Improving Smallholder Navel Orange Farmers Participation in Agricultural Supply Chain: Perceptions from the Officials and Intermediaries in Gannan, China

Rao Zhiwei[1,2], Christopher Gan[3], Satit Aditto[1*] and Yaowarat Sriwaranun[1]

ABSTRACT: The fact that smallholder farmers are not well-structured and well-organized in the agricultural supply chain is well-known. An effort to better understand how to improve smallholder farmers' participation in the agricultural supply chain is an effective approach to increasing their farm income and optimizing the supply chain. Hence, the present study was aimed at developing countermeasures on how to integrate smallholder farmers into the agricultural supply chain. The study employed questionnaires to collect survey data from the officials and intermediaries in Gannan—a region with the highest navel orange production in China. Their concerns and suggestions were assessed with the t-test, providing a thematic summary of the differences in their perceptions. The results of the study revealed the levels of intermediaries' and officials' agreements on the survey items. The intermediaries were much more concerned about the product quality issues while the government officials tended to focus on the recommendations to provide better infrastructure services and brand building to support the Gannan navel orange industry development. Through the analysis of the results, some of the future policy implications relating to the research issue were propounded.

Keywords: smallholder navel orange farmers, agricultural supply chain, perceptions

Introduction

Smallholder farmers confronting several barriers in the agricultural supply chain are documented in many research studies. The farmers usually struggled to meet the private quality and safety standards set by food processors, large retailers, wholesale buyers, and exporters (Marsh and Runsten, 1996). The farmers were constrained by the limited support services provided by governments due to policy reforms, market liberalization, and fiscal and governance problems (Bienabe et al., 2004). The farmers normally had less connection to outside markets and suffered from low profitability, even if smallholder farmers had been experienced market players, globalization has changed the rules of the game significantly (Gadde and Snehota, 2001). Compounding the barriers, Towers and Burnes (2003) revealed that the nature of business competition is changing from company versus company to supply chain versus supply chain. Without supply chain, producers do not have the ability to give customers what, when and where they want. Producers compete with each other through their supply chains, and aim to provide quality products and services to consumers in the most efficient and economical mode (Sahin and Robinson, 2005). Eisenhardt and Tabrizi (1994) emphasized the importance of integrating suppliers into supply chains for industry sustainable development. Ragatz et al.

[1] Department of Agricultural Economics. Faculty of Agriculture. Khon Kaen University. Thailand

[2] Department of Logistics Management. Faculty of Business. Gannan Normal University. China

[3] Department of Accounting, Economics and Finance, Faculty of Commerce, Lincoln University, New Zealand

* Corresponding author: asatit@kku.ac.th

(1997) noted that the effective integration of suppliers into product supply chains will be a key factor for some industries in achieving the improvements necessary to remain competitive. Hendriks and Lyne (2003) emphasized that smallholder farmers must coordinate horizontally in order to link vertically with intermediaries in preferred supply chains, as most smallholder farmers relied on intermediaries for access to the market. Genier, Stamp and Pfitzer (2008) further revealed better integration of the suppliers into the supply chain in agriculture is significant to the sustainable development of agriculture.

Agriculture in Asia is characterized by smallholder farmers cultivating small plots of land. It is estimated that about 87% of the world's 500 million smallholder farmers are in Asia and the Pacific region (Hazell et al., 2007). China accounts for 193 million, and 95% of farms are smaller than 2 hectares (National Commission for Enterprises in the Unorganised Sector, 2008). Zhang and Aramyan (2009) revealed millions of smallholder farmers are not well structured and organized in the Chinese agricultural supply chain, and the most challenging task in the Chinese agricultural supply chain is improving millions of smallholder farmers participation in the chains. In an effort to better understand the issue, this study examines the perceptions that intermediaries and government officials have regarding transactions with smallholder farmers, using smallholder navel orange farmers in Gannan area, China as the context. The objective of the study is to examine the countermeasures affecting smallholder farmers' participation in the supply chain from the perceptions of the intermediaries and the officials. By asking the intermediaries and officials to evaluate the countermeasures, we obtain a more direct indication of their perceptions to the improvement in smallholders' participation. The findings will indicate the respondents' agreement level on the survey items, and assess with t-test providing a thematic summary of their perceptions differences.

Materials and Methods

Study Site

The study was carried out in Gannan area, Jiangxi Province, China. According to The People Government of Ganzhou (2010), Gannan is the largest navel orange planted region in China, and the third largest producing region in the world. It is known as "China's navel orange homeland", with a planted area of 1.6 million mu (106,666 ha) and annual total yield of 1.1 million tons. Gannan consists of 18 counties and cities with a population of 8.45 million. There are 260,000 fruit growing households with approximately 730,000 people who participate in the fruit industry, and 200,000 rural surplus laborers, returning migrant workers and middle-aged laborers employed in the navel orange farms. According to The Statistics Bureau of Ganzhou (2010), the total fruit output in Gannan was CNY¥6 billion (US$0.886 billion), and the income of fruit farmers was CNY¥3,300 (US$487) per capita. Compare with other agriculture, navel orange industry has become the most dynamic and profitable leading agricultural industry in Gannan area.

Data Collection

The items in the survey were developed based on literature and the focus group

discussion with the government officials in Gannan navel orange bureau. The survey questionnaire consists of 32 listed questions, which addressed the countermeasures to improve smallholder farmers' participation in the agricultural supply chain, and focused on gaining and understanding intermediaries and government officials' perceptions. For each of the questions, intermediaries and government officials were asked to rate the agreement level on a five-point Likert scale to investigate their perceptions, where 1 indicated "strongly disagree" and 5 indicated "strongly agree".

The data was collected between April and June of 2012. A total of 50 intermediaries who are involved in the navel orange supply chain were randomly interviewed from the Gannan area. For the government officials' survey, the questionnaires were emailed as an official document to the officers in the Gannan navel orange bureaus and branches under the help of the navel orange bureau director. Sixty-five questionnaires were returned in closed envelopes as a requirement, a total of sixty-two are valid and used for data analysis.

Results and Discussion

Perception of Intermediaries and Government Officials on the Survey Measures

The intermediaries perception scores on the survey items were reported and ranked in descending order of average score from highest to lowest. That indicates how strongly the respondents agree with each item for improving smallholder farmers' participation in the supply chain (**Table 1**). The mean values for the 32 measures rated ranged from 2.50 to 4.72. Since the mean values of 31 items are above 3 (neutral) except the "Brand uniform" item, it can be interpreted that the respondents believed the suggested recommendations to be effective and feasible in general but with different levels of agreement. The five highest score items are "Cultivation technology improvement" (4.72), "Agricultural production materials cost reduction" (4.56), "Brand image protection" (4.52), "Quality system set up" (4.42), and "Market expansion" (4.22).

The sampled intermediaries were rated "Cultivation technology improvement" as the most effective way to improves smallholder farmers' participation in supply chain. Because smallholder farmers are excluded from high value markets due to the low value commodities, which do not meet the private quality standards set by the intermediaries. The second most effective countermeasure as perceived by the respondents was cost reduction of "Agricultural production materials". This is related to the most effective item "Cultivation technology improvement" which could reduce farmer's production cost, it suggested that smallholder farmers would better perform in the marketing channel with high quality products. The other high ranking items like, "Brand image protection", "Quality system set up" and "Market expansion" also focus on the product quality in order to improve the marketing performance. The item "Brand uniform" is unique in the results with the mean score of 2.50. The respondents do not agree the countermeasure that unifying all brands to a uniform brand named "Gannan navel orange" would effective for smallholder navel orange farmers.

Table 1 Descriptive characteristics of survey items from intermediaries (n=50)

	Mean	SD[1]	Rank
Cultivation technology improvement	4.72	0.45	1
Agricultural production materials cost reduction	4.56	0.50	2
Brand image protection	4.52	0.61	3
Quality system set up	4.42	0.50	4
Market expansion	4.22	0.51	5
Wide use of biological pest control	4.14	0.67	6
Transaction cost reduction	4.08	0.53	7
Establishment of early warning and emergency mechanism	4.04	0.28	8
Comply with the contract	4.02	0.43	9
Traffic facilities construction	4.00	0.29	10
International navel orange festival holding	3.98	0.38	11
Develop juice processing industry	3.96	0.57	12
Postharvest processing upgrade	3.94	0.59	13
Develop accessory industries	3.94	0.59	13
Increase information source	3.92	0.27	15
Agriculture insurance service	3.90	0.54	16
Loan policy support	3.86	0.45	17
Information share platform building	3.84	0.42	18
Variety diversification in planting	3.76	0.56	19
Risk sharing	3.68	0.47	20
Scale planting	3.68	0.59	20
Improve pricing power	3.64	0.49	22
Contract farming	3.62	0.49	23
Brand building	3.60	0.70	24
Organic agriculture	3.46	0.68	25
Regular communication keeping	3.42	0.50	26
Land transfer policy support	3.24	0.43	27
Cooperative participation	3.20	0.40	28
Cold warehouses construction	3.16	0.37	29
Develop cooperative	3.14	0.41	30
Sub-brand construction	3.08	0.78	31
Brand uniform	2.50	0.86	32

Items were rated on a five-point Likert scale (1 - strongly disagree; 2 - disagree; 3 - neutral; 4 - agree; 5 - strongly agree)

[1] SD = Standard deviation

Unlike the intermediaries' perceptions, the five highest score items are "Develop juice processing industry" (4.32), "Quality system set up" (4.27), "Traffic facilities construction" (4.27), "Market expansion" (4.26), and "Brand image protection" (4.23). The mean value of all other items is above 3.61, this means the government officials agree that the countermeasures are effective and feasible to improve smallholder farmers participation in the supply chain.The most effective item from the perception of government officials is to "Develop juice processing industry" (**Table 2**). According to Yin (2007), the deep processing such as juice processing or other relevant accessory industries can optimize the industry structure and increase the product added value, and further to bring benefits to the farmers. The second effective item is "Quality system set up", the government officials and intermediaries' perception is similar on this item. They all strongly agree that navel orange quality and a producing area tracing system should be established. "Traffic facilities construction" is also the effective item, government officials strongly agree traffic infrastructure should be strengthened with constructions to make transportation convenience. Marsh and Runsten (1996) revealed the inefficiencies in infrastructure is a significant barrier for smallholder farmers involves higher transaction costs. The establishment of a fruit logistics service system to reduce the transportation cost due to the navel orange farmers' worse orchard location. Besides, government officials consider brand building and brand image protection is very important. A brand is the achievement of all the members in the whole supply chain, and is also for the purpose of maximizing the value of the whole supply chain and taking full advantage of the brand's value added effect. The mean value of the item "Organic agriculture" is the lowest. This indicates that respondents did not believe organic farming is a suitable countermeasure for the smallholder farmers in Gannan navel orange industry.

Comparison of the Respondents Perceptions

All data are presented as mean and standard deviations previously, and t-test were performed to analyze the differences of perceptions between groups. A p value of < 0.05 was considered to be statistically significant. As shown in **Table 3**, the intermediaries and officials hold different views on the majority of the survey items. There are 6 items with negative t value which are significant and include "Increase information source", "Brand image protection", "Comply with the contract", "Organic agriculture", "Agricultural production materials cost reduction", and "Cultivation technology improvement". The intermediaries more strongly agree with the 6 countermeasures compared with government officials. They focus on the countermeasures to improve smallholder farmers' planting technology to further increase the products quality and reduce the cost. According to Gao et al. (2005), intermediaries are the link between smallholder farmers and market in the Chinese agricultural supply chain. Smallholder farmers are passive in relationship with intermediaries due to they have to rely on the intermediaries' marketing channel, and they have difficulty meeting the private quality standards set by intermediaries. It can be interpreted that intermediaries would like to source high quality products from farmers in the supply chain. Bienabe et al. (2004) approved smallholder farmers lack consistency in terms of supplying products to markets in terms of quality and quantity, this is a serious barrier for smallholder farmers to make farm contracts.

Table 2 Descriptive characteristics of survey items from officials (n=62)

	Mean	SD[1]	Rank
Develop juice processing industry	4.32	0.57	1
Quality system set up	4.27	0.58	2
Traffic facilities construction	4.27	0.61	2
Market expansion	4.26	0.57	4
Brand image protection	4.23	0.58	5
Brand building	4.19	0.60	6
Agriculture insurance service	4.19	0.54	6
Develop accessory industries	4.16	0.58	8
Establishment of early warning and emergency mechanism	4.15	0.51	9
Agricultural production materials cost reduction	4.15	0.60	9
Postharvest processing upgrade	4.13	0.67	11
Scale planting	4.11	0.58	12
Cultivation technology improvement	4.11	0.66	12
Loan policy support	4.11	0.58	12
Information share platform building	4.10	0.53	15
Variety diversification planting	4.08	0.73	16
Brand uniform	4.05	0.84	17
International navel orange festival holding	4.03	0.91	18
Cold warehouses construction	4.03	0.65	18
Land transfer policy support	4.02	0.59	20
Widely use of biological pest control	3.95	0.61	21
Transaction cost reduction	3.95	0.66	21
Develop cooperative	3.87	0.69	23
Cooperative participation	3.77	0.69	24
Increase information source	3.71	0.73	25
Comply with the contract	3.71	0.76	25
Regular communication keeping	3.69	0.69	27
Improve pricing power	3.66	0.87	28
Risk sharing	3.66	0.75	28
Sub-brand construction	3.61	0.91	30
Contract farming	3.61	0.91	30
Organic agriculture	2.77	1.18	32

Items were rated on a five-point Likert scale (1 - strongly disagree; 2 - disagree; 3 - neutral; 4 - agree; 5 - strongly agree)

[1] SD = Standard deviation

The government officials more strongly agree with the countermeasures that include “Brand building”, “Cooperative participation”, “Develop cooperative”, “Land transfer policy support”, “Cold warehouses construction”, and “Brand uniform”. There is a large difference from the perceptions of intermediaries and government officials. These above items concentrate on

"Brand construction", "cooperative", and "policy support", which can be summarized to be "Government support". It interpreted that government officials tend to offer government support to improve smallholder farmers' participation in the supply chain from their perceptions. Baloyi (2010) noted smallholder farmers can only have market power if they form cooperatives, which should be established with the help of the government. D'Hease and Kirsten (2003) revealed efficiencies in infrastructure may facilitate the barrier of transaction cost. Srivastava and Shocker (1991) documented that the value of a brand name can be measured in terms of not only the advantages it provides in its present competitive arena but also the potential advantages it offers in untapped markets.

As Tables 1-3 show, the respondents have their own perceptions in considering the suitable recommendations to smallholder farmers. It also depend on their position in the supply chain, Guo (2008) documented that government is the governing position in the supply chain, and intermediaries are the link between farmers and market as mentioned above. The analysis results indicates that the principal areas of the respondents' concern. As a whole, intermediaries are much more concerned about the product quality issues that direct link between smallholder farmers and them. They suggested smallholder farmers should improve the products quality and total yield through improve cultivation technology, and reduce production costs, it could makes them have more chance to access to the high value market. Government officials are more tend to focus on the recommendations for industry development from a holistic view, and further benefit the smallholder farmers. They emphasized government should provide better infrastructure service and brand building construction to support the Gannan navel orange industry development.

Policy Implication

According to the participants' agreements on the survey items, in summary, to improving smallholder navel orange farmers participation in the supply chain, government should continue to support the navel orange industry in its efforts to maintain a dynamic and competitive agricultural industry, due to government is the governing position in the agricultural supply chain.

Firstly, government should reinforce the cultivation technology training among the smallholder farmers. Most of the smallholder holder farmers are low educated in Gannan, it results in poor new planting technology confronting them. Due to lack of the cultivation technology, smallholder farmers always produce the poor quality products, or the percentage of the high quality products is too low. On the contrary, smallholder farmers cannot effectively control and prevent the plant diseases and insect pests instead of the chemical pesticide are widely used. In according with the interview with navel orange farmers, some of them ever used trapping lamp in their orchards. But they do not know how to use it properly, on the contrary more and more insects are attracted to the orchards. Cultivation technology training is not only can help smallholder farmers to produce high quality products, but also for the prevention and control of plant diseases and insect pests.

Table 3 Comparison of the perspectives between intermediaries and officials

	t-value	*P-value*	Sig.
Improve pricing power	0.16	.87	NS
Market expansion	0.37	.71	NS
International navel orange festival holding	0.41	.68	NS
Establishment of early warning and emergency mechanism	1.39	.16	NS
Postharvest processing upgrade	1.58	.11	NS
Contract farming	-.05	.95	NS
Risk sharing	-.15	.87	NS
Transaction cost reduction	-1.11	.26	NS
Quality system set up	-1.41	.161	NS
Widely use of biological pest control	-1.55	.12	NS
Develop accessory industries	2.00	.04	*
Regular communication keeping	2.35	.02	*
Loan policy support	2.59	.01	*
Variety diversification planting	2.56	.01	*
Information share platform building	2.77	.00	**
Agriculture insurance service	2.86	.00	**
Traffic facilities construction	3.16	.00	**
Sub-brand construction	3.28	.00	**
Develop juice processing industry	3.36	.00	**
Scale planting	3.92	.00	**
Brand building	4.76	.00	**
Cooperative participation	5.50	.00	**
Develop cooperative	6.99	.00	**
Land transfer policy support	7.81	.00	**
Cold warehouses construction	8.42	.00	**
Brand uniform	9.59	.00	**
Increase information source	-2.09	.04	*
Brand image protection	-2.59	.01	*
Comply with the contract	-2.74	.00	**
Organic agriculture	-3.86	.00	**
Agricultural production materials cost reduction	-3.93	.00	**
Cultivation technology improvement	-5.56	.00	**

Variables and models significant at $P<0.05(^{*})$, $P<0.01(^{**})$, or Not Significant at $P>0.05$ (NS)

Secondly, the information platform should be provided under the government's guidance. This is, because information platform can provide a lot of demand information to smallholder navel orange farmers, and to expand their market channel. Marketing is always the big problem to smallholder farmers due to they are lack of information source and marketing channel, the construction of the information sharing platform can help the smallholder farmers have more opportunities to access to the market. On the other hand, through the sharing of the information platform, the government can realize monitoring the entire journey of market. It may makes each kind of information of market supervision public, fair, transparent, and the access market mechanism strict, standard, so that the quality of products can be guaranteed effectively.

Lastly, farming insurance should be offer to the smallholder farmers as one of the government's priorities. Farming insurance is an efficient instrument to facilitate smallholder farmers' losses when they suffer from serious natural disasters. But, the insurance companies would not like to offer the farming insurance to the farmers due to the high risk and low return. Therefore, Government should makes greater efforts to promote the insurance companies to offer the farming insurance business to the smallholder farmers, and help the smallholder farmers can easy to receive the insurance indemnity by administrative intervention.

Conclusions and Limitations

Smallholder farmers are not well structured and organized in the supply chain, along with today's business competition mode changing to supply chain versus supply chain a decade ago. This study has shown the countermeasures to improve the smallholder farmers' participation in the supply chain from the perceptions of intermediaries and government officials. Due to stand in different positions in the supply chain, intermediaries are concerned smallholder farmers should improve their planting technology and reduce the production cost to increase their income. The good quality products can help smallholder farmer access to the high value market, easy to sell the products, and then creates more profit. The governments officials are concentrate on the countermeasures relate to the government support behaviors. Juice processing industry is the most important item they concerned. Processing industry can effective facilitate the most difficult marketing question, increase the value added of the products and promote the industry upgrading. Like intermediaries, they also considered product quality improvement is important to better help smallholder farmers participate in the supply chain. According to the analysis of the results, policies including cultivation technology training, information platform constructing, and farming insurance providing are suggested to be the future work to improve the smallholder farmers' participation in the agricultural supply chain.

Our research does have its limitations, the data was collected from the intermediaries and the government officials in the agricultural supply chain, and future studies could be better if included the other key participants' perceptions. Moreover, the sample size is limits the application of other methods. Finally, the generalizability of the results could be not general due to the specific study region.

Acknowledgements

My gratitude to Khon Kaen University for the financial support for the study. I am grateful to Associate Professor Dr. Yupa Hanboonsong, Professor Dr. Christopher Gan, Dr. Satit Aditto, and Dr. Yaowarat Sriwaranun for providing significant critique and suggestions in the study. Thanks to the officials and the intermediaries for their participation in the survey research.

References

Baloyi, J.K. 2010. An analysis of constraints facing smallholder farmers in the agribusiness value chain: A case study of farmers in the Limpopo Province. M.S. Thesis. Pretoria: University of Pretoria, Pretoria.

Bienabe, E., C. Coronel, J. Lecoq, and L. Liagre. 2004. Linking smallholder farmers to markets: lessons learnt from literature review and analytical review of selected projects. Breton: World Bank.

D'Haese, L., and J.Kirsten. 2003. Rural development: focusing on small scale agriculture in Southern Africa. Department of Agricultural Economic Extension and Rural Development, University of Pretoria, Pretoria.

Eisenhardt, K.M., and B.N.Tabrizi. 1994. Accelerating adaptive processes: product innovation in the global computer industry. Administrative Science Quarterly. 40(1): 84-110.

Gadde, L.E., and I.Snehota. 2001. Rethinking the role of middlemen. Paper for Industrial Marketing and Purchasing Conference 2001. BI Norwegian School of Management, Oslo. P. 9-11.

Gao, B., C. L. Zhuang, and Z.T.Fu. 2005. Vegetable supply chain in China: current structure and components analysis. China Agricultural University, Beijing, China.

Genier, C., M. Stamp, and M. Pfitzer. 2008. Corporate social responsibility in the agri-food sector: harnessing innovation for sustainable development. Available: www.sustainablefoodlab.org. Accessed Aug. 6, 2012.

Guo, L.L. 2008. Study on the construction of Gannan navel orange supply chain. Nanchang University, Nanchang.

Hazell, P., C. Poulton, S. Wiggins, and A. Dorward. 2007. The future of small farms for poverty reduction and growth. Washington: International Food Policy Research Institute.

Hendriks, S.L., and M.C.Lyne. 2003. Agricultural growth multipliers for two communal areas of KwaZulu-Natal. Development Southern Africa.

Marsh, R.R., and D.Runsten. 1996. The potential for small-holder fruit and vegetable production in Mexico: barriers, opportunities, and an alternative model. NAFTA and Agriculture.

National Commission for Enterprises in the Unorganised Sector. 2008. A special programme for marginal and small farmers. New Delhi, India.

Ragatz, G.L., R.B. Handfield, and T.V. Scannell. 1997. Success factors for integrating suppliers into new product development. J Prod Innovat Manag. 14: 190-202.

Sahin, F., and E. P. Robinson. 2005. Information sharing and coordination in make-to-order supply chains. Journal of Operations Management. P. 579-598.

Srivastava, R.K., and A.D.Shocker. 1991. Brand Equity: A perspective on its meaning and measurement. Marketing Science Institute, Cambridge.

Statistics Bureau of Ganzhou. 2010. Ganzhou Statistical Yearbook 2010. Ganzhou, Jiangxi.

The People Government of Ganzhou. 2010. Ganzhou Government Report 2010. Available: http://www.ganzhou.gov.cn/zwgk/. Accessed Aug. 16, 2012.

Towers, N., and B.Burnes. 2003. A conceptual model of supply chain flexibility management and enterprise planning for small and medium-sized manufacturing enterprises. Supply Chain Management: An International Journal. 13(5): 349-355.

Zhang, X.Y., and L.H. Aramyan. 2009. A conceptual framework for supply chaingovernance: An application to agri-food chains in China. China Agricultural Economic Review. 1(2): 136-154.