\mathbf{Z} = \mathbf{X}^s \mathbf{V} \tag{3}$$

“Where \mathbf{X}^s is $n \times k$ matrix of standardised original variables, and \mathbf{V} is the eigenvector matrix as defined in Equation 3. There are k explanatory variables, as there are k variables. The new sets of variables (explanatory variables), unlike the original variables, are orthogonal, i.e. they are uncorrelated” (Shiimi, 2010:59).

As explained above, the Kaiser Criterion indicates that only factors with an eigenvalue greater than 1.00 will explain the observed variance. The next step is to eliminate the explanatory variables with the smallest eigenvalues.

After the explanatory variables have been calculated and explanatory variables with the smallest eigenvalues have been eliminated, the explanatory variables having a significant impact on the probability of decision-making of whether to produce for the contract market or not, must be identified.

Table 1. Anti-image matrix before reduction with a correlation of 0.3 and higher between variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.492	-0.381	-0.886	-0.014	0.014	-0.013	-0.023	-0.128	-0.16	0.145	0.048	-0.112	0.045	-0.119	-0.083	0.054	-0.229	0.178	0.088	0.071	-0.044	-0.08	-0.229	0.151	0.014	-0.189
2	-0.381	0.207	0.304	-0.028	-0.22	0.27	-0.174	0.164	-0.179	0.128	-0.3	0.065	-0.286	0.114	0.32	0.382	-0.186	0.033	-0.201	-0.429	-0.298	-0.099	0.345	-0.428	-0.243	0.023
3	-0.886	0.304	0.492	-0.095	-0.027	-0.085	0.024	-0.014	0.22	-0.211	0.039	0.129	0.011	-0.014	-0.217	0.236	-0.139	0.129	-0.033	0.085	0.048	0.082	-0.149	0.035	0.288	
4	-0.014	-0.028	-0.095	0.665	0.21	0.657	0.013	0.114	-0.217	0.12	-0.146	-0.209	0.077	0.149	-0.207	0.077	-0.045	-0.219	0.054	0.002	-0.007	0.082	-0.007	-0.109	-0.065	-0.006
5	0.014	-0.22	-0.027	0.21	0.37	-0.202	0.216	0.189	0.115	0.034	0.167	-0.075	0.336	0.009	-0.153	-0.11	0.094	-0.111	-0.111	0.254	0.379	-0.369	0.093	-0.124	-0.01	
6	-0.013	0.27	-0.065	0.067	-0.202	0.172	0.12	-0.16	-0.234	0.037	-0.002	0.09	-0.338	0.088	0.084	0.465	0.084	-0.219	-0.07	-0.057	-0.351	-0.133	0.279	-0.217	-0.008	-0.052
7	-0.023	-0.174	0.024	0.103	0.216	0.12	0.821	-0.124	0.039	-0.198	-0.198	0.002	0.042	0.14	-0.164	-0.205	-0.099	0.132	0.065	0.288	0.348	-0.134	0.145	-0.139	0.167	
8	-0.128	0.164	-0.014	0.114	0.169	-0.16	-0.124	0.745	0.199	0.15	0.001	-0.002	0.128	0.123	0.102	0.079	-0.206	-0.08	-0.334	-0.25	0.008	-0.027	0.135	-0.022	-0.113	-0.014
9	-0.16	-0.179	0.22	-0.217	0.115	-0.234	0.039	0.199	0.549	-0.082	0.241	0.115	0.097	0.079	-0.399	-0.354	0.274	-0.359	0.035	0.027	0.335	0.045	-0.035	0.162	0.199	0.089
10	0.145	0.128	-0.211	0.12	0.034	0.037	-0.198	0.15	-0.082	0.799	0.068	-0.284	0.084	-0.13	0.132	0.127	-0.26	-0.089	-0.4	-0.159	-0.004	-0.168	0.015	-0.138	-0.016	0.019
11	0.048	-0.3	0.039	-0.146	0.157	-0.002	-0.198	0.001	0.241	0.068	0.869	0.277	0.126	0.045	-0.01	-0.092	0.03	0.108	-0.007	0.023	0.088	-0.002	-0.155	-0.052	0.227	0.074
12	-0.112	0.065	0.128	-0.209	-0.075	0.09	0.072	-0.002	0.115	-0.284	0.277	0.833	-0.216	0.097	0.069	0.087	0.002	-0.06	-0.05	-0.292	-0.042	-0.045	0.227	-0.173	-0.082	-0.067
13	0.045	-0.286	0.026	0.077	0.435	-0.338	0.042	0.018	0.097	0.084	0.126	-0.216	0.626	-0.077	0.088	-0.337	-0.128	-0.01	-0.01	-0.019	0.246	0.125	-0.248	0.088	-0.068	0.077
14	-0.119	0.114	0.141	0.129	0.328	0.088	0.14	0.123	0.079	-0.13	0.045	0.097	-0.077	0.669	-0.013	0.247	0.101	-0.047	0.069	-0.11	-0.151	0.153	0.126	-0.072	-0.059	-0.119
15	-0.083	0.32	-0.014	-0.207	0.009	0.084	-0.164	0.102	-0.299	0.162	-0.01	0.059	0.068	-0.013	0.333	0.338	-0.315	0.267	-0.195	-0.255	-0.355	-0.137	0.269	-0.103	-0.193	-0.054
16	0.054	0.382	-0.217	0.067	-0.153	0.465	-0.04	0.079	-0.384	0.127	-0.092	0.087	-0.337	0.247	0.338	0.399	-0.139	0.049	-0.092	-0.138	-0.415	-0.266	0.31	-0.068	0.047	-0.195
17	-0.229	-0.186	0.298	0.022	-0.17	0.084	0.265	-0.205	0.274	-0.26	0.03	0.002	-0.128	0.101	-0.315	-0.139	0.686	-0.633	0.3	0.446	-0.039	0.211	0.032	0.164	0.147	0.146
18	0.178	0.033	-0.139	-0.045	0.094	-0.219	-0.099	-0.06	-0.339	-0.089	0.108	-0.06	-0.01	-0.047	0.267	0.049	-0.033	0.818	-0.043	-0.234	-0.187	-0.102	-0.185	-0.057	0.096	-0.071
19	0.098	-0.201	0.129	-0.219	-0.111	-0.07	0.132	-0.334	0.035	-0.4	-0.007	-0.05	-0.01	0.099	-0.195	-0.002	0.3	-0.043	0.63	0.279	-0.121	0.06	-0.08	0.274	0.246	0.1
20	0.071	-0.429	-0.033	0.054	-0.11	-0.057	0.065	-0.25	0.027	-0.169	0.023	-0.292	-0.019	-0.11	-0.355	-0.138	0.446	-0.234	0.279	0.448	0.06	-0.022	-0.03	0.396	0.181	0.003
21	-0.044	-0.298	0.065	0.002	0.254	-0.351	0.268	0.008	0.335	-0.004	0.088	0.042	0.246	-0.151	-0.339	-0.187	-0.121	0.06	0.726	0.137	-0.283	0.148	-0.023	0.099		
22	-0.069	0.048	-0.007	0.379	-0.133	0.348	-0.027	0.045	-0.168	-0.092	-0.045	0.125	0.163	-0.137	-0.286	0.211	-0.102	0.06	-0.022	0.137	0.497	-0.159	-0.048	-0.259	-0.022	
23	-0.229	0.345	-0.087	-0.187	-0.369	0.719	-0.134	0.135	-0.035	0.015	-0.155	0.227	-0.348	0.126	0.269	0.31	0.002	-0.185	-0.006	-0.03	-0.383	-0.159	0.35	-0.153	-0.228	-0.169
24	0.151	-0.428	-0.149	-0.09	0.093	-0.217	0.145	-0.022	0.162	-0.138	-0.062	-0.173	0.088	-0.072	-0.103	-0.058	0.164	-0.057	0.274	0.396	0.148	-0.046	-0.153	0.378	0.132	-0.146
25	0.014	-0.243	0.036	-0.055	-0.124	-0.008	-0.139	-0.113	0.199	-0.016	0.227	-0.082	-0.056	-0.059	-0.163	0.047	0.147	0.096	0.246	0.181	-0.023	-0.259	-0.228	0.132	0.706	0.046
26	-0.189	0.023	0.268	-0.008	-0.01	-0.052	0.167	-0.014	0.089	0.019	0.074	-0.087	0.077	-0.119	-0.064	-0.185	-0.071	0.1	0.003	0.089	-0.022	-0.169	-0.146	0.046	0.457	

1 = age; 2 = education; 3 = experience; 4 = credit; 5 = profit; 6 = less marketing costs; 7 = market information; 8 = convenience; 9 = only farmer; 10 = less risk; 11 = less quality details; 12 = conditions; 13 = risk; 14 = size; 15 = distance to market; 16 = ownership of land; 17 = transport; 18 = price certainty; 19 = pay; 20 = negotiation period; 21 = number of contacts; 22 = conflict; 23 = payment delay; 24 = price knowledge; 25 = price; 26 = information

Once the insignificant explanatory variables from Equation (3) were identified and eliminated, Equation (4) was obtained in terms of the retained hypothesized variables (Shiimi, 2010: 59).

$$P = F(\alpha_0^s + Z\gamma + \varepsilon^o) \tag{4}$$

where $Z = X^s V$ and $\gamma = V' \varphi^s$. Z is an $n \times \ell$ matrix of retained explanatory variables, V is a $k \times \ell$ matrix of the eigenvectors corresponding to the ℓ retained components, γ is $\ell \times 1$ vector of coefficients associated with the ℓ variables. Standard errors of the estimated coefficients γ are represented by a $\ell \times 1$ vector.

$$\text{Var}(\hat{\gamma}) = \hat{\delta}^2 (Z'Z)^{-1} = \hat{\delta}^2 \text{diag}(\lambda_1^{-1}, \lambda_2^{-1}, \dots, \lambda_\ell^{-1}) \tag{5}$$

where $\hat{\delta}^2$ is the variance of residuals from Equation 4. Thus the standard error of γ may be given by

$$k^s = (s.e.\hat{\gamma}_1, s.e.\hat{\gamma}_2, \dots, s.e.\hat{\gamma}_\ell) \tag{6}$$

Results from Equation 4 can then be changed back to explanatory variable estimators of the standardised variables:

$$\begin{bmatrix} \alpha_{1,E}^s \\ \alpha_{2,E}^s \\ \cdot \\ \cdot \\ \cdot \\ \alpha_{k,E}^s \end{bmatrix} = \begin{bmatrix} V_1 & V_2 & \cdot & \cdot & \cdot & V_{1l} \\ V_2 & \cdot & \cdot & \cdot & \cdot & V_{2l} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ V_{k1} & \cdot & \cdot & \cdot & \cdot & V_k \end{bmatrix} \times \begin{bmatrix} \hat{\gamma}_1 \\ \hat{\gamma}_2 \\ \cdot \\ \cdot \\ \cdot \\ \hat{\gamma}_l \end{bmatrix} \tag{7}$$

where $\hat{\gamma}_i$ is estimator of γ_i in Equation 5. The constant $\alpha_{o,E}^s = \bar{y}$.

A PCR combined with a Logit model was used in order to identify characteristics

of a contract producer. A Logit model was chosen for the regressions because the dependent variable was a binary variable, whether producers produced for the contract market (1) or the spot market (2). Two software programs, SPSS and Simentar, were used for the calculations (Richardson *et al.*, 2004).

3 RESULTS AND DISCUSSION

In order to compile a marketing strategy to establish long-term contracts, it was important to identify producers who would participate in a contract governance structure. Strydom *et al.* (2011) determined that the contract market was the transaction cost minimising governance structure when compared with a spot-market structure. Twenty-six variables that could influence the producer to choose between a spot market and a contract market were identified before PCR was implemented. In order to use PCR, a correlation of 0.3 and higher between variables had to be obtained. This was the case with the data set in Table 1. The Keiser-Meyer Olkin Measure of Sampling Adequacy (MSA) had to be more than 0.5 for the model and each individual variable. Variables less than 0.5 were excluded from the model by using an anti-image correlation matrix. This action was repeated until the MSA of all the variables was more than 0.5. The MSA of all the variables before exclusion is presented in Table 2. This action reduced the variables to 13, with an overall adequate MSA of 0.858 (Table 3).

The PCR excluded components with an eigenvalue smaller than 1 according to the Kaiser Criterion. After the exclusion of the variables there were three components with eigenvalues more than 1. Communalities represented the proportion of the variance in the original variables that was accounted for by the factor solution. The factor solution should explain at least half of each original variable's variance, so the communality value for each variable should be 0.50 or more and if not, the variable must be excluded. This action excluded another two variables, whereby the rest of the variables were used in the final regression. These were identified as: less marketing costs⁴, market information, convenience, only marketing channel, less risk, less quality penalties, credit options, transport, price certainty, negotiation period and number of contacts (Table 4).

4 This includes all the costs after harvesting eg. commission, packaging, washing

Table 2. Anti-Image correlation matrix before reduction with Olkin Measure of Sampling Adequacy (MSA) higher than 0.5 for each individual variable

	Less marketing costs	Market information	Convenience	Only channel	Less risk	Less quality penalties	Creditoptions	Risk	Transport	Price certainty	Payment	Negotiation period	Number of contacts
Less marketing costs	0.907	0.233	-0.249	-0.062	-0.048	0.096	0.008	-0.14	0.188	-0.251	0.006	0.054	-0.187
Market information	0.233	0.909	-0.143	0.016	-0.129	-0.247	0.148	-0.034	0.15	0.012	0.059	-0.017	0.233
Convenience	-0.249	-0.143	0.81	0.266	0.088	0.086	0.009	0.015	-0.167	-0.062	-0.233	-0.195	0.029
Only channel	-0.062	0.016	0.266	0.657	0.057	0.191	0.127	0.047	0.179	-0.366	-0.194	-0.127	0.179
Less risk	-0.048	-0.129	0.088	0.057	0.882	0.111	-0.294	0.106	-0.088	-0.223	-0.312	-0.056	0.081
Less quality penalties	0.096	-0.247	0.086	0.057	0.882	0.111	0.924	0.269	0.072	0.049	-0.122	-0.026	0.005
Creditoptions	0.008	0.148	0.009	0.127	-0.294	0.269	0.879	-0.188	0.014	-0.026	-0.065	-0.314	0.006
Risk	-0.14	-0.034	0.015	0.047	0.106	-0.03	-0.188	0.916	-0.05	-0.168	0.031	-0.051	0.065
Transport	0.188	0.15	-0.167	0.179	-0.088	0.072	0.014	-0.05	0.808	-0.61	0.13	0.334	-0.174
Price certainty	-0.251	0.012	-0.062	-0.366	-0.223	0.049	-0.026	-0.168	-0.61	0.844	0.016	-0.159	-0.155
Payment	0.006	0.059	-0.233	-0.194	-0.312	-0.122	-0.065	0.031	0.13	0.016	0.779	0.12	-0.234
Negotiation period	0.054	-0.017	-0.195	-0.127	-0.056	-0.026	-0.314	-0.051	0.334	-0.159	0.12	0.86	-0.082
Number of contacts	-0.187	0.233	0.029	0.179	0.081	0.005	0.006	0.065	-0.174	-0.155	-0.234	-0.082	0.91

Table 3: Kaiser-Meyer-Olkin Measure of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.858
Bartlett's Test of Sphericity	Approx. Chi-Square	383.589
	df	78
	Sig.	.000

Table 4: Regression results of Logit model of factors influencing probability to use contract market as governance structure.

Variables	Coefficient	Standard error	T-value	Probabilities ¹	
Constant	-0.7036704	0.284469	-2.47362	0.0161	**
Less marketing cost	0.0547363	0.02301	-2.37883	0.0211	**
Market information	0.06470677	0.031927	2.026689	0.0478	**
Only channel	0.19250515	0.104535	1.841543	0.0712	*
Less quality penalties	-0.02772562	0.012829	2.161144	0.0353	**
Transport	0.1428942	0.07506	-1.90372	0.0625	*
Price certainty	-0.0218822	0.009041	-2.4203	0.0190	**
Negotiation period	0.0313511	0.013508	-2.32096	0.0242	**
Number of contacts	0.43800231	0.24151	1.813597	0.0755	*
Convenience	0.00772205	0.012534	0.616086	0.5405	NS
Less risk	-0.0198771	0.008033	-2.47431	0.0166	**
Credit options	-0.0006627	0.004534	-0.14616	0.8844	NS
Model summary					
Number of observations		63			
% correct prediction		77.78%			
Number of contract market producers		20			
Number of spot market producers		43			

Notes: *,** indicate a 10% and 5% level of significance, respectively; NS indicates not significant

After PCR reduction, the remaining components were regressed using a Logit model. The Logit model was chosen because the dependent variable is binary. The PCR was set to use components with an eigenvalue more than 1. In this study three factors with an eigenvalue more than 1 were identified and used in the regression. The model correctly predicted 77.78% of the observations, implying that the model had a good fit. The probability of the model was also significant at a 5% level of significance.

Only nine variables were significant at 5% and 10% levels of significance (Table 4). This provides a basis for the processors to tailor-make their contracts and to approach producers who are more inclined to enter into contracts. The characteristics of contract producers were as follows:

- **Less marketing costs**

Contract producers significantly ($P < 0.05$) favoured low marketing costs. The producers were asked whether obtaining less marketing costs would make them choose a specific governance structure, that is, the contract (1) or the spot market (0) (1 not at all; 5 main reason). Therefore a positive coefficient indicated that as the variable increased, the more likely the producer would favour a contract market. In this case, the variable was positive, which meant that the more producers deemed lower marketing costs important, the more likely they would be to participate in contract marketing. Possible reasons for the positive outcome might be that producers do not have to advertise on potato bags or phone market agents in order to sell their potatoes.

Processing companies must promote the fact that contract farming for potato processing has lower marketing costs than a spot market. This means that there is a decrease in transaction cost (time, costs and effort). This will draw the attention of producers and they will find the need to calculate these costs and evaluate contract prices.

- **Market information**

Contract producers would be significantly ($P < 0.05$) concerned about market information. The producers were asked whether obtaining more market information (daily price, demand and supply and daily agent data) would be a reason to choose a specific governance structure (1: not at all; 5: main reason). The variable was also positive, which meant that contract producers wanted to receive more market information. Processing companies can develop decision support models that will assist producers in making a more effective and calculated decision regarding pricing of their produce. This can include, for example, a model that calculates the fresh produce price by subtracting all the marketing costs versus a contract price over a historic period. This information will give the producers an idea of which prices are more profitable over a period and not just based on the previous production year's figures.

- **Only channel**

The hypothesis for this variable was that some producers neither had access to washing/bagging nor wanted to invest in such facilities, which means that the contract market was their sole marketing channel. This variable was significant at 10% ($P < 0.1$) with a positive coefficient, which confirmed the hypothesis. Therefore some producers only made use of a contract market because that was their sole marketing channel and they subsequently needed less on farm investment.

Processing companies must promote the fact that a producer would not need additional facilities. This will attract new producers to participate firstly in the processing industry and secondly in contract marketing. This can also help in terms of obtaining credit, because producers do not need a large capital investment to produce processing potatoes compared with fresh produce potatoes.

- **Less quality penalties**

The hypothesis was that spot market producers would favour a specific market where they did not incur quality penalties (such as rejected freights). This variable was significant at 5% ($P < 0.05$) with a negative coefficient giving an indication that the hypothesis could be accepted. This meant that producers who were sensitive to quality penalties were not interested in the contract market as a governance structure, thus choosing the spot market.

It is important that processing companies attract producers. Currently with contracts, producers only get a maximum price and a discount scale for lower standard potatoes. This method discourages producers because the price they could realise is not clear, while the discounts are highlighted. Processing companies must give a minimum standard with a minimum price and supply a scale based on price premiums for better quality. This method will not only make contracts attractive, but will also encourage producers to deliver a better quality product. In order to facilitate rejections, processing companies must develop systems whereby potatoes are used for other purposes, and not to reject a freight on quality constraints. Potato processing companies can sort poor quality potatoes and pay the producer a discounted price. However, the standards must be specified within the contract. As per example, after a freight is labelled as rejected (not up to minimum standard) a discounting scale is used to calculate a new price and the freight is not sent back to the producer at additional costs. This provides the producers with the perception that their freight is not just rejected, but that the processing company is still willing to assist producers. This is very important mainly because producers might have only one freight of poor quality, but the rest might be up to standard.

- **Transport**

This variable was significant at 10% ($P < 0.1$). The hypothesis was that contract producers would not make use of their own transport in order to deliver their

produce. The producers were asked what type of transport they used (1 = buyer transport; 0 = own or hired transport). The coefficient of this variable was positive, which meant that contract producers preferred not to make use of their own transport.

Processing companies must indicate in the contract that producers do not pay extra transport costs, which are included in the suggested contract price. The procurement manager must also use the transport aspect as a promotional item. The manager must market the support that a processing company provides in the case of transport arrangements and logistical difficulties.

- **Price certainty**

The hypothesis for this variable was that contract market producers would have a high certainty of prices at planting time, because the contract would be based on a specific price. The extent of quality penalties would, however, be unknown. This variable was significant at 5% ($P < 0.05$). Producers were asked to indicate their levels of certainty (1 very uncertain; 5 very certain) in order to evaluate the hypothesis. Price certainty had a positive coefficient indicating that contract producers had a high certainty of prices at planting time and the hypothesis could be accepted. The reasoning behind price certainty is that contract market producers are reasonably sure of their end product price, whereas spot market producers are only aware of current prices (planting time) and not the harvest price.

Processing companies must offer attractive prices in order to attract producers. The result indicates that the producers want to know the price levels setting a minimum price in a contract and with the occurrence of earning higher prices through premiums. This will reduce the transaction cost and risks and thereby making contract marketing more attractive to producers.

- **Negotiation period**

The hypothesis for this variable was that price bargaining would take longer in the spot market than the contract market. The variable had a significance of 5% ($P < 0.05$) and a positive coefficient. The hypothesis was rejected because the coefficient was positive, indicating that price bargaining took longer in the contract market than in the spot market. The main reason for this was that in the spot market producers could bargain directly with market agents for small price changes, but still had to sell their produce. In the contract market, producers bargained with a buyer (agricultural manager), after which the processing management would approve the price, a time consuming process. Another factor that played a role was that contract producers negotiated prices before planting, but the spot market producers bargained at harvest time. When spot market producers harvest their produce they do not have much time for price negotiation, thus they do not have many options.

There is a need for decision support models, which will assist producers and processing companies with price negotiations. The procurement manager has to answer to a board of directors and satisfy producers. If the prices are too high, the board will give the instruction to cut costs and if prices are too low producers will not participate in contract marketing. Therefore, the procurement manager is in need of models that indicate the price level relevant to costs and a model that compares the spot price with the contract price over a period of time. Given that the contract price and the spot price differ, the two prices must be compared at a fair level that takes yield differences and additional marketing costs (table>processing) into account.

- **Frequency of contacts between buyer and producer**

The hypothesis for this variable was that contract market producers had less contact with buyers than spot market producers in terms of price negotiation. In this regard, producers were asked how much contact they had with their buyers (1 daily, 5 monthly). The variable was significant at 10% ($P < 0.1$) with a positive coefficient. This meant the hypothesis could be accepted that contract producers had less contact with their buyers. Spot market producers had daily contact with their market agents during harvesting and delivery of their produce. The contract producer only had weekly or monthly contact with buyers. Therefore, producers who wanted less contact with buyers preferred the contract market.

The frequency of contacts between buyer and producer is important to farmers; this is a similar characteristic as negotiation. The contract marketing system has longer once-off negotiating periods, after which the contract producers only obtain market information from the buyers. Spot market producers have shorter negotiating periods, but the frequency is high because they negotiate prices on a daily basis during harvest time. This means that contract producers do not want long negotiating periods and they do not want a high frequency. The processing companies must bring this to the attention of producers through marketing and promotions. Contract producers will only have contact with the buyer in order to receive market information and to obtain technical advice. This is important because spot markets have a high frequency in terms of price negotiation, but no technical information is obtained from the buyer.

- **Less risk**

This variable was significant at 5% ($P < 0.05$) and the hypothesis was that the contract market had a lower overall risk profile than the spot market. The producers were asked to indicate the level of risk relative to the alternative/substitute governance structure (1 very low, 5 very high). The coefficient was negative, implying that the higher the risk the lower the possibility that the contract producers would produce for the specific market. This meant the hypothesis could be accepted and that

producers chose the contract market because of a lower risk profile. Therefore, a producer preferring the contract market would be a risk-averse person.

Rhodes *et al.* (2007) indicated that contract marketing had lower risks than spot marketing. However, this differs for each commodity in the potato market and producers cannot use futures to hedge themselves mainly due to the unavailability of a potato contract. This means that producers must make use of contracts to lock in quantities as well as prices. Strydom *et al.* (2012) indicated that the contract market has lower transaction costs than the spot market for potato producers. The question is: how do the processing companies illustrate to the producers that they have lower risks with a contract? Processing companies must make use of negotiating models and decision support models. These models must give the producers an idea of what their risks are when producing for each of the different marketing channels. This will facilitate the negotiating process as well as the producer’s decision to use contract or spot markets. Promotional material regarding the advantages and disadvantages of contracts in terms of risk must be used to promote contracts. A few examples are pull-up banners, flyers and posters with research results indicating the risk differences, and articles in local potato producers’ magazines. The strategy must be to remind the producers of the benefits of contracts. Table 5 is a summary of all the chosen characteristics that must be used when considering contracts for producers.

Table 5: Summary of contract producer characteristics

Variables	Probabilities
Produce at minimum risk	0.0166
Wants to obtain a minimum price (certainty)	0.019
Prefer channel with less marketing cost	0.0211
Wants a channel with a small negotiation period	0.0242
Wants to have less quality penalties	0.0353
Want to obtain more market information	0.0478
Do not want to make use of own transport	0.0625
Only marketing channel available without additional on farm investment	0.0712
Frequency of contacts between buyer and producer must be smaller	0.0755

Various authors evaluated characteristics for different industries regarding contracting. Bogetoft and Olsen (2002), Ali and Kumar (2011) and Lawrence and Grimes (2001) confirm some of the variables identified by the results. These are variables such as minimum risk, prefer less quality penalties, smaller negotiating

period and want to obtain more market information. However, as stated by Ali and Kumar (2011), the characteristics differ for every industry, thus each industry must be evaluated on its own.

4 CONCLUSION

Imports are increasing in the South African processing and frozen fries industry, which makes procurement more complex. Imports put pressure on local producers to procure better quality potatoes at a pre-determined price. This also has an effect on the producer of processing potatoes and puts pressure on their profit margins. If it is not worthwhile for the producers to produce processing potatoes (contract market) they will produce the alternative, namely table potatoes (spot market). In order to ensure sufficient supply of quality and quantity, processing companies must make use of a suitable procurement strategy, such as contract marketing and more specific long-term contracting. This study determined the characteristics of a contract producer by interviewing producers using one of two governance structures, either the contract or the spot market in the eastern Free State region of South Africa. After the identification of the characteristics, suggestions were made in terms of strategies to attract producers.

Out of 26 possible characteristics of a contract producer, nine were identified as significant ($P < 0.1$ or $P < 0.5$). The variable, marketing costs, was identified, indicated that producers chose the contract governance structure that would decrease marketing costs. Regarding the variable market information, contract market producers were not as concerned about market information compared with the spot market producers. Therefore, producers who are sensitive to marketing costs, but are not concerned with market information, must be targeted for long-term contracts.

Some producers indicated that the contract market was their only channel of production. This meant that producers who do not have access to washing and sorting facilities must be targeted for long-term contracts. Spot market producers were more sensitive to quality penalties than contract producers. Thus, producers sensitive to quality penalties must be excluded from the long-term contract target group, or their concerns must be addressed.

Transport and price certainty were important to producers. A contract producer did not want to transport his/her produce and preferred that the buyer collected the produce on the farm. At planting time, a contract producer wanted to be certain of the final produce price. Contract producers also preferred to negotiate prices and should form part of the target market. Some contract producers indicated that they produce for the contract governance structure because there is less risk involved. This meant that producers who are risk-averse should be targeted for long-term contracts. Contracts must be developed in order to reduce the current price and

production risks even more.

It is important for processing companies to use these characteristics to establish a contract that is price transparent and self-explanatory. This will provide the producers with information that contracts do not only penalise them, but help and protect them to manage external risks such as price movements.

There is a need for processing companies to reduce negotiating time and to provide farmers with market information. Processing companies must have marketing strategies in place, which explains the benefits of their type of marketing channel and how it is constructed. This means that the model explained by Strydom *et al.* (2012) can be used to reduce negotiating time and to set minimum prices with premiums in contracts and not maximum prices with quality penalties. There is also a need for a decision support model. This model will assist producers in the choice between the different marketing channels. In this support system, prices for both channels must be evaluated according to comparable prices and historic price trends.

In conclusion, it is important that processing companies promote the benefits of their marketing channels. Characteristics of contract producers must be evaluated and then models, contracts and marketing strategies must be developed that complement these characteristics. This will ensure higher quality and quantities since the processing companies will attract more producers and there are incentives in place to produce higher quality potatoes. This paper was written from the view of producers and not so much from the view of processors. However, additional research is needed in terms of the cost/benefit implications for processors along with the impact of change regarding competitiveness.

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D.B. Strydom, H. van Zyl, B.J. Willemse

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