Improving cooperation to make the South African fresh apple export value chain more competitive

Paul A. Hardman[1], Mark A.G. Darroch[2] and Gerald F. Ortmann[3]
[1] Postgraduate Student in Agricultural Economics, School of Agricultural Sciences and Agribusiness, University of Natal, Pietermaritzburg, South Africa.
[2] Senior Lecturer in Agricultural Economics, School of Agricultural Sciences and Agribusiness, University of Natal, Pietermaritzburg, South Africa.
[3] Professor in Agricultural Economics and Head, School of Agricultural Sciences and Agribusiness, University of Natal, Pietermaritzburg, South Africa.

Abstract

This paper investigates aspects of cooperation between South African (SA) apple producers, packers and exporters in the Western Cape and Langkloof East areas during 2001 in order to show where these players need to commit more resources to make the SA fresh apple export value chain more competitive. A recursive Ordinary Least Squares model shows that higher levels of trust led to more cooperation (joint problem-solving and communication) between these players. Higher levels of joint problem-solving and communication, in turn, encouraged producers to commit more human resources to working with packers and exporters to find ways of making the chain more competitive. Results also suggest that the players need to particularly improve cooperation in production planning, delivery scheduling and quality control. Packers and exporters ranked climatic conditions as the top constraint currently facing the SA fresh apple industry, probably reflecting their concerns over the annual "pack-out" (quality distribution) of the apple crop. Other factors affecting competitiveness include the recent withdrawal of government export incentives, restrictive labour policy, high real interest rates, a lack of market information, and the growing and marketing of inappropriate apple varieties.

Key words: trust, commitment, communication, joint problem-solving, risk

1. Introduction

The resource-based view of the firm proposes that a firm must develop appropriate resources and capabilities that are valuable, rare and difficult to substitute or copy in order to create a sustainable competitive advantage (O'Keeffe, 1998a; Thompson and Strickland, 1998). This focus on the firm as the main unit of analysis overlooks the potential competitive advantages or disadvantages that are created by the linkages that a firm has with other players in a value chain. The relational view of competitive advantage focuses on these linkages, and contends that collaborating firms can use relation-specific assets (such as specialized capital investments, information, language and know-how), knowledge-sharing, complementary resource endowments (such as collective reputation and excellent customer and supplier relationships), and effective governance, to strengthen the competitive edge created by differentiation and/or low-cost competitive strategies (Dyer and Singh, 1998). Managers, therefore, need to consider how to cooperate across firms to build alliances and leverage resources that make their value chains more competitive.

Cooperation hence describes a process by which firms develop mechanisms to come together, interact and form relationships for mutual benefit. These mechanisms may be informal or formal, and are likely to change over time, depending on the willingness of the firms to continue in cooperative relationships (Ring and Van de Ven, 1994; Smith *et al.*, 1995). Higher levels of cooperation are expected to help improve the rate of learning and innovation, lower transaction costs (Dyer, 1997; Lazzarini *et al.*, 2001), and achieve effective coordination, leading to better human and product performance (Hewett and Bearden, 2001; Smith *et al.*, 1995).

The aim of this paper is to consider how players in the South African (SA) fresh apple export value chain can improve cooperation in order to address constraints that prevent the chain from being more competitive internationally. Fresh apple exports are the focus of the study as about 58 per cent of annual gross income on SA apple farms is derived from export sales (Directorate: Agricultural Statistics, 2001). Since 1996, SA apple producers have faced major structural changes following the deregulation of SA apple marketing and the declining profitability of apple exports as world prices have fallen in real terms (O'Rourke, 2001). Global

retail consolidation has also shifted market power in fresh fruit value chains towards downstream firms (retailers, category managers, and import receivers), and put pressure on upstream (exporter, packer and producer) margins (Cook, 1998; O'Rourke, 2001). About ten per cent of SA apple producers faced liquidation of their business operations in 2000. With the world over-supply of apples unlikely to change over the next five years, and competition from other apple exporting countries likely to increase, players in the SA fresh apple export value chain must implement appropriate strategies to try and improve its competitiveness.

The paper analyses this problem using the *first* empirical survey of the perceptions of apple producers, packers and exporters in the major SA apple producing areas of the Western Cape and Langkloof East conducted in 2001. A conceptual model of cooperative behaviour amongst the players in a value chain is first outlined as a basis for developing research hypotheses and applying these to the case of the SA fresh apple export value chain. This model draws on work reported by Anderson and Weitz (1991), Campbell (1992), Hunt *et al*. (2002), and Smith *et al*. (1995), to highlight the role of trust in promoting cooperative behaviour - like joint problem-solving and communication - and how such behaviour encourages the players to commit more human resources to chain activities. The model is then extended to consider how monitoring changes internal and external to the value chain, and evaluating the risks associated with investments in the chain, can help to build trust and implement cooperation by identifying the key constraints on chain competitiveness that the players need to manage over time. Data sources and the research methodology are then described, while the last two sections present study results and discuss the management and policy implications of the findings.

2. Conceptual Model

Cooperation refers to similar or complementary coordinated actions taken by firms in independent relationships to achieve mutual or singular outcomes with expected reciprocation over time (Anderson and Narus, 1990). Social factors that contribute to the formation and maintenance of cooperative relationships include the beliefs, attitudes, values and goals held by the players (Smith *et al*., 1995). Mutual trust helps to build shared values between the players and to reduce the risks of doing business (Barney and Hansen, 1994; Dyer, 1997). Cooperation, therefore, is likely to be stronger the more trust that the players have in one another. Nitschke and O'Keeffe (1999) emphasize the role that trust experiences have played in developing vertical and horizontal relationships between growers and marketers in the Australian grain industry, concluding that the successful management of the supply chain was attributable to this valuable and rare resource. Similarly, McKay (1993) and Hunt *et al*. (2002) found that mutual trust must be present before a strategic alliance can flourish.

The optimization of production and operations, lower transaction costs, and the appropriation of property rights are sources of value that can result from more effective vertical linkages (Lazzarini *et al.*, 2001). The need to improve downstream performance by, for example, adapting to market changes, can lead downstream players to cooperate more closely with upstream firms to cut costs, improve product quality, develop new products, etc. (Browning *et al.*, 1995; Langfield-Smith and Greenwood, 1998). Following Heide and John (1990) and Campbell (1992), the degree of cooperation between firms can be evaluated by studying the *cooperative behaviour* characteristics within that relationship. Joint problem-solving, communication, monitoring, adaptations, joint decision-making, and assistance offered, are all inter-firm behaviours that are associated with cooperation (Anderson and Narus, 1990; Frazier *et al.*, 1988). What aspect of cooperative behaviour to focus on depends on the unique key success factors in a particular value chain. For example, firms in technology-related industries should be concerned about working jointly on scientific innovation, testing and performance problems and making appropriate adaptations to current operations, while firms in marketing and service-related industries might focus more on aspects of communication, such as fast and courteous customer assistance, accurately recording how customer needs are changing, and ways to maximize net returns on advertising.

Stronger cooperative behaviour between the players makes exiting from the relationship undesirable, and causes a deeper commitment from the players to the value chain to overcome factors that constrain its future competitiveness. Over time, the players are likely to learn more about the external and internal environments in which the value chain operates, the task of the value chain, each other and how to work together, their respective skills, and how to mould compatible goals. They are then likely to be more committed to reevaluate their linkages and to implement necessary changes to make the value chain perform better (Doz, 1996; Heide and John, 1990; Steffel, 2000). An unfavorable reputation with final buyers, lack of production and operating flexibility, and declining product and service quality through the value chain, are examples of competitive disadvantages that all players need to commit to solving before competitiveness can improve.

Commitment to a trading relationship can be defined - in a behavioural sense - by the amount of long-term idiosyncratic investments made by the value chain partners. The conceptual model outlined above implies that the level of cooperation is determined by the level of trust between players in the value chain, and that the level of human resource commitment depends on the level of cooperation. Causality, therefore, runs from TRUST→COOPERATION → HUMAN RESOURCE COMMITMENT (Anderson and Weitz, 1991; Campbell, 1992; Hunt *et al*., 2002; Smith *et al*., 1995). Based on these elements, stronger commitment implies a greater ability to deal more effectively with obstacles that limit the competitiveness of a value chain. The research hypotheses to investigate the conceptual model can be summarized as follows:

Hypothesis 1: The higher are the levels of trust that producers (upstream players) have in their working relationships with packers and exporters (downstream players), the greater will be the level of cooperative behaviour as evidenced by higher levels of joint problem-solving, communication, monitoring, adaptations, joint decision-making, and assistance offered.

Hypothesis 2: The higher are the levels of joint problem-solving, communication, monitoring, adaptations, joint decision-making, and assistance offered, the greater will be the level of human resources that producers (upstream players) will commit to their working relationships with packers and exporters (downstream players).

Past research by Boehlje *et al*. (1999), Doz (1996), and O'Keeffe (1997; 1998b), suggests that the process of building trust and implementing cooperation will be helped if the partners monitor changes in the external and internal environment, and evaluate the risks associated with their investments in the value chain. This helps them to identify the key barriers or constraints to chain competitiveness over time, and how best to adjust to, and manage, these factors for mutual benefit. The third plausible research hypothesis, therefore, is:

Hypothesis 3: Identifying and communicating the key barriers or constraints that limit value chain competitiveness will improve the players' understanding of each other's business and of where resources must be committed to jointly solve problems.

The above conceptual model is adapted in the next section to indicate the research hypotheses that were applied in this study to try and evaluate how players in the SA fresh apple export value chain can improve cooperation to make the value chain more competitive.

Applying the conceptual model to the SA fresh apple export value chain

Fresh apples are highly perishable and many factors affect apple quality, implying that players in the SA fresh apple export value chain must constantly communicate about aspects such as the effect of recent weather patterns, how crops are responding to chemical sprays, and current levels of fruit ripeness. Maintaining and improving product freshness, and dealing with supply shocks caused by hail damage, disease (codling moth), etc. often involves trying to solve associated logistical and fruit quality problems. Personal interviews held by the the first author with experts in the SA apple industry[1] during 2001 indicate that the industry must give more attention to joint problem-solving and communication, in particular, to try and respond to falling export revenues and greater rivalry in export markets. These experts also identify production planning, delivery scheduling, apple marketing and quality control, as key activities in the SA fresh apple export value chain that are related to cooperative behaviour. To assess what may influence SA producers of fresh apple exports to 'cooperate with packers and exporters to be more competitive', this study adapts hypotheses 1 and 2 in the conceptual model outlined above and tests the following *a priori* expectations about players in the SA fresh apple export value chain:

(1) *The higher are the levels of trust that SA apple producers have in their working relationships with apple packers and exporters, the greater will be the level of cooperative behaviour as evidenced by higher levels of joint problem-solving and communication.*

(2) *The higher are the levels of joint problem-solving and communication, the greater will be the level of human resources that SA apple producers will commit to their working relationships with packers and exporters.*

Hypothesis 3 in the conceptual model can also be adapted by listing potential key constraints that limit the competitiveness of the SA fresh apple export value chain and then having the players evaluate these constraints and add any others that they may deem appropriate. Drawing from research by Eidman (1990), Sonka and Patrick (1984),

1 Mr P. Dall (Chairman, Deciduous Fruit Producers' Trust), Mr P. Finn (Group Manager: Quality Services, Perishable Products Export Control Board), Mr V. Jensen (Chairman, Fresh Products Exporters' Forum), and Mr A. Rabe (Managing Director, Deciduous Fruit Producers' Trust).

and Woodburn *et al*., (1995) on the sources of risk in agriculture, the personal interviews held with SA apple industry experts, and the authors' knowledge of the current drivers of change affecting SA agribusinesses, it is expected *a priori* that:

(3) C*ommitting human and other resources to managing constraints like poor climatic conditions, the withdrawal of government export incentives, greater rivalry in export markets, high interest rates, and the production and marketing of inappropriate apple varieties, can help SA apple producers, packers and exporters to improve the competitiveness of the SA fresh apple export value chain.*

The next section discusses the sources of data and the research methodology used to assess these three research hypotheses for the case of the SA fresh apple export value chain.

3. Data Sources and Research Methodology

The target population of 522 apple producers, 37 apple packers and 14 apple exporters in the Western Cape and Langkloof East were sent questionnaires by post or e-mail in April and May 2001, or personally interviewed during July 2001, to obtain information about (1) the degree of trust, joint problem-solving, communication, and human resources commitment, between them in the SA fresh apple export value chain, (2) their levels of cooperation in production planning, harvest scheduling, apple marketing and quality control, and (3) the factors that they perceive constrain the industry from becoming more competitive internationally. The five largest apple packers (dealing with 34 per cent of fresh apple exports), the seven largest apple exporters (handling 68 per cent of fresh apple exports) and 37 producers returned usable questionnaires. Another 30 producers indicated during personal interviews that they did not have time to complete a full questionnaire but would briefly describe the nature of their relationships with packers and exporters, and identify constraints that limit the competitiveness of the SA fresh apple export value chain. These producers' comments supported the links between trust, cooperation and resource commitment, and the major constraints, that were identified after the 37 usable producer questionnaires were analyzed as reported in section 4.

Individual producer's perceived levels of trust in their working relationships with packers and exporters were estimated using an index derived from their scores on Likert-type scales that showed how strongly they agreed or disagreed with five statements including "We have a strong personal confidence in each other", "We have a strong business confidence in each other," and "We can always rely on each other when it counts" (see Appendix 1A). To avoid neutral responses (neither agree or disagree with the statements), respondents had to select one of four responses - strongly agree, agree, disagree or strongly disagree - for each statement. For example, producers that strongly agreed with a statement scored a four, while those that strongly disagreed scored a one. An index of the level of trust perceived by each producer was then estimated by taking his/her average score over the five statements that related to aspects of trust in the business relationship. For example, if he/she scored a 2, 3, 3, 3 and 2 for the five statements, he/she scored 2.6 on the level of trust index ([2 + 3 + 3 + 3 + 2]/5). Estimated trust index scores for producers ranged from 2.00 to 4.00, with a mean score of 3.10 for the sample. Index values above 3.5 indicate high levels of trust, while values below 1.5 suggest low levels of trust in the working relationship.

Individual producer's perceived levels of communication, joint problem-solving and human resource commitment in working relationships with packers and exporters were similarly estimated by averaging their Likert-type scores for linked statements (also given in Appendix 1A) about each of these behaviours. High communication scores imply that respondents strongly agreed with statements like "We often discuss issues such as changes in technology and market conditions", and "We have extensive formal and informal communications", and strongly disagreed that "We discuss only need-to-know information that relates directly to our relationship". Producers who perceived high levels of joint problem-solving strongly agreed that they make joint decisions about reducing exporting costs in the packhouse, delivery schedules, and fruit quality control, and that both players worked together to achieve productivity gains for mutual benefit. Individual levels of human resource commitment were estimated by whether producers agreed or disagreed that " We devote considerable time trying to improve this relationship", "We devote considerable time trying to improve the packer's productivity", and that they had made a substantial number of adaptations in their delivery schedule in order to deal more effectively with a packer.

Producers, packers and exporters were also asked to rank their perceptions about the level of cooperation in production planning, harvest scheduling, apple marketing, and quality control on Likert-type scales from one (very low) to five (very high). Appendix 1B shows the format of this question used to assess producer perceptions about the level of cooperation in these activities for the producer-packer link. Finally, producer, packer and exporters'

perceptions of the major barriers that limit SA fresh apple export value chain competitiveness were elicited by asking them to rank the set of potential constraints listed in Appendix 1C on Likert-type scales from one (minor constraint) to five (major constraint). As explained in section 2 above, these constraints are developed with reference to past research on the sources of risk in agriculture, personal interviews held with SA apple industry experts, and the authors' knowledge of the current drivers of change in SA agribusiness. The players were also requested to score any other constraint(s) that they wanted to add to the hypothesized list.

Based on the 37 usable producer questionnaires, Ordinary Least Squares (OLS) regression was applied to estimate recursive models (Gujarati, 1995, p. 680) to test the adapted hypotheses 1 and 2 for the producer-packer link and the producer-export link in the SA fresh apple export value chain. Each recursive model showed how the level of cooperation between the two players (joint problem-solving and/or communication) depends on the level of trust, and, in turn, how the level of human resource commitment by producers depends on the level of cooperation (joint problem-solving and/or communication) between the two players. These models, therefore, reflect the unilateral causal chain relationship from trust to cooperation to human resource commitment specified in the conceptual model of cooperative behaviour outlined in section 2. The levels of trust, cooperation (joint problem-solving and communication), and human resource commitment were represented by the estimated producer index scores for these concepts derived from the Likert-type scales as explained above.

4. Results

Index scores for perceived levels of trust, cooperation, and human resource commitments

The mean, minimum, and maximum index scores showing SA fresh apple producers' perceived levels of trust, cooperation (joint problem-solving and communication) and human resource commitment in their working relationships with fresh apple packers and exporters are reported in Table 1.

Scores for the producer-packer link ranged from 1.50 for joint problem-solving, to a maximum of 4.00 for trust, joint problem-solving and human resource commitment. Mean scores close to 3.00 for all four aspects of the relationships suggest that producers in the sample, on average, perceive relatively high levels of trust, joint problem-solving, and communication in their relationships with packers, and that producers are quite strongly committed to these relationships. Scores for the producer-exporter link ranged from 1.00 for joint problem-solving and communication to a maximum of 4.00 for all surveyed aspects of the link. Given mean scores again close to 3.00, producers in the sample, on average, seem to perceive relatively high levels of trust, joint problem-solving, and communication in their relationships with exporters, and are quite strongly committed to these relationships.

Recursive models

The estimated recursive models, as expected, showed that higher levels of trust encouraged more upstream cooperative

Table 1. Producer scores for their perceived levels of trust, joint problem-solving, communication and human resource commitment in working relationships with packers and exporters in the SA fresh apple export value chain.

	Packer relationship[a]				Exporter relationship[a]			
Aspect of relationship	Minimum index score	Maximum index score	Mean index score	Std. Deviation	Minimum index score	Maximum index score	Mean index score	Std. Deviation
Trust	2.00	4.00	3.10	0.557	1.60	4.00	3.09	0.658
Joint problem-solving	1.50	4.00	2.69	0.754	1.00	4.00	2.78	0.814
Communication	1.67	3.67	2.91	0.499	1.00	4.00	2.71	0.725
Human Resource Commitment	2.00	4.00	2.72	0.533	1.67	4.00	3.13	0.567

[a] Scores ranging from 1 (strongly disagree) to 4 (strongly agree) indicate to what extent producers agree or disagree with statements linked to aspects of their packer and exporter relationships. Scores near 1 suggest a perceived weak aspect of the relationship, while scores near 4 indicate a strong aspect.

behaviour in the SA fresh apple export value chain. In the producer-packer recursive model, the level of perceived trust (TRUST) had a positive impact on the level of joint problem-solving (JPS) between these players (equation (1)). Greater levels of joint problem-solving between them also lead to greater levels of human resource commitment (RES) by producers to the working relationship (equation (2)). Estimated t values for equation (1) and equation (2) are given in parentheses, and ** and *** indicate statistically significant estimated coefficients at the 5% and 1% levels of significance, respectively. These results give some support to the hypotheses about determinants of cooperation and human resource commitment derived in the conceptual model described in section 2. The level of communication was not statistically significantly related to either TRUST or RES, and so this aspect of cooperation was omitted from the reported producer-packer recursive model.

Producer-Packer link: JPS = 0.729 + 0.641TRUST (1)
*(0.930) (2.579)***

*Adjusted R^2 = 0.191 F = 6.649** df = 35*

Producer-Packer link: RES = 2.155 + 0.279JPS (2)
*(5.639)*** (2.056)***

*Adjusted R^2 = 0.119 F = 4.229** df = 35*

In the producer-exporter recursive model, TRUST had a positive effect on the level of communication (COMM) between these players (equation (3)). The level of joint problem-solving (JPS) was not statistically significantly related to TRUST, but was significantly related to both COMM and RES. To overcome the resulting multicollinearity problem, RES was regressed on a principal component, defined as "Cooperation" (COOPN), that explained 79.43 per cent of the variation in JPS and COMM. The positive relationship between COOPN and RES implies that higher levels of communication and joint problem-solving encouraged producers to commit more human resources to this working relationship (equation (4)). Estimated t values for equation (3) and equation (4) are given in parentheses, with *** showing statistically significant estimated coefficients at the 1% level of significance. These results also give some support to the hypotheses about determinants of cooperation and human resource commitment derived in the conceptual model described above.

Producer-Exporter link: COMM = 0.466 + 0.727TRUST (3)
*(0.925) (4.565)****

*Adjusted R^2 = 0.415 F = 20.842*** df = 35*

Producer-Exporter link: RES = 2.058 + 0.285COOPN (4)
*(5.651)*** (3.024)****

*Adjusted R^2 = 0.230 F = 9.386*** df = 35*

The next section reports on perceived levels of cooperation between producers, packers and exporters in production planning, delivery scheduling, apple marketing and quality control, and how these players ranked perceived constraints that limit the competitiveness of the SA fresh apple export value chain.

Table 2. Respondents' scores for their perceived levels of cooperation with other players in key SA fresh apple export value chain activities.

Activity	Chain Player					
	Producer		Packer		Exporter	
	Packer	Exporter	Producer	Exporter	Producer	Packer
Production Planning	3.41	2.46	2.25	2.80	2.72	3.00
Delivery Scheduling	3.78	2.31	2.75	2.80	2.85	-
Apple Marketing	3.12	2.70	2.50	3.00	3.14	3.40
Quality Control	3.89	2.04	2.50	3.00	3.14	3.40
Overall Cooperation	3.55	2.38	2.50	2.90	2.96	3.26

[a] Scores were based on the players' perceptions of the level of cooperation for each activity in the SA fresh apple export value chain, and could range from 1 (extremely low cooperation) to 5 (extremely high cooperation).

Overall cooperation, and constraints that producers, packers and exporters must overcome

Producer, packer and exporter perceptions of their levels of cooperation with each other regarding key activities in the SA fresh apple export value chain are summarized in Table 2 using average scores that could range from one (very low cooperation) to five (very high cooperation).

Producers view overall cooperation with packers as "moderate" to "high", especially in delivery scheduling and quality control. They also perceive that exporter cooperation is "low" to "moderate", especially regarding fruit quality control. Similarly, exporters felt that overall producer cooperation was "moderate", with production planning and delivery scheduling as activities where the least cooperation exists. Production planning involves, among other things, planting new apple cultivars and the varieties that final consumers demand. As retailers are becoming more selective about which apple varieties they stock to meet consumers' needs (World Apple Report, 2001), producers that grow an inappropriate mix of apple varieties will find their access to some markets restricted and will become less competitive. Table 2 shows that there is still scope to improve the level of overall cooperation between these three players in the SA fresh apple export value chain. The players' rankings of the key constraints that limit SA fresh apple export value chain competitiveness that are shown in Table 3 identify further aspects that they need to communicate about, commit resources to, and jointly solve.

Producers ranked the recent withdrawal of government export incentives, restrictive labour policy, business (climate) and financial (interest rate) risks, rival exporters, and lack of independent market information as the six main constraints they face currently. Climatic conditions were ranked the top current constraint by packers and exporters, probably reflecting concerns that they and producers have about the effect of recent drought on the overall "pack-out" (quality distribution) of the apple crop. Poor quality apples are channeled away from packing and exporting facilities towards juicing and other processing plants. This cuts packer and exporter volumes, and thus reduces their competitiveness by driving up operating costs per unit. Total annual apple production in SA remained stable in the last decade, but export (high value) volumes fell by 11 and 22 per cent in 1999 and 2000, respectively, due to warm and dry winters.

Table 3. Respondents' rankings of the key constraints on SA fresh apple export value chain competitiveness.

Constraint	Ranking of Constraints[a]		
	Producers	Packers	Exporters
Climatic conditions	4	1	1
No government export incentives	1	2	6
Increased competition from rival apple-exporting countries	5	6	2
Restrictive government labour policy	2	3	9
High interest rates	3	6	3
Lack of independent market information	6	14	9
Production and marketing of inappropriate apple varieties	13	3	9
Relaxation of fruit handling protocols through the supply chain	8	5	7
Harbour terminal bottlenecks	16	6	4
Over-capitalization at packhouses	6	10	8
Lack of training and human development	14	10	4
Exporter inexperience in international trade	10	6	13
Current levels of investment in R &D of apple varieties	10	12	15
Exporter liquidity problems	17	12	9
Crime	12	16	17
Lack of foreign investment into SA	15	17	13
Ageing apple exporting infrastructure	9	14	15

[a] Rankings are based on the players' average scores on each constraint, which ranged from 1 (minor constraint) to 5 (major constraint).

Apple packers also ranked the lack of export incentives and restrictive labour policy in their top three constraints, but seemed more concerned than producers and exporters about whether an appropriate mix of apple varieties was being produced and marketed. Packers viewed the relaxation of pre-harvest and post-harvest fruit handling protocols as their fifth ranked constraint. Although ranked slightly lower by producers and exporters, this constraint reflects concerns about the potential effect of market deregulation on the quality and "image" of SA fruit exports now that more fruit classes are exported than before deregulation in 1996. Packers ranked exporter trade inexperience, harbour terminal bottlenecks, high interest rates and rival international exporters jointly as the sixth most pressing constraint. Exporters ranked rivalry, high interest rates and terminal bottlenecks in their top four constraints, along with a lack of training and human development. They perceived that harbour terminal bottlenecks, and training and development were more pressing constraints than did producers and packers. With an understanding of these perceived constraints, the players can now make better decisions about where to allocate scarce human and other resources in order to improve the international competitiveness of the SA fresh apple export value chain. The constraints identified in Table 3 give some support to the third hypothesis adapted from the conceptual model described in section 2.

5. Discussion and Conclusion

This paper first developed a standard causal model showing how higher levels of trust lead to greater cooperation, and how greater cooperation, in turn, encourages the players to commit more human resources to value chain activities. The paper then extends this standard model and contributes to theory with the hypothesis that identifying and communicating key constraints on value chain competitiveness can help the players to build trust and improve cooperation as they know where to focus resources to jointly try and overcome these constraints. The extended model is then applied to identify how to improve cooperation to make the SA fresh apple export value chain more competitive. The management implication of the extended model for any value chain is that over time, the players must learn more about the external and internal environments in which the chain operates, each other's business, and the key sources of risk associated with their investments. They are then likely to be more committed to reevaluate their linkages and work together to overcome the constraints and implement necessary changes to make the value chain perform better.

In the SA fresh apple export value chain, higher levels of trust led to more joint problem-solving between producers and packers, and to more communication between producers and exporters. More joint problem-solving between producers and packers encouraged producers to commit greater levels of human resources to the working relationship. At the producer-exporter link, higher levels of both communication and joint problem-solving led to higher human resource commitment by producers to the relationship. These players could cooperate more closely on delivery scheduling and quality control to promote the competitiveness of the SA fresh apple export value chain. These efforts can be assisted if the players communicate more about what are, and how to overcome, the perceived key constraints that limit competitiveness.

Although the three players rank the main constraints differently, and some factors are more specific to each player, there is broad agreement on some of the constraints that must be addressed. Climatic conditions are essentially beyond the players' control and affect the delivery quantity and quality of SA fresh apple exports. Patrick *et al*. (1985), and Woodburn *et al*. (1995) also identified yield (weather) variability as a major source of risk for United States and South African crop farmers, respectively, while Wermund and Fearne (2000) cite variable climate as a major constraint on production in the British stone fruit industry. The withdrawal of export incentives will affect the sustainability of those producers that were most heavily dependent on this assistance. The policy question is whether these producers would exit the industry without support due to a lack of appropriate management skills. The SA government is currently addressing calls from the business community to reduce the transaction costs of implementing new labour legislation. This would improve the medium-term viability of producers facing lower real world apple prices. Local interest rates are likely to remain relatively high in nominal and real terms, implying that more leveraged players must give more attention to debt management and consider strategies like debt roll-over, debt consolidation and possible mergers.

All three players acknowledge the threat posed by rival global fresh apple exporters. In major European markets, particularly the United Kingdom, quality and price competition from apple producers in Chile and France are the main threat. In this regard, more timeous provision of information on where apple consignments leaving SA ports are destined for could help SA exporters to make better decisions about where and when to send apples to avoid problems of over-supply (and lower prices) on specific markets. The Perishable Products Export Control Board

currently collects these data, but information dissemination is delayed by up to six months. Exporters need to consider working with the Board to improve this turn-around time, or consider alternative price information sources - provided that the benefits of timely access to consignment information outweigh the private cost. Producers and exporters felt that the current mix of apple varieties grown in SA was not the most important constraint, unlike packers who ranked this constraint third. The World Apple Report (2001) indicates that apple varieties such as Gala and Pink Lady© are becoming increasingly popular, yet these only contribute about ten per cent of the annual SA crop. Traditional consumer favourites like Granny Smith and Golden Delicious have maintained their position in the top eight, and account for 68 per cent of SA fresh apple exports. The longer-term question is whether or not competitiveness could be improved by growing a better mix of traditional and new apple varieties. Producer views could reflect the limited scope for producing the Pink Lady variety in SA where there is a lack of sufficiently cold conditions to promote fruit colouring. Most of the apple producers in this study were prepared to pay a levy towards funding research on key industry issues, such as apple variety testing.

All three players need to focus on quality control, given the perceived lack of cooperation in this activity and the relaxation of protocols on fruit handling. Product quality assurance standards, such as Hazard Analysis Critical Control Point (HACCP), and management quality assurance standards, such as ISO 9000, are tools that the players can integrate into current fruit handling systems to improve apple quality management throughout the SA fresh apple export value chain. Finally, packers and exporters need to cooperate more and work together with downstream firms to overcome harbour terminal bottlenecks. The players could also cooperate more in identifying and overcoming gaps in staff training and development throughout the chain.

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Appendix 1A: Questions used to capture SA apple producers' perceptions about the levels of trust, cooperation (joint problem-solving and communication) and commitment between players in the SA fresh apple export value chain.

To what extent do you **agree or disagree** with the following statements regarding your **relationship with your packer** (please mark the appropriate block)?

Statement	**Strongly agree**	**Agree**	**Disagree**	**Strongly disagree**
Trust				
We have a strong personal confidence in each other	❑	❑	❑	❑
We have a strong business confidence in each other	❑	❑	❑	❑
We can always rely on each other when it counts	❑	❑	❑	❑
I believe this packer will work hard in the future to maintain a close relationship with my firm	❑	❑	❑	❑
I am very confident that this relationship will continue in the future	❑	❑	❑	❑
Communication				
We often discuss issues such as changes in technology and market conditions	❑	❑	❑	❑
We have extensive formal and informal communications	❑	❑	❑	❑
We discuss only need-to-know information that relates directly to our relationship	❑	❑	❑	❑
Joint-Problem-Solving				
We make joint decisions about:	❑	❑	❑	❑
Reducing costs in the packhouse	❑	❑	❑	❑
Delivery scheduling	❑	❑	❑	❑
Quality control	❑	❑	❑	❑
In this relationship, both sides work together to achieve productivity gains from which both sides benefit	❑	❑	❑	❑
Commitment				
We devote considerable time trying to improve this relationship	❑	❑	❑	❑
We devote considerable time trying to improve the packer's productivity	❑	❑	❑	❑
We have made a substantial number of adaptations in our delivery schedule in order to deal more effectively with this packer	❑	❑	❑	❑

Appendix 1B: Questions used to capture producers' perceptions about the level of cooperation with packers in key SA fresh apple export value chain activities.

How would you describe the level of **cooperation** between **you and your packer** in the following business activities (please mark the appropriate block)?

Business Activity	Very high	High	Moderate	Low	Very low
Production Planning	❑	❑	❑	❑	❑
Harvest Scheduling	❑	❑	❑	❑	❑
Apple Marketing	❑	❑	❑	❑	❑
Quality Control	❑	❑	❑	❑	❑

Appendix 1C: List of potential constraints that limit the competitiveness of the SA fresh apple export value chain.

In your opinion, what are the **major obstacles** hindering the SA apple export industry from **becoming more competitive**? Rate the following aspects on a scale of 1 (**minor constraint**) to 5 (**major constraint**) and **add** any further factors that you view as important.

Constraint	Score				
	Minor constraint				Major constraint
	1	2	3	4	5
Crime	❑	❑	❑	❑	❑
Production and marketing of inappropriate apple varieties	❑	❑	❑	❑	❑
Lack of foreign investment into SA	❑	❑	❑	❑	❑
Ageing apple exporting infrastructure	❑	❑	❑	❑	❑
Lack of market information	❑	❑	❑	❑	❑
No government export incentives	❑	❑	❑	❑	❑
Restrictive government labour policy	❑	❑	❑	❑	❑
Increased competition from Southern Hemisphere countries	❑	❑	❑	❑	❑
Climatic conditions	❑	❑	❑	❑	❑
High interest rates	❑	❑	❑	❑	❑
Abandoning of fruit handling protocols through the supply chain.	❑	❑	❑	❑	❑
Over-capitalization at packhouses	❑	❑	❑	❑	❑
Lack of training and human development	❑	❑	❑	❑	❑
Harbour terminal bottlenecks	❑	❑	❑	❑	❑
Exporter liquidity problems	❑	❑	❑	❑	❑
Exporter inexperience in international trade	❑	❑	❑	❑	❑
Current levels of investment in research and development (R & D) of apple varieties	❑	❑	❑	❑	❑
Other: Please specify:	❑	❑	❑	❑	❑
Other: Please specify:	❑	❑	❑	❑	❑