Exploring factors related to entrepreneurial orientation and innovation capacity of farm-firms: A lesson from vegetable farmers in West Java, Indonesia

Etriya[1,3*] ,Victor Scholten[2], Emiel Wubben[1] , Onno Omta[1]

[1]*Wageningen University, Management Studies, Hollandseweg 1, 6706 KN Wageningen, The Netherlands*
[2]*Delft University of Technology, Department of Technology, Strategy and Entrepreneurship, Faculty of Technology, Policy and Management, The Netherlands*
[3]*Bogor Agricultural University, Department of Agribusiness, Faculty of Economics and Management, Indonesia*

Abstract

Emerging modern supply-chain attracted farmers to participate in the supply-chain channels by improving the product quality through implementing innovation. Modern supply-chain provides farmers with several option of marketing channels, that may stimulate farmers to be more entrepreneurial. Our study aims to investigate relationship between dimensions of entrepreneurial orientation and innovation capacity to human resources, physical assets, networks, governance type, and regions. Data collection was conducted by using a survey with 282 samples in five regions in West Java, i.e. Pangalengan, Cisarua, Warung Kondang, Cipanas, and Bogor. Findings show that education of farm-firm owner, farm size, and network heterogeneity positively influence entrepreneurial orientation and somewhat in innovation capacity. Governance type in terms of contract farming, cooperative, and autonomy does not influence entrepreneurial orientation and innovation capacity. It shows that human resources, physical assets, and external networks play an important role in building entrepreneurship and innovation.

Keywords: contract farming, cooperative, autonomy, physical assets, human resources.

*Corresponding author: Etriya. E-mail: etriya.etriya@wur.nl; etriya@yahoo.com

Introduction

Emerging modern food supply-chain like supermarkets and food processors have attracted farmers to participate in the supply-chain channels by improving the product quality through implementing innovation. Modern supply-chain provides farmers with several option of marketing channels, that may stimulate farmers to be more entrepreneurial and innovative.

There a two ways where farmers can link to this modern supply chain. First, through contract farming where farmers have contractual agreement with buyers. The contractor buyers can provide certain innovation to the farmers. Second, through cooperative where the cooperative aggregate the farmers' products. The cooperatives facilitate the members to deal with buyers then the cooperative organize the members how to fulfill the buyers' requirement. Some other farmers decide not to join either in contract farming or cooperative. They prefer to be independent to sell their products without any obligation to fulfill certain requirement.

Most studies on innovation benefit for farmers have concentrated on innovation adoption and diffusion with individual farmers as a unit of analysis. On the other hand, the majority of studies on innovation management focus on large firms, and on the cooperation of large firms (Pannekoek, van Kooten et al. 2005). Not many studies are conducted to innovation on farmers as firms and its entrepreneurial orientation. Our study will fill this gap by concentrating on innovation capacity and entrepreneurial orientation of small farm-firms. Our study aims to investigate what factors influence entrepreneurial orientation and innovation capacity of farm firms. We focus on factors of human resources, physical assets, network heterogeneity, governance type, and regions.

Literature review

Entrepreneurial orientation

Entrepreneurship focuses on exploring and exploiting opportunities by constructing current and new resources to create values (Zahra 2005). Study on entrepreneurship has developed widely in many different levels, from individuals, groups, to firms. The concept of entrepreneurial orientation addresses at the firm level that is consistent with classical economics regarded an individual entrepreneur as a firm. Small firm is an extension of the individual entrepreneur who leads the firm (Lumpkin and Dess 1996).

Study on entrepreneurial orientation is built upon investigation on its dimension. Previous studies construct the dimension differently. The initial concept developed by Lumpkin and Dess (1996) suggests five dimension of an entrepreneurial orientation: autonomy, innovativeness, risk taking, proactiveness, and competitive aggressiveness. Further studies elaborate the dimensions differently. For instance, some studies concentrate on two dimensions, such as proactiveness and competitive aggressiveness (Lumpkin and Dess 2001) and proactiveness and risk taking (Grande, Madsen et al. 2011). Another study focuses on three dimensions: innovativeness, proactiveness, and risk taking (Avlonitis and Salavou 2007). Because our study is conducted in small farm

firms that show characteristics as simple firms (Miller 1983), we follow innovativeness, risk taking, and proactiveness as the dimension of entrepreneurial behavior that relevant for this context (Grande, Madsen et al. 2011).

Innovation capacity

Literature generally defines innovation as the exploration and exploitation of new ideas or things in organization as a product, service, production method, market, or organizational structure (Pérez-Luño, Wiklund et al. 2011). This paper concentrates the innovation as product and process innovation. Newness is the essential element on innovation concept and we can find this is relative. An innovation can be new to an adopter, but it can be not to others.

We address the innovation capacity as innovation adoption, knowledge generation, and innovation resources. Innovation adoption refers to the decision of a firm to acquire and utilize an idea, practice, object, knowledge, and technology from external providers that is perceived as new by adopters (Rogers 1995; Diederen, Van Meijl et al. 2003; Pérez-Luño, Wiklund et al. 2011). Innovation adoption depends on existing knowledge that involves exploitation processes such as selection, refinement, and execution (March 1991). As an adopter, a firm depends on the knowledge that is owned by other firms or organizations in the market (Pérez-Luño, Wiklund et al. 2011).

Research Method

To learn entrepreneurial orientation and innovation capacity, we chose vegetable farmers in West Java because the farmers have integrated to modern supply chain and have applied certain innovations who are relatively faster than other-crops farmers. We conducted a survey over the period of January –August 2012 in five regions in West Java. The regions are Pangalengan, Cisarua, Warung Kondang, Cipanas, and Bogor. These regions are the centers of vegetable production in West Java. A total of 282 vegetable farm firms were interviewed by using a semi-structured questionnaire with face to face interviews. We divided the farm firms as three types of governance, i.e. contract farmers, cooperative farmers, and autonomous farmers. Contract farmers are the farm firms who have contractual agreement with buyers, cooperative farmers who aggregate their products to the cooperatives, and autonomous farmers who both have no contract deal with any buyer and do not aggregate their products to the cooperative.
We measure dimensions of entrepreneurial orientation in terms of innovativeness, proactiveness, and risk taking with a nine-item, 7-point Likert-type scale (Covin and Slevin 1990). We measure innovativeness with questions related to R&D, new products, and radical changes; proactiveness with questions related to initiative, pioneer, and competitiveness; risk taking with questions related to high-risk project, obtaining objectives, and exploring new opportunity.

We developed questions with a seven-item, 7-point Likert-type scale, and two-item, ratio scale, to measure innovation capacity based on our in-depth studies of vegetable farm-firms that have been carried out between July-December 2011. This measure is based upon farm-firms' innovation activities and resource allocation for innovation.

We carried out descriptive analysis, factor analysis, and regression analysis to analyze the data in detail. The descriptive analysis provides description of entrepreneurial orientation and innovation capacity for different type of governance (contract farming, cooperative, and autonomy). We conduct Kruskal-Wallis test followed by Mann-Whitney test to check the differences among three governance types upon entrepreneurial orientation and innovation capacity. To reduce the dimension of entrepreneurial orientation and innovation capacity, we conducted factor analysis with principle component analysis. We found one factor for entrepreneurial analysis and three factors for innovation capacity, i.e. innovation generation, innovation adoption, and innovation resources. We treated each factor as dependent variable for regression analysis to measure the influence of education of farm firm owner as human resources, farm size as physical assets, network heterogeneity, governance type, and regions. We conducted stepwise regression to check the influence of each factor on model determination.

Result and discussion

Table 1 shows the descriptive statistics of dimensions of entrepreneurial orientation based on governance type, and the difference test between two groups. In general, contract farmers have higher mean score for all dimensions than cooperative farmers and autonomous farmers. The mean score that higher than 3.5 (the middle score of 7-point Likert-type scale) are innovativeness in R&D and radical changes, and risk taking in obtaining objectives and exploiting new opportunities. There is no mean score of proactiveness that higher than 3.5. It means that in general the samples are less proactive or very few of farmers who are highly proactive. On most dimensions are there significant difference between contact farmers, cooperative farmers, and autonomous farmers, except new products and competitiveness.

Table 1. Descriptive statistics of dimensions of entrepreneurial orientation

Dimension1	Contract farmers N=91		Cooperative farmers N=80		Autonomous farmer N=111		Mann-Whitney sig.		
	Mean	Stdev.	Mean	Stdev.	Mean	Stdev.	CTF vs COF	CTF vs AF	COF vs AF
Innovativeness									
R&D	3.82	1.66	2.39	1.45	3.10	1.63	***	***	***
New products	2.91	1.70	1.76	.86	1.69	1.06	***	***	
Radical changes	3.77	1.60	2.38	1.34	3.01	1.62	***	***	***
Proactiveness									
Initiative	3.43	2.19	1.78	1.55	2.85	2.35	***	***	***

Dimension1	Contract farmers N=91		Cooperative farmers N=80		Autonomous farmer N=111		Mann-Whitney sig.		
	Mean	Stdev.	Mean	Stdev.	Mean	Stdev.	CTF vs COF	CTF vs AF	COF vs AF
Pioneer	2.70	1.87	1.36	1.01	2.03	1.65	***	***	***
Competitive	3.13	1.61	2.20	1.05	2.76	1.21	***		***
Risk taking									
High risk projects	3.22	1.79	2.00	1.02	2.22	1.68	***	***	***
Braveness in obtaining objectives	4.00	2.02	2.33	1.59	3.45	2.17	***	**	***
Braveness in exploiting new opportunities	3.97	1.83	2.00	1.02	2.80	1.68	***	***	***

1: Likert's scale (1-7); Statistic significant: *** indicates p<.01, ** indicates p<.05; N=282; CTF=contract farmer; COF= cooperative farmer; AF=autonomous farmer

Table 2 provides the descriptive statistics of innovation capacity based on governance type, and the difference test between two groups. Contract farmers show the highest score on most variables, especially on innovation adoption. There are significant difference among three governance type, except farm-equipment adoption, seed adoption, pesticide generation, and farm-technique generation.

Table 2. Descriptive statistics of dimensions of innovation capacity

Dimension	Contract farmers N=91		Cooperative farmers N=80		Autonomous farmer N=111		Mann-Whitney sig.		
	Mean	Stdev.	Mean	Stdev.	Mean	Stdev.	CTF vs COF	CTF vs AF	COF vs AF
Innovation adoption									
New-seed adoption	5.37	1.58	4.40	1.29	4.10	1.73	***	***	
Farm-techniques	4.68	1.75	3.63	.92	3.63	1.56	***	***	**

	Contract farmers N=91		Cooperative farmers N=80		Autonomous farmer N=111		Mann-Whitney sig.		
Dimension	Mean	Stdev.	Mean	Stdev.	Mean	Stdev.	CTF vs COF	CTF vs AF	COF vs AF
adoption									
Farm-input adoption	4.92	1.61	3.90	.88	3.97	1.43	***	***	
Farm-equipment adoption	1.97	1.81	1.65	1.48	1.75	1.42			
Knowledge generation									
Fertilizer Formulation	2.86	2.13	1.81	1.37	2.47	1.93	***	***	
Pesticide formulation	2.08	1.97	1.21	.67	2.20	1.93	***		***
Farm techniques	3.05	2.20	1.50	1.08	2.48	1.84	***		***
Farm size for trials (ha)	.11	.20	.02	.08	.08	.19	***	***	***
Trial costs (000 US$)	.61	1.74	.44	1.32	.47	1.22	***	***	

  Statistic significant: *** indicates $p<.01$, ** indicates $p<.05$; N=282; CTF=contract farmer; COF= cooperative farmer; AF=autonomous farmer

We conducted factor analysis with principle component analysis to reduce the dimensions of entrepreneurial orientation and variables of innovation capacity. We found one factor for entrepreneurial orientation and three factors for innovation capacity. Table 4 provides factor loadings of entrepreneurial orientation, and table 5 presents factor loadings of innovation capacity.

Table 4. Factor loadings of entrepreneurial orientation

Dimension	Entrepreneurial orientation
	Factor loadings
R&D	.872
New products	.501
Radical changes	.775
Initiative	.718

Dimension	Entrepreneurial orientation
	Factor loadings
Pioneer	.779
Competitive	.788
High risk project	.780
Obtaining objectives	.751
Exploiting opportunities	.715

N=282

We carried out a factor analysis with principle component analysis to regroup nine variables of innovation capacity into three factors. The first factor is knowledge generation with variables generation of fertilizer formula, pesticide formula, and farm techniques. The second factor is innovation adoption with variables adoption of seeds, farming techniques, and farm inputs. The third factor is R&D resources with variables farm size for trials, trial expenses, and farm equipment.

Table 5. Factor loadings of innovation capacity

Dimension	Knowledge generation	Innovation adoption	Innovation resources
		Factor loadings	
Fertilizer generation	.819		
Pesticide generation	.843		
Farm-technique generation	.782		
Seed adoption		.811	
Farming-technique adoption		.831	
Farm input adoption		.785	
Farm equipment			.618
Farm size for trials (ha)			.558
Trial expenses (000 US$)			.866

N=282

We carried out stepwise regression analysis with dependent variables are factor of entrepreneurial orientation, knowledge generation, innovation adoption, and innovation resources. We measure the influence of education, farm size, network heterogeneity, governance type, and regions on the four factors. Table 6 presents the determinant of entrepreneurial orientation, and Table 7 provides the determinant of innovation capacity.

Table 6. Determinant of entrepreneurial orientation

Independent variable	Step 1	Step 2	Step 3	Step 4	Step 5
	Beta	Beta	Beta	Beta	Beta
Education (year)	.139**	.117**	.068**	.069**	.042**
Farm size (ha)		.099**	.079**	.077**	.070**
Network heterogeneity			.408**	.341**	.281**
Governance type (dummy 1) Contract farmer				.234*	.135
Governance type (dummy 2) Cooperative farmer				-.296**	-.009
Dummy 1 region Pangalengan					.158
Dummy 2 region Cisarua					.217
Dummy 3 region Warung Kondang					-.617**
Dummy 4 region Cipanas-Pacet					-.199
R^2	.289	.363	.557	.593	.649
Adjusted R^2	.286	.359	.552	.586	.637
Sig. F change	**	**	**	**	**

Statistic significant: ** indicates $p<.01$, * indicates $p<.05$; N=282

The regression analysis shows that farm firms who the owners with higher formal education are higher in entrepreneurial orientation. Farm firms with larger size are greater in entrepreneurial orientation. Farm firms who have more heterogeneous networks are higher in entrepreneurial orientation. Formal education, farm size, and network heterogeneity provide the farm firm with sufficient knowledge, resources, and supports to be more innovative, more proactive, and more risk taking. However, farm firms who are located in Warung Kondang are low in entrepreneurial orientation,

because difficult access to this region makes the farm firms have less opportunity to explore more markets and innovation.

The following tables present the stepwise regression analysis of innovation capacity with dependent variables are factor knowledge generation, innovation adoption, and R&D resources. Table 7 shows that farm firms that are located in Pangalengan and Cisarua have positive influence to knowledge generation.

Table 7. Determinant of knowledge generation

Independent variable	Step 1	Step 2	Step 3	Step 4	Step 5
	Beta	Beta	Beta	Beta	Beta
Education (year)	.104**	.086**	.074**	.072**	.016
Farm size (ha)		.082**	.077**	.073**	.019
Network heterogeneity			.097*	.056	.012
Governance type (dummy 1) Contract farmer				.015	.073
Governance type (dummy 2) Cooperative farmer				-.442**	-.047
Dummy 1 region Pangalengan					1.497**
Dummy 2 region Cisarua					.511*
Dummy 3 region Warung Kondang					-.040
Dummy 4 region Cipanas-Pacet					.033
R2	.160	.212	.261	.261	.518
Adjusted R2	.206	.206	.214	.247	.502
Sig. F change	**	**	*	**	**

Statistic significant: ** indicates p<.01, * indicates p<.05; N=282

Table 8 presents that the higher the education of farm-firm owner the more they adopt innovation. The more heterogeneous the network that the firms have, the more they adopt innovation. Contract farmers shows positive influence to innovation adoption because the buyer may support the farmers with innovation or the buyer requirement stimulate farmers to adopt more innovation. Farmers who are located in Pangalengan show low in innovation adoption

Table 8. Determinant of innovation adoption

Independent variable	Step 1	Step 2	Step 3	Step 4	Step 5
	Beta	Beta	Beta	Beta	Beta
Education (year)	.061**	.056**	.021	.028	.044**
Farm size (ha)		.021	.007	.011	.032
Network heterogeneity			.297**	.199**	.199**
Governance type (dummy 1) Contract farmer				.670**	.669**
Governance type (dummy 2) Cooperative farmer				.245	.061
Dummy 1 region Pangalengan					-.571**
Dummy 2 region Cisarua					.014
Dummy 3 region Warung Kondang					-.027
Dummy 4 region Cipanas-Pacet					-.211
R2	.055	.059	.162	.231	.267
Adjusted R2	.052	.052	.153	.217	.243
Sig. F change	**		**	**	**

Statistic significant: ** indicates p<.01, * indicates p<.05; N=282

Table 9 presents the determinant of innovation resources. farm firms who have higher farm size have more have more innovation resources. It make them possible to allocate part of their farm land or working capital for trials. Farm firms who have more heterogeneous networks have more innovation resources. The networks stimulate the farm firms to allocate their resources for innovation. Farm firms in Cisarua show have more innovation resources.

Table 9. Determinant of innovation resources

Independent variable	Step 1	Step 2	Step 3	Step 4	Step 5
	Beta	Beta	Beta	Beta	Beta
Education (year)	.071**	.056**	.040*	.038*	.029
Farm size (ha)		.064**	.058**	.058**	.089**
Network heterogeneity			.138**	.183**	.126*
Governance type (dummy 1) Contract farmer				-.219	.009
Governance type (dummy 2) Cooperative farmer				.074	-.091
Dummy 1 region Pangalengan					-.367
Dummy 2 region Cisarua					1.174**
Dummy 3 region Warung Kondang					.022
Dummy 4 region Cipanas-Pacet					-.115
R2	.074	.106	.128	.140	.289
Adjusted R2	.070	.099	.118	.124	.266
Sig. F change	**	**	**		**

Statistic significant: ** indicates p<.01, * indicates p<.05; N=28

Conclusion

The paper explore what factors influence entrepreneurial orientation and innovation capacity. The evidence shows that education, farm size, and network heterogeneity have an positive influence to entrepreneurial orientation, and somewhat influence innovation capacity. The type governance of contract farming provides positive influence on innovation adoption. Regarding regions, farm firms in Warung Kondang show negative influence to entrepreneurial orientation, farm firms in Pangalengan show negative influence to innovation adoption, and farm firms in Cisarua show positive influence to innovation resources.

References

Avlonitis, G. J. and H. E. Salavou (2007). "Entrepreneurial orientation of SMEs, product innovativeness, and performance." Journal of Business Research 60(5): 566-575.

Covin, J. G. and D. P. Slevin (1990). "New venture strategic posture, structure, and performance: An industry life cycle analysis." Journal of Business Venturing 5(2): 123-135.

Diederen, P., H. Van Meijl, et al. (2003). "Modernisation in agriculture: what makes a farmer adopt an innovation?" International Journal of Agricultural Resources, Governance and Ecology 2(3): 328-342.

Grande, J., E. L. Madsen, et al. (2011). "The relationship between resources, entrepreneurial orientation and performance in farm-based ventures." Entrepreneurship and Regional Development 23(3-4): 89-111.

Lumpkin, G. T. and G. G. Dess (1996). "Clarifying the entrepreneurial orientation construct and linking it to performance." The Academy of Management Review 21(1): 135-172.

Lumpkin, G. T. and G. G. Dess (2001). "Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and industry life cycle." Journal of Business Venturing 16(5): 429-451.

March, J. G. (1991). "Exploration and Exploitation in Organizational Learning." Organization Science 2(1): 71-87.

Miller, D. (1983). "The Correlates of Entrepreneurship in Three Types of Firms." Management Science 29(7): 770-791.

Pannekoek, L., O. van Kooten, et al. (2005). "Entrepreneurial innovation in chains and networks in Dutch greenhouse horticulture." Journal on Chain and Network Science 5(1): 39-50.

Pérez-Luño, A., J. Wiklund, et al. (2011). "The dual nature of innovative activity: How entrepreneurial orientation influences innovation generation and adoption." Journal of Business Venturing 26(5): 555-571.

Rogers, E. M. (1995). Diffusion of innovations. New York, Free Press.

Zahra, S. A. (2005). "Entrepreneurial risk taking in family firms." Family Business Review 18(1): 23-40.